JBOS

The Journal of Bangladesh Orthopaedic Society

January 2022 Volume 37 Number 1

ISSN 1998-6602

The Journal of Bangladesh Orthopaedic Society (JBOS)

Published by

BANGLADESH ORTHOPAEDIC SOCIETY

The Journal of Bangladesh Orthopaedic Society (JBOS)

JOURNAL COMMITTEE 2018 - 2020

Chairman		Prof. Ramdew Ram Kairy
Editor	:	Dr. Md. Golam Sarwar
Associate Editor	:	Dr. Kazi Shamim Uzzaman
Assistant Editor	:	Dr. Mohammad Mahfuzur Rahman Dr. Mohammad Moazzam Hossain
Members	:	Dr. Md. Wahidur Rahman Dr. Monaim Hossen Dr. Md. Jahangir Alam Dr. Maftun Ahmed Dr. Moinuddin Ahmed Choudhury Dr. Md. Rezaul Karim Dr. Md. Mohiuddin

BANGLADESH ORTHOPAEDIC SOCIETY (BOS)

Executive Committee (2018 - 2020)

President	:	Dr. Md. Abdul Gani Mollah
Vice President (Dhaka City)	:	Dr. Monaim Hossen Dr. S.M. Amir Hossain
Vice President (Outside Dhaka City)	:	Dr. A.S.M. Jahangir Chowdhury Titu Dr. Ishtiaque Ul Fattah
Secretary General	:	Dr. Md. Wahidur Rahman
Treasurer	:	Dr. Md. Jahangir Alam
Joint Secretary	:	Dr. A.K.M. Zahiruddin
Publication Secretary	:	Dr. Md. Golam Sarwar
Organizing Secretary	:	Dr. Md. Aminul Haque Pathan (Dhaka) Dr. Md. Mizanur Rahman Chowdhury (Chittagong) Dr. Md. Rezaul Alam (Jewel) (Rajshahi) Dr. Md. Mehedi Newaz (Khulna) Dr. Md. Moniruzzaman Shahin (Barisal) Dr. Shankar Kumar Roy (Sylhet) Dr. Md. Mostafizur Rahman (Suzon) (Rangpur) Dr. Md. Matiur Rahman (Mymenshingh)
Office Secretary	:	Dr. Mohammad Mahfuzur Rahman
Secretary International Affairs	:	Dr. Md. Abdus Sabur
Scientific Secretary	:	Dr. Kazi Shamim Uzzaman
Social Welfare Secretary	:	Dr. Mohammad Khurshed Alam
Members	:	Dr. Kh. Abdul Awal Rizvi Dr. Md. Iqbal Qavi Dr. Ramdew Ram Kairy Dr. M. Amjad Hossain Dr. Md. Anisur Rahman Labu Dr. ABM Golam Faruque Dr. Mohammad Moazzem Hossain Dr. Riad Majid Dr. Moinuddin Ahmed Choudhury Dr. A. M. Fasiul Alam Dr. Molla Mizanur Rahman (Kallol)
Immediate Past President	:	Dr. Md. Abdul Gani Mollah
Immediate Past Secretary General	:	Dr. Syed Shahidul Islam (Shahid)

INFORMATION TO CONTRIBUTORS

The Journal of Bangladesh Orthopaedic Society is published twice in a year in the month of January and July. Articles are received throughout the year in the office of BOS, NITOR, Dhaka. Acknowledgement receipt may be taken from the office. Letter of acceptance will be given on demand after initial scrutiny of the paper by the Journal committee. If any paper is found to be copied, pirated or not a genuine works as claimed by the author, will be discarded automatically without information. Authors are requested to follow the instructions outlined below:-

Preparation of manuscript:

Manuscript should be typed on white A4 size paper with liberal margins and double spacing and on one side of the paper only. Pages are to be numbered consecutively beginning with the title page & not exceeding six (6) pages.

Title page:

The title page should contain the title of the study of investigation and abstract, mentioning basic procedures, main findings, principal conclusions and keywords.

Text:

The text of the article should be divided into introduction, materials & methods, results, discussion and conclusion.

Tables & Illustrations:

Each table or illustration is to be typed on a separate sheet & numbered in roman numbers & attached at the end of the text.

Photographs should be clear, glossy and in black & white preferably. Top of the picture should be indicated by arrow sign (T). Diagrams & graphs are to be drawn by jet black ink or printed by laser printer in white sheet.

References:

References are to be numbered consecutively in the order in which they appear in the text. The form of references should be as per examples below:-

a) References for journal:- References should be written according to the following sequence-authors name, topic, name of the journal with year of publication, volume number, page numbers e.g: Ratliff ABC. Truamatic Separation of the upper femoral epiphysis in Children. J.B.J.S. (Br.) 1968. 5013:57507-70.

When there are seven authors or more the first three names will be listed & then the word 'et. al' to be added.

b) References for Complete books:

Sequence for references are - authors name, name of book, number of edition, Publishers name, Year of Publication, Page e.g: Adams J.C. Outline of Orthopaedic. 9th edition Churchill Livingstone 1981. 347.

c) Reference of articles of Magazines

Sequence of reference are - authors name, name of subject, name of magazine, year & date, Pages e.g: Zachary R.B. Result of nerve suture M. Seddon H.S. Ed. Peripheral Nerve injuries. MRC Special Report Series No. 282. London. 1954 3 5c4-88.

Authors may submit the article composed in Microsoft Word as in the journal format in two columns with pictures and diagrams. 3 copies of printed article to be submitted at Bangladesh Orthopaedic Society office along with soft copy composed in Microsoft Word in a CD or data can be transferred by pendrive or by e-mail. Original copies & digital photos in JPEG format to be attached in a separate folder.

Articles are accepted for Publication on the condition that they are contributed solely to this journal.

Address of Bangladesh Orthopaedic Society Office:
National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR)
Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh.
Tele-Fax: +88 - 02 - 9135734
PABX: +88 - 02 - 9144190-4, Ext-280
Mobile: +88 - 01917-665140
web: www.bosbd.org
e-mail: bos_bdortho@yahoo.com,

FORWARDING LETTER FOR SUBMISSION TO JBOS

Date.....

To

The Editor

Dr. .....

The Journal of Bangladesh Orthopaedic Society (JBOS)

Sub: Submission of manuscript

Dear Sir,

We are submitting our manuscript entitled**,** ..... by, ... [1], ... [2], ... [3], ... [4], ... [5]. for publication in your journal. This article **has not been published or submitted for publication elsewhere.**

We believe that this article may be of value to medical professionals engaged in Orthopaedic Surgery & related subjects/..... We are submitting 3 copies of manuscript along with an electronic version (CD).

We therefore, hope that you would be kind enough to consider our manuscript for publication in your journal **as original / Review article / Case Report**.

Thanks and best regards

(1)

Professor,

Department of ..... BSMMU/NITOR/ Medical College. .....

(2)

Associate Professor,

Department of ..... BSMMU/NITOR/ Medical College. .....

(3)

Assistant Professor

Department of ..... BSMMU/NITOR/ Medical College. .....

(4)

Consultant /...../.....

.....

.....

The Journal of Bangladesh Orthopaedic Society (JBOS)

Date : .....

To

.....

.....

.....

.....

Subject : Acceptance of the Article for publication

Dear Author

Your article Titled "....." has been accepted for publication by the Editorial Board of the The Journal of Bangladesh Orthopaedic Society (JBOS)

Your article will be published in any of the coming issues.

Thanking you.

……

Editor

The Journal of Bangladesh Orthopaedic Society (JBOS)

THE JOURNAL OF BANGLADESH ORTHOPAEDIC SOCIETY

VOLUME 37 **NUMBER 1** **JANUARY 2022**

CONTENTS

ORIGINAL ARTICLES

- Outcome of Split Transfer of Tibialis Posterior to Dorsum to Correct Foot Drop in Adults with Neglected Common Peroneal Nerve Injury 1
  Md. Shadiqur Rahman,Shyamal Chandra Debnath, Syed Golam Samdani, Subrata Saha, Mohammad Ruhul Ammin Molla, Md. Ziaul Hasan
- Outcome of Fixation of Extra capsular fractures of the proximal femur by Proximal Femoral Nail 5
  Md. Asaduzzaman, Md. Golam Sarwar, Mohammad Ruhul Amin Mollah, Fazlay Akbar Khan, Md. Shadiqur Rahman, Golam Mahbub Chowdhury, Ashiq Ahmed, Md. Ziaul Hasan
- Etiologic Factors of Postoperative Discitis in Lumber Spine: A cross sectional study 15
  Gazi Md. Ruhul Quddus, Md. Shafiul Alam, KM Hafiz Uddin, Tayseer Farzana, Khaled Kaisar, Sabira Tabassum
- Evaluation of The Result of Management of Fracture Shaft of Femur in Children by Titanium Elastic Nails (TENS) 19
  Khandaker Abu Sayed, Md. Abdul Halim, Arun Kumar Sarker, Md. Raisul Tasneem, Ashker Ibne Shams, Ruhul Amin Mollah
- Operative versus conservative management in Failed back surgery syndrome for Prolapse lumbar intervertebral disc 25
  Mohammad Russel, Md. Ahsan Kabir, Zinat Parveen, Noor E Nahrin, Md Mahbub Ali, Md. Akshad Al Masur, Mst. Fatema Khatun
- Correlation between clinical diagnosis and Arthroscopic Findings in ACL Injuries 29
  Pankoj Kanti Mondol, Sajeeb Imtiazur Rahman, A. M. Fasiul Alam, Md. Samiul Islam, Sujit Pau, Md. Mesh-ke Alam Jony, Syed Khaledur Rahman, S. M. Tanveer Rahman
- Evaluation of Treatment Schatzker Type-I Tibial Plateau Fracture with Percutaneous Cannulated Cancellous Screw Fixation 33
  Muhammad Rafiqul Islam, Md. Shah Alam, Ripan Gosh, Rashedul Islam, Jibonanondo Halder, Md. Ziaul Hasan
- Evaluation of Non-therapeutic Laparotomy for Abdominal Trauma in a Tertiary Care Hospital 39
  Abdullah-Al-Maruf ,Shahidul Huq, Faisal Mostafa, Hussain Ahammed Khan, Tahira Benzir, Tazdina Haque Khan
- Pattern of Sports Injury among Adolescent Cricket Players in Dhaka City: A Cross-sectional Study 45
  Mahmuda Akter, Md. Juel Haque, Md Golam Sarwar, Mst Sabnam Saila Sharmin, Md Nazrul Islam, Md Nur Alam, Foisal Md. Mosiul Alom
- Diagnostic Performance of X-ray & MRI in the Evaluation & Staging of Bilateral Avascular Necrosis of Femoral Head 52
  Noushin Huda, Mosa. Nahid Farjana, Maksuda Begum, Mst.Sabina Yasmin, Sadia Noor Arabi, Mosa. Runa, Snigdha Sarker, Rasheda Pervin , Lovely Yesmin, Delara Begum

Case Report

- Intertrochanteric fracture fixation in a patient with below-knee amputation presents a surgical dilemma: a case report 59
  Md. Kamruzzaman, Shamol Chandra Debonath, Syed Golam Samdani, Hamidul Islam, S.M. Shakawat Hossain, Md. Sadiqur Rahmann

Original Article

Outcome of Split Transfer of Tibialis Posterior to Dorsum to Correct Foot Drop in Adults with Neglected Common Peroneal Nerve Injury

Md. Shadiqur Rahman[1],Shyamal Chandra Debnath[2], Syed Golam Samdani[3], Subrata Saha[4], Mohammad Ruhul Ammin Molla[4], Md. Ziaul Hasan[1]

ABSTRACT:

Common Peroneal Nerve (CPN) palsy resulting foot drop has been reported as the most frequent lower extremity palsy. Foot drop is a disabling condition and the result of nerve repair and grafting is not promising. Purpose of this present study was to find out the effectiveness of the outcome of split transfer of Tibialis Posterior tendon to Tibialis Anterior &rest of the extensor for management of Foot drop. This observatonal study was conducted at NITOR, Dhaka for duration of two years. Sixteen patients of foot drop were selected. Purposive sampling technique was used as per inclusion and exclusion criteria. A total number of sixteen patients (male 13 and female 3) were recruited in this study. Mean age was 33 years. Pre operatively, all patients' degree of active dorsiflexion of ankle and toes were MRC grade 0 . Fourteen patients (87.50%)had achieved Grade 4 active dorsiflexion of ankle and thirteen(81.25%) had achieved Grade 4 dorsiflexion of toes after a follow up of 24 weeks post-operatively. Pre operatively, all patients' had 0p active dorsiflexion of ankle and after 24 weeks post-operatively, fourteen (87.50%) patients had achieved 0p-5p active dorsiflexion of ankle.. Pre operatively, according to Stanmore assessment questionnaire, total Mean±SD was 12.06±5.89 and post operative total Mean±SD became 80.75±4.49 which indicates statistically signicant improvements was achieved. According to Stanmore assessment questionnaire, 4 (25%) patients had excellent, 11 (68.75%) patients had good outcome, 1(6.25%) had fair outcome. There was significant improvement of active dorsiflexion of ankle and toes as well as significant improvement of other function after split transfer of tibialis posterior to anterior paralysed tibialis anterior and rest of the extensor tendons of ankle.

Keywords: Tibialis posterior, Split Transfer, Drop foot, CPN injury.

INTRODUCTION

Common peroneal nerve is the most commonly injured nerve in the lower limb and commonly manifests with foot drop[1].The common peroneal nerve consists of 2 divisions-superficial & deep peroneal nerves. The deep peroneal nerve innervates the tibialis anterior, extensor digitorum longus (EDL), and extensor hallucis longus (EHL) tendons; these tendons dorsiflex the foot and extend the toes[2]. The objectives of tendon transfer for treatment of posttraumatic paralysis is to improve functional deficit by restoring or reinforcing lost functions. Dynamic tendon transposition represents the gold standard for surgical restoration of functional dorsiflexion of a permanently paralyzed foot[3]. Tendon-to-tendon suturing has been described as an alternative to the tendon to bone proceduret. Many advantages are claimed for the tendon-to--tendon technique. It is easy to do, it does not involve elaborate dissection and it does not damage the tarsal bones. Because

1. Medical Officer, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
2. Professor, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
3. Assistant Prfessor, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
4. Assistant Registrar, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka

Correspondence: Dr. Md. Shadiqur Rahman, Medical Officer, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka

two slips are used, the difficulty of trying to balance the foot, using a single guy rope, is avoided. The motor tendons are attached to the recipient tendons beyond the joint over which they have to act. The pull is spread evenly over the entire forefoot, producing a more physiological function, and the dropping of the forefoot and toes is also correctedu . The tendon may then be passed deep to the extensor retinaculum or superficial to the extensor retinaculum. The proponents of transferring superficial to the extensor retinaculum feel that the transferred tendon glides better in the fat of the subcutaneous tissues and that the biomechanics are more favorable as the tendon takes a more direct route to the dorsum of the footv . In our study, we willevaluate the outcome of foot dorsiflexion after performing split tendon to tendon transfer procedure of foot drop patients.

METHODOLOGY:

This Prospective Observational Study was conducted during the periods of July 2019 to June 2021 for duration of two years in the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. All patients, aged 17 to 60 years with both sexes clinically diagnosed as foot drop due to common peroneal nerve injury were the study population. Total 16 patients with foot drop were included in the study. Purposive technique was applied as a sampling technique according to inclusion and exclusion critaria.

With the patient lying supine, above knee tourniquet was applied.Three different incision is used. The first incision is made at the os naviculare. Then tibialis posterior tendon was identified. The second incision starts from 3 cm above the medial malleolus and runs proximally for a distance of 0.5 cm to the edge of the tibia. After identification of the muscle belly of the posterior tibial muscle, mobilize of the distal 1-2 cm of bony insertion. The tendon is detached from its bony insertion then. The tendon was pulled through the proximal second incision.During cutting the tendon from it's insertion point, we tried to take as much as possible the tendon length which helped us during implanting the tendon at dorsum.The third incision is made on the dorsal aspect of the foot, parallel/vertical to the ankle crease and approximately 2 cm distal to the line joining the malleoli. This incision should be long enough to permit access to the tibialis anterior, extensor hallucis longus (EHL), extensor digitorum longus (EDL) & peroneous tertius.

Then Tibialis Posterior tendon was split longitudinally & tagged them. Then through third incision splited tibialis posterior tendon pulled out subcutaneously. During pull trough the tendon, we try to pull the splitted tendons two different subcutaneous route. Then, medial half is inserted to TA and lateral half is inserted to the rest of the extensors including EHL,EDL,Peroneous Tertius tendon. The foot should be placed in 0° supination/ pronation and, if possible, in slight overcorrected dorsiflexion (10%). Tendons are sutured in Pulvertaft technique with non-reabsorbable material. A below knee cast was applied with ankle 10 degree dorsiflexion. Leg was kept elevated using a pillow.



Fig.-1: *Medial two incision to identify TA*



Fig.-2: *3rd incision over dorsum of foot*



Fig:3 *Two Tail of Tibialis Posterior*



Fig:4 *Sutured tendons by Pulvertaft Technique*

Post operatively, strict rehab protocol was maintained.For 1st 6 weeks after surgery,non weight bear ia allowed at operated foot. After 6 weeks,cast was removed and allowes partial weight bearing at that foot with support aid, Continously use foot drop splint and passive dorssiflexion of ankle and toes with acitve Planterflexion to ankle and toes was instructed.Finally after 12th weeks,full weight bearing was allowed with gradual withdrawl of foot drop splint. Heal walking and toe walking exercises at least 10 minutes 2 times daily was advised.

RESULTS:

The results were assessed after 6 weeks, 12 weeks and 24 weeks postoperatively using the Stanmore system questionnaire Assessmentw after 24 weeks postoperatively considered as final outcome of my study.

Total 16 patients with foot drop were included in the study where the mean age of patients was 33 years (ranges 17-60 years).Out of 16 patients 13 (81.25%) were male and 3 (18.75%) were female in this study.

Fourteen (87.50%) patients of this study, had achieved 0p to 5p active dorsiflexion at the end of this study and 87.50% patients had degree of active dorsiflexion of ankle was grade 4 after a follow up of 24 weeks postoperatively..Thirteen patients (81.25%) had grade 4 active dorsiflexion of toes & rest of the patients, three(18.75%) achieved grade 3 after a follow up of 24 weeks postoperatively.

All the patients are evaluated preoperatively according to Stanmore assessment questionnaire (Yeap et al., 2001) and post operatively after 6 months parameters are also calculated. There is significant improvement of all functional activity. p-value is significant for all parameters that are compared.

Table-I

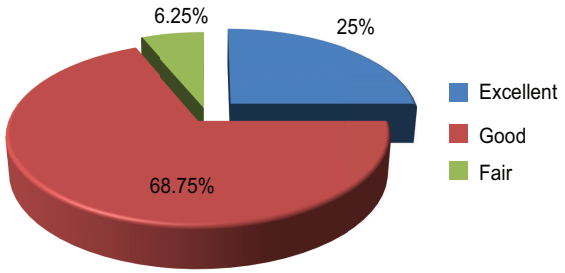
Pre and post operative comparison after transfer of tibialis posterior tendon to tibialis anterior and Rest of the extensors

Parameters	Pre operative	After 06 monthsPost operatively	p value
Pain	6.56±2.40	10.62±1.71	Â0.05
Need for orthosis	2.5±3.65	13.75±2.89	Â0.05
Ability to wear normalshoes	0.56±1.17	4.65±0.81	Â0.05
Function	0.75±1.34	7.25±1.91	Â0.05
Grade	0.00±0.00	18.75±3.41	Â0.05
Degree	0.00±0.00	20.62±1.71	Â0.05
Foot posture	1.68±1.54	4.5±0.90	Â0.05

Paired t test is done to measure the level of significance.

In this study,all the patients are evaluated preoperatively according to the stanmore assessment questionnairew and post operatively after 6 months parameters are calculated. Pre operatively total Mean±SD was 12.06±5.89 and post operative total Mean±SD became 80.75±4.49. So,there is significant changes between pre operative and post operative statistical outcome. p-value is significant for all parameters that are compared.

According to Stanmore assessment questionnairew , it was seen that 4 (25.00%) patients had excellent, 11 (68.25%) patients had good & 1(6.25%) patient had fair outcome in this study.



I *assessment questionnairew*

In the study, 62.50% patients had no complications, only 12.50% patients suffered from superficial infection and seroma & 6.25% were by wound gaping and haematoma.

After the final follow up, my patients' postural balance gained significant improvement. It showed an overall satisfying progression of gait characterized by the absence of external overload in toe plantar flexion and by reduction of foot contact time with the ground (stance phase) with improvement of heel contact and push off phase with evidence of a longer step. This positively affects dynamicity of the gait cycle.

CONCLUSION:

Traditionally , we perform tendon to bone suturing technique to treat foot drop patients. But, we treat these foot drop patients with tendon to tendon suturing technique and found satistically significant improvement of active dorsiflexion of toes and ankle as well as significant improvement of other functions of foot. After this study, it can be concluded confidently that tendon to tendon suturing technique is an excellent option to treat foot drop patients.

REFERENCES:

1. Krishnamurthy S, Ibrahim, M. Tendon Transfers in Foot Drop.Indian J PlastSurg 2019;52:100–108.
2. Yeganeh MM. Triple Tendon Transfer for Correction of Foot Deformity in Common Peroneal Nerve Palsy.Foot & Ankle International 2016 ;10:1–5.
3. Vigasio A, Marcoccio I, Patelli A, Mattiuzzo V, Prestini, G. New Tendon Transfer for Correction of Drop-foot in Common Peroneal Nerve Palsy. Clin OrthopRelat Res 2008; 466:1454–1466.
4. Hove LM. Nilsen PT.Posterior tibial tendon transfer for dropfoot: 20 cases-5 years. Acta Orthop Scand 1998;69:608-610.
5. Srinivasan H. Mukherjee SM.Subramaniam RA.Two tailed transfer of tibialis posterior for correction of drop-foot in leprosy. JBone Joint Surg Br 1968;50(3): 623-628.
6. Jacques L. Astous D. Bruce A. William M. Kim SJ. Bachus KN. Superficial Versus Deep Transfer of the PosteriorTibialis Tendon. J Pediatr Orthop 2005; 25: 245–248.
7. Yeap JS. Singh D.Birch R.A Method for Evaluating the Results of Tendon Transfers for Foot Drop. Clin Orthop Relat Res 2001;383: 208-213.

Original Article

Outcome of Fixation of Extra capsular fractures of the proximal femur by Proximal Femoral Nail

Md. Asaduzzaman[1], Md. Golam Sarwar[2], Mohammad Ruhul Amin Mollah[1], Fazlay Akbar Khan[3], Md. Shadiqur Rahman[4], Golam Mahbub Chowdhury[4], Ashiq Ahmed[4], Md. Ziaul hasan[4]

Abstract

Extra capsular fractures of the proximal femurare common and challenging fractures representing 10% to 34% of hip fractures. The best treatment option is still a matter of debate. Proximal femoral nail (PFN), a modern intramedullary implant offers several advantages. Bearing all these advantages of PFN in mind, the present study has undertaken to evaluate the outcome of fixation extra capsular fractures of the proximal femurby PFN in our setting. A prospective observational study was conducted at NITOR, Dhaka, from January 2019 to December 2020. Patients with Extra capsular fractures of the proximal femurmeeting the selection criteria were study population. Total 41 patients were included in the study. All cases were evaluated by clinical features, imaging by X-ray and Harris Hip Score. Six months follow up was done with clinical, functional and radiological assessment. The mean age was 50.5±16.8 years with a male predominance (80.48%). The main cause of injury was motor vehicle accident (66.41%). The most occurred fracture was intertrochanteric (65.85%, n=27). The mean duration of injury to operation was 16.5±4.7 days. The duration of follow up was 24 weeks. Wound infection was found in 4 (69.75%) cases. Mean radiological union time was 14.1±2.4 weeks. Mean LLD was 0.39±0.48 cm and in 24 (58.53%) cases there were no LLD. 41.47% cases had 5 to 10^0 coronal mal alignment. At last follow up after operation, 63.41% cases had no pain, 34.15% cases have complained mild pain. The mean flexion of hip at last follow up was 122.420±12.030. Again the mean abduction and adduction was 32.40±5.30 and 32.580±5.30 respectively. Internal rotation and external rotation at last follow up was 29.840±5.980 and 29.350±6.420 respectively. Finally, out of 41 cases, 28 (68.29%) were excellent, 7 (117.07%) were good, 4 (9.76%) were fair and the rest 2 (4.885%) were poor. Treatment of extra capsular fractures of the proximal femurby proximal femoral nailing is an effective andsafe method without any significant complication.

Key word : PFN, Extra capsular fractures of the proximal femur.

INTRODUCTION

Extra capsular fractures of the proximal femur remain one of the most challenging fractures facing orthopedic surgeons. These fractures pose a great problem because of the diversity of fracture patterns and difficulty in attaining anatomical reduction[1]. The inherent instability of the fracture and the enormous muscle forces acting across the fracture fragments render treatment options difficult.[2]

Extra capsular fractures of the proximal femoral fractures occurat intertrochanteric area and below the lesser trochanter upto 5 cm shaft of femur.[3] The incidence of fractures of the proximal femur is markedly increasing because of increasing life expectancy and motor vehicle accidents.[1] These fractures account for 10% to 34% of all hip fractures.[4]

In younger patients, the fractures are high-energy injuries from road traffic accidents, falls from a height, or gunshot wounds.[5] Significantly less force is required for aextra capsular proximal femoral fracture in patients with osteoporotic bone. In this typically older patient

1. Assistant Registrar, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
2. Professor, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
3. Registrar, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
4. Medical Officer, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka

Correspondence: Md. Asaduzzaman, Assistant Registrar, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka Phone : 01711472357 E-mail: azadss29th@gmail.com

population, the most common mechanism of injury is a ground-level fall. Atypical, stress-type fractures occurring in patients exposed to chronic (5 years or greater) or high-dose bisphosphonate therapy usually occur from low-energy trauma as well; however, spontaneous fractures in this patient group have also been reported.[3]

The Extra capsular fractures proximal femoral fracture is subjected to many stresses resulting from bending movements and compressive forces generated by body weight and hip muscles, thus leading to the malunion and nonunion of fractures and mechanical failure of the implants.[6] So, these fractures are the most difficult to manage in the femur. But improved understanding of the complex biology and biomechanics of the trochanteric region as well as the rapid development of orthopedic philosophy and implants has led to consensus on the treatment of these fractures.[7] However, the appropriate implant for the internal fixation of these fractures remains debatable; and a multitude of different intra- and extramedullary devices for their surgical fixation have been advocated.[6]

The high incidence of delayed union, malunion and nonunion of fractures has left conservative treatment, as advocated by DeLee[8] abolished in modern trauma care. For a long time, the solution for such fractures was open reduction and internal fixation. The technique of open reduction has changed substantially over the past decades.[1]

Extramedullary fixation with plating has the potential disadvantages of extensive surgical exposure, severe soft tissue damage and blood loss, thus leading to problems of fracture union and implant failure. In addition, the eccentrically plating is prone to fatigue breakage due to their mechanical load-sharing effect.[9,10,11,] Moreover, as anatomical reduction with rigid internal fixation was desired, entailing too much soft-tissue dissection leaves the fragment avascular.[1]

Recent development in mini-invasive surgery and orthopedic implants such as mini-invasive percutaneous plate osteosynthesis (MIPPO), locking compression plate (LCP), and less invasive stabilization system (LISS) are current topics among trauma surgeons worldwide[11,12,13] but preliminary results of application of LISS or LCP through MIPPO technique on subtrochanteric fractures has not been as successful as on fractures of the distal femur or proximal tibia.[6] Great difficulties were often encountered during fracture reduction and plate pre-contouring. So, open reduction is sometimes inevitable, thus making this technique not truly minimally invasive.[6]

Allowing a minimally open approach, intramedullary nailing is closely linked to "biological internal fixation", in addition to its mechanical benefits over plate fixation. Initially, standard femoral nail was tried in subtrochanteric fractures but the proximal fragments were usually not long enough for stable fixation.[6]

In 1997 the Arbeitsgemeinschaft fur Osteosynthesefragen (AO) designed an innovative intramedullary implant, the proximal femoral nail (PFN) to reduce the risk of implant related complications. Therefore, in addition to the load bearing femoral neck screw, the PFN has an anti-rotation screw to increase the rotational stability of the neck fragment. An anatomic 6^0 neck valgus bend in the coronal plane, a narrower distal diameter and distal flexibility of the nail eliminates the need for routine reaming of the femoral shaft and also minimizes stress concentration and tension in the femoral shaft. This should reduce the risk of intraoperative and postoperative femoral shaft fractures.[14]

PFN is biomechanically stronger and more rigid. Osteosynthesis with the PFN offers the advantages of high rotational stability of the head–neck fragment, an unreamed implantation technique and the possibility of static or dynamic distal locking.[15] Moreover, the anti-rotation screw along with other advantages has to be regarded as fundamental improvements of the PFN.[16,17]



Fig.-1 : *The proximal femoral nail (PFN)[17]*

The proximal femoral nail, in titanium orsteel and for left and right use, consists of a 240 mmlong nail, the distal part of which is available in 10, 11or 12 mm diameter. The proximal part measures 17mm in diameter. The angle of both parts is 6^0 (M-L angle), situatedat 11 cm distally from

the top of the nail. Through theproximal part two screws can be inserted into thefemoral neck, a lower 11.0 mm load bearing neckscrew, the tip of which should be placed subchondrallyin the lower half of the femoral head. Furthermore, anadditional 6.5 mm antirotational hip pin is placedthrough the proximal part of the nail into the upper half of the femoral neck to prevent rotation of thehead±neck fragment[17]

The tip of the nail is specially shaped to reducestress concentration. Distally the nail can be lockedstatically or dynamically by using either the round or the oval locking hole[17].

The realization of the magnitude of forces on the definitive construct makes the choice of intramedullary fixation of displaced extra capsular fractures of the proximal femureven more desirable. High tensile forces at the lateral and high compressive forces along the medial cortex of over 1000 lb/in^2 create high biomechanical stress at the proximal femur[18,19].

Hip screws are used to fix various types offemoral neck fractures. Early hip screw designs, such as theJewett nail, consisted of a nail or screw that was fixed in thefemoral head and was attached to a side plate that was fixedto the femur. More recent compression hip screw designsallow sliding of the screw or nail within a barrel attached tothe side plate to accommodate the inevitable collapse that occurs during fracture healing. These compression hip screwsact according to a tension band principle in that the screw isloaded in tension and the bone at the fracture site is loadedin compression. The applied bending moment, and thus thefatigue strength, of these devices depends on the anglebetween the side plate and the screw or nail. Biomechanicalstudies have shown that higher angles with shorter momentarms result in smaller bending moments than do lower angles with longer moment arms.

Until the fracture site is consolidated, the chosen implant has to be sufficiently stable to preserve reduced fracture positioning. In these cases, a nail is obviously advantageous for fracture fixation compared with a plate. Biomechanical tests of intramedullary nails have proven to obtain greater stiffness and more rigid fixation. These effects are combined with higher bending and compressive loads based on the implant design and the implantation area.Owing to the centered position in the shaft and subsequent adjacent position in the head-neck complex, intramedullary implants have a shorter lever arm compared with extramedullary osteosynthesis. The shorter lever arm decreases the torque, which decreases the risk of a mechanical failure of the implant until the fracture is entirely consolidated[20].

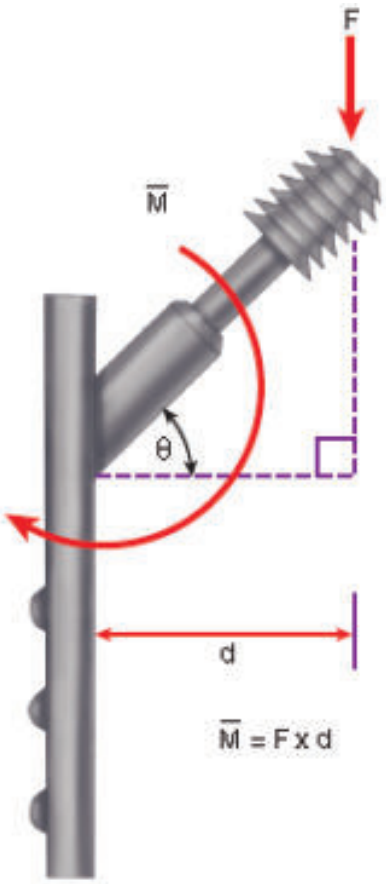


Fig.-2: *Influence of nail plate angle on bending moment (Gustilo, et al., 1984)*

Larger angle results in smaller moment because of shorter distance (d); conversely, smaller angle results in larger moment because of longer distance.

In addition, the intramedullary implant shifts the weightbearing axis to the middle of the proximal femur shaft, resulting in axial load sharing.

The unique advantage of intramedullary nailing overplating of a extra capsular fractures of the proximal femur remains the lateralbuttress effect provided by the nail itself. The intramedullaryimplant works as a brace to minimize collapse into the greatertrochanter. Furthermore, the nail acts as a stable fixationagainst a medialization of the shaft and impedes a total collapseof the fracture fragments. These advantages cannot beachieved by monocortical plating[21].

Having all the above mention advantages of PFN, the present study was carried out to observe its efficacy on extra capsular fractures of the proximal femur management. This kind of nail may be a choice for extra capsular fractures of the proximal femur in a tertiary level hospital like NITOR

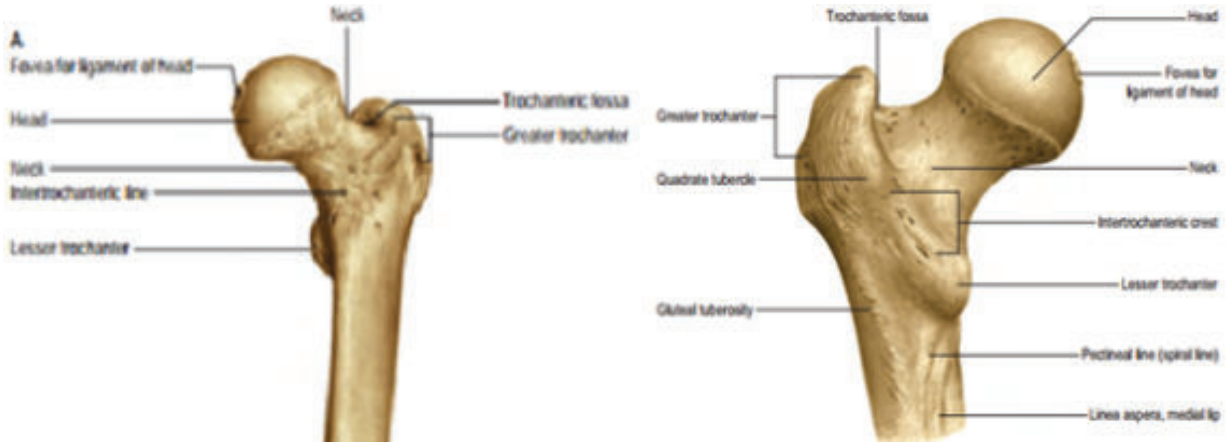


Fig.-3: *Proximal Femur (Anterior and Posterior view)*[22]

Femoral neck: The femoral neck is approximately 5 cm long, narrowestin its mid part and widest laterally, and connects the head to theshaft at an average angle of 127°. The neck–shaft angle is widest atbirth and diminishes gradually until the age of 10 years; it is smaller in females. The neck is laterally rotated withrespect to the shaft (angle of anteversion) some 10–15°, althoughvalues of this angle vary between individuals and between populations[23].

Greater trochanter: The greater trochanter is large and quadrangular, projecting up from thejunction of the neck and shaft. Its posterosuperiorregion projects superomedially to overhang the adjacent posteriorsurface of the neck and here its medial surface presents the rough trochantericfossa. The proximal border of the trochanter lies approximatelya hand's breadth below the iliac tuberculum, level with thecentre of the femoral head. It has an anterior rough impression. Itslateral surface, continuous distally with the lateral surface of the femoralshaft, is crossed anteroinferiorly by an oblique, flat strip, which is widerabove. This surface is palpable, especially when the muscles are relaxed.The trochanteric fossa occasionally presents a tubercle or exostosis[22].

Lesser trochanter: The lesser trochanter is a conical posteromedial projection of the shaftat the posteroinferior aspect of its junction with the neck. Its summit and anterior surface are rough, but its posterior surface, at the distalend of the subtrochanteric crest, is smooth[22].

Subtrochanteric line: The subtrochanteric line, a prominent ridge at the junction of the anterior surfaces of the neck and shaft, descends medially from a tubercle on the upper part of the anterior aspect of the greater trochanter to a point on the lower border of the neck, anterior to the lesser trochanter, where there may also be a tubercle. This line is the lateral limit of the hip joint capsule anteriorly. The upper and lower bands of the iliofemoral ligament are attached to its proximal and distal ends and the associated tubercles. Distally, it is continuous with the spiral line[22].

Subtrochanteric crest: The subtrochanteric crest, a smooth and prominent ridge at the junction of the posterior surface of the neck with the shaft, descends medially from the postero superior angle of the greater trochanter to the lesser trochanter. A little above its centre is a low, rounded quadrate tubercle. It is covered by gluteus maximus, from which it is separated, medial to the tubercle, by quadratus femoris and the upper border of adductor magnus[22].

Gluteal tuberosity: The gluteal tuberosity may be an elongated depression or a ridge. It may at times be prominent enough to merit the title of a third trochanter[22].

Materials and Methods:

Study design: This was a prospective observational study.

Sample size :

The calculated sample size was

n= (Z2x p x q)/ d2, where

Z = Standard normal deviate= 1.96 corresponding to 95% of CI

p = Proportion of extra capsular fractures of the proximal femur, taken from established scientific literature.

In 1980, the incidence of hip fracture was 98 per 100000 U.S populations (James & Hunter, 1983). Again from 1980 the incidence of hip fracture was declining 1.37% per year (Melton, et al., 2009). So, the estimated incidence in 2019 was 57.22 per 100000 populations. Again, extra capsular

fractures of the proximal femur account for 10% to 34% of all hip fractures (Akilan, et al., 2018). So, estimated

p= 0.02% =0.0002

q = (1-p) = 0.9998, and

d = degree of accuracy desired, set at 0.01

Therefore the required sample size, n=(1.962 x 0.0002 x0.9998)/(0.01)2 = 7.68H"8

So, the calculated sample size was 8. But due to availability of the sample, a total 41 cases were taken for the study.

Inclusion Criteria

- Age above 18 years
- Only closed Extra capsular fractures of the proximal femur were included

Exclusion Criteria

- Open contaminated fractures
- Multiple fractures and poly-trauma
- Patient who cannot follow up at least for 6 months

Variables

A. Demographic

- Age
- Gender

B. Clinical Variables

- Mechanism of Injury
- Type of fracture
- Interval between injury and operation
- Duration of follow up

C. Outcome Variable

- Duration of radiological union
- ROM of affected Hip
- Pain at last follow up
- LLD at last follow up
- Coronal malalignment
- Functional status
- Final outcome according to Harris Hip score (Harris, 1969).
- Complications

1st follow up was given at 14th POD to check any signs of infection, pain status and distal neurovascular status. Stitch was removed on the same day. X-ray was done to check alignment. Advice given about above mentioned exercises.

Next follow up was at 6th week after operation. Range of motion was tested. X-ray was done to check callus formation. Improvement was noted. Partial weight bearing was given at this follow up. Subsequent follow up was given at 12 week. Full weight bearing was given after radiological evidence of union. Last follow up was given at the end of 24th week. During each visit, X-ray was done to see union status. Functional assessment was done according to Harris Hip Score (HHS)

RESULT AND OBSERVATIONS

Age of the study population

Table I

Age of the study population(N=41)

Age (In years)	Frequency	Percentage
20-39	13	31.70%
40-59	12	29.26%
60-79	16	39.02%
Total	41	100.00%
Mean±SD	48.77±9.75	

Table I showed distribution of patients by age. In this study, the highest number of patients 16 (39.02%) were 60 to 79 year age group followed by 13 (31.70%) cases in 20 to 39 year age group and12 (29.26%) cases in 40 to 59 year age group. The mean age was 48.77±9.75years with range from 20 to 78 years.

Sex distribution of patients

Table II

Gender of the study population (N=41)

Gender	Frequency	Percentage
Male	33	80.48%
Female	8	19.51%
Total	41	100.00%

The above table shows the gender distribution of the study population.Male was 25 (80.48%) and female 6 (19.51%).

Limb length discrepancy (LLD)

Table III

LLD of the study population (N=41)

LLD (in cm)	Frequency	Percentage
No LLD	24	58.53%
0.5	3	7.31%
1	14	34.14%
Total	41	100.00%
Mean±SD	0.39±0.48	

Regarding limb length discrepancy, in 24 (58.53%) cases there were no LLD. In 3 (7.31%) cases, LLD was 0.5 cm and1 cm LLD was found in 14 (34.145%) cases. Mean LLD was 0.39±0.48 cm.

CORONAL MISALIGNMENT

Table IV

Coronal malalignment of the study population (N=41)

Coronal Malalignment (in degree)	Frequency	Percentage
No Malalignment	24	58.53%
5	12	29.27%
10	5	12.20%
Total	41	100.00%
Mean±SD	2.7±3.6	

Among the 41 cases, in 24 (58.53%) cases, there were no coronal malalignment. 17 (41.47%) had coronal malalignment and all of them were varus. Five degree malalignment found in 12 (29.27%) cases and 10^0 malalignment in 4 (12.20%) cases.

PAIN STATUS

Table V

Pain status at last follow up (N=31)

Pain at last follow up	Frequency	Percentage
No pain	26	63.41%
Mild pain	14	34.15%
Moderate pain	1	2.44%
Total	41	100.00%

At last follow up after operation, 26 (63.41%) cases had no pain, 14 (34.15%) cases have complained mild pain and the rest 1 (2.44%) had moderate pain.

Functional activity at last follow up

Table VI

Functional activity at last follow up (N=41)

Function		Frequency	Percentage
Limp	None	33	80.49%
	Slight	8	19.51%
Support	None	28	68.29%
	Cane for long walks	8	19.51%
	Cane for most of time	5	12.20%
Distance walked	Unlimited	27	65.85%
	Six blocks	8	19.51%
	Two or three blocks	6	14.63%
Sitting	Comfortable in ordinary chair for 1 hour	36	87.80%
	On a high chair for 30 minutes	5	12.20%
Use of public transport	Yes	35	85.37%
	No	6	14.63%
Stairs	Normal	29	70.73%
	Use railing	9	21.95%
	Unable	3	7.32%
Put on shoes or socks	Easily	28	68.29%
	With difficult	10	24.39%
	Unable	3	7.32%

The functional activity of the cases was measured according to Harris hip score (Harris, 1969). 33 (80.49%) cases did not limp at last follow up and 8(19.51%) cases limped slightly. 28 (68.29%) cases walked without support whereas, 8 (19.51%) needed cane for long walk and 5 (12.20%) needed cane most of the time.27(65.85) could walk unlimited distance while 8 (19.51%) could walk six blocks and the rest 6 (14.63%) could only walk 2 or 3 blocks. 36 (87.80%) could comfortably sit on ordinary chair for at least 1hour but 5 (12.20%) could sit in high chair for 30 minutes. 35 (885.37%) could enter public transport. No help was needed to climb stairs in 29 (70.73%) cases, aid of railing was needed for 9 (21.95%) cases and the rest 3 (7.32%) could not climb at all. 29(70.73%) could put on socks/ shoes easily whereas 9 (21.95%) could do it with difficulties and the rest 3 (7.32%) could not put on socks/ shoes.

Range of motion of hip

Table VII

ROM of hip at last follow up (N=31)

Direction of motion	Mean	SD
Flexion (in degree)	122.42	12.03
Abduction (in degree)	32.42	5.30
Adduction (in degree)	32.58	5.30
Internal rotation (in degree)	29.84	5.98
External Rotation (in degree)	29.35	6.42

The mean flexion of hip at last follow up was $122.42^0 \pm 12.03^0$. Again the mean abduction and adduction was $32.4^0 \pm 5.3^0$ and $32.58^0 \pm 5.3^0$respectively. Internal rotation and external rotation at last follow up was $29.84^0 \pm 5.98^0$ and $29.35^0 \pm 6.42^0$respectively.

Harris Hip Score (HHS) at different follow up

Table VIII

HHS at different follow up (N=41)

Follow up	Mean	SD	P value
At 6 weeks	47.6	12.1	
At 12 weeks	76.7	13.8	$2.6x10^{-26}$
At last follow up	91.1	13.0	$2.4x10^{-24}$

P value was calculated with paired two sample t-test for means.The mean HHS after 6 weeks was 47.6±12.1 which has increased to 76.7±13.8.At last follow up, the mean HHS score has increased to 91.1±13.

Final outcome

Table IX

Final outcome according to HHS (N=31)

Final outcome	Frequency	Percentage
Poor	2	4.88%
Fair	4	9.76%
Good	7	17.07%
Excellent	28	68.29%
Total	41	100.00%

After last follow up, the final outcome was assessed with HHS tool. Out of 41 cases, 28 (68.29%) were excellent,7 (17.07%) were good, 4(9.76%) were fair and the rest 2 (4.88%) were poor

DISCUSSION

Extra capsular fractures of the proximal femur are usually the result of high-energy trauma and often subjected to significant displacement[4]. Extra capsular fractures of the proximal femur have peculiar anatomic and mechanical characteristics which poses problems in their management. Extra medullary fixation with plating has the potential disadvantages of extensive surgical exposure, severe soft tissue damage and blood loss, thus leading to problems of fracture union and implant failure. In addition, the eccentric plating is prone to fatigue breakage due to their mechanical load bearing effect. Allowing a minimally open approach, intramedullary nailing is closely linked to "biological internal fixation", in addition to its mechanical benefits over plate fixation[24].

In this study, the mean age was 50.5±16.8 years with range from 20 to 78 years. The mean age of the patients was 46 years and 49.1 years respectively. Younger patients are becoming more and more prone to extra capsular fractures of the proximal femur probably because of increasing incidence of MVA[15].

The number of male was 33 (80.48%) and female 8 (19.51%). In several studies with extra capsular fractures of the proximal femur showed male were predominant with this fracture. Like, in the series of percentage of male was 83.33% and 76% respectively[1,25]. Ten (32.3%) cases were service holder, 5 (16.1%) housewives, 5 (16.1%) ex-service holders, 5 (16.1%) businessmen, 3 (9.7%) students and 3 (9.7%) farmers.

In this study, fall on slippery ground accounted for 15 (36.58%) cases and motor vehicle accident was accounted for 26 (63.41%) cases. In younger patients, the fractures

are high-energy injuries from road traffic accidents (RTAs), falls from a height, or gunshot wounds [5]. This is evidently showed in the present study as well as other studies. In the series of caused 60% and 67% of the fractures respectively[26,14]. In elderly patients, these injuries are caused by low energy trauma such as a simple fall. These patients tend to be osteoporotic, and have wide medullary canals and narrow cortices [5]. In the present study, average age of the patients whose fractures were caused by fall on slippery ground was 67.9 years.

The mean duration of injury to operation was 16.5±4.7 days, ranging from 7 days to 24 days. The average delay to operation from the time of injury was 6.53 days[26]. As NITOR is one of the hospital with huge patient load in Bangladesh, the duration of injury to operation was more.

No complication occurred in 34 (82.92%) cases and 7 (17.07%) cases had complications. Among them, superficial wound infection were found in 4 (9.75%) cases, 1 (2.43%) patient had pulmonary infection, 1 ((2.43%) had Z effect and 1 ((2.43%) had reverse Z effect. The cases of superficial wound infection were managed by regular dressing and change of antibiotic according to culture and sensitivity of the wound swab. Pulmonary infection was managed by respiratory physiotherapy and change of antibiotic. Z effect was managed by reinsertion of the neck screw through a small incision. Reverse Z effect was managed by removal of hip pin.The mean radiological union time was 14.1±2.4 weeks ranging from 10 weeks to 18 weeks. In the series of Sachin, et al., (2020) the average time required for radiological union was 11.74 weeks. As there was a delay in operation, the mean radiological union was longer in the current study.

Regarding limb length discrepancy, in 24 (58.53%) cases there were no LLD. In 3 (7.31%) cases, LLD was 0.5 cm and 1 cm LLD was found in 14 (34.14%) cases. Mean LLD was 0.39±0.48 cm. As none of the LLD was 2 cm or more, the result was acceptable. The observed LLD more than 2 cm in 3.8% of their cases[14]. As in the present series, anatomical reduction was tried to done in all cases, the instaces of significant LLD is nil.

Among the 41 cases, in 24 (58.53%) cases, there were no coronal malalignment. 17 (41.46%) had 0.5-10^0 coronal malalignment and all of them were varus. The used the term "varus deformity" which they defined as whenthe neck-shaft angle was reduced by more than 10° compared with the contralateral hip[1]. According to this definition, there was no single case of "varus deformity" in the present study. Previous studies also suggested that the incidence of varus deformity was significantly less in patients treated with the PFN compared with those treated with side plates[1].

At last follow up after operation, 26 (63.41%) cases had no pain, 14(34.15%) cases have complained slight pain and the rest 1 (2.44%) had mild pain. Meanwhile, there was no instance of moderate or severe pain in the present study. The incidence of pain at last follow up was 19.5% and 20% respectively[24,27]. But both the study had a longer follow up period. As in the present series the average follow up was shorter, it is hoped that pain would be less if follow up was longer.

The functional activity of the cases was measured according to Harris hip score [28]. 33 (80.49%) cases did not limp at last follow up and 8(19.51%) cases limped slightly. 28(68.29%) cases walked without support whereas, 8(19.51%) needed cane for long walk and 5 (12.20%) needed cane most of the time. 27 (65.85) could walk unlimited distance while 8 (19.51%) could walk six blocks and the rest 6 (14.63%) could only walk 2 or 3 blocks. 36 (87.80%) could comfortably sit on ordinary chair for at least 1 hour but 5 (12.20%) could sit in high chair for 30 minutes. 35 (85.37%) could enter public transport. No help was needed to climb stairs in 29 (70.73.7%) cases, aid of railing was needed for 9 (21.95%) cases and the rest 3 (7.32%) could not climb at all. 28 (68.29%) could put on socks/ shoes easily whereas 10 (24.39%) could do it with difficulties and the rest 3 (7.32%) could not put on socks/ shoes.

At last follow up, in 10 (24.39%) cases there was at least one out of four deformities, defined by Harris (1969), present. In the rest 31 (75.61%) cases, there was no residual deformity. The mean flexion of hip at last follow up was 122.420±12.030. Again the mean abduction and adduction was 32.40±5.30 and 32.580±5.30 respectively. Internal rotation and external rotation at last follow up was 29.840±5.980 and 29.350±6.420 respectively.

The mean HHS after 6 weeks was 47.6±12.1 which has increased significantly to 76.7±13.8 at 12 weeks. At last follow up, the mean HHS score has increased significantly to 91.1±13. After last follow up, out of 41 cases, 28 (68.29%) were excellent, 7 (17.07%) were good, 4 (9.76%) were fair and the rest 2 (64.88%) were poor. The functional results were consistent with the observations of Ahmad, et al., (2017). In their study, excellent functional results were obtained in 75% of cases and 20% of cases reported good results, 5% as fair result. Other studies like Isaac, et al., (2016) and Rao, et al., (2019) overall satifactory result (excellent or good) was found in 80% and 84% of the cases repectively. In the present study, overall satifactory result was obtained in 83.9% which is similar to other international studies.

CONCLUSION:

Treatment of Extra capsular fractures of the proximal femurby proximal femoral nailing is an effective and safe method without any significant complication

REFERENCES

1. El-Mowafi, H. M., Eid, T. A., El-Sayed, A. S. & Zalalo, S. H., 2014. Fixation of subtrochanteric fracture femur using a proximal femoral nail. *Menoufia Medical Journal,* 27(1), pp. 208-212.
2. Parker, M. J., Dutta, B. K., Sivaji, C. & Pryor, G. A., 1997. Subtrochanteric fractures of the femur. *Injury,* 28(2), pp. 91-95.
3. Sassoon, A. A., Langford, J. & Haidukewych, G. J., 2015. Subtrochanteric Femur Fractures. In: C. M. Court-Brown, et al. eds. *Rockwood and Green's Fractures in Adults.* 8th ed. Philadelphia: Wolters Kluwer Health, pp. 2131-2148.
4. Akilan, C., Neelakrishnan, R., Barathiselvan, V. & Anush, R. P., 2018. Functional outcomes of subtrochanteric fractures of femur treated with long proximal femoral nail (PFN). *National Journal of Clinical Orthopaedics,* 2(4), pp. 8-17.
5. Craig, N. J. & Maffulli, N., 2005. Subtrochanteric fractures: current management options. *Disability and rehabilitation,* 27(18-19), pp. 1181-1190.
6. Jiang, L. S., Shen, L. & Dai, L. Y., 2007. Intramedullary fixation of subtrochanteric fractures with long proximal femoral nail or long gamma nail: technical notes and preliminary results. *Annals-Academy of Medicine Singapore,* 36(10), pp. 821-824
7. Hoffmann, R. & Haas, N., 2007. Femur, proximal. In: T. P. Ruedi, R. E. Buckley & C. G. Moran, eds. *AO Principles of Fracture Management.* 2nd ed. New York: Thieme, pp. 751-766.
8. DeLee, J. C., Clanton, T. O. & Rockwood Jr, C. A., 1981. Closed treatment of subtrochanteric fractures of the femur in a modified cast-brace. *The Journal of Bone and Joint Surgery. American Volume,* 63(5), pp. 773-779.
9. Blatter, G. & Janssen, M., 1994. Treatment of subtrochanteric fractures of the femur: reduction on the traction table and fixation with dynamic condylar screw. *Archives of orthopaedic and trauma surgery,* 113(3), pp. 138-141.
10. Siebenrock, K. A., Mu, U. & Ganz, R., 1998. Indirect reduction with a condylar blade plate for osteosynthesis of subtrochanteric femoral fractures. *Injury,* 29(1), pp. 7-15.
11. Krettek, C., Muller, M. & Micalu, T., 2001. Evolution of minimally invasive plate osteosynthesis (MIPO) in the femur. *Injury,* 32(3), pp. 14-23.
12. Frigg, R., Appenzeller, A., Christensen, R., Frenk, A., Gilbert, S., & Schavan, R., 2001. The development of the distal femur Less Invasive Stabilization System (LISS). *Injury,* 32(3), pp. 24-31
13. Egol, K. A., Kubiak, E. N., Fulkerson, E., Kummer, F. J., & Koval, K. J., 2004. Biomechanics of locked plates and screws. *Journal of orthopaedic trauma,* 18(8), pp. 488-493.
14. Isaac, J., Krishna, V. & Kumar, R., 2016. Surgical outcomes of subtrochanteric fractures of femur treated with Proximal Femoral Nail (PFN). *Journal of Evolution of Medical and Dental Sciences,* 5(52), pp. 3373-3378.
15. Kanthimathi, B. & Narayanan, V. L., 2012. Early complications in proximal femoral nailing done for treatment of subtrochanteric fractures. *Malaysian orthopaedic journal,* 6(1), pp. 25-31.
16. Schwab, E., Höntzsch, D. & Weise, K., 1998. Treatment of unstable inter-and subtrochanteric fractures with the proximal femoral nail (PFN). *Akt Traumatol,* Volume 28, pp. 56-60
17. Simmermacher, R. J., Bosch, A. M. & Van der Werken, C. R., 1999. The AO/ASIF-proximal femoral nail (PFN): a new device for the treatment of unstable proximal femoral fractures. *Injury,* Volume 30, pp. 327-32.
18. Schipper, I. B., Bresina, S., Wahl, D., Linke, B., van Vugt, A. B., & Schneider, E., 2002. Biomechanical evaluation of the proximal femoral nail. Clinical orthopaedics and related research, Volume 405, pp. 277-86.
19. Kyle, R. F., 1994. Fractures of the proximal part of the femur. The Journal of Bone and Joint Surgery. British Volume, Volume 76, pp. 924-50.
20. Lorich, D. G., Geller, D. S. & Nielson, J. H., 2004. Osteoporotic pertrochanteric hip fractures: management and current controversies. The Journal of Bone and Joint Surgery, Volume 86, pp. 398-410.
21. Schlickewei, C. W., Rueger, J. M. & Ruecker, A. H., 2015. Nailing of displaced intertrochanteric hip fractures. Techniques in Orthopaedics, Volume 30, pp. 70-86.
22. Drake, R. L., Vogl, W. & Mitchell, A. W., 2010. Gray's Anatomy for Students. 2nd ed. Philadelphia: Churchill LIvingstone.
23. Eckhoff, D. G., Kramer, R. C., Watkins, J. J., Alongi, C. A., & Van Gervan, D. P., 1994. Variation in femoral anteversion. Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists, Volume 7, pp. 72-5.
24. Ahmad, S., Singh, R., Ghani, A., Muzaffar, K., & Singh, O., 2017. Management of Subtrochanteric Fractures with

Long PFN: Union Rates and Functional Results. International Journal of Current Researh and Review, 9(9), pp. 14-18.

25. Kapila, R., Singh, P. & Mahajan, S., 2018. Functional Outcome of Proximal Femoral Nail (PFN) in the Management of Intertrochanteric and Subtrochanteric Fractures Femur. Journal of Medical Science and Clinical Research, 6(2), pp. 682-687.

26. Samynathan, G. & Noordeen, S., 2018. Functional outcome of subtrochanteric fracture fixed with long proximal femoral nail. International Journal of Orthopaedics, 4(2), pp. 883-888.

27. Sachin, N. S., Manjunath, J., Kiran, G. U., Druva, V., & Kore Aditya, B., 2020. Surgical management of subtrochanteric fractures treated with long proximal femoral nail. International Journal of Orthopaedics, 6(1), pp. 677-681.

28. Harris, W. H., 1969. Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. The Journal of Bone and Joint Surgery. American Volume, Volume 51, pp. 737-55.

Original Article

Etiologic Factors of Postoperative Discitis in Lumber Spine: A cross sectional study

Gazi Md. Ruhul Quddus[1], Md. Shafiul Alam[2], KM Hafiz Uddin[3], Tayseer Farzana[4], Khaled Kaisar[5], Sabira Tabassum[6]

Abstract

The exact cause of postoperative discitis is not clear. There are multiple factors are responsible for postoperative discitis in lumber region. Many of them are preventable. A total of 25 cases of postoperative discitis were treated from January 01, 2018 to June 30, 2021 for a period of 3.5 years. We analyzed the following data: (1) Patient related risk factors like age, sex, nutritional status, history of smoking, socio-economic status and other co-morbid conditions such as diabetes mellitus, urinary incontinence, complete neurologic deficit, Urinary infection, Immunodeficiency (2) Intraoperative risk factors like Prolong operation time, High number of OT staff, Direct shedding of bacteria from surroundings [OT light handle, Microscope or C arm], Instrument tray mishandling and use of non disposable diathermy cord or sucker tube. There was no relation of age and sex with postoperative discitis in our study. But there are definite relation of nutritional status (under nutrition and obesity), history of smoking, poor socio-economic status and other co-morbid conditions like diabetes mellitus, urinary incontinence,Tuberculoses, Urinary infection, Immunodeficiency (patient receiving steroid). Prolong operation time, High number of OT staff, Direct shedding of bacteria from OT light handle, Microscope, C arm, Instrument tray mishandling and use of non disposable diathermy cord or sucker tube are also responsible for high incidence of postoperative discitis. Most (52%) of the patients were improved by conservative treatment and rest (48%) were treated surgically. Out 12 patients treated surgically 9 (75%) was pyogenic discitis. There were 2 (16.7%) patients found tubercular and 1 (8.3%) patient found fungal discitis Early diagnosis and appropriate management is the key for effective treatment of postoperative discitis. It is important to find out the probable etiologic factors of postoperative discitis. It helps to prevent such condition in future.

Keywords: Postoperative discitis, etiologic factors, prevention.

INTRODUCTION

Postoperative discitis after lumber disc surgeryis rare but it is one of the worst complications following lumber disc surgery[1]. The average incidence is about 1% after simple discectomy[2]. It comprises superficial and deep infections and was first described as a clinical entity by Turnbull in 1953[3].The possible cause may be haematogenous spread or direct inoculation of virulent organisms during the surgery.It may be localized to disc space or disseminate under the fascia and include discitis, epidural abscess, and spondylitis[4].*Staphylococcus* is the most common etiological agent of pyogenic discitis; followed by aerobic Gram-negative bacilli. Other rare causes were tubercular and fungal infection[5].Two types of post-operative discitis

1. Assistant Professor, Department of Ortho-surgery, National Institute of Traumatology and Orthopaedic Rehabilatation, Dhaka, Bangladesh.
2. Associate Professor, Department of Gamma Knife, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh.
3. Assistant Professor, Department of Neurosurgery, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh.
4. Consultant, Department of Radiology & Imaging, Popular Diagnostic Center, Mirpur Branch, Dhaka, Bangladesh.
5. Assistant Professor, Department of Anaesthesiology, National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh.
6. Assistant Professor, Department of Physiology, Delta Medical College, Dhaka, Bangladesh.

Address of Correspondence: Gazi Md. Ruhul Quddus, Assistant Professor, Department of Ortho-surgery, National Institute of Traumatology and Orthopaedic Rehabilatation, Dhaka, Bangladesh, Mobile: 01711358022, Email: ruhulquddus936@gmail.com

have been described: septic and aseptic. Other terms used include acute and subacute septic discitis[6], and chemical discitis after chemonucleolysis[7,8]. Postoperative discitishave been reported to be associated with a twofold increase in mortality, fivefold increase in hospital readmission, fourfold increase in financial burden, and 60% greater chance of intensive care unit admission[9,10]. Usually patients are present with severe low back pain with radiation, muscle spasm and fever. The aim of this study was to seethe patient related and intraoperative factorsthose contribute to an increase risk of postoperative discits.

MATERIALS AND METHODS

This is a retrospectivecross-sectional study was done in the Department of Neurosurgery, National Institute of Neurosciences and Hospital, Dhaka, Bangladesh. The study period was from January 01, 2018 to June 30, 2021 for a period of 3.5 years. Total 25 patients with the diagnoses of post-operativediscits were recruited in this study. The diagnoses were made by typical clinical features, biochemical marker (CBC, High ESR and CRP) and radiological findings. We analyzed the following data: (1) Patient related risk factors like age, sex, nutritional status, history of smoking, socio-economic status and other co-morbid conditions such as diabetes mellitus, urinary incontinence, tuberculosis, Urinary infection, Immunodeficiency (2) Intraoperative risk factors like Prolong operation time, High number of OT staff, Direct shedding of bacteria from surroundings[OT light handle, Microscope or C arm], Instrument tray mishandling anduse of non disposable diathermy cord or sucker tube.The data was collected from EMR (Electronic Medical Record) of our department and operation theatre (OT) records with prior consent of the patient. An approval of the Ethical Review Committee was also taken.

RESULTS

Most of the patients with postoperative discitis were from 4th and 5th decades of life (Table-1). Male were more sufferer than female. The Male: Female was 3: 2 (Figure-1).In our study 10 (40%) patients had poor nutritional status and 3 (12%) petitions were obese (Table-2). Regarding personal history 7 (28%) patients gave history of smoking and 12 (48%) were came from low socio-economic condition. The co-morbid conditions like diabetes mellitus was found in 4 (16%) patients. 2 (8%) patients had incontinence of urine due to caudaequina syndrome and urinary tract infection was found in 1 (4%) patient. Tuberculosis was found in 2 (8%) patients. 2 (8%) patients had immunodeficiency may be due to taking of steroidal drugs for a long time (Table-2).Among the intraoperative factors the prolong operation time (more than 3hours) and high number of OT staff (more than 10 person) were associated with high incidence of infection. Direct shedding of bacteria from OT light handle, microscope and C-Arm also causes infection. Instrument tray mishandling by scrub nurses (8%) anduse of non disposable diathermy cord orsucker tube (12%) were also responsible for postoperative discitis(Table-3). 13 (52%) patients were treated conservatively whereas 12 (48%) patients were treated surgically (Table-4).

Table-I

Age distribution of the patients (n=25)

Age (Years)	No. of Patients	Percentage (%)
01-10	00	00
11-20	01	04
21-30	3	12
31-40	3	12
41-50	8	32
51-60	6	24
61-70	4	16
Total	25	100

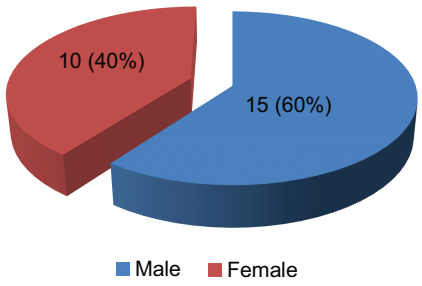


Fig.-1: *Sex distribution of the patients*

Table-II

Patient related risk factors (n=25)

Sl.	Type of risk factor	No. of Patients	Percentage
1	Nutritional status		
	Poor nutrition	10	40
	Obesity	3	12
2	History of smoking	7	28
3	Poor socio-economic status	12	48
4	Co-morbid diseases		
	Diabetes	4	16
	Urinary incontinence	2	8
	Tuberculosis	2	8
	Urinary infection	1	4
	Immunodeficiency	2	8

Table-III

Intra-operative risk factors(n=25)

Sl.	Risk factor3	Number	Percentage (%)
1	Prolong operation time>3 hours	5	20
2	High number of OT staff>10 persons	4	16
3	Direct shedding of bacteria from OT light handle, Microscope, C-Arm	4	16
4	Instrument tray mishandling	2	8
5	Use of non disposable diathermy cord and sucker tube	3	12

Table-IV

Treatment type (n=25)

Type of treatment	Number of patient	Percentage (%)
Conservative	13	52
Surgical	12	48
Total	25	100

Table-V

Histopathological findings(n=12)

Sl.	Histopathological type	Number	Percentage
1	Infective	9	75
2	Tubercular	2	16.7
3	Fungal	1	8.3
	Total	12	100

DISCUSSION

Postoperative discitis are usually pyogenic; however, tuberculous and fungal spondylodiscites have been described. In our study, we had done histopathological study in all surgically treated patients. Out 12 patients treated surgically 9 (75%) was pyogenic discitis. There were 2 (16.7%) patients found tubercular and 1 (8.3%) patient found fungal discitis(Table-5).A variety of risk factors have been described, including the patient's age, obesity, diabetes, urinary incontinence, history of smoking, poor nutritional status, complete neurologic deficit, ASA score > 2, previous urinary tract infections (UTIs), hypertension, unintentional durotomies, operating level, revision surgery, nonsteroidal anti-inflammatory drug (NSAID) use, a posterior surgical approach, oncologic cases, increased estimated blood loss, blood transfusion use, increased operative time, extension to the sacrum, and use of spinal instrumentation[11,12]. In our study there was no relation of age and sex with the incidence of postoperative discitis. But some studies showed that postoperative discitis are more common in advanced ages. The study by Koutsoumbelis *et al*.[13] identified four procedure-related risk factors: (1) longer duration of surgery; (2) intraoperative blood loss/need for transfusion; (3) incidental durotomy; and (4) >10 people in the operation theater (OT), specifically cautioning against unnecessary nurses. Previous studies have shown that prolonged surgery, prolonged hospital stays, and poor postoperative wound care are likely to result in SSIs[14]. These results are supported by our study, as we found that prolonged operative times increased the chance of developing potoperativediscitis. These results are consistent with those found in the study conducted by Hamdehet al[15].] Further studies showed that the risk of developing potoperativediscitis is related to the procedure duration, nutritional status, and patient comorbidities[16].There are many potential sources of intraoperative contamination. Weiner et al. showed the use of a headlamp, loupes or the operative microscope was associated with bacterial shedding[17]. Instrumentmishandling can also be a source. Bible et al. demonstrated that uncovered implant trays have a 16.7% contamination rate (as assessed by swab and culture) while covered trays were contaminated in only 2.0% of cases[18]. Other sources of contamination include the C-arm/fluoroscope[19] as well as surgeons and assistants. The use of pre-incision, intravenous antibiotic prophylaxis has the most significant effect in decreasing postoperative infection rates[20, 21]. This demonstrates that despite adequate preparation and draping, skin flora remains an important potential contaminant.In our study, we observed that use of non disposable diathermy cord and sucker tube was associated with postoperative discitis. But use of disposable diathermy cord and sucker tube markedly reduces postoperative discitis.

CONCLUSIONS

The incidence of postoperative discitisis rare. But it is associated with high morbidity, prolong hospital stay and increase healthcare cost.Early diagnosis and appropriate

management is the key for effective treatment of postoperative discitis. Medical treatment with intravenous antibiotics is typically the first line of treatment and is often effective, but surgery is required in selected cases.It is important to find out the probable etiologic factors of postoperative discitis. Postoperative discitis is usually pyogenic.However, the spine surgeon must also consider other sources like tuberculosis and fungal discitis. In those cases anti-tubercular and anti-fungal drug were started. The knowledgeable regarding factors that contribute to postoperative discitis help to take the preventative measures and formulate a protocol for the management of discitis. It helps to prevent such condition in future.

REFERENCES

1. Gerometta A, Bittan F, Rodriguez Olaverri JC. Postoperative spondilodiscitis. *IntOrthop*. 2012;36(2):433-438.
2. Fang A, Hu S, Endres N, Bradford D. Risk factors for infections after spinal surgery. *Spine.* 2005;30: 1460–1465.
3. Turnbull F. Postoperative inflammatory disease of lumbar discs. *J Neurosurg.* 1953; 10:469–73.
4. Singh DK, Singh N, Das PK, Malviya D. Management of Postoperative Discitis: A Review of 31 Patients. *Asian J Neurosurg*. 2018;13(3):703-706.
5. Grane P, Josephsson A, Seferlis A, Tullberg T. Septic and aseptic post-operative discitis in the lumbar spine — evaluation by MR imaging. ActaRadiologica. 1998;39(2):108-115.
6. PETRI A. & JENSEN I.P: Postoperative lumbaldiscitis. Typeinddeling, udredningogbehandling. (In Danish.) Ugeskr. Laeger 158/38 (1996), 5281.
7. BRIAN J. E., WESTERMAN G. R. & CHADDUCK W. M.: Septic complications of chemonucleolysis. Neurosurgery 15 (1984), 730.
8. FOUQUET B., GOUPILLE F!, JATTIOT E et al.: Discitis after lumbar disc surgery. Features of aseptic and septic forms. Spine 17 (1992), 356.
9. Calderone RR, Garland DE, Capen DA, Oster H. Cost of medical care for postoperative spinal infections. OrthopClin North Am. 1996;27(1):171-182.
10. Jarvis WR. Selected aspects of the socioeconomic impact of nosocomial infections: morbidity, mortality, cost, and prevention. Infect Control HospEpidemiol. 1996;17(8):552-557.
11. Wimmer C, Gluch H, Franzreb M, et al. . Predisposing factors for infection in spine surgery: a survey of 850 spinal procedures. *J Spinal Disord* 1998;11:124–8.
12. al-nuaim AR, al-rubeaan K, al-mazrou Y, et al. . High prevalence of overweight and obesity in Saudi Arabia. *Int J ObesRelatMetabDisord* 1996;20:547–52.
13. Chahoud J, Kanafani Z, Kanj SS. Surgical site infections following spine surgery: Eliminating the controversies in the diagnosis. *Front Med (Lausanne)* 2014;1:7.
14. Massie JB, Heller JG, Abitbol JJ, et al. . Postoperative posterior spinal wound infections. *ClinOrthopRelat Res* 1992;284:99–108.
15. Abu Hamdeh S, Lytsy B, Ronne-Engstrom E. Surgical site infections in standard neurosurgery procedures – a study of incidence, impact and potential risk factors. *Br J Neurosurg* 2014;28:270–5.
16. Beiner JM, Grauer J, Kwon BK, et al. . Postoperative wound infections of the spine. *Neurosurg Focus* 2003;15:P1–5.
17. Weiner BK, Kilgore WB. Bacterial shedding in common spine surgical procedures: headlamp/loupes and the operative microscope. Spine (Phila Pa 1976). 2007;32(8):918-920.
18. Bible JE, O'Neill KR, Crosby CG, Schoenecker JG, McGirt MJ, Devin CJ. Implant contamination during spine surgery. Spine J. 2013;13)16):637-640.
19. Biswas D, Bible JE, Whang PG, Simpson AK, Grauer JN. Sterility of C-arm fluoroscopy during spinal surgery. Spine (Phila Pa 1976). 2008;33(17):1913-1917.
20. Rohde V, Meyer B, Schaller C, Hassler WE. Spondylodiscitis after lumbar discectomy. Incidence and a proposal for prophylaxis. Spine (Phila Pa 1976). 1998;23(5):615-620.
21. Schulitz KP, Assheuer J. Discitis after procedures on the intervertebral disc. Spine (Phila Pa 1976). 1994;19(10):1172-1177.

Original Article

Evaluation of The Result of Management of Fracture Shaft of Femur in Children by Titanium Elastic Nails (TENS)

Khandaker Abu Sayed[1], Md. Abdul Halim[2], Arun Kumar Sarker[3], Md. Raisul Tasneem[4], Ashker Ibne Shams[3], Ruhul Amin Mollah[3]

Abstract

Management of femoral diaphyseal fractures in the age group 6-14 years is controversial. Titanium flexible intramedullary nailing has become a well-accepted method of treatment of paediatric femoral shaft fractures.To evaluate the outcome of fixation by Titanium elastic nails for management of fractures of shaft of femur in children, twenty four children aged 6-14 years with femoral diaphyseal fractures was stabilized with retrograde Titanium Elastic Nails. Two nails were used in each fracture. The results were evaluated by using Flynn's scoring criteria.All of the 24 children were available for evaluation and follow up for a mean duration of 9.6±3 months and radiological assessment was done during the follow up. Radiological union in all cases was achieved in a mean time of 10.08±1.99 weeks. Full weight bearing was possible in a mean time of 12.24±1.48 weeks. The results were excellent in 62.5% cases, satisfactory in 25% of the cases and poor in 12.5% cases. Needless to say, Intramedullary fixation of pediatric femoral shaft fractures by Titanium Elastic Nail is safe, simple and reliable method for treatment of most femoral shaft fractures in children of the 6 to 14 years age group.

Keywords: Titanium Elastic Nail, Paediatric femoral shaft fracture

INTRODUCTION

Trauma is the leading cause of morbidity and mortality in children (Cusick, et al., 2005) accounting for 50% of mortality in children after the first year of life and fractures are the most adverse event in the life of children (Tandon, et al., 2007). Femoral-shaft fractures are among the most common fractures of the lower extremity in children, with an annual incidence of up to 1 per 5,000 (Hinton, et al., 1999; Buess & Kaelin, 1998). Paediatric femoral shaft fractures are common in males with approximately a 2.5:1 male to female ratio (Bengner, et al., 1990). Most femoral fractures in children are closed injuries and traditionally are treated by closed methods. The management of paediatric femoral fractures as noted by Galpin et al., (1994) evolved gradually in past decade toward operative approaches because of desire for more rapid recovery and reintegration of patients, with recognition that prolonged immobilization have negative effects on children. Various methods of treatment can be used successfully depending upon the age of the patient

1. Assist Prof.(current change), MMCH, Mymensingh.
2. Jr. Consultant, NITOR, Dhaka.
3. Assistant Professor, NITOR, Dhaka.
4. Consultant, BRB Hospital, Dhaka, Bangladesh

Correspondence: Dr. Md. Abdul Halim, Jr. Consultant, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Email: drmahalim21@gmail.com

and the type of fracture but there is no consensus on one method as the best option (Moroz, et al., 2006).Treatment option for age between six months to fiveyears are Pavlik harness, early spica cast placement unless excessive shortening is present on initial films. Relative contraindications include severe comminution, open fractures, obesity, severe soft tissue swelling and a home situation in which spica cast care is not practical. In these situations, operative treatment may be required. For children aged 6(six) to 10(ten) years, spica casting, usually preceding a period of skeletal traction, is treatment option with good results but prolonging hospitalization. During the last decade, there has been an increasing tendency to change from non-operative treatment to minimally invasive treatment by retrograde TEN and external fixation (Solongo, 1990). However the risks of certain complications (particularly pin tract infection and refracture after external fixation, or avascular necrosis after solid antegrade IM nailing) have been prevented these methods from becoming adopted as the best treatment.

An ideal fixation device for pediatric femur fracture would be load sharing internal splint maintaining reduction for few weeks until a callus forms (Flynn, et al., 2001). Special precaution should be taken for preventing physis damage and blood supply damage to femoral head. Titanium elasticity limits amount whether how much nail will be deformed during insertion. Elasticity promotes callus formation by limiting stress shielding. Titanium also has excellent bio compatibility. Many observations show that flexible intramedullary nail fixation meet these requirements because it allows rapid mobilization, no risk for osteonecrosis, low risk for physical injury and reduced risk for re-fracture. Because of its clinical effectiveness and low rate of complications, elastic stable intramedullary nailing for fractures of long bones in the skeletally immature patient (e.g., children) has gained widespread popularity.

After positive reports from Ligier, et al., titanium elastic nails (TENs) which is variously known as elastic stable intramedullary nailing (ESIN), become popular in Europe, North America & India (1985). According to the lack of data in Bangladesh in this regard, the present study is aimed at the evaluation of intramedullary fixation with TEN in children with shaft of femur fracture.

MATERIALS AND METHOD

This quasi experimental study was carried out for 24 months in National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Bangladesh. Twenty four patients with mid and distal diaphy sealtransverse or short oblique fractures of the femur with minimal comminution, in children 6 to 14 years old admitted in hospital was purposively included in the study after taking proper written consent from their legal guardians.

Inclusion criteria were middle and lower 1/3rd of the femoral diaphyseal transverse or short oblique fractures with minimal comminution, Only closed fractures of the shaft of femur, All patients between 6 to 14years of age & Fractures aging less than two weeks were included.

Exclusion criteria were open fractures of the shaft of femur,proximal and spiral femoral fractures, undisplaced fracture treated by non-operative method, infected cases, pathological fractures&obese child.

RESULTS

All of the 24 children were available for evaluation and follow up for a mean duration of 9.6±3 months and radiological assessment was done during the follow up. Radiological union in all cases was achieved in a mean time of 10.08±1.99 weeks. Full weight bearing was possible in a mean time of 12.24±1.48 weeks. The results were excellent in 62.5% cases, satisfactory in 25% of the cases and poor in 12.5% cases.

Evaluation of outcome:

Table I

Distribution of patients by status of union (n=24)

Status of union	Frequency	Percentage
United	24	100%
Nonunion	0	0%

Radiological evaluation of fracture site showed that 100% united rate and there was no case of nonunion.

Table II

Incidence of complication (n=24)

Complications	Frequency	Percentage
Minor complication	5	20.8%
Pain at the site of nail insertion	2	8.3%
Minor leg length discrepancy	2	8.3%
Loss of knee movement (worse than 100 to 110) more than two weeks after removal)	1	4.2%
Major complication	1	4.2%
Surgery to revise nail placement	1	4.2%
Total	6	25.0%

In terms of complications, 05 (20.8%) of the patients developed minor complications and 01 (4.2%) of the patients developed major complication which was nail breakage. The total complication rate was 25% (n=6).

Table III

Distribution of patients by activity level (n=24)

Activity level	Frequency	Percentage
Return to preinjury activities	11	45.8%
Preinjury activities with mild limitations	12	50.0%
Preinjury activities with moderate limitations	1	4.2%

Eleven (45.8%) patients return to preinjury activities, 12 (50%) patients to preinjury activities with mild limitations and 1 (4.2%) to routine activities with moderate limitations.

Table IV

Final Outcome

	Excellent results	Satisfactory results	Poor results
Leg-length discrepancy	<1.0 cm	≤2.0 cm	>2.0 cm
Malalignment	<5 degrees	≤10 degrees	>10 degrees
Pain	None	None	Present
Complication	None	Minor and resolved	Major complications and/ or lasting morbidity
Study results (n=24)	15	6	3
Percentage	62.5%	25.0%	12.5%

After the final follow up, 15 (62.5%) patients had excellent outcome, 6 (25%) had satisfactory outcome and 3 (12.5%) had poor outcome. This outcome was measured according to Flynn et al. (2001).

Successful outcome included both the excellent and satisfactory outcome. Accordingly, the successful outcome of the study was 87.5% and unsuccessful outcome was 12.5%.



Pre operative x-ray



Post operative



X-ray after 2 months after 4 months





Follow up after 7 months Appendix VII

DISCUSSION

A complete history regarding the cause and mechanism of injury with duration was taken. After initial resuscitation like intravenous fluid, blood, nonsteroidal analgesics, antibiotics and tetanus prophylaxis in cases with associated injuries, all cases were admitted in the ward. X-ray of the affected thigh including hip and knee was done in antero-posterior and lateral views. Skeletal traction by upper tibial pin of 12 patients and surface traction of 8 patients was applied in all cases. Meanwhile all routine

investigation for anaesthesia- blood urea, serum creatinine, random blood sugar, blood grouping and x-ray chest P/A view was done. Through pre-operative evaluation, informed written consent was taken. All necessary implants and instruments were kept ready. Pre-anesthetic check-up was done in time. During post-operative period limb was supported by long leg back slab maintaining 5^0 to 10^0 knee flexion for two to three weeks. Isometric quadriceps exercise was started day after operations. Stiches were removed on 12^{th} to 14^{th} post-operative day. The patients were allowed to walk as long as pain was tolerable by using crutches without weight bearing on affected limb. Adequate antibiotics were given for two to three weeks in all the cases. The following advices were given on dischargeRegular quadriceps exercise, Active movement of hip and knee joints after removal of back slab, Crutch ambulation without weight bearing on affected limb&Follow up at outpatient department every 4 week interval. Each of the patients was evaluated both clinically and radiologically.If there was radiological evidence of healing (callus), the patient was allowed to toe touch walking and thereafter gradual weight bearing.Full weight bearing was allowed after radiological evidence of consolidation. Data was collected with a pre tested structured questionnaire containing history, clinical, laboratory investigations, pre-operative, perioperative, post-operative complications and post-operative follow up findings. Data sheet was formulated to evaluate the final outcome according to TEN scoring criteria of Flynn et al. (Flynn, et al., 2000). Data was collected, compiled and tabulated according to key variables and functional assessment scoring.

The analysis of different variable was done according to standard statistical analysis by using Microsoft Excel 2010.After enrollment of the patient the data of the following variables evaluated by using Flynn's scoring criteria.

CONCLUSION

In this study outcome of mid-diaphyseal pediatric femoral shaft fractures treated by flexible elastic intramedullary nail demonstrated excellent to satisfactory in majority of the cases. Eighty seven percent of the cases showed successful outcome according to Flynn's TEN scoring criteria. Intramedullary fixation with TEN may be the preferred method for the treatment of pediatric femoral shaft fractures. Minimum disturbance of fracture hematoma would not hamper fracture healing. Respect to the soft tissue during operation and early mobilization will improve final outcome.

REFERENCES

1. Agus, H., Kalenderer, O., Eryanilmaz, G. & Omeroglu, H., 2003. Biological internal fixation of comminutedfemur shaft fracture by bridge plating in children. *Journal of Pediatric Orthopaedics,* Volume 23, pp. 184-189.
2. Anderson, W. A., 1983. Causative factorsresponsible for femoral fractures in infants and young children. *Journal of Pediatric Orthopaedics,* Volume 3, pp. 341-343.
3. Aronson, D. D., Singer, R. M. & Higgins, R. F., 1986. Skeletal traction for fractures of the femoral shaft in children. A long-term study. *Journal of Bone & Joint Surgery (Am),* Volume 69, pp. 1435-1439.
4. Aronson, J. & Tursky, E. A., 1992. External fixation of femur fractures in children. *Journal of Pediatric Orthopaedics,* Volume 12, pp. 157-163.
5. Bar-On, E., Sagiv, S. & Porat, S., 1997. External fixation or flexible intramedullary nailing for femoral shaft fractures in children: A prospective randomised study. *Journal of Bone & Joint Surgery,* Volume 79-B, pp. 975-978.
6. Beals, R. K. & Tufts, E., 1983. Fractured femur in infancy: the role of child abuse. *Journal of Pediatric Orthopaedics,* Volume 3, pp. 583-586.
7. Beaty, J. H., 1998. Aseptic necrosis of the femoral head following antegrade nailing of femoral fractures in adolescents. *Techniques in Orthopaedics,* Volume 13, pp. 96-99.
8. Beaty, J. H., Austin, S. M., Warner, W. C., Canale, S. T., & Nichols, L., 1994. Interlocking intramedullary nailing of femoral shaft fractures in adolescents: preliminary results and complications. *Journal of Pediatric Orthopaedics,* Volume 14, pp. 178-183.
9. Bengner, U., Ekbom, T., Johnell, O. & Nilsson, B. E., 1990. Incidence of femoral and tibial shaft fractures: Epidemiology 1950-1983 in Malmo, Sweden. *Acta Orthopaedica Scandinavica,* Volume 61, pp. 251-254.
10. Bertocci, G. E., Pierce, M. C., Deemer, E. & Aguel, F., 2001. Computer stimulationof stair falls to investigate scenarios in child abuse. *Archives of Pediatrics and Adolescent Medicine,* Volume 155, pp. 1008-1014.
11. Eren, O. T. et al., 2003. Open reduction and plate fixation of femoral shaft fracturesin children aged 4 to 10. *Journal of Pediatric Orthopaedics,* Volume 23, pp. 190-193.
12. Flynn, J. M., Hresko, T., Reynolds, R. A., Blasier, R. D., Davidson, R., & Kasser, J., 2001. Titanium elastic nails for pediatric femur fractures: a multicenter study of early results with analysis of complications. *Journal of Pediatric Orthopaedics,* Volume 21, pp. 4-8.

13. Flynn, J. M., Luedtke, L. M., Ganley, T. J., Dawson, J., Davidson, R. S., Dormans, J. P., et. al., 2004. Comparison of titanium elastic nails with traction and a spica cast to treat femoral fractures in children. *The Journal of Bone & Joint Surgery (Am),* Volume 86-A.

14. Flynn, J. M. & Schwend, R. M., 2004. Management of pediatric femoral shaft fractures. *Journal of the American Academy of Orthopaedic Surgeons,* Volume 12, pp. 347-359.

15. Fricka, K. B., Mahar, A. T., Lee, S. S. & Newton, P. O., 2004. Biomechanical analysis of antegrade and retrograde flexible intramedullary nailfixation of pediatric femoral shaft fractures using a systhetic bone model. *Journal of Pediatric Orthopaedics,* Volume 24, pp. 167-171.

16. Galpin, R. D., Willis, R. B. & Sabano, N., 1994. Intramedullary Nailing of Pediatic femoral Fractures. *Journal of Pediatric Orthopaedics,* Volume 14, pp. 184-189.

17. Gomez, M. A. & Nahum, A. M., 2002. Biomechanis in bome. In: *Accidental injury.* s.l.:Springer New York, pp. 206-227.

18. Hughes, B. F., Sponseller, P. D. & Thompson, J. D., 1995. Pediatric femur fractures: effects of spica cast treatments on family and community. *Journal of Pediatric Orthopaedics,* Volume 15, pp. 457-460.

19. Hymel, K. P. & Jenny, C., 1996. Abusive spiral fractures of the humerus: a videotaped exception. *Archives of Pediatrics and Adolescent Medicine,* Volume 150, p. 226.

20. Iqbal, M., Manzoor, S., Cheema, G. M. & Ahmed, E., 2010. Comparative study of fracture shaft of femur fracture in children treated with Titanium Elastic Nail and early external fixator. *Annals of King Edward Medical University,* Volume 16, p. 2.

21. Kumar, N. & Chaudhary, L., 2010. Titanium Elastic Nails for Pediatric Femur Fractures: Clinical and Radiological Study. *Journal of Surgical Science,* Volume 1, pp. 15-19.

22. Miller, M. E., Bramlett, K. W., Kissell, E. U. & Niemann, K. M. W., 1987. Improved treatment of femoral shaft fractures in children The "Pontoon" 90-90 spica cast. *Clinical Orthopaedics and Related Research,* Volume 219, pp. 140-146.

23. Mirdad, T., 2000. Operative treatment of femoral shaft fractures in children: a nine year experience in Saudi Arabian population. *Injury,* Volume 31, pp. 760-771.

24. Narayanan, U. G., Hyman, J. W., Wainwright, A. M., Rang, M., & Alman, B. A., 2004. Complications of elastic stable intramedullary nail fixation of pediatric femoral fractures, and how to avoid them. *Journal of Pediatric Orthopaedics,* Volume 24, pp. 363-369.

25. Rockwood, C. A., 2010. *Rockwood and Wilkin's Fractures in Children.* s.l.:Lippincott Williams &Wilkins.

26. Saikia, K. C., Bhuyan, S. K., Bhattachaya, T. D. & Saikia, S. P., 2007. Titanium elastic nailing in femoral diaphyseal fractures of children in 6-16 years of age. *Indian Journal of Orthopaedics,* Volume 41, pp. 381-385.

27. Salem, K. H., Lindemann, I. & Keppler, P., 2006. Flexible intramedullary nailing in pediatric lower limb fractures. *Journal of Pediatric Orthopaedics,* Volume26, pp. 505-509.

28. Sanders, J. O., Browne, R. H., Mooney, J. F., Raney, E. M., Horn, B. D., Anderson, D. J., Hennrikus, W. L., Robertson, W. W., 2001. Treatment of femoral fractures in children by pediatric orthopedists: Results of a 1998 Survey. *Journal of Pediatric Orthopaedics,* Volume 21, pp. 436-441.

29. Shapiro, F., 1981. fractures of the femoral shaft in children: the overgrowth phenomenon. *Acta Orthopaedica Scandinavica,* Volume 52, pp. 649-655.

30. Solongo, T., 1990. [The external fixator for children: an ideal method?]. *Z Unfallchir Versicherungsmed,* Volume83, pp. 74-80.

Original Article

Operative versus conservative management in Failed back surgery syndrome for Prolapse lumbar intervertebral disc

Mohammad Russel[1], Md. Ahsan Kabir[2], Zinat Parveen[3], Noor E Nahrin[4], Md Mahbub Ali[5], Md. Akshad Al Masur[6], Mst. Fatema Khatun[7]

Abstract :

Failed back surgery syndrome (FBSS) due to Prolapse lumbar intervertebral disc (PLID) is a widespread public health problem. Patients with FBSS typically experience a decrement in their functional capacity, morale, and productivity. They are also more vulnerable to develope psychosocial problems. This can be managed effectively either conservative or operative treatment. Although conservative management is commonly and primarily used for people who have failed back surgery syndrome for prolapse lumbar intervertebral disc with radiculopathy, operative management play an important role. The aim of this study was to find out the result of Operative versus conservative management in FBSS for prolapse lumbar intervertebral disc. This was a prospective interventional study carried out in the Department of Orthopaedics at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from March 2013 to September 2015. For this study, a total number of 30 patients presented with Failed back surgery syndrome for prolapse lumbar intervertebral disc with radiculopathy age ranging from 20 to 60 years, with clinical symptoms, signs and radiological evidence suggestive of previous back spinal surgery due to prolapse lumbar intervertebral disc managed either operatively or conservatively. Among 30 cases 15 were selected for group-I managed operatively and 15 were for group-II managed conservatively and both groups fulfill the selection criteria. Out of 30 patients in our study maximum age incidence was found in 41-50 years with a mean age 47 years. Out of 30 patients 73.3% were male and 70% were manual worker. 66.7% were suffering from FBSS due to prolapse lumbar intervertebral disc at L_{4-5} level in group-I. In 12 months follow up, 73.3% satisfactory outcome was seen in operatively treated (group-I) patients with 33.3% satisfactory outcome showed in conservatively managed patients. In our study, surgical treatment showed significantly better results for pain relief, functional outcome and satisfaction as compared with conservative management in failed back surgery syndrome for PLID.

Keywords: **Failed back surgery, PLID, Conservative management**

INTRODUCTION:

Papageorgiou (1995) shows 60–80% of lifetime prevalence of back pain in a large population study. This high prevalence has considerable impact in the national health policy and employment sector. For example, in a study of back pain consulters from United Kingdom 37% of those unemployed attributed this to their back pain (Wynne-Jones, 2008).The prevalence of sciatic symptoms reported in the literature varies considerably ranging from 1.6% in the general population to 43% in a selected working

1. Classified Specialist in Surgery (Orthopaedics), CMH Bogura
2. Assistant Registrar, Department of Orthopaedics, Army Medical College Bogura.
3. IMO, Dept. of Gynae and Obstetrics, Sir Salimullah Medical College and Mitford Hospital, Dhaka.
4. Associated professor (cc), Department of Gynae and Obstetrics, Army Medical College Bogura.
5. Lt Col, Gd Spl in Surg (Ortho) CMH Bogura
6. Junior Consultant, Department of Orthopedics, 250 Bedded General Hospital, Pabna
7. Medical Officer, 250 Bedded General Hospital, Pabna

Correspondence: Dr. Mohammad Russel, Classified Specialist in Surgery (Orthopaedics), CMH Bogura

population (Konstantinou, 2008). Although the prognosis is good in most patients (Legrand, 2007). A substantial proportion up to 30% continues to have pain for 1 year or longer (Vroomen, 2000)

In approximately 90% of the cases, sciatica is caused by Prolapse lumbar intervertebral disc (PLID) involving nerve root compression. The most important symptom of FBSS with PLID is lumbosacral radicular leg pain that follows a dermatomal pattern radiating below the knee and into the foot and toes. The pain worsens with coughing, patients may report sensory symptoms, limited forward flexion of the lumbar spine, gait deformity and unilateral spasm of the paraspinal muscles. Conservative treatment for prolapse lumbar intervertebral disc is primarily aimed for pain reduction. There seems to be consensus that surgery is indicated in carefully selected patients for sciatica in presence of a herniated lumbar disc, or severe sciatica with serious or progressive neurologic deficits and imaging demonstrating prolapse lumbar disc at the nerve root level correlating with the patient's examination findings (Gregory, 2008). Patients with severe symptoms who fail to improve following 6–8 weeks of conservative management indicated for surgery. Patients with back and leg pain, about 300,000 operations were performed in the United States in 1994, and this number rose to nearly 400,000 by 2000 (Gregory, 2010). Although it is estimated that 60% or more of these initial surgeries are successful, many are not (Law, 1978), results in Failed back surgery syndrome (FBSS).

Failed back surgery syndrome (FBSS) refers to chronic back and/or leg pain that occurs after back (spinal) surgery (Oaklander, 2001). Nearly 20% of the patients undergoing spine surgery will require secondary surgery for persistent pain or surgery related complications during the subsequent years. The reoperation rate is between 10% and 19%, and approximately 25,000 to 50,000 cases of FBSS occur per year in USA, according to Heithof KB in 1981. A 2008 study places the yearly incidence as high as 80,000 (Gregory, 2010). Multiple factors can contribute to the development of FBSS. Surgery-related factors may be wrong surgical technique, surgical complications, instability, recurrent disc herniation, and fibrosis-associated neuropathic pain, age, lifestyle (i.e. smoking, obesity, lack of physical exercise) and psychosocial factors. Previous studies regarding clinical outcome in patients with FBSS had limited focus on possible associations between conservative management and operative management. In the present case series of 30 patients with FBSS for prolapse lumbar intervertebral disc, 15 patients were treated conservatively and 15 patients were treated operatively. Associations between patient characteristics and outcome were evaluated.

MATERIALS AND METHODS

Study design

This is a Prospective interventional study .

Duration of the study:

This study was carried out between March 2013 to September 2015 at the Department of Orthopaedics, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka.

Ethical issue:

Informed written consent were taken from the patient after duly informing the treatment, anticipated result, possible procedure of advantages, disadvantages and complications considering all ethical issues.

Sample size:

Following formula was used to calculate sample size:

$$n = \frac{P_1 (1- P_1) + P_2 (1- P_2)}{(P_1 - P_2)^2} X (u+v)^2$$

Sampling technique

Two patients of FBSS for prolapse lumbar intervertebral disc were selected in outpatient department strictly considering the inclusion and exclusion criteria. In this way 30 patients were enrolled. Among them 15 were selected for group-I and 15 were selected for group-II.

Sample collection

Collected from the outpatient department of spinal unit of Orthopaedics of Bangabandhu Sheikh Mujib Medical University (BSMMU) Shahbag, Dhaka.

Study Population

The patients with Failed back surgery syndrome due to prolapse lumbar intervertebral disc diagnosed on the basis of presenting complaints, clinical examination & investigations.

Age

From 20 years to 60 years.

Place of the study

Department of Orthopedics Bangabandhu Sheikh Mujib Medical University (BSMMU) Shahbag, Dhaka.

Selection of the patients

The patients for the study were selected on the basis of following inclusion and exclusion criteria.

Selection Criteria:

Inclusion criteria of cases

1) FBSS following prolapse lumbar intervertebral disc operation at one level.
2) With radiculopathy (e.g: leg pain and/or back pain; restricted SLR; Motor, Sensory, Reflex deficit.
3) With Positive radiology & MRI.
4) Along with prolapse lumbar intervertebral disc at one level, unilateral or bilateral.

Exclusion criteria of cases

1) FBSS due to other than prolapse lumbar intervertebral disc.
2) Due to direct trauma with fracture –dislocation of vertebra.
3) Associated with cervical spinal pathology.
4) More than one level.
5) Patients who are severely ill, disabled, psychotic patient.
6) Cauda equina syndrome.

RESULT:

The present single centered, prospective interventional study was conducted between the periods of March 2013 to September 2015 for duration of two and half years in the Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University, Dhaka. All patients visited in the Department of Orthopaedic Surgery, aged 20 to 60 years with both sexes diagnosed as low back spinal surgery on the basis of presenting complaints, clinical examination & investigations were selected as study population. The results of the study are as follows:

Table-I

Sex distribution of the patients (n=30).

Sex	Group		p	
	Operative (n=15) no(%)	Conservative (n=15) no(%)	Total (n=30)	value
Male	12 (80.0%)	10 (66.7%)	22 (73.3%)	0.409^{NS}
Female	3 (20.0%)	5 (33.3%)	8 (26.7%)	
Total	15 (100.0%)	15 (100.0%)	30 (100.0%)	

- Chi-square test was done to measure the level of significance.
- P = 0.409 indicate non- significant
- NS= non- significant
- n = number of patient

Out of 15 patients 12 (80.0%) were male and 3 (20.0%) were female in Operative group. Out of 15 patients 10 (66.7%) were male and 5 (33.3%) were female in conservative group. Out of 30 patients in both group male were 22 (73.3%). Male were more sufferer than female. The difference between these two groups was not statistically significant.

Table-II

Work status of the patients (n=30).

Work status	Group		p
	Operative (n=15) no(%)	Conservative (n=15) no(%)	value
Manual worker	11 (73.3%)	10 (66.7%)	0.690^{NS}
Sedentary worker	4 (26.7%)	5 (33.3%)	
Total	15 (100.0%)	15 (100.0%)	

- Chi-square test was done to measure the level of significance.
- P > 0.05 indicate non- significant
- NS= non- significant
- n = number of patient

Out of 15 patients 11 (73.3%) were manual worker and 4 (26.7%) were sedentary worker in operative group. Out of 15 patients 10 (66.7%) were manual worker and 5 (33.3%) were sedentary worker in conservative group. The difference between these two groups was not statistically significant.

CONCLUSION:

The long term outcomes of surgery and conservative management though sometimes considered similar, but in short term, surgery provides quicker relief.

In our study, surgical treatment showed significantly better results for pain relief, functional outcome and satisfaction as compared with conservative management in failed back surgery syndrome for PLID.

REFERENCES:

1. Atlas, SJ, Deyo, RA, and Keller, RB. (1996) " The maine lumbar spine study: II 1 year outcomes surgical and nonsurgical management of sciatica', *Spine,* 21, pp. 1777-86.
2. Atlas, SJ, Keller, RB, and chang, Y. (2001) 'surgical and nonsurgical management of sciatica secondary to a lumbar disc herniation: five year outcomes from the maine lumbar spine study', *Spine,* 26, pp. 1179-87.

3. Benson, RT, Tavaras, SP, Robertson, SC, Sharp, R. and Marshall, RW. (2010) 'Conservatively treated massive prolapsed disces: a 7 years follow-up', *Ann R Coll Surg Engl.,* 92(2), pp. 147-53.

4. Benzon, HT. (1986) 'Epidural steroid injections for low back pain and lumbosacral radiculopathy', *Pain,* 24,pp. 277-95.

5. Borenstein, DG, Wiesel, SW, and Boden, SD. (1995) ' Low Back Pain: Medical Diagnosis and Comprehensive Management', 2nd edition, Philadelphia, W.B. Saunders Co, pp. 109-35.

6. Deyo, RA, Gray, DT, Kreuter, W, Mirza S, and Martin BI. (Jun 2005). "United States trends in lumbar fusion surgery for degenerative conditions", *Spine,* 30 (12) pp. 1441–5.

7. Epker, J, and Block, AR. (2001) 'Presurgical psychological screening in back pain patients: A review', *Clinical Journal of Pain.* 17, pp. 200-5.

8. Fairbank, JC, and Pynsent, PB,(2000) "the Oswestry Disability Index", *Spine,* 25(22), pp. 2940-2952

9. Franklin, G, Haug, J, Heyer, N, McKeefrey, S, and Picciano, J. (1994) 'Outcome of lumbar fusion in Washington state worker's compensation", *Spine,* 17, pp.1897-1904.

10. Friedenberg, ZB, and Shoemaker, RC. (1954) 'The results of non-operative treatment of ruptured lumbar discs', *Am J Surg,* 88, pp. 933-5.

11. Fritsch, EW, Heisel J, Rupp, S. (1996) 'The failed back surgery syndrome: reasons, intraoperative findings, and long-term results: a report of 182 operative treatments', *Spine,* 21(5), pp. 626-33

12. Gardea, MA, and Gatchel, RJ. (2000) 'Interdisciplinary treatment of chronic pain', *Current Review of Pain,* 4, pp.18-23.

13. Gatchel, RJ, Polatin, PB, Mayer, TG. (1995) 'The dominant role of psychosocial risk factors in the development of chronic low back pain disability', *Spine,* 20, no.24, pp.2702-09.

14. Gatchel, RJ. (2001) 'A biopsychosocial overview of pre-treatment screening of patients with pain', *Clinical Journal of Pain,* 17, pp.192-9.

Original Article

Correlation between clinical diagnosis and Arthroscopic Findings in ACL Injuries

Pankoj Kanti Mondol[1], Sajeeb Imtiazur Rahman[2], A. M. Fasiul Alam[3], Md. Samiul Islam[4], Sujit Paul[1], Md. Mesh-ke Alam Jony[5], Syed Khaledur Rahman[5], S. M. Tanveer Rahman[4]

Abstract

ACL is the commonest ligament to be involved in knee joint injuries. Despite the superiority of diagnostic arthroscopy in ACL injuries, it has considerable complications and economic drawbacks. Thus, careful clinical examinations appear as a noninvasive alternative to this diagnostic modality. Therefore, this study aimed at evaluating the accuracy and usefulness of clinical diagnosis in diagnosis of ACL tears using arthroscopy as gold standard. A cross sectional study between January 2020 to June 2021 was carried out at NITOR and BSMMU, including 42 patients by purposive sampling. Each case was evaluated clinically, with MRI and by arthroscopic methods; sensitivity, specificity, accuracy; PPV & NPV of combined Lachman test and anterior drawer test were measured. The mean age of patients was 25.96±7.7 years with a male: female ratio of 13:1. Principal cause of ACL tear was either sports injury or motor vehicle accident (42.9% each) and 15 patients (35.7%) had associated medial meniscal injury. 30 were positive and 4 were negative evaluated by arthroscopy. Clinically negative ACL injuries were found in 8 (19.05%) patients. Among them 4 were positive and 4 were negative evaluated by arthroscopy. The sensitivity, specificity and accuracy of Clinical diagnosis with respect to arthroscopy were 88.24%, 50% and 80.95%, respectively (fair correlation with arthroscopy in diagnosing ACL tears). The PPV was 88.24% and the NPV of MRI was 50%. The study concludes that anterior drawer and Lachman tests are valuable means to assess ACL injuries.

Keywords: ACL injury, Lachman test, anterior drawer test, arthroscopy

INTRODUCTION

The knee is one of the most commonly injured joint of body and early detection of the cartilage and ligament abnormalities is vital for early intervention to prevent further degeneration[1]. The anterior cruciate ligament is currently the most common ligament injury in the knee joint with a prevalence of 14.4%[2].

Injuries to the ACL rarely occur in isolation. Of the four major ligaments in the knee, the ACL and the MCL are most often injured in sports[3]. Meniscal damage frequently occurs at the time of an ACL injury, and the incidence of further damage increases in patients who do not undergo reconstruction[4].

There are many modalities to diagnose the anterior cruciate ligament (ACL) injury, however good history and physical examination are the key steps. History regarding the mechanism of knee injury gives a clue to the structures injured in the knee joint. Hyperextension with an audible pop would suggest an anterior cruciate ligament (ACL) tear. A direct blow to the knee from the side would point toward collateral ligament injury, and from the front, would indicate a cruciate ligament injury[5]. The Lachman (anterior displacement of tibial manually at 20° of flexion) is an accurate test for detecting ACL tear (mean sensitivity 84%). Anterior drawer test and the pivot shift tests have a sensitivity of about 62 percent[6]. But their combined accuracy was scarcely evaluated in past.

The aim of this study is to evaluate the accuracy of combined Lachman and anterior drawer tests in the knee with ACL injury in compare with arthroscopy findings.

1. Junior Consultant, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207
2. Resident, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207
3. Assistant Professor, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207
4. Medical Officer, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207
5. Assistant Registrar, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207

Correspondence: Dr. Pankoj Kanti Mondol, Junior Consultant, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh-1207. E-mail: dr.pakmondol@gmail.com

MATERIALS AND METHODS

This was a cross sectional study held at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka and Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka from January 2020 to June 2021. Nonrandomized purposive sampling was done according to the availability of patients, which included 42 patients with ACL injury seen at MRI of injured knee. Patients with previous knee arthroscopy, surgery or knee fractures were excluded from the study.

After selection of the subject, verbal consent was taken. Thorough clinical examinations were performed according to the pre-designed study proforma. Patient either Lachman positive or anterior drawer tests were considered to be clinically positive. Informed consent was taken prior to arthroscopic evaluation and the modalities of treatment were under taken. All the findings were recorded according to the design study proforma. Post-operatively the patients were taken care by joint immobilization, antibiotic prophylaxis and a standard rehabilitation programme.

Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The quantitative observations were indicated by frequencies and percentages. The summarized data were presented in the form of tables and charts. Institutional approval was taken from the Institutional Review Board (IRB) of NITOR to conduct the study.

RESULTS

Age of the patients ranged from 16-45 years. Among them majority of subjects (52.4%) were from 16-25 years age group. The mean age was found 25.96±7.71 years. 39 (88.6%) of all patients were male and rest were female and the ratio was 13:1.



Fig.-1: *Anterior drawer test*



Fig.-2: *Lachman test*

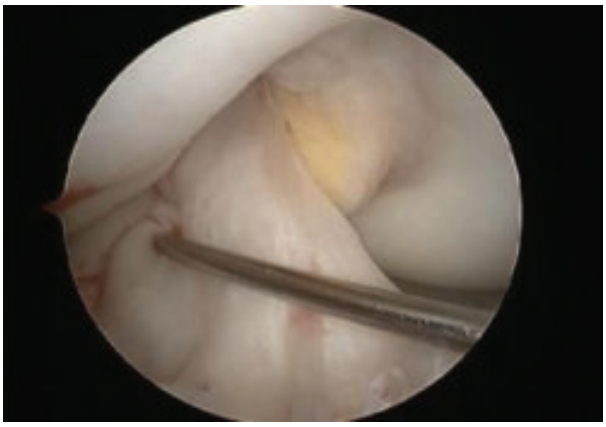


Fig.-3: *Arthroscopic view of normal ACL*

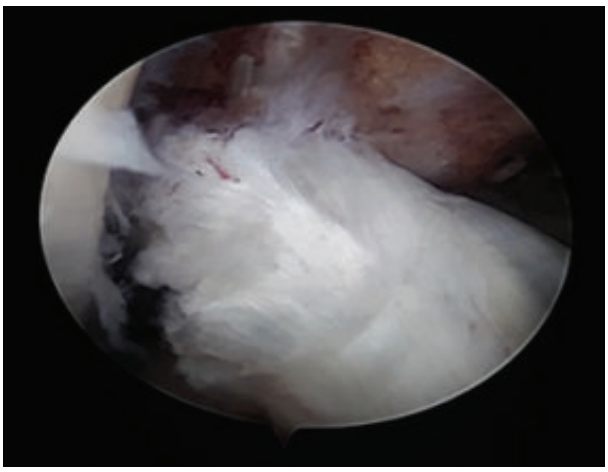


Fig.-4: *Arthroscopic view of torn ACL*

Clinically, 34 (80.95%) patients had either Lachman test positive or Anterior drawer test positive. 15 patients (35.7%) had an associated medial meniscal injury followed by 9 patients (21.4%), who had lateral meniscal injury (Table I).

In arthroscopic assessment, 34 (80.95%) patients were found with injured ACL and 8 (19.05%) had no ACL injury. Out of 34 arthroscopic positive cases, 7 (16.7%) cases had tibial attachment tear/avulsion, 9 (21.4%) cases had femoral attachment tear and 18 (42.9%) had mid-substance tear.

Table I

Distribution of the cases by clinical diagnosis (n=42)

Clinical diagnosis	Frequency	Percentage
Anterior cruciate ligament injury	34	80.95%
Posterior cruciate ligament injury	1	2.38%
Medial collateral ligament injury	1	2.38%
Lateral collateral ligament injury	2	4.76%
Medial meniscus injury	15	35.71%
Lateral meniscus injury	9	21.43%

*Multiple entries

Table II

Correlation between Clinical diagnosis and arthroscopy diagnosis evaluation for ACL injury

Clinical	Arthroscopy		Total
Diagnosis	Positive	Negative	
Positive	30	4	34
	(True positive)	(False positive)	
Negative	4	4	8
	(False negative)	(True negative)	
Total	34	8	42

Clinically positive ACL injuries were found in 34 (80.95%) patients. Among them 30 were positive and 4 were negative evaluated by arthroscopy. Clinically negative ACL injuries were found in 8 (19.05%) patients. Among them 4 were positive and 4 were negative evaluated by arthroscopy diagnosis evaluation for anterior cruciate ligament injury (Table II). The sensitivity, specificity and accuracy of Clinical diagnosis with respect to arthroscopy were 88.24%, 50% and 80.95%, respectively (fair correlation with arthroscopy in diagnosing ACL tears). The PPV was 88.24% and the NPV of MRI was 50% (Table III).

Table III

Sensitivity, specificity, accuracy, positive and negative predictive value of clinical diagnosis in diagnosing anterior cruciate ligament injury

Test of validity	Percentage
Sensitivity	88.24%
Specificity	50.00%
Accuracy	80.95%
Positive predictive value	88.24%
Negative predictive value	50.00%

DISCUSSION

In this study majority 22 (52.4%) patients belonged to age 16-25 years. 13 (31%) cases belonged to age group 26-35 years and 7 (16.7%) cases belonged to 36 to 45 years. The mean age were found 25.96±7.71 years. Khandelwal, et al. (2018) observed maximum patients (47.14%) between 21 and 30 years[7], which was almost similar to the study done by Ishani, et al.[8].

Men suffered most of the knee injuries as that of the study by Khandelwal, et al.[7] because they tend to do more outdoor activities and sports. Moreover, in concordance with the study of Avcu et al.[9], our study had almost three fifth of patients with right sided ACL injury.

Among 42 cases, in 18 (42.9%) patients the cause of injury was sport injury, 18 (42.9%) was motor vehicle accident and 6 (14.3%) was fall from height. Similar observation was found in Ahmed, et al. (2017) where they showed 50.81% patients were road traffic accidents, 45.95% were sports injuries and 3.24% were miscellaneous injury[10].

According to clinical diagnosis, associated other injuries includes, medial meniscus injury in 15 (35.7%) cases, lateral meniscus injury in 9 (21.4%) cases, lateral collateral ligament injury in 2(4.8%) cases, medial collateral ligament injury in 1(2.4%) case and posterior cruciate ligament injury in 1 (2.4%) case. Jah, et al. (2005) diagnosed clinically 21 anterior cruciate ligament injuries, 9 posterior cruciate ligament injuries, 24 medial meniscal injuries and 13 lateral meniscal injuries in 56 patients[11].

In this study, it was observed that in arthroscopic procedure, 34 (80.95%) patients were found injured ACL and 8 (19.05%) had no ACL injury. Gupta, et al. (2014) showed all the patients underwent arthroscopy where MM tear 21(52.5%), LM tear 18(45%), ACL tear 23(57.5%) and PCL tear 14(35%) cases[1]. Jah, et al. (2005) showed 20 anterior cruciate ligament injuries through arthroscopy, 9

posterior cruciate ligament injuries, 26 medial meniscal and 16 lateral meniscal injuries[11].

Regarding location of ACL injury revealed by arthroscopy, the study showed that, 7 (16.7%) cases had tibial attachment tear/avulsion, 9 (21.4%) cases had femoral attachment tear and 18 (42.9%) had mid-substance tear in arthroscopic positive cases.

Clinically positive ACL injuries were found in 34 (80.95%) patients. Among them 30 were positive and 4 were negative evaluated by arthroscopy. Clinically negative ACL injuries were found in 8 (19.05%) patients. Among them 4 were positive and 4 were negative evaluated by arthroscopy diagnosis evaluation for anterior cruciate ligament injury which was nearly similar to that of Makhmalbaf, et al.,[6].

The sensitivity, specificity and accuracy of Clinical diagnosis with respect to arthroscopy were 88.24%, 50% and 80.95%, respectively (fair correlation with arthroscopy in diagnosing ACL tears). The PPV was 88.24% and the NPV of MRI was 50%. Makhmalbaf, et al., (2013) observed that the sensitivity of clinical diagnosis in reference to arthroscopy for ACL tear were 94.6% [6]. In Benjaminse's meta- analysis, the accuracy for Lachman test showed a pooled sensitivity of 85%[12]. Katez et al concluded that in all ACL injuries, irrespective of age, the anterior drawer sign was 40.9% sensitive and 95.2% specific [6].

Lachman and anterior drawer tests are subjective and operator dependent tests; then, the results of this study should be considered with more caution. The experience and precision of examiner will influence the end result of the test. For as much as general practitioners who are at the first line of dealing with patients are less experienced in carrying out these tests, the tests inevitably would be less accurate in primary care and outpatient clinics[13, 14].

CONCLUSION

Lastly, from the present study, it can be suggested that the anterior drawer and Lachman tests are valuable means to assess ACL injuries.

REFERENCES

1. Gupta MK, Rauniyar MK, Karn NK, Sah PL, Dhungel K, Ahmad K. MRI evaluation of knee injury with arthroscopic correlation. Journal of Nepal Health Research Council. 2014 Jan 1;12(26):63-7.
2. Stein V, Li L, Lo G, Guermazi A, Zhang Y, Kwoh CK, Eaton CB, Hunter DJ. Pattern of joint damage in persons with knee osteoarthritis and concomitant ACL tears. Rheumatology international. 2012 May;32(5):1197-208.
3. Beynnon BD, Johnson RJ, Abate JA, Fleming BC, Nichols CE. Treatment of anterior cruciate ligament injuries, part I. The American journal of sports medicine. 2005 Oct;33(10):1579-602.
4. Gupta K, Guleria M, Sandhu P, Galhotra R. Correlation of clinical, MRI and arthroscopic findings in diagnosing meniscus and ligament injuries at knee joint: A prospective study. Journal of Orthopaedics and Allied Sciences. 2013 Jan 1;1(1):2.
5. Noyes FR, Mooar PA, Matthews DS, Butler DL. The symptomatic anterior cruciate-deficient knee. Part I: the long-term functional disability in athletically active individuals. JBJS. 1983 Feb 1;65(2):154-62.
6. Makhmalbaf H, Moradi A, Ganji S, Omidi-Kashani F. Accuracy of Lachman and anterior drawer tests for anterior cruciate ligament injuries. Archives of Bone and Joint Surgery. 2013 Dec;1(2):94.
7. Khandelwal K, Chaturvedi VC, Mishra V, Khandelwal G. Diagnostic accuracy of MRI knee in reference to arthroscopy in meniscal and anterior cruciate ligament injuries. The Egyptian Journal of Radiology and Nuclear Medicine. 2018 Mar 1;49(1):138-45.
8. Ishani P, Vijay C, Supreeth N, Ravishankar R, Vardhan RV, Vanaja GS. Clinical, magnetic resonance imaging, and arthroscopic correlation in anterior cruciate ligament and meniscal injuries of the knee. J Orthop Trauma Rehabil. 2018 Jun 1;24:52-6.
9. Avcu S, Altun E, Akpinar I, Bulut MD, Eresov K, Biren T. Knee joint examinations by magnetic resonance imaging: The correlation of pathology, age, and sex. North American journal of medical sciences. 2010 Apr;2(4):202.
10. Ahmed A, Razzaque MA, Kaleem M, Zaman AU, Akram R, Javed S. Diagnostic accuracy of magnetic resonance imaging in detecting anterior cruciate ligament injuries. Medical journal of Indonesia. 2017 Nov 27;26(3):218-3.
11. Jah AE, Keyhani S, Zarei R, Moghaddam AK. Accuracy of MRI in comparison with clinical and arthroscopic findings in ligamentous and meniscal injuries of the knee. Acta Orthop Belg. 2005 Apr 1;71(2):189-96.
12. Benjaminse A, Gokeler A, van der Schans CP. Clinical diagnosis of an anterior cruciate ligament rupture: a meta-analysis. Journal of Orthopaedic & Sports Physical Therapy. 2006 May;36(5):267-88.
13. Konishi Y, Oda T, Tsukazaki S, Kinugasa R, Hirose N, Fukubayashi T. Relationship between quadriceps femoris muscle volume and muscle torque after anterior cruciate ligament rupture. Knee Surgery, Sports Traumatology, Arthroscopy. 2011 Apr;19(4):641-5.
14. van Eck CF, van den Bekerom MP, Fu FH, Poolman RW, Kerkhoffs GM. Methods to diagnose acute anterior cruciate ligament rupture: a meta-analysis of physical examinations with and without anaesthesia. Knee Surgery, Sports Traumatology, Arthroscopy. 2013 Aug;21(8):1895-903.

Original Article

Evaluation of Treatment Schatzker Type-I Tibial Plateau Fracture with Percutaneous Cannulated Cancellous Screw Fixation

Muhammad Rafiqul Islam[1], Md. Shah Alam[2], Ripan Gosh[3], Rashedul Islam[4], Jibonanondo Halder[5], Md. Ziaul Hasan[4]

Abstract:

Tibial plateau fractures, intra-articular in nature and caused by high-velocity trauma, constitute approximately 1% of all fractures. Primary goal in the management of proximal tibial articular fracture to be a stable, congruous, pain-free, mobile joint. To find out the result of fixation of Sehatzker type-I tibial plateau fracture with percutaneous cancellous cannulated screw. The present prospective observational study of management of Schatzker type-I tibial plateau fracture with percutaneous screw fixation was carried out during the period from May 2019 to June 2020 at the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. Out of 40 initially selected patients, 7 patients did not report for follow-up. Therefore, the result of the study was based on 33 patients. All the 33 cases were Schatzker type-I tibial plateau fracture. bThe age of the patients ranged from 20 to 53 years, mean (±SD) being 38.45±1.55 years. 24(72.72%) were male and 9(27.28%) were female. Road traffic accident 21(63.6%), domestic accident 5(15.2%) and fall from height 7(21.2%). Right side was affected more, i.e. 20(60.6%). At the final follow-up, all cases were evaluated clinically and radiologically. Plateau tilting was found in 2 case (6.1%), valgus tilt in 2 case (6.1%), condylar widening in 7 (21.2%) cases, articular step-off in 8 (24.2%) cases and >50% joint space narrowing in 1 case (3.0%). Less than 50 percent jointspace narrowing was found in 7(21.2%) cases. Results were graded using Rasmussen's criteria. The overall results were satisfactory in 30 (90.9%) and unsatisfactory in 3(9.1%). Considering outcome of treatment, it can be concluded that percutaneous screw fixation in Schatzker type-1 tibial plateau fracture is a satisfactory method of treatment.

Keywords: Tibial plateau, percutaneous cancellous, cannulated screw

Introduction

Tibial plateau is the upper part of tibia and is constituted by lateral and medial condyles separated by intercondylar eminence. Medial articular facet is oval and lateral one is more or less circular. These surfaces articulate with condyles of femur to form the knee joint.

Tibial plateau fractures constitute approximately 1% of all fractures. They involve the knee joint and usually result from axial loading in combination with varus/valgus stress forces. The lateral side of the knee joint is most commonly injured during road traffic accidents, which results in torn ligaments, sprains, and fractures of one or both condyles[1,2]. Tibial plateau fractures are intra- articular fractures caused by high-velocity trauma. They are usually associated with neurovascular injury, compartment syndrome, compounding of fractures, and crushing of soft tissues. Associated injuries at and around the knee joint are more common and severe in patients with fracture- dislocation. The primary goal in the treatment of

1. Assistant Professor, Department of Orthopaedic, Netrokona Medical College, Netrokona, Bangladesh
2. Ex Professor and Head of department Orthopaedic Surgery, Dhaka Medical College, Dhaka, Bangladesh
3. Junior Consultant (Ortho) NITOR, Dhaka, Bangladesh
4. Medical Officer, NITOR, Dhaka, Bangladesh
5. Assistant Professor, Department of Orthopaedic, NITOR, Dhaka, Bangladesh

Corresponding author: Muhammad Rafiqul Islam, Assistant Professor, Department of Orthopaedic, Netrokona Medical College, Netrokona, Bangladesh. Email: mrislam1977ssmc@gmail.com

proximal tibial articular fracture includes restoration of articular congruity, axial alignment, joint stability, and functional motion[3].

This tibial plateau and the knee joint are very important for transmission of body weight. Stability and congruity of the joint is of utmost importance because any incongruity affects its major function tremendously. Ligamentotaxis that is traction along the long axis of lower limb exerts longitudinal force through the ligaments particularly lateral collateral ligament in case of fracture lateral condyle, which brings the fracture fragments in proper position and helps percutaneous screw fixation without open reduction[4,5].Tibial plateau fractures are usually followed by high-energy trauma. These fractures are difficult to treat because of the involvement of the articular surface, the comminution, and condition of the soft tissues. Internal fixation with locking plates following the principles of MIPPO (Minimally Invasive Percutaneous Plate Osteosynthesis) provides effective and satisfactory fracture reduction with good results in terms of functional outcome6.

There are several classification systems in tibial plateau fracture, of which Schatzker et al. (1979) classification system is more acceptable, which is based on fracture configuration. Each type of fracture needs particular management[7].

Difficulties with conservative treatment include inadequate reduction and instability[8]. Gyling and Lindholm (1953) stated that degenerative changes occurred in 55 percent of their cases after conservative treatment[9].

Open reduction and internal fixation may require an extensive exposure resulting in long operative time, increased blood loss and devascularizalion of bone fragments. Nonoperative treatment can result in articular incongruity and knee instability. An ideal form of management would be minimally invasive, yet allow for an anatomic reduction: fixation would be stable enough to permit early motion10.

At NITOR, we received patients at the emergency and outpatient departments. Usually the patients come immediately to the emergency department and within few days at the outpatient department.

Objective General:

The aims of this study was to find out the result of fixation of Sehatzker type-I tibial plateau fracture with percutaneous screw.

Specific:

a) To find out the incidence of Schatzker-I tibial plateau fracture in different age, sex and side.

b) To find out the functional outcome after minimal fixation of tibial plateau Schatzker type- I.c) To find out postoperative complications.

Methodology Type of study:

This is a prospective observational study.

Place of study:

National Institute of Traumatology and Orthopedic Rehabilitation, Dhaka.

Period of study: May 2019 to June 2020.

Study population:

All the patients above 18 years of age with tibial plateau fracture Schatzker Type-1 admitted in the different units of NITOR.

Sample size:

Due to time limitation and insufficient number of available patients, a total of 40 consecutive patients who underwent fixation with percutaneous cancellous screw. Purposive sampling was followed as per inclusion and exclusion criteria. 7 patients were drop out. So, a total of 33 patients were included for evaluation.

Sampling technique

A total number of 40 patients were selected for this study. Cases were diagnoses on clinical and radiological basis at the emergency or outpatient department of NITOR as tibial plateau fracture Schatzker type-1. During admission the patients were labelled as 1, 2, 3 and so on were treated by ligamentotaxis and percutaneous screw fixation. Initially, 40 cases were included in the study. However, among them, 7 patients did not report in subsequent follow-up visits and were excluded from the study. So, the final study was done among the remaining 33 cases.

After completion of data collection it was compiled and tabulated according to key variables. Analysis of different variables was done according to standard statistical method and calculations using scientific calculators & SPSS version 22.

Data Presentation:

Suitable charts and tables used to present the observation & result of the study and statistical analysis.

Results

After an average of 6 months follow-up. The following findings were compiled.

Table-1

Age incidence of the study patients

Age group (years)	Frequency	Percentage (%)
20-30	6	18.18
31-40	15	45.45
41-50	9	27.28
51-60	3	9.09
Total	33	100.0

The age of the patients ranged from 20 to 53 years, mean (±SD) being 38.45+1.55 years. The commonest age group was 31-40 years. Out of 33 patients, 15 (45.45%) were in this group. The second peak was between 41-50 years (27.28%). The age distribution of the patients are shown in Table-1.

Table-II

Sex distribution of the patients

Sex	Frequency	Percentage (%)
Male	24	72.7
Female	9	27.3
Total	33	100.0

Male patients were more frequently affected than female. Out of 33 patients. 24 (72.72%) were male and 9 (27.28%) female. The male-female ratio was 2.67:1. The results are shown in Table-2

Table-III

Causes of trauma

Cause of trauma	Frequency	Percentage (%)
Road traffic accident	21	63.6
Domestic accident (fall on the slippery ground, fall from staircase)	5	15.2
Fall from height	7	21.2
Total	33	100

All the 33 patients presented with a history of trauma (100%). Out of them 21 (63.64%) had road traffic accident, 5 (15.15%) had domestic accident and 7 (21.21) had fall from height. The results arc shown in Table-3.3

Table-IV

Time interval between injury and fixation (n =33)

Time interval between injury andfixation	Number of cases	Percentage
Within 5 days	0	0.0
11-15 days	8	24.3
Total	33	100.00

Most of the 23(69.7%) patients were operated within 5-10 days of injury, 8(24.3%) were within

11-15 days. Mean injury surgical interval time was 8.1±2.4 days.

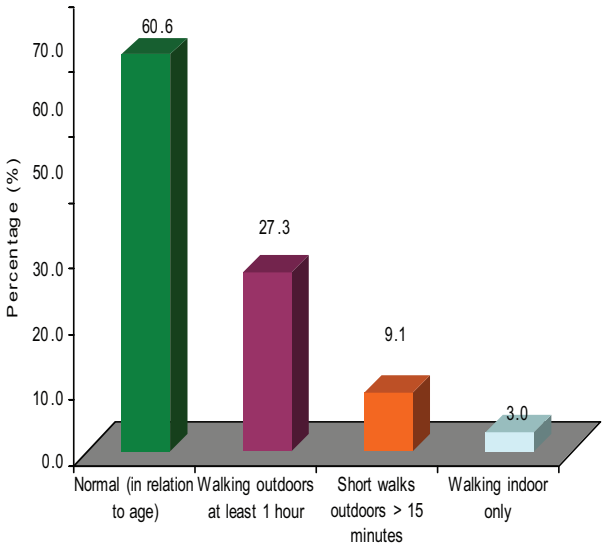


Chart 1: *Bar diagram showing the walking capacity at 6 months follow up*

At 6 months follow-up, out of 33 treated patients, 20(60.6%) had normal and 13 (39.4%) had decreased walking capacity. The results are shown in Chart-1

Table-IV

Stability of knee joint at 6 months follow-up

	Frequency	Percentage
Normal in extension and 20° of flexion	30	90.9
Abnormality in 20° of flexion	2	6.1
Instability in extension < 10°	1	3.0
Instability in extension > 10°	0	0.0

At 6 months follow-up, among 33 patients, normal stability of knee joint was found in 30(90.9) patients, abnormality in 200 of flexion in 2(6.1%) patients and instability in extension (<10°) in 1(3.0%) patient. The results are shown in Table-4

Table-VI

Radiological evaluation of tibial plateau (Honkonen and Jarvinen, 1992) at final follow-up

		Frequency	Percentage
Plateau tilting (degree)			
1	None	31	93.9
2	1-5	2	6.1
3	6-10	0	0.0
4	>10	0	0.0
Varus/valgus tilt (degree)			
1	None	31	93.9
2	1-5	2	6.1
3	6-10	0	0.0
4	>10	0	0.0
Condylar widening (mm)			
1	None	26	78.8
2	1-5	6	18.2
3	6-10	1	3.0
4	>10	0	0.0
Articular step-off (mm)			
1	None	25	75.8
2	1-3	8	24.2
3	4-6	0	0.0
4	>16	0	0.0
Degeneration (relative narrowing of joint space			
1	None	25	75.8
2	<50%	7	21.2
3	>50%	1	3.0
4	Obliterated	0	0.0

1= Excellent; 2 = Good; 3 = Fair; 4 = Poor

At the final follow-up, all cases were evaluated clinically and radiologically with the help from the Department of Radiology, NITOR. Out of 33 cases, plateau tilting was found in 2 case (6.1%), valgus tilt in 2 case (6.1%), condylar widening in 7 (21.2%) cases, articular step-off in 8 (24.2%) cases and >50% joint space narrowing in 1 case (3.0%). The results of radiological evaluation are shown in Table-V

Table-VI

Final outcome of management

Results	Frequency	Percentage
Excellent	25	75.7
Good	5	15.2
Fair	3	9.1
Poor	0	0
Total	33	100.0
Final assessment		
Satisfactory (excellent + good)	30	90.9
Unsatisfactory (fair + poor)	3	9.1
Total	33	100.0

Table-VII shows that the satisfactory result (excellent + good) was 30(90.9%) and unsatisfactory (fair) 3(9.1%).

So, among the population we found almost 81.1% to 100.7% satisfactory result by this procedure. It is quite acceptable outcome.

Among 33 study patients, 25(75.7%) had excellent, 5(15.2%) good and 3(9.1%) fair results.

DISCUSSION

Tibial plateau fracture is not an uncommon problem encountered in emergency and outpatient department of a hospital. This is most frequently caused by road traffic accident and mechanism as due to fall with. According to Apley and Solomon (1993), tibial plateau fractures are caused by a varus or valgus force combined with axial loading11. The major difficulty with tibial plateaufractures is that they involve the articular surface and the supporting metaphysis of a major weight bearing bone[7].

Schatzker type-I fracture is usually the result of high-velocity trauma. It occurs in young people, in whom the cancellous bone of the tibial condyle is very strong and, therefore, it cleaves rather than crumbles7. The aim of treating fractures of the tibial plateau is to produce a painless stable knee with a good range of movement supported by strong muscles[12].

Schatzker type-I tibial plateau fracture can be treated by ligamentotaxis with percutaneous screw fixation. A total number of 40 patients were initially included in this study.

Out of 40, 7 patients did not report after 3rd follow-up. So, the study was based on 33 patients.

The age of the patients ranged from 20 to 53 years, mean (± SE) being 38.45±1.55 years. The vast majority of fractures occur between 31-40 years of age. In this series, The commonest age group was 31-40 years. Out of 33 patients, 15 (45.45%) were in this group. The second peak was between

41-50 years (27.28%). In this study, there were 24 (72.72%) male and 9 (27.28%) female.

In a series by Lansinger et al. (1986), the mean age was 55 years (range: 16-85 years) and 55 percent were male and 45 percent female13. So, there is age difference with this study. In this study, fracture occurred at a lower age group than the study by Lansinger et al. (1986)13. This is probably due to the fact that the average lifespan is lower in this region than western countries. Other causes may be that patients of this region have lack of knowledge regarding traffic rules. Most of the drivers are illiterate, reluctant to follow traffic rules.

Keogh et al. (1992) found average age as 52 years (range: 22-85 years) and 61.2 male and 38.8 percent female. Difference was noted between this series and the present study which may be due to same causes as mentioned before[8].

In a study by Koval et al. (1992), the commonest cause of trauma was road traffic accident (57.14%). Road traffic accident was the commonest cause of trauma (63.64%) in the present series10. The increased incidence of road traffic accident in this study is probably due to the fact that high-energy trauma is required for tibia! plateau fracture. Other causes may be lack of public safety education and lack of knowledge about traffic rules.In the present study, the basis of diagnosis was clinical examination and X-ray of the affected part in both anteroposterior and lateral views. In this series, all the cases had tibial plateau fracture, Schatzker type-I.

At review, all the patients were assessed tor pain, range of motion, stability of the knee joint and final result graded using Rasmussen's criteria[14].

At follow-up at 24 weeks, there was no complain of pain in 16(48.5%) operatively treated patients, occasional ache was present in 10(30.3%) operatively and stabbing pain in certain position in 4 (12.1%) cases.

29(87.9%) had satisfactory walking capacity after operation. Normal extension of knee and no wasting of thigh muscles were found in 20(60.6%) patients.

More than 120° range of motion of knee joint obtained in 29(87.9%) patients 24th weeks follow up. Stability of knee was normal in 30(90.9%) cases.

In the present series, results was observed excellent in 25(75.7%), good in 5(15.2%) and fair in 3(9.1%) patients and had no poor result. Therefore, 30 (90.9%) patients had satisfactory (excellent + good) results.

In the present study the result is 30(90.9%) out of 33 patients had a satisfactory result, which is similar to those reported by Lansinger et al. (1986) - 13 satisfactory out of 14. It is believed that percutaneous screw fixation has an expanding role to play in the management of Schatzker type-I tibial plateau fracture and will reduce the indications for open reduction13.

We found that percutaneous screw fixation for Schatzker type I fractures is an excellent treatment alternative to open reduction internal fixation (ORIF) or conservative management. Percutaneous cancellous screw fixation for closed tibial plateau fractures is minimally invasive, hence less morbid. It enables early mobilization with minimal instrumentation, and achieves satisfactory outcomes without any anatomical deformity or functional impairment.

CONCLUSION

The expected ideal outcome after a tibial plateau fracture is a stable, pain free. non-osteoarthritic knee joint with a range of motion that is adequate for functional requirements. Considering all the above points, it can be concluded that percutaneous screw fixation in Schatzker type-1 tibial plateau fracture is a satisfactory method of treatment.

REFERENCES:

1. Agarwal, T., Salgia, A., Biswas, S.K., Sanghi, S., Puri, S.R., 2013. 'Management of closed tibial plateau fractures with percutaneous cancellous screw fixation.' *Med J DY Patil Univ*, vol. 6, pp. 43-8.
2. Carlson, D.A., 2005. 'Posterior bicondylar tibial plateau fractures.' *J Orthop Trauma*, vol.19, pp. 73-8.
3. Guyton, J.L., 1998. 'Arthroplasty of ankle and knee.' In: Canale ST. editor. Campbell's Operative Orthopedics. 9th ed. St. Louis: Mosby, pp.236-44.
4. Rangitsch, M.R., Duwelius, P.J., Colville, M.R., 1993. 'Limited internal fixation of tibial plateau fractures.' *J Orthop Trauma*, vol. 7, p.168.
5. Duwelius, P.J., Connolly, J.F., 1988. 'Closed reduction of tibial plateau fractures: a comparison of functional and roentgcnographic end results.' *Clin Orthop Related Res*, vol. 230, pp.116-25.

6. Gunjalli, V.K., Rajagopal, H.P., Ramesh, L.J., 2016. 'A retrospective study to assess the functional outcome of tibial plateau fractures treated surgically with locking plate by Mippo technique-series of 36 cases.' Sch. *J. App. Med. Sci*., vol. 45A), p. 1483-1490.

7. Schatzker, J., Mcbroom, R., 1979. 'The tibia plateau fracture: The Toronto experience 1968-1975.' *Clinical Orthopaedics,* vol.138, pp. 94-95.

8. Keogh, P., Kelly, C., Cashman, W.F., Mcguinness, A.J., O'Rourke, S.K., 1992. 'Percutaneous screw fixation of tibial plateau fractures.' *Injury*, vol. 23, p. 387.

9. Gylling, U., Lindholm, R., 1953. 'Fracture of the tibial condyle.' Ann Chir Gynaecol Fenn, vol. 42, no. 4, pp. 229-35.

10. Koval, K.J., Sanders, R., Borrelli, J., Helfet, D., Dipasquale, T., Mast, J.W., 1992. 'Indirect reduction and percutaneous screw fixation of displaced tibial plateau fractures.' *J Orthop Trauma*, vol. 6, p. 340.11. Nayagam, S., 2010. 'Tibial plateau fractures'. In: Solomon, L., David, W., Nayagam, S., eds. Apley's system of orthopaedics and fractures, 9th ed. London: Butlerworth-Heinemann Ltd. pp. 889-891.

12. Scotland, T., Wardlaw, D., 1981. 'The use of cast bracing as treatment for fractures of the tibial plateau. *J Bone Joint Surg*, vol. 63B, p. 575.

13. Lansinger, O., Bergman, B., Kornerl, A., Andersson, G.B.J., 1986. 'Tibial condylar fracture.' *J Bone Joint Surg [Am]*, vol. 68A, pp.13-9.

14. Rasmussen, P.S., 1973. 'Tibial condylar fractures impairment of knee joint stability as an indication for surgical treatment.' *J Bone Joint Surg [Am]*, vol. 55A, pp. 133 1-50.

Original Article

Evaluation of Non-therapeutic Laparotomy for Abdominal Trauma in a Tertiary Care Hospital

Abdullah-Al-Maruf [1], Shahidul Huq [2], Faisal Mostafa [3], Hussain Ahammed Khan [4], Tahira Benzir [5], Tazdina Haque Khan [6]

Abstract

Trauma is a leading cause of death worldwide. A huge portion of trauma patient presented with abdominal trauma which may be blunt or penetrating. Exploratory laparotomy is a long established treatment for abdominal trauma especially in penetrating abdominal trauma. Classical signs to do exploratory laparotomy in trauma patient are peritonitis (involuntary muscle guarding, rebound tenderness), hemodynamic instability or shock, peritoneal breach or evisceration of omentum/gut. Early exploration needed to prevent further spread of contamination from damaged hollow viscus or to maintain necessary hemostasis. To save patients life or to make patient risk free many surgeon wants to do exploratory laparotomy when there is diagnostic dilemma. This diagnostic dilemma causes non-therapeutic laparotomy. The percentage of this non-therapeutic laparotomy depending on centre may be up to 40%. The increasing rate of non-therapeutic laparotomy is a burden not only for the patient but also for the hospital. For this reason non-therapeutic laparotomy is a burning issue globally for the surgeon. This prospective observational study will be performed in Casualty ward of Chittagong Medical College Hospital over a period of 6 months. The outcome of this study will aware the surgeons about the incidence, presenting feature and outcome of non-therapeutic laparotomy. The result will also help in future policy making or development a management protocol in abdominal trauma. This study carried out at Chittagong Medical College Hospital from April 2019 to October 2019 were evaluated 100 patients, who underwent exploratory laparotomy for abdominal for abdominal trauma. This was a Prospective observational study. Clinical presentation, investigation findings, preoperative diagnosis, operative findings, amount of blood transfusion and postoperative outcome including hospital stay are recorded in all cases. All patients were followed up to wound healing. Results were analyzed using chi-square, Fisher's exact, and Student *t* tests as appropriate. 100 patient with abdominal trauma underwent exploratory laparotomy, among them 66 for penetrating abdominal trauma and 34 for blunt abdominal trauma. The number of non-therapeutic laparotomy was 19(19%). The frequency of non-therapeutic laparotomy in penetrating abdominal trauma was 15 out of 66(22.7%) and in blunt abdominal trauma 4 out of 34(11.76%). Most of the patients presented with peritonitis 14(73.68%). Others are presented with shock 4(21.05%), evisceration of omentum or gut 2(10.52%), high pulse rate 1(5.26%) or low GCS 1(5.26%). Among the 19 patients of non-therapeutic laparotomy, the pre-operative diagnosis are perforation 6(31.57%), liver injury 9(47.36%), splenic injury 2(10.52%), mesenteric injury 1(5.26%), significant peritoneal collection 5(26.31%). Operative findings of non-therapeutic laparotomy patients are gut injury or serosal tear 6(31.57%), liver injury 9(47.36%), splenic injury 2(10.52%), mesenteric injury 1(5.26%), omental injury 1(5.26%). Post operative outcome of non-therapeutic laparotomy patients are wound infection 4(21.05%), wound dehiscence 2(10.52%), septicemia 1(5.26%), ARDS 2(10.52%), SICU 0(0%), Death 0(0%). The average hospital stay was 7.89 day. In this study we found a high rate of NTL where the decision of exploratory laparotomy in abdominal trauma was made based on certain clinical features, abdominal Ultrasonography and X-ray. More over higher rate of NTL in penetrating Abdominal trauma was due to very low threshold for exploratory laparotomy in these cases due to lack of availability of urgent CT scan, diagnostic laparoscopy, protocol obligation and medico-legal issue. So it seems that traditional way of decision making for exploratory laparotomy should be challenged and much scope to think in this issue.

Keywords: Exploratory laparotomy, therapeutic laparotomy and non-therapeutic laparotomy.

1. Assistant registrar (Hepatobilliary Surgery), Chittagong Medical College Hospital, Chattogram
2. Associate Professor, Department of Surgery, Chittagong Medical College Hospital, Chattogram
3. Assistant registrar (Surgical Oncology), Chittagong Medical College Hospital, Chattogram
4. Registrar (Surgery), Chittagong Medical College Hospital, Chattogram
5. Registrar (Burn & Plastic Surgery), Chittagong Medical College Hospital, Chattogram
6. Registrar (Colorectal Surgery), Chittagong Medical College Hospital, Chattogram

Correspondence: Dr. Abdullah-Al-Maruf, Assistant registrar (Hepatobilliary Surgery), Chittagong Medical College Hospital, Chattogram, E-mail: marufcmc@yahoo.com, Cell: +8801710-936603

INTRODUCTION

Trauma is the leading cause of death in the active people under the age 40 years.[1] In 40% of cases hemorrhage is the main cause of death in abdominal trauma where liver, spleen and kidney are most commonly injured organs.[2,3] Preventable trauma deaths are those where significant delay occur before hemorrhage is controlled though the required facilities are there.[4] In Penetrating Abdominal Trauma (PAT) death rate is 52% where as in Blunt Abdominal Trauma (BAT) death rate is reported 48%.[5] Sufficient therapy within the first hour after trauma significantly increases the patient's chance for survival. Thus, diagnostic evaluation and therapeutic procedures have to be concomitant events performed by a multidisciplinary team[6]. Over the past 40 years, many changes have occurred in the primary survey and treatment of patients with abdominal trauma. Traditionally, exploratory laparotomy is the long-established treatment for penetrating abdominal trauma.[3,7] Here peritonitis, evisceration of gut and omentum, hemodynamic instability and significant peritoneal collection on Ultrasonography or CT-scan are regarded as indicative signs.[3,8,9,10] Early exploration of abdomen is believed to prevent spread of contamination caused by damage to hollow viscus. It is also considered necessary for hemostasis and stabilization of patients by early packing of the abdominal cavity.[7] However studies have shown early or mandatory approach for exploratory laparotomy may result in increasing rate of NTL that may reach up to 40%[3,7,10,11,12] and has gained the interest of researchers globally to formulate a selective approach for these patients.[7]

There is definite protocol for conservative management of Blunt Abdominal Trauma (BAT) but much lower threshold for exploratory laparotomy in Penetrating Abdominal Trauma (PAT). Though some specific presenting features and investigation findings are crucial in decision making, still the rate of Non Therapeutic Laparotomy (NTL) varies centre to canter from 8% - 38% in both blunt and penetrating abdominal trauma.[3,7,9,10,11,12,13,14] The frequency of non therapeutic laparotomies can be minimized by offering imaging studies like contrast enhanced computerized tomography (CT scan), diagnostic laparoscopy or serial ultrasound scan along with clinical examination to stable patients or those who are stabilized after initial resuscitation.[3,8,9,12,13,15,16]

Non therapeutic laparotomy is not only a burden to hospital resources but also a source of discomfort and misery for the patients. It is shown to be associated with postoperative complications like atelectasis, post-operative hypertension, wound infection, postoperative adhesions, intra-abdominal abscesses, incisional hernia etc.[17] However the selective non operative approach in stable patients with penetrating abdominal trauma has shown to minimize complications, duration of hospital stay and cost.[3,18,19,20]

There is no data from Bangladesh about the rate and impact of non therapeutic laparotomies in abdominal trauma patients. This study aimed to determine the frequency of non therapeutic laparotomies in abdominal trauma patients, presenting clinical criteria, evaluation of hemodynamic status of patients, diagnostic procedures, hospital stay and the final outcome in terms of morbidity and mortality.

MATERIALS AND METHODS

This is a prospective type of observational study which was performed on 100 patients who underwent laparotomy for abdominal trauma from 1st May'19 to 31st October'19 at The Department of Casualty, Chittagong Medical College Hospital. A protocol was approved by the Ethical Review Committee and Institutional Review Board at the Chittagong Medical College Hospital.

Patients eligible for laparotomy for abdominal trauma were selected according to inclusion and exclusion criteria. Written informed consent was taken from participants. All the patients in this study was receive prophylactic antibiotic before the procedure.

All the patient undergone through X-ray abdomen in erect posture & ultrasonography of whole abdomen. All the investigation done by the radiology Department of Chittagong Medical College and Hospital or private clinic for emergency. When the patients were considered for exploratory laparotomy by the decision of Professor/ consultant of casualty unit, a case record form was used and a detailed review of the complaints of the patients at admission was performed. Thereafter, the operative findings of the patients and their amount of blood transfusion needed were recorded. After the operative procedure the post operative outcome with hospital stay monitored & recorded. The patients were on follow up for 01 months. At the end of the study data were analyzed and the result of the study was prepared and submitted.

Data were processed and analyzed using computer software Statistical package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA). All quantitative data (eg. age, hospital stay etc.) were expressed by mean and SD (standard deviation) and analyzed by t-test, ANOVA test. Test of significance P value < 0.05 was considered as significant.

RESULTS

Table I

Distribution of trauma events of Exploratory Laparotomy

Events	No. of cases	Percentage
Penetrating abdominal trauma	66	66%
Blunt abdominal trauma	34	34%
Total	100	100%

Table 1 shows the distribution of trauma events of exploratory laparotomy. most of the exploratory laparotomy done for penetrating abdominal trauma 66%.

Table II

Evaluation of non-therapeutic laparotomy(n=19) for penetrating and blunt abdominal trauma

	No. of cases	Percentages
Penetrating abdominal trauma	15	78.9%
Blunt abdominal trauma	4	21.1%
Total	19	100%

Table II shows the evaluation of non-therapeutic laparotomy for penetrating and blunt abdominal trauma. Most of the non-therapeutic laparotomy done in cases of penetrating abdominal trauma 78.9%.

Table III

Evaluation of Investigation findings of non-therapeutic laparotomy(n=19)

Investigations	Number	Percentages
Ultrasonography	13	68.42%
X-ray	6	31.57%
Total	19	100%

Table III shows the investigation findings of non-therapeutic laparotomy patients before exploratory laparotomy. Most of the patient of non-therapeutic laparotomy 13(68.42%) shows moderate or huge amount of peritoneal collection with suspected liver or spleen or gut injury. Some patients 6(31.57%) shows pneumo-peritonium on X-ray.

Table IV

Pre-operative diagnosis of non-therapeutic laparotomy patients(n=19)

	Number	Percentage
Perforation	6	31.57%
Liver injury	3	15.78%
Spleenic injury	4	21.05%
Mesentaric injury	1	5.26%
Peritoneal collection	5	26.31%
Total	19	100%

Table IV shows the pre-operative diagnosis of the cases of non-therapeutic laparotomy. 6(31.57%) patient diagnosed as suspected perforation. Others were diagnosed as liver or spleenic or mesenteric injury. Some patient 5(26.31%) underwent exploratory laparotomy for significant peritoneal collection.

Table V

Evaluation of Operative findings of non-therapeutic laparotomy patients(n=19)

	Number	Percentage
Gut injury(serosal tear)	6	31.57%
Liver injury	9	47.36%
Spleenic injury	2	10.52%
Mesentaric injury	1	5.26%
Omental injury	1	5.26%
Total	19	100%

Table V shows the per-operative findings of the patients of non-therapeutic laparotomy. Most of the patients 9(47.36%) had liver injury which donot need any procedure. In other cases found gut injury(serosal tear) or liver or splenic or mesentaric injury which did not need any procedure.

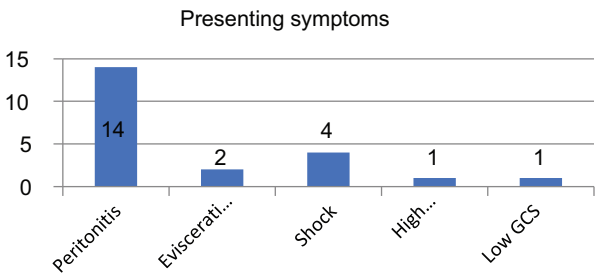


Figure I shows the presenting symptoms of the patients of non-therapeutic laparotomy.

Most of the patient presented with peritonitis 14(57.89%). Others were presented with evisceration of omentum 2(10.52%), shock 4(21.05%), high pulse rate 1(5.26%) and low GCS 1(5.26%).

Table VI

Hospital stay of non-therapeutic laparotomy cases(n=19)

	Number	Percentage
Upto 7 days	10	52.63%
8-14 days	6	31.57%
>14 days	3	15.78%

Average hospital stay following non-therapeutic laparotomy was 7.9day.

DISCUSSION

Despite the advent of technology exploratory laparotomy is long been practiced for management of abdominal trauma safely. Over the last few decades management of blunt abdominal trauma is mostly shifted towards conservative approach. But a confident decision making for conservative treatment is not much explored for penetrating abdominal trauma (PAT) rather exploratory laparotomy is an usual practice here.[7] In this situation surgeons feel a bit unsafe due to knowledge gap, lack of strong evidence and also for legal and hospital protocol constrains. This type of attitude is more marked in those countries where there is lacking of advanced diagnostic tools like Spiral CT-scanner at emergency department or even where the availability of ultrasonography (USG) is not ensured all the time. Clinical assessment of presenting feature of a trauma patient sometimes may be the only tool for decision making. In this situation a high rate of NTL is reported. Clinical assessment of presenting feature together with abdominal USG findings based decision making resulted in 33.33% NTL in this study which is quite high. Similar result was reported in the study of Arikan S et al. (2005).[8] Mandatory exploratory laparotomy in penetrating abdominal trauma (PAT) resulted in high rate of NTL.[7,10]

In this study we found that PAT was the mode of injury in 78.9% of NTL cases. The study of Dayananda KSS et al. (2017) found that in mandatory laparotomy cases, NTL rate is about 15 – 33% .[10] and in study of George C et al. (2001) this rate is about 47% when routine laparotomy is considered for gunshot abdominal injuries.

Our study also reveals that the conventional indications for exploratory laparotomy like unstable hemodynamic status, peritonitis, evisceration of gut and omentum and significant peritoneal collection on USG are not highly reliable guide for decision making. In our study NTL rate was high in peritonitis both BAT and PAT which were 15.8% and 52.6% respectively. In study of Riger BS et al (2010), the rate of negative laparotomy was 54.8% when peritonitis was the indication of abdominal exploration and in case of isolated penetrating injury NTL rate was 29% due to peritonitis.[9] These reveals that peritonitis is a confusing parameter in both BAT and PAT.

Significant peritoneal collection on Ct-scan in BAT resulted in NTL in 27.4% and 9.6% in false FAST cases in the study of Riger BS et al (2010) [9] . Where as in our study, NTL was about 21.1% in BAT and 36.8% in PAT when Significant peritoneal collection on abdominal USG was considered. So Significant peritoneal collection is not always helpful to avoid NTL. The study of Iqbal M et al . (2015) tried the local wound exploration as an indication for exploratory laparotomy. Here the NTL rate was 52.2%. [10] Thus this indication is also questionable.

Hemodynamic instability resulted in NTL in 34.8% in all trauma patient in report of Iqbal M et al(2015) [7] and 28.8% of PAT in study of Riger BS et al (2010) .[9] Our study also revealed almost similar results.

In study of Biffl et al. (2015) [8] revealed no significant intra abdominal injuries in 29% cases when indication was evisceration of gut or omentum that was comparable in our study (21.1% in PAT).

It is clear that traditional approach exploratory laparotomy in trauma patient is increasing the hospital stay, mortality and morbidity and total health cost burden of the country. This concern is reflected in other similar studies too.[10] So more meticulous and well designed multicentre based study is very crucial to develop the way of clinical assessment and a guideline to identify the actual indications of exploratory laparotomy in PAT as well as BAT.

CONCLUSION

In this study we found a high rate of NTL where the decision of exploratory laparotomy in abdominal trauma was made based on certain clinical features, abdominal Ultrasonography and X-ray. More over higher rate of NTL in penetrating Abdominal trauma was due to very low threshold for exploratory laparotomy in these cases due to lack of availability of CT scan, diagnostic laparoscopy, protocol obligation and medico-legal issue. So it seems

that traditional way of decision making for exploratory laparotomy should be challenged and much scope to think in this issue.

RECOMMENDATIONS

A large multicenter prospective observational studies with greater number of patients are needed to decrease the frequency of non-therapeutic laparotomy and to formulate a treatment protocol for the management abdominal trauma.

LIMITATIONS

1. This study was performed in a selected population of Casualty department of Chittagong Medical College and Hospital for a period of six month. Therefore, the sample lacks representation of the population.
2. Limited sample size with short period.

ACKNOWLEDGEMENTS

We offer our gratitude to the Honorable Chairman & Professor Dr. Md. Matiar Rahaman Khan, FCPS (Surgery), Department of Surgery, Chittagong Medical College & Hospital, Bangladesh for his continuous moral support that encourage us during this study. We would also like to express our gratefulness to all our patients and stuff for kindly consenting to participate in our study.

CONTRIBUTION OF AUTHORS:

AAM-Conception, Design, Acquisition of data, Data interpretation, Manuscript writing

SH-Analysis, Critical revision and Final approval

FM-Conception, Design, Analysis, Data interpretation

HAK-Data interpretation, Analysis, Critical Revision

TB- Analysis, Data interpretation, Critical Revision

THK- Technical support, Critical Revision, Final approval

DISCLOSURE:

All the authors declared no competing interest.

REFERENCES

1. Sauaia A, Frederick M A, Ernest E M, Kathe S M, Regina B , Robert A R.Epidemiology of Trauma Deaths: A Reassessment. The Journal of Trauma: Injury, Infection, and Critical Care: Feb 1995, Volume 38,185-193.
2. Demetrios D, Pantelis H, Costas C.Organ Injuries, Ann Surg.2006 Oct; 244(4): 620–628.
3. Osvaldo C, Stefania C, Alessio P, Sergio V. Preventable trauma deaths: from panel review to population basedstudies, World JouralEmerg Surg. 2006; 1: 12.
4. Zwingmann J, Schmal H, Sudkamp NP, Strohm PC, Zentralbl Chir. Injury severity and localisations seen in polytraumatised children compared to adults and the relevance for emergency room management, Safetylit Weekly Update, 2008; 133(1): 68-75.
5. Homer TC, Fernando S, Lorraine TN, Sandro BR, Frederick D. Preventable Deaths From Hemorrhage at a Level I Canadian Trauma Center, The Journal of Trauma: Injury, Infection, and Critical Care: January 2007 - Volume 62:1, 142-146
6. Philipp MO, Kubin K M, Hormann M, Metz V. Radiological emergency room management with emphasis on multidetector-row CT, European Journal of Radiology, Volume 48: 1, October 2003, Pages 2-4
7. Iqbal M, Baloch Q, Zaman A, Zaheer F, Aziz I, Arain A. Non therapeutic Laparotomies in Penetrating Abdominal Trauma Patients: Time to Change the Trend. Journal of Surgery Pakistan (International), January - March 2015
8. Biffl WL ,Leppaniemi A. Management guidelines for penetrating abdominal trauma. World J Surg. 2015 Jun;39(6):1373-80.
9. Riger BS, Lam L, Inaba K, Kobayashi L, Barbarino K, Demetrios D. Negative Laparotomy in Trauma: Are We Getting Better? Presented as a Poster Presentation at the American College of Surgeons, Southern California Chapter Meeting, January 2010, Santa Barbara, California.
10. Dayananda KSS, Kong VY, Bruce JL, Oosthuizen GV, Laing GV and Clarke DL. Selective non-operative management of abdominal stab wounds is a safe and cost effective strategy: A South African experience, Ann R CollSurg Engl. 2017 Jul; 99(6): 490–496.
11. ArikanS ,Kocakusak A, Yucel AF, Adas G.A prospective comparison of the selective observation and routine exploration methods for penetrating abdominal stab wounds with organ or omentum evisceration. J Trauma. 2005 Mar;58(3):526-32.
12. BifflWL ,Leppaniemi A. Management guidelines for penetrating abdominal trauma. World J Surg. 2015 Jun;39 (6):1373-80.
13. Eimer O, Boyle E, Callaghan A, Calvin J, Stewart R, Walsh. Role of Laparoscopy in Penetrating Abdominal Trauma: A Systematic Review, World Journal of Surgery, January 2013, Volume 37:1, 113–122
14. George C V, Demetrios D, Konstantinos G,Toutouzas,Sarkisyan G, Linda S, et al. Selective Nonoperative Management in 1,856 Patients With Abdominal Gunshot Wounds: Should Routine Laparotomy Still Be the Standard of Care? Ann Surg. 2001 Sep; 234(3): 395–403.

15. Bennett s, Amath A, Knight H and Lampron J. Conservative versus operative management in stable patients with penetrating abdominal trauma: the experience of a Canadian level 1 trauma centre, Can J Surg. 2016 Oct; 59(5): 317–321.

16. Hoffmann C ,Goudard Y, Falzone E, Leclerc T, Planchet M, Cazes N. Management of penetrating abdominal trauma: what we need to know? Ann Fr AnesthReanim. 2013 Feb;32(2):104-11

17. Renz BM , Feliciano DV. Unnecessary laparotomies for trauma: a prospective study of morbidity. J Trauma. 1995 Mar;38(3):350-6.

18. Cyle S, Goodman, Jee Y,Hur I, Marc A, Adajar et al. How Well Does CT Predict the Need for Laparotomy in Hemodynamically Stable Patients With Penetrating Abdominal Injury? A Review and Meta-Analysis, AJR, August 2009:193

19. Como JJ , Bokhari F, Chiu WC, Duane TM, Holevar MR, Tandoh MA et al. Practice management guidelines for selective nonoperative management of penetrating abdominal trauma. J Trauma. 2010 Mar;68(3):721-33.

20. Renz BM, Feliciano DV. The length of hospital stay after an unnecessary laparotomy for trauma: a prospective study. J Trauma. 1996 Feb;40(2):187-90.

Original Article

Pattern of Sports Injury among Adolescent Cricket Players in Dhaka City: A Cross-sectional Study

Mahmuda Akter[1], Md. Juel Haque[1], Md. Golam Sarwar[2], Mst Sabnam Saila Sharmin[3], Md. Nazrul Islam[4], Md. Nur Alam[5], Foisal Md. Mosiul Alom[1]

ABSTRACT:

To evaluate the percentage of sports injuries among adolescent cricket players to check the type or nature of sports injury, to identify the severity of sports injury, to identify the occurrence and body part of the injury. A quantitative cross-sectional study design was chosen to achieve the objectives of the study. The subject was selected through purposive sampling technique from the injuries cricket players who trained in BKSP, Musco, Sheikh Rasel, and other clubs by using a semi-structured questionnaire. The data was analyzed using SPSS version 25. A total of 190 participants the mean age were 16.11 years and the range was 11 to 19 years. And those who experience regional injury, 47.51% had upper limb injury, with 73.3% of males and 26.7% of females. In the case of lower limb injury, 29.84% had it, with 66.6% of males and 33.3% of females., while in the case of trunk and back injury, 68.3% of males and 31.7 of were female out of 22.65% had it. Shoulder joint injury (23.50%) and finger impact injury (22.50%) were more common in this study than rotator calf damage (9.80%), shoulder dislocation (8.80%), thrower elbow (15.70%), shoulder impingement (5.90%), and other upper limb injuries (13.70%). Lower limb ankle sprain (19.40%), others (19.40%), and quadriceps strain (17.70%) were all more common among participants than hamstring injury (12.90%), groin strain (16.10%), patellar tendon (6.50%), and medial meniscus damage (8.10%). The low back injury was more common among participants (71.40%) than side strain (19.00%) and other trunk and back injuries (9.50%) in the trunk and back. In this study, 1.0% of wounded individuals had a concussion, 7.6% of participants experienced laceration/abrasion, and 18.3% of the individuals suffered a strain/muscle injury. 28.9% of individuals had a sprain/ligament injury, 1.5% had a Meniscus injury, and 2.5% (n=5) suffered a fracture. Tendinopathy affected 5.6 % of participants, dislocation/Subluxation affected 4.1% of participants, contusion/hematomas affected 7.6 % of affected 7.1% of participants, and overuse injury-affected 10.2 % of participants 2.0% participants had opened wound and 1% participants had nerve injury. Among the participant 14.20% of injured participants reported severe pain, 35.80% reported moderate pain, 23.20% reported light pain, and 26.8% reported no pain. This study demonstrated that shoulder joint injury, impact injury of a finger, ankle joint sprain, and low back injury were more common. The most common nature of the injury was sprain and strain. More research should now be undertaken on sports-related injuries of the cricketers, with an emphasis on larger sample sizes and response rates to be able to generalize the results and conclusions.

Key Words: Sports injury, Pattern, Adolescent, Cricket

1. Physiotherapist, Dept. of Physiotherapy, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR)
2. Professor, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR)
3. Assistant Director(Academic),National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR)
4. Course Coordinator, Dept. of Physiotherapy, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR)
5. Consultant, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR)

Correspondence: (1) Mahmuda Akter, Physiotherapist,NITOR, Dhaka. Ph: +880 1635316319. email: mahmudakabir609 @gmail.com
(2) Md. Juel Haque, Physiotherapist,NITOR, Dhaka. Ph: +880 1558964943. email: haque183.jh@gmail.com

INTRODUCTION:

Sport is the best way to delight in the world. In sports, cricket is the most popular game in Bangladesh, and day by day, it is gaining importance in all South East Asian Countries (Sathya and Parekh, 2017). Sports injury is an injury that occurs as a result of participation in organized practice or games. Sports participation is assumed to be beneficial to health. Inevitably, injury is a potential outcome of participation and an important public health problem. Sports injuries are injuries that occur in athletic activity. In many cases, these types of injuries are often due to overuse or acute trauma of a part of the body when participating in a certain activity. Patterns of sports injuries mean type or nature, severity, and occurrence of sports injury. In Bangladesh, cricket is a favorite game, and many adolescent players like to play cricket and participate in many games like under fifteen, and so. There are millions of adolescent throwing athletes worldwide. Adolescent players are players whose ages are between 11 to 19. There are several factors like the presence of growth of cartilage which is less resistant to repetitive micro-injury than a mature adult counter's part, and skeletal immaturity aggressive training decreased flexibility because of a pronounced growth spurt, the tendency to take experiments and risk during the sports and finally physiological response to exercise differently in adolescent class, so adolescent was more vulnerable to injury.

In sports, cricket is a dynamic sport where many abstract skills and movements are involved, so the players are guaranteed that their bodies are kept in shape and strong (Dube Gundani and Rastogi, 2018). Adolescent cricket players need to know the patterns of sports injury for ensuring that their bodies are kept fit and strong, and it is important to know which type of injury can be happened like sprains, strains, and concussions. We also need to know the severity of injury and parts of bodies. There are many studies available about cricket injury at the international level, but only very few studies available in Bangladesh. (Zaman, 2012) a young age, like adolescent cricket players, Regular team sports participation has well-documented health benefits by improving physical fitness, socialization, and other health-related behaviors (Salatkaitë et al. 2016). Sport is for their enjoyment and health and professional development, so injury surveillance in cricket has been undertaken for almost a decade. (Dube Gundani and Rastogi, 2018). Sport is a common cultural element of modern societies and widespread recreational activity for adolescents. For education and socialization, sports play a significant role also sports play a significant role for patriotism and community spirit, recreation and health enhancement, and also in well-being and entertainment. There are many good things and advantages on health for the adolescent player who is playing sports, they are low risk of obesity, cardiovascular disease, hypertension, diabetes and improving physical fitness to name a few and the number of people participating in sporting activity is on the rise over last few decades. Psychometric mood and perceived stress indicators provide useful information in terms of explaining injury risk in athletes (Galambos et al., 2005) Illness surveillance and systematic injury are prerequisites to effective protection of athlete's health. In athletics issues, sports injuries reports across the spectrum of games remain valuable. All athletes by participation in sports also entail a risk of injury, right from the professional level sports persons down to the amateurs. Injuries in youth sports account for substantial morbidity and cost. Sports injuries result from acute trauma or repetitive stress associated with athletic activities. In many cases, these types of injuries are due to overuse of a part of the body when participating in a certain activity. Risk factors for injury specifically related to adolescents include the presence of growth cartilage, the existence of muscle imbalance, and pressure to competed spite pain and fatigue (Stein & Micheli, 2010). The increase in injury risk is of particular concern at younger levels as research has shown that adolescent cricket injury risk is higher than that in adult cricketers. (Pote, 2018). In cricket, injuries can occur in all activities of the game, like bowling, batting, or fielding. (McLeod et al. 2020). Among adolescent cricketers, bowlers are mostly affected by the injuries in cricket. (Rahman, et al., 2019). The younger players suffered most of the first-time injuries, and they also sustained slightly more injuries than the older players.

RESEARCH METHODOLOGY:

This was a cross-sectional study. The study site was NITOR, but data was collected from BKSP, City club, and other clubs in Dhaka city and another city. Players who had injuries by playing cricket and training sessions in between last one years. The study population was cricket players of Bangladesh Krira Shikkha Protishtan, Sheikh Rasel Cricket Academy, Musco Sakib Cricket Academy, Mirpur cricket academy, Abahani Cricket Academy, Bangladesh Police Cricket Academy, and the Dhaka City Clubs. Players who had injuries by playing cricket and training sessions in between the last year.

RESULTS:

Socio-Demographic variables and life style and physical factor : The study was conducted by 190 participants of both males and females in Bangladesh. Participants' mean age was 16.11(SD±1.8) Years. The minimum range was 11 and the maximum was 19. Among the participant, the greater number were the range of 14-16 and the number was 126. Among the age group, 11-13 years were 8.4%, 14-16 years were 66.3% and 17-19 years were 25.3%.Among 190 participants 65.30% (n=124) were male and 34.70% (n=66) were female. Within 190 respondents 21.60% (n=41) were Graduation, 25.80% (n=49) were Higher School Certificate, 33.20% (n=63) were Secondary School Certificate, 16.30% (n=31) were Junior School Certificate and 3.20% (n=6) were Primary School Certificate. Among 190 respondents 68% (n=129) were Urban, 18% (n=34) were Peri-urban and 14% (n=27) were Rural. The fathers' occupations were 37.90 % (n=72) job, 31.10 % (n=59) business, 14.70 % (n=28) Farmers, 1.10 % (n=2) retired, 0.50 % (n=1) sports, and 14.70 % (n=28) others among 190 respondents.Among 190 respondents mothers' occupation 86.80% (n=165) were housewife, 2.10% (n=4) were business, 5.3% (n=10) were job and 5.8% (n=11) were others.Among 190 respondents 79% (n=151) were normal BMI, 16% (n=30) were underweight and 5% (n=9) were overweight.Among 190 participants 65% (n=123) had a history of the previous injury and 35% (n=67) participants didn't have any history of the previous injury.

Preventive measure related factors

Among 190 participants 95.80% (n=182) had done warm-up always before training, 3.70% (n=7) participants had done warm-up often before training and 0.50% (n=1) participants had done warm-up sometimes before training. Among 190 participants 97.90% (n=186) had done warm-up always before cricket match, 2.10% (n=4) participants had done warm-up often before a cricket match. Among 190 participants 96.30% (n=183) had done cool down always after training, 2.10% (n=7) participants had done cool down often after training and 1.60% (n=1) participants had done cool down sometimes after training. Among 190 participants 95.35% (n=181) had done cool down always after a cricket match, 4.20% (n=8) participants had done cool down often after cricket match and 0.50% (n=1) participants had done cool down sometimes after a cricket match. Among 190 participants 48.90% (n=93) had used always special equipment during Cricket Match or Training, 15.30% (n=29) participants had used often special equipment during Cricket Match or Training, 3.70% (n=7) participants had used sometimes special equipment During Cricket Match or Training and 32.10% (n=61) participants had never used special equipment During Cricket Match or Training. Among 190 participants 0.50% (n=1) had never maintained preventive measures during playing cricket, 4.20% (n=8) participants had to maintain preventive measures during playing cricket at sometimes, 27.90% (n=53) participants maintaining preventive measures during playing cricket at often, 67.40% (n=128) participants had maintaining always preventive measure during playing cricket. Out of 190 participants, 7.90 % (n=15) did core stability and strengthening occasionally, 28.90 % (n=55) did core stability and strengthening frequently, and 63.20 % (n=120) did core stability and strengthening consistently. during playing cricket at often, 67.40% (n=128) participants had maintaining always preventive measure during playing cricket. out of 190 participants, 7.90 % (n=15) did core stability and strengthening

Circumstances of playing-related factors

Among 190 participants 7.40% (n=14) were wicket keeper, 32.60% (n=62) participants were all-rounder, 12.10% (n=23) participants were spin bowler, 21.10% (n=40) participants were fast bowler, 26.80% (n=51) participants were batsman. Among 190 participants 13.20% (n=25) were practiced 4 days a week, 66.80% (n=127) participants were practiced 5 days a week, 20.00% (n=38) participants were practiced 6 days in a week. Among 190 participants 74.20% (n=141) practiced 3 hours per session, 20.00% (n=38) participants were practiced 4 hours per session, 5.80% (n=11) participants were practiced 5 hours per session

Anatomical site of injury-related variable

In this study, 73.16% (n=139) of the 190 individuals were injured, whereas 26.48 % (n=51) were not injured. There were 47.51% of injured individuals with upper limb injuries, 28.84% with lower limb injuries, and 22.65% with trunk and back injuries. Upper limb injury, 73.3% were male and 26.7% were female. In the case of lower limb injury, 66.6% were male and 33.3% were female (figure 24), while in the case of trunk and back injury, 68.3% were male and 31.7 percent were female. Batsmen accounted for 23.3 % of those with upper limb injuries, while fast bowlers made up 19.8%, spin bowlers made up 17.4%, all-rounders made up 32.6 %, and wicket-keepers made up 7%. 24.1% of participants with lower limb injuries were batsmen, 24.1% were fast bowlers, 7.3% were spin bowlers, 42.6% were all-rounders, and 1.9% were wicket-keepers. 17.1% of individuals with upper trunk and back injuries were batsmen, 24.4% were fast bowlers, 7.3% were spin bowlers,

43.9% were all-rounders, and 7.3% were wicket-keepers. Shoulder joint injury (23.50%) and finger impact injury (22.50%) were more common in the upper limb than rotator calf injury (9.80%), shoulder dislocation (8.80%), thrower elbow (15.70%), shoulder impingement (5.90%), and other upper limb injuries (13.70%). Lower limb ankle sprain 19.40%, others 19.40%, and quadriceps strain 17.70% were more prevalent among participants than hamstring injury 12.90%, groin strain 16.10%, patellar tendon 6.50%, and medial meniscus damage 8.10%. The low back injury was more common among participants (71.40%) than side strain (19.00%) and other trunk and back injuries (9.50%) in the trunk and back.

Nature of injury related variables

In this study, 1.0% of wounded individuals had a concussion, 7.6% of participants experienced laceration/abrasion, and 18.3% of the individuals suffered a strain/muscle injury. 28.9% of individuals had a sprain/ligament injury, 1.5% had a Meniscus injury, and 2.5% (n=5) suffered a fracture. Tendinopathy affected 5.6 % of participants, dislocation/Subluxation affected 4.1% of participants, contusion/hematomas affected 7.6 % of participants, heat injury-affected 2.5% of participants, bruises affected 7.1% of participants, and overuse injury-affected 10.2 % of participants 2.0% participants had opened wound and 1% participants had nerve injury. In our findings, 7.90% of injured participants had a deltoid muscle injury/strain, 18.40% had a quadrates lumborum injury/strain, 7.90% had a hamstring injury/strain, 7.90% had a calf muscle injury/strain, 7.90% had a Supraspinatus muscle injury/strain, 13.20 percent had a gluteus injury/strain, 10.50% had a rotator calf muscle injury 10.50% participants had adductor group of muscles injury/strain, 5.30% participants had trapezius muscle injury/strain, 7.90% participants had quadriceps muscle injury/strain and 2.60% participants had common extensor muscle of elbow injury/strain. Among the participant 14.20% of injured participants reported severe pain, 35.80% reported moderate pain, 23.20% reported light pain, and 14.20% reported no discomfort.

Severity of sports-related variable

Among 190 participants 14.20% (n=) severity of the pain were severe, 35.80% (n=) participants pain were moderate, 23.20% (n=) participants pain were mild, and 26.8% (n=) participants had no pain.

Distribution of percentage of injury (n=190)

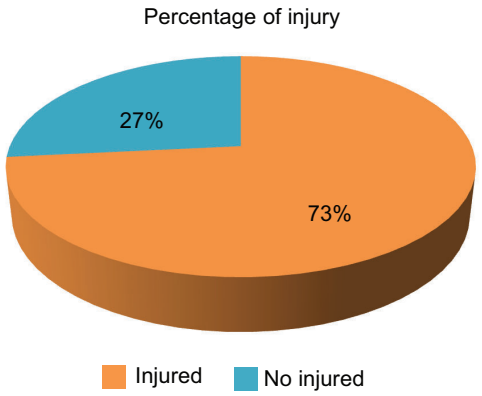


Fig.-1: *Distribution of percentage of injury*

Distribution of site of injury

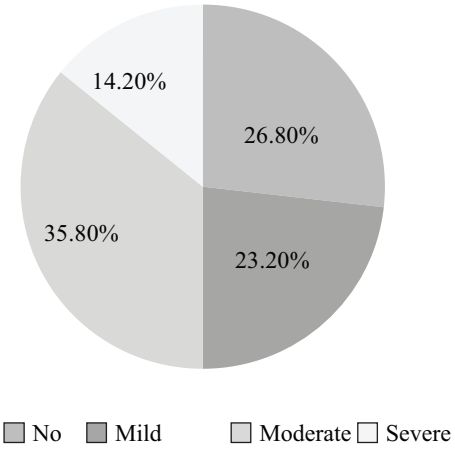


Fig.-2: *Distribution of site of injury*

Distribution of participants according to the severity of pain

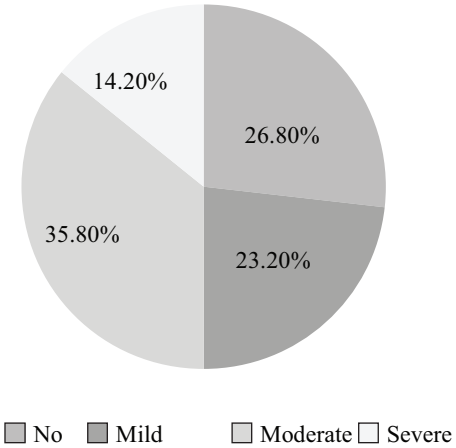


Fig.-3: *Distribution of participants according to the severity of pain.*

Distribution of participants according to the nature of the injury

Table-I

Distribution of participants according to the nature of the injury

Factors	Frequency (n)	Percentage (%)
Nature of injury		
Concussion	2	1.0%
Laceration/Abrasions	15	7.6%
Strain/Muscle injury	36	18.3%
Sprain/Ligament injury	57	28.9%
Meniscus injury	3	1.5%
Fracture	5	2.5%
Tendinopathy	11	5.6%
Dislocation/Subluxation	8	4.1%
Contusion/Hematomas	15	7.6%
Heat injury	5	2.5%
Bruises	14	7.1%
Overuse injury	20	10.2%
Open wound	4	2.0%
Nerve injury	2	1.0%
Total	197	100.0%

DISCUSSION

The study was conducted on 190 adolescent cricket players and there was 124 (66.3%) male and 66 (34.7%) female who play in a different club in Bangladesh. After conducting the study, the following results were found from analysis. And this result was compared to other cricket-playing countries and some research which was conducted in Bangladesh. The mean age of the participants in this study was 16.11 years and the minimum age was 11 years and the maximum was 19 years. According to Rahman et al, (2019) the mean age of the cricketer was 19. According to Dube A, (2018) the mean age of the cricketer was 16.4 years. According to Gregory Batt and Kerslake, (2004) the mean age of the cricketer was 15.3 years. According to Noorbhai et al, (2012), the mean age was 15.6 years. According to Stretch and Venter (2005), the mean age was 16.8 years. In Australia, the age range was 13-19 years (Dennis et al., 2005). According to Rashaduzzaman et al, (2019), the mean age was 16.94 years As per study analysis showed 26.8% (n=51) were batsman, 21.1% (n=40) were fast bowler, 12.1% (n=23) were spin bowler, 32.6% (n=62) was all-rounder (both bowling and bating), 7.4% (n=14) were wicket-keeper. According to Rahman et al, (2019), the incidence of the injury of bowlers was 60% (n=60) which was greater than batsman 30% (n=30) and all-rounder 8% (n=8) and wicket-keepers 2% (9n=2). According to Olivier B. (2013), in a South African study on international cricket players, it was found that the highest percentage (27%) of injury was bowling and a high number of injuries were sustained during the bowling action (94%) in this study. According to stretch, (2014), the incidence of the injury at bowlers was 47% which was greater than batsmen 29.8% and fielders (22.8%). He also mentioned that 66.6% injury was recurred.29.8% of them was from the previous season and 36.8% of them were from the same season. The incidence of sports injuries was 2% for wicket keepers. According to pote and Christie, (2018) found that bowling workloads are associated with injury in adolescent fast bowlers so fast bowlers most injured than batsmen and wicket keepers. According to Dannie, there was a constant relationship between high bowling workload and injury. According to Blanch et al, (2015) found that younger bowlers (less than 22 years old) were more injured than other ages, can be said that adolescent bowlers get more injured and it may be for their bone & ligament not fully developed and it may be for high workload than others. According to our results, 49.27% (n=101) was upper limb injury, 30.25%(n=62) was lower limb injury, 20.48% (n=27) was trunk and back injury. In South African adolescent cricketers 34% injured were sustained to the upper limb,34% to the lower limb, and 31% to the back and trunk (MH Noorbhai,2012). According to Stretch (2014), the pattern of injury of adolescent/schoolboy were found 26% to the upper limb, 38% to the lower limb, and 33% to the back and trunk. In this study we found nature of injuries of participants 1.00% had a concussion, 7.60% had laceration/ abrasions, 18.30% had strain/muscle injury, 28.90% had sprain/ligament injury, 1.50%) had meniscus injury, 2.50% had a fracture, 5.60% had Tendinopathy, 4.10% had dislocation/Subluxation, 7.60% had contusion/hematomas, 2.50% had heat injury, 7.10% had bruises,10.20% had overuse injury,2.00% had an open wound, and 1% had nerve injury.

In our study, the most common nature of injury among adolescent players was sprain 28.9% (n=57) and the strain was 18.31% (n=36). In Zimbabwe found two most common nature of injuries among cricketers was sprain (45%) and strain (30%) compared among fractures, dislocation, wounds, and others (Dube et al,2018). Similar findings to the present study were found in line with those of (Stretch,2014), (Kumar et al,2015), (Das et al,2014.) Inside

the study, among injured participants, 23.50% was shoulder joint injury, 9.80% was rotator calf injury, 8.80% was shoulder dislocation, 15.70% was thrower elbow, 22.50% was impact injury to a finger, 5.90% was shoulder impingement and 13.7% was others injury. According to Stretch (2005), upper limb injuries account for 34.1% of all 45 injuries. Finger injuries account for 13.6% and 7.1% were shoulder injuries. According to Frost et al. (2012), in New Zealand, the upper limb accounted for 17.8% and 14.9% injury. 26.8% upper limb injury (Stretch, 2014). In this study, the percentage was 26.3 for fractures of phalanges. 10.5% had tendinitis, 15.8% had rotator cuff injury, 52.6% had shoulder pain, and 1.8% had shoulder instability.

According to Zaman (2012) among 31 participants, 3 (9.68%) had a hand injury and finger injury which include 2 (6.5%) had MCP injury on the other hand in his study, finger injury about 26.3% (Fracture of phalanges). In India, the injury incidence in cricketers was 1.24 per ten thousand hours to play (Dhillon et al, 2012). In this study among 190 participants 12.90% hamstring injury, 16.10% groin strain, 17.70% quadriceps strain, 6.50% patellar tendon injury, 8.10% medial meniscus injury, 19.40% ankle sprain, and 19.40% others injury at the lower limb. In New Zealand, 47.3% of injury accounted for in lower limbs, where the knee was 11.2%, the thigh was 10.8% (Frost et al., 2012). Graduation was achieved by 21.60% of the 190 respondents, followed by Higher School Certificate by 25.80%, Secondary School Certificate by 33.20%, Junior School Certificate by 16.30%, and Primary School Certificate by 3.20%. As a result of this investigation, the highest proportion of people with higher education credentials was 33.20%. The National Federation of State High School Associations data showed that between 1988 and 1998 participation in girls high school sports has risen, nearly 40% of the female participants were below graduation level (Powell & Foss, 2000). According to the finding 190 participants, 14.20% had severe pain, 35.80% had moderate pain, 23.20% had mild pain and 14.20% had no pain. According to Noorbhai et al, (2012), the pain was more severe to the batsman (30%) than bowlers (23%) and 7% wicket-keeper. Male suffered 73.3% upper limb injuries, 66.6% lower limb injuries, and 68.3% trunk and back injuries whereas females suffered 26.7% upper limb injuries 33.3% lower limb injuries,31.7 trunk & back injuries. According to William et al. (1998), a higher number of injuries were seen in males 55% compared to females 37%. In our study, we found some significant relationship such as the relationship between the severity of injury/pain with the age group of the participant (P=0.009), the relationship between the severity of injury/pain with the gender of the participant (P=0.000). the relationship between trunk and back injury right with the previous type of injury (P=0.002). the relationship between the severity of injury/pain with the previous type of injury (P=0.000).

RECOMMENDATION:

The field of sports physiotherapy is flourishing day by day. Injuries are very common in sports and also in cricket, and also the demand for physiotherapy increases as the day progresses. In recent years the role of physiotherapy become more specific and the therapist conduct more and more research and designed so many clinical trials in the sports injury sector. The physiotherapist plays role in both the prevention and management of sports injury. Today cricket demands greater physical effort for players during their vital stage in their careers. It was the duty of the players, medical support team, and the administrators to put in place measures to ensure that unnecessary injuries do not prevent players from reaching their full potential. This study was more important to key role players, as it provides details of the effect of practice and matches, the role of the players in the team, and the mechanism, nature, site of injury to players at different ages and levels of play. To understand further the incidence and nature of injuries, it is recommended that research is carried out to assess the number of injuries sustained about the exposure time to training, practice, and matches for a junior and international player. In this study, the shoulder, ankle was also at risk of injury. If team management takes proper steps to prevent injuries of those regions, then the incidence of recurrence of injury will be reduced. Finally, the differences in injury patterns between adolescents and adults, more research will help prevent adolescent's injury and will be helpful for their professional carrier as a cricketer and also might play a vital role in improving the professional efficacy.

CONCLUSION:

The overall aim of this study was to find out the pattern of sports injury among adolescent cricket players in Bangladesh. The study represents that more participants were injured. Among the age of the participant, the greater number was the range of 14-16 years. Among the injured participants male was more compared with female and in educational background Secondary School Certificate was more injured compared to others. A more concise overview reflects the regional upper limb, lower limb, and trunk & back injury where upper limb injury was more common between adolescent cricketers. Among the participants,

the all-rounder was more injured compared with other positions of playing. In the upper limb shoulder, the joint injury was a more common site compared with others and an Ankle sprain was a more common sight in the lower limb. The study showed that sprain and strain was more common nature of injury among adolescent. This study also found the Association of the severity of injury/pain with the Age group of the participant, the severity of injury/ pain with the gender of the participant, the severity of injury/pain with the previous type of injury, and the severity of injury with a range of warm-up before a cricket match.

References:

1. Aginsky, K.D., Lategan, L. & Stretch, R.A., 2004. Shoulder injuries in provincial male fast bowlers - predisposing factors. *South African Journal of Sports Medicine*, 16(1), p.25.
2. Akoto, Ralph et al. (2018): "Epidemiology of injuries in judo: a cross-sectional survey of severe injuries based on time loss and reduction in sporting level." *British journal of sports medicine* vol. 52,17, p.1109-1115
3. Alway, P. et al., 2019. Incidence and prevalence of lumbar stress fracture in English county cricket fast bowlers, association with bowling workload and seasonal variation. *BMJ Open Sport & Exercise Medicine*, 5(1).
4. Bahr, R., and Holme, I., (2003). Risk factors for sports injuries-a methodological approach. *British Journal of Sports Medicine*, 37(5), pp.384–392.
5. Bailey, D.M., Hissong, A.N. &Lape, J.E., 2015. Getting Started in the Research Process. In *Bailey's research for the Health Professional*. Philadelphia: F.A. Davis Company.
6. Bipasha, Farhana. Tasnin. et al. (2018). Cricket Injuries among Bangladeshi Female Cricketers. Elixir international journal, vol. 6, p. 123
7. Blanch, P. et al., 2015. Different tissue type categories of overuse injuries to cricket fast bowlers have different severity and incidence which varies with age. *South African Journal of Sports Medicine*, 27(4), pp.108–113.
8. Bodanki, C. et al., 2020. Prevalence of cricket-related musculoskeletal pain among Indian Junior Club cricketers. *International Journal of Research in Orthopaedics*, 6(4), p.744.
9. Bodanki, C., Krishna, Y.H., Badam, V.K., Harsha, T.S.S. and Reddy, A.G., 2020. Prevalence of cricket-related musculoskeletal pain among Indian junior club cricketers. *International Journal of Research in Orthopaedics*, *6*(4), p.744.
10. Bowling, A., 2002. The philosophical framework of measurement. In *Research methods in health: Investigating health and health services*. Buckingham: Open University Press.
11. Bristi, S.N., 2015. *Prevalence of sports injuries among female athletes* (Doctoral dissertation, Bangladesh Health Professions Institute, Faculty of Medicine, the University Of Dhaka, Bangladesh)).
12. Burton, N.W., Kadir, M.A. and Khan, A., 2020. Physical activity attitudes among adolescents in Bangladesh. *Public health*, *179*, pp.59-65.
13. Cai, H., Bullock, G.S., Sanchez-Santos, M.T., Peirce, N., Arden, N.K. and Filbay, S.R., 2019. Joint pain and osteoarthritis in former recreational and elite cricketers. *BioMed Central Musculoskeletal Disorders*, *20*(1), p.596.
14. Cassel, M. et al. 2019. Orthopedic injury profiles in adolescent elite athletes: a retrospective analysis from a sports medicine department. *Frontiers in physiology*, *10*, p.544.
15. Das, N.S. et al., 2014. Nature and pattern of cricket injuries: The Asian Cricket Council Under-19, Elite Cup, 2013. *PLoS ONE*, 9(6):e0100028
16. Dennis, R.J., Finch, C.F. and Farhart, P.J., 2005. Is bowling workload a risk factor for injury to Australian junior cricket fast bowlers? *British journal of sports medicine*, *39*(11), pp.843-846.
17. Dhillon, M. S. et al., (2012). Nature and incidence of upper limb injuries in professional cricket players a prospective observation. *Sports medicine, arthroscopy, rehabilitation, therapy & technology: SMARTT*, *4*(1), 42. https://doi.org/10.1186/1758-2555-4-42
18. Dube, A., Gundani, M.P.D. and Rastogi, S., 2018. Musculoskeletal injuries among adolescent cricketers in Zimbabwe. *Med Crave Online Journal Sports Medicine*, *2*(1), p.00045.
19. Forrest, M.R. et al. 2017. Risk factors for non-contact injury in adolescent cricket pace bowlers: a systematic review. *Sports medicine*, *47*(12), pp.2603-2619
20. Galambos, S.A. et al. 2005. Psychological predictors of injury among elite athletes. *British journal of sports medicine*, *39*(6), pp.351-354
21. Gamage, P.J., Worthington, L.V. and Finch, C.F., 2017. Perceived injury risk among junior cricketers: a cross-sectional survey. *International journal of environmental research and public health*, *14*(8), p.946.
22. Green, R.A. et al. 2013. Altered scapular position in elite young cricketers with shoulder problems. *Journal of science and medicine in sport*, *16*(1), pp.22-27.

23. Gregory, P.L., Batt, M.E. and Kerslake, R.W., 2004. Comparing spondylolysis in cricketers and soccer players. *British Journal of Sports Medicine*, *38*(6), pp.737-742.

24. Hicks, C.M. (1999). *Research methods for clinical therapists: applied project design and analysis*. Edinburgh: Churchill Livingstone.

25. Islam M. R., Akter N, and Kamrujjaman., 2021. Sports injuries in club based adolescent male players: A Cross-Sectional Study. *Journal of current medical research and opinion,* 4(1) pp. 775-779

26. Kountouris, A., Portus, M. and Cook, J., 2012. Quadratus lumborum asymmetry and lumbar spine injury in cricket fast bowlers. *Journal of Science and Medicine in Sport*, *15*(5), pp.393-397

27. Kumar, S. et al. 2015. One year prevalence of the musculoskeletal disorder among cricket Players in Haryana: A retrospective study. *Strain*, *20*, p.36.

28. Martin, C., Olivier, B. and Benjamin, N., 2017. Asymmetrical abdominal muscle morphometry is present in injury-free adolescent cricket pace bowlers: A prospective observational study. *Physical Therapy in Sport*, *28*, pp.34-42.

29. McLeod, G. et al. 2020. Medical-attention injuries in community cricket: a systematic review. *British medical journal open sport & exercise medicine*, *6*(1), p.670.

30. Mondam, Srinivas, et al.2014., "Surveillance of Musculoskeletal Symptoms and Anthropometric Variables among Four International Cricket Teams Competed in ACC Premier League Malaysia." *Asian Journal of Pharmaceutical Research and Health Care*, vol. 8, no. 2, p. 47

31. Noorbhai, M.H et al. 2012. Prevalence of cricket-related musculoskeletal pain among adolescent cricketers in KwaZulu-Natal. *South African Journal of Sports Medicine*, *24*(1).

32. Olivier, B. et al. 2015. Static and dynamic balance ability, lumbopelvic movement control, and injury incidence in cricket pace bowlers. *Journal of science and medicine in sport*, *18*(1), pp.19-25.

33. Pote, L. and Christie, C., 2018. A novel intervention program for the strength and conditioning of adolescent cricket players. *Human Movement*, *19*(1), pp.34-43

34. Rahman, E. et al. 2019. Common Sports Injuries among Male Cricket Players in Bangladesh. *Journal of Current Medical Research and Opinion*, *2*(11), pp.331-333.

Original Article

Diagnostic Performance of X-ray & MRI in the Evaluation & Staging of Bilateral Avascular Necrosis of Femoral Head

Noushin Huda[1], Mosa. Nahid Farjana[2], Maksuda Begum[3], Mst.Sabina Yasmin[4], Sadia Noor Arabi[5], Mosa. Runa[1], Snigdha Sarker[6] , Rasheda Pervin[7], Lovely Yesmin[7], Delara Begum[8]

Abstract

The femoral head's avascular necrosis (AVN) is characterized as bone cellular death brought on by a loss of blood flow for any reason. Males are affected more commonly than females, and it affects people at a younger age. X-Ray is most available & cheaper modality & MRI is a non-invasive & reliable imaging modality for early detection of AVN. To evaluate & compare the role of X-Ray and MRI in the diagnosis of bilateral avascular necrosis of femoral head. This cross sectional study was conducted in Department of Radiology & Imaging, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka.50 clinically suspected patients of bilateral avascular necrosis of femoral head, in both gender came at NITOR OPD, who were referred to Department of Radiology and Imaging, during the one-year period e.g. July 2021 to July 2022, were included in the study. Informed consent was obtained. Most common stage of AVN was found to be stage III 51.0% followed by stage I 3.0%, stage II 32.0% and stage IV 14.0%. Sensitivity for X-ray was found 33.3 in stage I, 59.4% in stage II, 82.4% in stage III and 92.9% in stage IV. Sensitivity for MRI was found 66.7 in stage I, 87.5% in stage II, 96.1% in stage III and 100.0% in stage IV. MRI was found to have a greater sensitivity than X ray. MRI is more sensitive and specific than plain X-ray for early detection & staging of bilateral AVN of femoral head & it should be used for confirmation,follow-up and surgical intervention.

Key word: Avascular Necrosis of Femoral head (AVN), Stages of AVN, MRI, X-ray, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR).

INTRODUCTION

Avascular necrosis (AVN) of the femoral head is defined as cellular death of bone caused by loss of blood supply for any reason. It affects individuals at a younger age, and males are affected more frequently than females. Magnetic resonance imaging is said to be highly sensitive and specific for AVN diagnosis, and it aids in early detection.[1] The femoral head usually the anterolateral aspect immediately below the weight-bearing articular surface is most commonly involved, as it is the site of the greatest mechanical stress, directly affecting the lateral epiphyseal arteries.[2]It mainly affects the age of late 30s and early 40s. It is initially unilateral with progression to bilateral involvement in up to 72% of patients.[3] Avascular necrosis of the femoral head (AVN) is an increasingly common cause of musculoskeletal disability, and it poses a major diagnostic and therapeutic challenge. During this COVID pandemic, AVN has become one of the post treatment complications of corticosteroid misuse/over use. Although patients are initially asymptomatic, AVN usually progresses to joint destruction, requiring total hip replacement, usually before the fifth decade. Bilateral avascular necrosis of femoral head results generally systemic causes, e.g. corticosteroid use, pancreatitis, alcoholism, radiation, sickle cell disease, trauma involving both hip, infiltrative diseases etc. Femoral head is the most

1. Registrar (Radiology and Imaging), National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR).
2. Medical Officer (Radiology and Imaging), National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR).
3. Professor & Head of the department (Radiology and Imaging), NITOR.
4. Assistant Registrar (Radiology and Imaging),NITOR.
5. Junior Consultant, NITOR.
6. Associate Professor, Radiology & imaging Department, Dhaka Medical college.
7. Assistant Professor, NITOR
8. Professor,NITOR

Correspondents to: Dr. Noushin Huda, Registrar (Radiology and Imaging),National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR). E-mail: dr.nushin34@gmail.com.

commonly affected site and patients usually present with hip and referred knee pain.

The aim of diagnostic imaging procedures in avascular femoral head necrosis is to provide the patient with a stage-adapted therapy. Plain x-ray is more available, cheaper & first imaging approach of choice.

CT scans can be particularly useful to exclude subchondral fractures. MRI is non-invasive, highly sensitive, and commonly used imaging modality.[4] The principal role of MR imaging is in establishing the diagnosis of AVN in symptomatic patients before radiographic changes become apparent. MR imaging can also detect early stages of AVN in high-risk, asymptomatic patients or in the asymptomatic contralateral hips of patients with known AVN.[5] Bone marrow edema, joint effusion etc have been well correlated with progression of the disease.[6] It was expected that, results of this study would encourage further research in larger scale, which in turn help the clinicians to take prompt decision & early management of bilateral AVN of femoral head.

Methodology

This cross-sectional study was conducted in Department of Radiology & Imaging, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka.50 clinically suspected patients of bilateral avascular necrosis of femoral head, in both gender came at NITOR OPD & were referred to Department of Radiology and Imaging, during the one-year period e.g. July 2021 to July 2022, were included in the study by taking the written and explained consent. All details of the patients like age, sex and staging system based on the consensus of the Subcommittee of Nomenclature of the International Association on Bone Circulation and Bone Necrosis (ARCO). The sensitivity and specificity were calculated. Following proper informed consent, 50 patients who had risk factors and were clinically suspected to have bilateral AVN of femoral head were evaluated by both plain x-ray and MRI and staged according to modified Ficat and Arlet classification.

RESULT

Table 1 shows that more than one third (36.0%) patients belonged to age 41-50 years, followed by 31- 40 (26%). Majority of patients with bilateral AVN of femoral head shows male preponderance with male to female ratio 4:1. Table 2 shows that more than half (52%) patients was found in idiopathic followed by 11(22.0%) in aspirin & other NSAIDs use. Table 3 shows that most common stage of AVN was found to be stage III 52.0% followed by stage I 8.0%, stage II 28.0% and stage IV 12.0%. In X-ray findings, 64.0% subjects was found sclerotic lesion, 52.0% lytic lesion, 48.0% collapse, 40.0% osteophytes, 38.0% osteopenia and 22.0% crescent sign (Table-4). In MRI findings, 92.0% subjects was found in bone marrow edema, 84.0% in double line sign, 72.0% in joint effusion, 60.0% in contour loss and 24.0% in reduced joint space (Table-5). Table 6 shows that 26 subjects were found in stage III among them 23 cases were detected by X ray and 25 cases were detected by MRI. Sensitivity for X-ray was found 25.0 in stage I, 64.3% in stage II, 84.6% in stage III and 100.0% in stage IV. Sensitivity for MRI was found

75.0 in stage I, 87.5% in stage II, 96.2% in stage III and 100.0% in stage IV. MRI was found to have a greater sensitivity than X ray (Table-7).

Table-I

Demographic characteristics of the study patients (n=50)

	Frequency	Percentage
Age (years)		
≤30	4	8.0
31-40	13	26.0
41-50	18	36.0
51-60	9	18.0
>60	6	12.0
Sex		
Male	40	80.0
Female	10	20.0

Table II

Risk factors of the study patients (n=50)

Risk factors	Frequency	Percentage
Idiopathic	26	52.0
Aspirin & otherNSAIDs use	11	22.0
Steroid use	8	16.0
Trauma (involving bothhip)	2	4.0
Hypercoagulable state	1	2.0
(Sickle cell disease)		
Alcohol	1	2.0
Radiotherapy	1	2.0

Table III

icat and Arlet staging of the subjects

Ficat and Arlet staging	Frequency	Percentage
Stage I	4	8.0
Stage II	14	28.0
Stage III	26	52.0
Stage IV	6	12.0

Table IV

X-ray findings of the subjects (also evident in MRI)

X-ray findings	Frequency	Percentage
Sclerotic lesion	32	64.0
Lytic lesion	26	52.0
Collapse	24	48.0
Osteophytes	20	40.0
Osteopenia	19	38.0
Crescent sign	11	22.0

Table V

Additional MRI findings of the subjects

MRI findings	Frequency	Percentage
Bone marrow edema	46	92.0
Double line sign	42	84.0
Joint effusion	36	72.0
Contour loss	30	60.0
Reduced joint space	12	24.0

Table VI

Comparison between of Ficat and Arlet staging with X-ray and MRI

Ficat and Arletstaging	Total	X-ray	MRI
Stage I	4	1	3
Stage II	14	9	12
Stage III	26	23	25
Stage IV	6	5	6

Table-VII

Sensitivity of the X-ray and MRI diagnosis

	X-ray	MRI
Stage I	25.0	75.0
Stage II	64.3	85.7
Stage III	84.6	96.2
Stage IV	100.0	100.0



Figure 1: *Flattening, irregularities, sclerosis, subchondral lucencies & fissuring are noted in both femoral head (Bilateral AVN). Both femoral necks are widened. Sclerosis & osteophytosis are also evident in both acetabulum (secondary osteoarthritic change).*



Figure 2: *Both femoral heads are collapsed, elongated & deformed shape. Altered signal intensity area which is heterogeneously hypo intense on T1WI is also seen. Articular margin of femoral heads are irregular.*

DISCUSSION

In this study observed that more than one third (36.0%) patients belonged to age 41-50 years.There were male preponderance of the disease with male to female ratio of 4:1.

Vardhan et al.[8] also showed male predominance of the disease & male to female ratio was 5:1. Similar results were obtained by Kaushik et al.[3] who found in their study that patients affected with AVN are generally younger adults age 35 years to 45 years, Males are affected up to three times more than females.

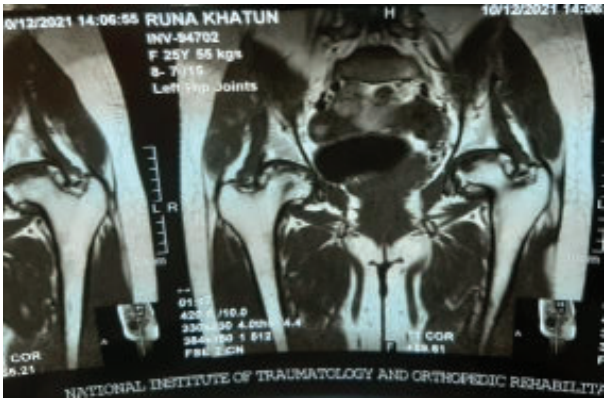


Figure 3: *Both femoral necks are widened. Altered signal intensity area which is heterogeneously hyperintense on T2WI are noted at both femoral heads, with double line sign, more marked on left side-(inner bright line: representing granulation tissue & outer dark line representing sclerotic bone.)*

Current study observed that more than half (52%) patients was found in idiopathic followed by 11(22.0%) in aspirin & other NSAIDs use, 8(16.0%) in steroid use, 2(4.0%) in trauma involving both hip, 1(2.0%) in hypercoagulable state, 1(2.0%) in alcohol and 1(2.0%) in radiotherapy. Similar results were obtained by Vaghamashi et al.[12] they conducted a study where idiopathic was found to be most common risk factor in 50% of cases. Among the associated risk factors, causes like steroids was observed in 18.7%, alcohol in 12.5% and trauma, sickle cell anemia and pancreatitis was found in 6.25% each. Trauma may mechanically disrupt blood supply to the femoral head. In non-traumatic cases, although susceptibility genes have been identified, the pathological process is less well defined and the disease is considered multifactorial.[13] Rekha et al.[10] observed avascular necrosis FH was seen in 14.2% of alcoholics, 28.6% of patients taking steroids, 11.4% of patients with history of trauma and only 5.8% of patients suffering from sickle cell disease. Das et al.[6] reported the most number of hip osteonecrosis was found to be Idiopathic (42.5%), followed by corticosteroid intake (25%); both of them caused bilateral involvement.



Figure 4: *Reduction of height with altered signal intensity which is heterogeneously hyperintense on PDWI are noted at both femoral heads. Reductions of joint spaces are evident in both side.*

In this study observed that most common stage of AVN was found to be stage III 52.0% followed by stage I 8.0%, stage II 28.0% and stage IV 12.0%. Saleem et al.[1] reported Stage I AVN was detected in 1 (1.23 %) femoral head whereas Stage II AVN was detected in 32 (39.50%) femoral heads. Stage III and Stage IVAVN was seen in 28 (34.56%) and 20 (24.69%) femoral heads.

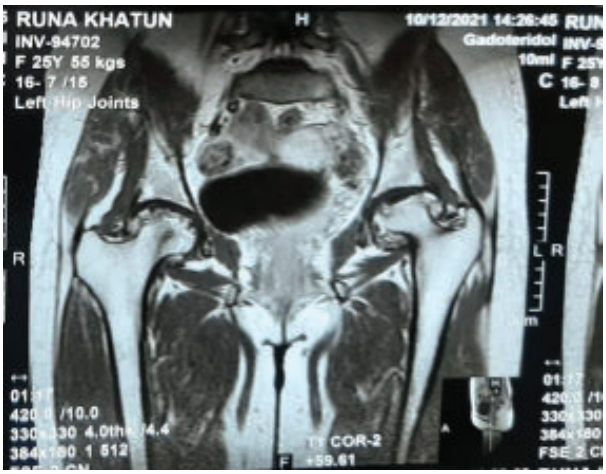


Figure 5: *After I/V contrast: Mild heterogeneous enhancement of the lesions are evident on both femoral heads.*

Present study showed in X-ray findings, 64.0% subjects was found sclerotic lesion, 52.0% lytic lesion, 48.0% collapse, 40.0% osteophytes, 38.0% osteopenia and 22.0% crescent sign. Rangareddy and Prashanth Kumar[14] carried

out a study in total 60 patients who presented with the complaint of hip pain and suspected clinically to be AVN. In their study, 20 cases (33.3%) had lytic lesion, 26 cases (43.3%) had sclerotic lesion, 9 cases (15%) had femoral head deformity &rest of the hips (33.3%) were normal on plain x-rays.

In additional MRI findings, 92.0% subjects were found in bone marrow edema, 84.0% in double line sign, 72.0% in joint effusion, 60.0% in contour loss and 24.0% in reduced joint space. Das et al.[6] reported the most common finding picked upby MRI was Bone marrow edema (86.2%). Saleem et al.[1] reported the most common MRI sign in studied cases was double line sign which was present in 73/81 (90.12%) femoral heads. The other common MRI findings were Bone marrow edema (83.95%) followed by joint effusion (70.37%) and contour loss (59.26%). Reduced joint space was seen in 20 (24.69%) femoral heads. Vaghamashi et al.[12] studied 52 patients presenting with the complaint of painful hip. Most common MRI finding of AVN was focal subchondral signal abnormality which was present in 100 % of the involved hip joints. Hip joint effusion, bone marrow edema, collapse, double line sign, decreased joint space, osteophytes, thinning of articular cartilage and subchondral cysts were seen in 65.2%, 52.2%,56.5%,43.5%, 47.8%, 26.0%, 13.0%,8.7% of involved hip joints respectively.

In this study observed that 26 subjects were found in stage III among them 23 cases were detected by X ray and 25 cases were detected by MRI. Rekha et al.[10] reported in pre collapsed stages (I and II), plain x-ray detected less number of hips than MRI (38.1% in stage I and 54.5% in stage II) whereas MRI was able to detect 95.2% of hips in stage I and 100% in stage II. In collapsed stages (III and IV), both plain x- rays as well as MRI detected 100% of hips of clinically affected patients. Thus, it is concluded that in initial stages, plain x-rays are less sensitive in detecting AVN changes as compared to MRI. However, in later stages, both are equally sensitive.

Current study showed sensitivity for X-ray was found 25% in stage I, 64.3% in stage II, 84.6% in stage III and 100.0% in stage IV. Sensitivity for MRI was found 75.0 in stage I, 87.5% in stage II, 96.2% in stage III and 100.0% in stage IV. MRI was found to have a greater sensitivity than X ray. Deshmukh and

Deshmukh[7] observed the sensitivity (Sn)and Specificity (Sp) for X-ray and MRI respectively for various stages was For STAGE I was 34.29, 29.12 and 98.45,95.12; for STAGE II was 75.12, 68.23 and 99.17, 98.27; for STAGE III was 98.56, 93.12 and 99.69, 98.36; for STAGE IV 99.34, 92.19 and 100.0,

99.19. From this we can notice that for early stages plain X-ray is less sensitive and specific as compared to MRI. These findings are similar to Netamet al.[16] MRI turns out to be most sensitive for diagnosis and determination of extent of disease process. MR imaging has high degree of sensitivity in early stages of AVN as compared to x-ray. Karantanas and Drakonaki[16] found that MRI was more sensitive than CT or scintigraphy for early detection of AVN inpatients with normal radiographs (stage I). They reported sensitivity of MRI for early diagnosis of AVN between 88% and 100%. Das et al.[6] reported MRI was found to have a greater sensitivity than X ray and CT scan in detecting early stages.

CONCLUSION

Present study concluded that MRI is the most accurate imaging modality in the diagnosis of bilateral AVN of femoral head, T1WI, T2WI, STIR, PD, sagittal, coronal and T1WI post contrast sequences permit confident diagnosis and staging of AVN. When someone is clinically suspected to have bilateral AVN of femoral head, neither CT nor any other investigation but MRI should be the choice of investigation.X-Ray can be done as first line imaging modality as it is most available & easily accessible for the patient. But MRI is the preferred modality for confirming the diagnosis since it has higher sensitivity and specificity than X-ray. This study also reveals the diagnostic advantages of MRI in the early diagnosis and accurate staging of lesions.

REFERENCES

1. Saleem MZ, Dahiphale DB, Apte A. Role of MRI in Evaluation of Avascular Necrosis of Femoral Head: A Prospective Study. Journal of Medical Science and Clinical Research 2019; 7(4):480- 489.
2. Murphey MD, Foreman KL, Klassen-Fischer MK, Fox MG, Chung EM, Kransdorf MJ. From the radiologic pathology archives imaging of osteonecrosis: radiologic-pathologic correlation. Radiographics. 2014;34(4):1003-28.
3. Kaushik AP, Das A, Cui Q. Osteonecrosis of the femoral head: an update in year 2012. World journal of orthopedics. 2012;3(5):49-57.
4. Jawad MU, Haleem AA, Scully SP. In brief: Ficat classification: avascular necrosis of the femoral head. ClinOrthopRelat Res. 2012;470(9):2636–9
5. Stoica Z, Dumitrescu D, Popescu M, Gheonea I, Gabor M, Bogdan N. Imaging of avascular necrosis of femoral head: familiar methods and newer trends. Current health sciences journal. 2009;35(1):23.

6. Das A, Das A, Gogoi P, Chakrabartty DK, Dutta A. Radiological evaluation of avascular necrosis of bone with clinical correlation. International Journal of Radiology and Diagnostic Imaging. 2021; 4(1):23-30.

7. Deshmukh AH, Deshmukh SA. Role of plain radiograph versus MRI in avascular necrosis of femoral head. International Journal of Radiology. 2019; 12(2): 69-71.

8. Vardhan H, Tripathy SK, Sen RK, Aggarwal S, Goyal T. Epidemiological profile of femoral head osteonecrosis in the North Indian population. Indian journal of orthopaedics. 2018;52(2):140-6.

9. Zhao DW, Yu M, Hu K, Wang W, Yang L, Wang BJ, et al. Prevalence of nontraumatic osteonecrosis of the femoral head and its associated risk factors in the Chinese population: results from a nationally representative survey. Chinese Medical Journal. 2015;128(21):2843-50.

10. Rekha D, Amarjit K, Yogesh G, Navkiran K, Priyanka M. Role of Plain Radiography and MRI in the Evaluation of Avascular Necrosis of Head of Femur. International Journal of Science and Research 2018;8:433-437.

11. Jacobs B. Epidemiology of traumatic and nontraumatic osteonecrosis. Clinical orthopaedics and related research. 1978;130:51-67.

12. Vaghamashi A, Bhatt J, Doshi J, Patel V. MRI in evaluation of painful hip joint. IOSR-JDMS. 2017;16(5):85-96.

13. Malizos KN, Karantanas AH, Varitimidis SE, Dailiana ZH, Bargiotas K, Maris T. Osteonecrosis of the femoral head: etiology, imaging and treatment. Eur J Radiol 2007; 63(1):16-28.

14. Rangareddy S, Prashanth Kumar KS. Femoral Head Avascular Necrosis: Correlation of Clinical Findings, Radiographic Staging and Magnetic Resonance Imaging. Sch. J. App. Med. Sci. 2016; 4(11C):4064-69.

15. Netam SS, Singh R, Bichpuria S, Kumar S, Jain V. MRI in diagnosis and evaluation of AVN of femoral head in sickle cell disease and comparison with plain x ray. Journal of Evolution of Medical and Dental Sciences. 2015;4(77):13514-25.

16. Karantanas AH, Drakonaki EE. The role of MR imaging in avascular necrosis of the femoral head. Seminars in musculoskeletal radiology 2011;15(3):281-300.

Case Report

Intertrochanteric fracture fixation in a patient with below-knee amputation presents a surgical dilemma: a case report

Md. Kamruzzaman[1], Shamol Chandra Debonath[2], Syed Golam Samdani[1], Hamidul Islam[3], S.M. Shakawat Hossain[3], Md. Sadiqur Rahmann[4]

Abstract:

Intertrochanteric fracture fixation surgery in patients with below-knee amputations poses a challenging problem to the surgeon in terms of obtaining traction for reduction of the fracture. The absence of the foot and part of the leg in these patients makes positioning on the fracture table difficult. We highlight this difficult problem and suggest techniques to overcome it.

Key words: Intertrochanteric fracture, BK amputation , Results

INTRODUCTION:

Inter-trochanteric fractures have traditionally been treated by closed reduction and internal fixation with a dynamic hip screw or an intramedullary device. Reduction is usually achieved by positioning the patient on a fracture table with the foot secured to a boot to aid in traction and rotation. These fractures and positioning for their surgical treatment pose a difficult problem.

When encountered in patients with below-knee amputations. Absence of the foot and part of the leg in these patients makes positioning on the fracture table challenging. We highlight the difficulties encountered in a patient with below-knee amputations undergoing fixation of an inter-trochanteric fracture and the various techniques available to overcome this problem.

CASE PRESENTATION:

A 45years man presented to NITOR with a history of fall. He complained of pain in the left hip especially on movement of his hip. He had left sided below-knee amputations following peripheral vascular disease and had below-knee suction prostheses fitted to his lower limbs for mobility.

Radiographs of his pelvis and left hip revealed inter-trochanteric fracture of the femur kyle type 2.A dynamic hip screw fixation was planned for the fracture but the dilemma was how to position the patient on the fracture table for the surgery.The patient was positioned on a fracture table with a perineal post and the affected limb supported on a radiolucent leg support .The opposite leg was strapped securely to a leg support with the limb placed in abduction to allow easy access for the image intensifier .As the fracture was undisplaced, fixation of the fracture was performed with rotation of the hip by the assistant. The procedure was completed satisfactorily and postoperatively the patient was mobile with full weight-bearing after fitting prostheses to his

1. Associate Professor, Ortho Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
2. Associate Professor, Ortho Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
3. Assistant registrar, Ortho Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka
4. Medical Officer, NITOR, Dhaka

Correspondence: Dr. Md. Kamruzzaman, Associate Professor, Ortho Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka. E-mail: ztushar2000@yahoo.com



Figure 1: *Clinical photograph shows Preoperative x-ray, patient positioning*



Figure 2: *Clinical photograph shows post operative patient position*



Figure 3: *Clinical photograph shows post operative x-ray*

lower limb.

DISCUSSION

Inter-trochanteric fractures of the femur are quite common. Management of these fractures is essentially surgical and the various techniques used include dynamic hip screw fixation, intramedullary nailing and dynamic condylar screw fixation. Patients with below-knee amputation with inter-trochanteric fractures pose a special problem as positioning on the fracture table is difficult due to the absence of the foot and part of the leg. The problem is accentuated when there is a need to apply traction for obtaining reduction of the fracture. There is little information in the literature ontechniques to deal with this problem. We describe a few methods that can be used when this rare and unusual problem is encountered.

If the fracture is undisplaced or minimally displaced, the limb can be placed on a radiolucent leg support with the

opposite hip kept abducted to allow access for the image intensifier. Traction and rotation of the hip can be performed by an assistant. An alternative is to fit the patient's prosthesis onto the stump and secure the foot of the prosthesis to the boot on the traction table. A radiolucent leg support should be placed under the limb for safety. These techniques cannot be used when the fracture is displaced and more traction is needed.Prosthesis fitted onto the stump and the limb secured on the boot of the traction table.

If the fracture is displaced and greater traction is anticipated, the method of shortening the traction arm and inverting the boot to accommodate the flexed knee and stump, as described by Al-Harthy *et al.* [5], can be used. A standard boot should be used and the stump should be 12 cm or more (below the tibial tuberosity). If the stump is long, the boot tongue can be inverted for the stump to protrude. Upper tibial skeletal traction can be used if the stump is short but this method has some drawbacks. The skeletal pins may 'cut out' of the bone, which is usually osteoporotic, on applying traction. The other option is to use a distal femoral skeletal traction which would assist in traction.

CONCLUSIONS:

Intertrochanteric fracture fixation surgery in patients with below-knee amputations is a difficult and challenging problem for the surgeon. The dilemma is on how to provide the traction and rotation required for reduction of the fracture. We believe that the techniques mentioned here to overcome this problem are safe and give the surgeon various options to handle this situation.

REFERENCES:

1. Fogagnolo F, Kfuri M, Jr, Paccola CA. Intramedullary fixation of pertrochanteric hip fractures with the short AO-ASIF proximal femoral nail. Arch Orthop Trauma Surg. 2004;124:31–37. doi: 10.1007/s00402-003-0586-9.
2. Hardy DC, Descamps PY, Krallis P, Fabeck L, Smets P, Bertens CL, Delince PE. Use of an intramedullary hip-screw compared with a compression hip-screw with a plate for intertrochanteric femoral fractures. A prospective, randomized study of one hundred patients. J Bone Joint Surg Am. 1998;80:618–63.
3. Sadowski C, Lübbeke A, Saudan M, Riand N, Stern R, Hoffmeyer P. Treatment of reverse oblique and transverse intertrochanteric fractures with use of an intramedullary nail or a 95 degrees screw-plate: a prospective, randomized study. J Bone Joint Surg Am. 2002;84A:372–381.
4. Valverde JA, Alonso MG, Porro JG, Rueda D, Larrauri PM, Soler JJ. Use of the gamma nail in the treatment of fractures of the proximal femur. Clin Orthop Relat Res. 1998;350:56–61. doi: 10.1097/00003086-199805000-00007.
5. Al-Harthy A, Abed R, Campbell AC. Manipulation of hip fracture in the below-knee amputee. Injury. 1997;28:570. doi: 10.1016/S0020-1383(97)00118-6.