ORTHOPAEDIC JOURNAL OF M. P. CHAPTER

An official publication of Madhya Pradesh Chapter of Indian Orthopaedic Association

P-ISSN 2320-6993 | E-ISSN 2582-7243

www.ojmpc.com

Index Copernicus International
ICV 71.64
Indexed

2023 Jul-Dec

Volume 29

Issue 2

Special Task Force
to
Counter Attack Tough Pathogens

STF-625

Amoxycilin & Potassium Clavulanate with LB Tabs

To Counter Attack Severe Bacterial Infection

CEFGEM-T

1.125 / Kid Inj.
(Ceftriaxone + Tazobactum Inj.)

The Powerful Coalition Forces

CEFGEM-PT INJ.

(Piperacilline 4gm & Tazobactum 0.5gm Injection)

Strike Hard !!!

Lextra Pharmaceuticals

Let's give Life an extra boost !

EDITORIAL TEAM

M.P. ORTHOPAEDICS ASSOCIATION
2023-24

PRESIDENT	Dr Saket Jati, Indore
PRESIDENT ELECT	Dr Sandeep Sharma, Bhopal
PAST PRESIDENT	Dr Suneet Tandon, Bhopal
VICE PRESIDENT	Dr Arvind Verma Jangid, Indore Dr Pradeep Choudhari, Indore
HON SECRETARY	Dr R S Bajoria, Gwalior
PAST SECRETARY	Dr Saket Jati, Indore
JOINT SECRETARY	Dr S S Yadav, Gwalior Dr Manish Dwivedi, Bhopal
TREASURER	Dr Kamlesh Meena, Bhopal
EDITOR OJMPC	Dr Vivek Singh, Ujjain
WEBMASTER	Dr Vinay Tantuway, Indore
ASSIST SURGEON WELFARE COMMITTEE	Dr. D. K. Sharma, Indore
EXECUTIVE MEMBERS	Dr Ajay Khare, Ujjain Dr Arjun Jain, Indore Dr Pankaj Sharma, Shivpuri Dr Devendra Nayak, Indore Dr Akhilesh Jain, Sagar Dr Lekhraj Patidar, Ratlam Dr Sandeep Bajpai, Gwalior Dr Vishal S Champawat, Bhopal Dr Abhishek Jain, Jabalpur Dr Jagdish Nagar, Dewas
ADVISOR	Dr D K taneja Dr N Shrivastava Dr Pradeep Bhargava Dr J Jamdar Dr S K Lunawat

Artificial Intelligence and Robotic surgery in Orthopaedics

Singh V

Professor, Department of Orthopaedics, R D Gardi Medical College, Ujjain

Artificial intelligence (AI), first proposed by Prof. John McCarthy in 1956, aims to reproduce human intelligence using computers. Machine learning (ML) is a form of AI that uses computational algorithms that learn and improve with experience.[1]

Artificial intelligence is improving the surgical skills of orthopaedic surgeons by improving their clinical decisions. Technology can improve the surgical skills of the doctors. It can also improve the healthcare system. By this, the computer uses neural networks and learning models to learn to distinguish patterns directly from data and learns on its own to select features to classify the input data. To put it simply, using AI and machine learning algorithms, the surgeon can make good use of a huge amount of data. This allows them to comprehend, predict, act, and learn. (2)

Keyword: Artificial Intelligence, Robotic surgery, orthopaedic

Address of correspondence:
Dr Vivek Singh, Professor, Department of Orthopaedics, R. D. Gardi Medical College, Ujjain, (M.P), India
Email- drviveksingh29@rediffmail.com

How to site this article
Singh V, Artificial Intelligence and Robotic surgery in Orthopaedics. Ortho J MPC. 2023; 29 (2):29-30
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/174

AI and robotics have significantly impacted orthopedic surgery, revolutionizing procedures and patient outcomes. Robotic systems assist surgeons in performing procedures with enhanced precision and accuracy. They provide real-time feedback, aiding in precise bone cuts and implant placement. Robotic platforms offer personalized treatment plans based on patient-specific anatomy, allowing for tailored procedures and implant fitting. Robotic-assisted techniques enable smaller incisions, reducing trauma to surrounding tissues, minimizing blood loss, and promoting faster recovery times. (3)

The accuracy of robotics leads to improved implant positioning, potentially reducing complications and enhancing the longevity of implants. AI integrated into these systems can analyze pre-operative and intra-operative data, aiding surgeons in decision-making during surgery. AI algorithms can analyze medical images (X-rays, MRIs, CT scans) with high accuracy, assisting in identifying fractures, abnormalities, or degenerative conditions. (4)

AI helps in creating optimized treatment plans by analyzing patient data, medical history, and outcomes from similar cases, assisting surgeons in decision-making. Machine learning models can predict post-operative outcomes, potential complications, and recovery times based on various patient factors. AI-powered rehabilitation systems offer personalized exercise plans and track patient progress, improving post-surgery recovery. (5)

AI facilitates the analysis of vast datasets, aiding in the development of new orthopedic techniques, materials, and implants. Both AI and robotics continue to evolve, offering more sophisticated tools and techniques for orthopedic surgeons. However, their integration into clinical practice often requires ongoing validation, training, and refinement to ensure optimal patient outcomes and safety. (6)

Robotic surgery will also be a common orthopedic technology. Patients have so far shown great interest and enthusiasm for surgery assisted by robots, dazzled by the high-tech sophistication. But they do still prefer

orthopedic surgeons to be around them during the treatment process. (7)

Robotic surgery is making huge advances in medicine. But a large component of the physician/patient relationship, even for surgeons, is communication, which would be lost if Artificial Intelligence and Robotic surgery would be something automatic. (8)

Robotics and AI will be always there in the future and a synergistic relationship between the human mind and them is the way forward for more effective care of patients.

Reference

1. Deo RC. Machine learning in medicine. Circulation 2015;132:1920– 1930. doi: 10.1161/CIRCULATIONAHA.115.001593
2. Houserman DJ, Berend KR, Lombardi AV Jr, Duhaime EP, Jain A, Crawford DA: The viability of an artificial intelligence/machine learning prediction model to determine candidates for knee arthroplasty. J Arthroplasty. 2022, S0883-5403:00394-1. 10.1016/j.arth.2022.04.003
3. Wu D, Liu X, Zhang Y, Chen J, Tang P, Chai W: Research and application of artificial intelligence based three-dimensional preoperative planning system for total hip arthroplasty (Article in Chinese). Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi. 2020, 34:1077-84. 10.7507/1002-1892.202005007
4. Gyftopoulos S, Lin D, Knoll F, Doshi AM, Rodrigues TC, Recht MP. Artificial intelligence in musculoskeletal imaging: current status and future directions. AJR Am J Roentgenol 2019;213:506–513. doi: 10.2214/AJR.19.21117.
5. Kurmis AP, Ianunzio JR: Artificial intelligence in orthopedic surgery: evolution, current state and future directions. Arthroplasty. 2022, 4:9. 10.1186/s42836-022-00112-z
6. Han XG, Tian W: Artificial intelligence in orthopedic surgery: current state and future perspective . Chin Med J (Engl). 2019, 132:2521-3. 10.1097/CM9.0000000000000479
7. Chung SW, Han SS, Lee JW, Oh KS, Kim NR, Ypoon JP, et al. Automated detection and classification of the proximal humerus fracture by using deep learning algorithm. Acta Orthop 2018;89:468–473. doi: 10.1080/17453674.2018.1453714.
8. Xue Y, Zhang R, Deng Y, Chen K, Jiang T. A preliminary examination of the diagnostic value of deep learning in hip osteoarthritis. PLoS One 2017;12:e0178992. doi: 10.1371/journal. pone.0178992. Chinese Medical Journal 2019;132(21) www.cmj.org 2522

Pauwels' osteotomy in fracture neck of femur in type II and type III

Tirkey R, Barua V K, Vidhyarthi A

This study is conducted in Netaji Subhash Chandra Bose Medical College, Jabalpur

Abstract

Background: Pauwels' osteotomy is a promising procedure to treat non-union in fracture neck of femur of type II and type III, with good success rate.

Material and methods: This study is conducted in department of orthopaedics, Netaji Subhash Chandra Bose Medical College & Hospital, Jabalpur (M.P.) India from 1st December 2022 to 31st December 2023. This prospective study and functional analysis of Pauwel's Osteotomy in fracture neck of femur in type II and type III was done on 10 patients.

Results: Out of 10, union was achieved in 8 patients and 2 patients were lost to follow up. Average time of union of fracture was 15 weeks. All the patients were able to squat, sit cross-legged and stand up on one leg.

Conclusion: Valgus osteotomy and fixation with dynamic hip screw has high success rate in young patients with neglected and ununited intracapsular fracture neck of femur as far as the union of fracture is concerned.

Keywords: Pauwels osteotomy, fracture neck of femur

Address of correspondence:
Dr. Vinay Kumar Barua, Department of Orthopaedics, N.S.C.B. Medical College, Jabalpur (M. P.)

E-mail: vidyarthi_ashok@rediffmail.com

How to site this article
Tirkey R, Barua V K, Vidhyarthi A. Pauwels osteotomy in fracture neck of femur in type II and type III. Ortho J MPC. 2023; 29 (2):31-36
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/175

Introduction

Fracture neck of femur is aptly called as "the unsolved fracture". This is because even with so much of advances in orthopedic field, there is no simple method of treatment which can give consistently successful results for this fracture. Management of this fracture especially in younger patients is a really demanding and challenging task for any orthopaedic surgeon (1). Fracture neck of femur is common in old people as many of them are osteoporotic. With improvement in quality of life leading to increased life expectancy, the incidence is even more common nowadays. Due to the congested vehicular traffic, it is also commonly seen in young patients after road traffic accidents and many a times they are polytraumatized. Many of these fractures are unstable. Because of its peculiar blood supply, a fracture neck of femur may cause circulatory disturbance leading to avascular necrosis and non-union. So, every fracture neck of femur should be treated as an emergency (2). It should be reduced accurately anatomically and fixed stably by one of the many implants available now. Usually, undisplaced stable fractures have a good prognosis and displaced unstable fractures a poor prognosis.

In Madhya Pradesh, because many patients go to native bone setters for treatment of fractures, these patients present with non-union of fracture neck of femur. Another factor leading to non-union is the angle of inclination of fracture. Usually, horizontal fractures with less than 30° of angle unite well and those with more than 30° may result in non-union even when treated expertly (3). This is because in fractures with more than 30° of inclination the resulting forces will act as

shearing forces leading to displacement of fragments and non-union. The Pauwels' principle which was described in 1927 is used, even today successfully. Pseudoarthrosis of femoral neck will unite, if inclination of pseudoarthrosis is changed in such a way that the shearing forces are converted into compression forces and converting unstable fracture into stable one. This leads to endochondral ossification of the fibrocartilage at pseudoarthrosis making the fracture to unite (4). Since, our patients require squatting for their routine daily activities, it is important to preserve the natural femoral head by making the fracture unite. One should not think of prosthetic replacement for every patient with fracture neck of femur. The best end result after fracture neck of femur treatment is the patient's own healed femoral head and neck and every attempt must be made to achieve that goal (5).

Non-union after femoral neck fracture is defined as lack of radiographic evidence of union 6 months after fracture. King [6], in 1939, in his comprehensive review of both recent and old case of fracture neck femur, emphasized that 3 weeks old can be arbitrarily called old and ununited, as it can be assumed that the head of the femur is devoid of its blood supply, has less chances of osseous union and that secondary changes are more probable, than if operation were performed earlier. If the fracture neck of femur remains untreated for more than 3 weeks, internal fixation alone is likely to have high rate of non-union, as reported by Barnes et al. [1]; in their series on fractures of more than 1-week duration they had non-union rate as high as 50%. The femoral neck fracture is probably the fracture, for which there exists the larger number of methods of osteosynthesis. Internal fixation of femoral neck fracture is followed by certain incidence of fixation failure. Nonunion may occur in one-third of patients, with higher rate in vertical or displaced fractures [7]. Number of methods of internal fixation when used alone has failed to achieve the desired end result. Osteoporosis directly influences degree of displacement and quality of internal fixation. The deficient bone stock and posterior comminution play a significant role in biological failure to unite the fracture. Age and sex of patient, osteoporosis, degree of displacement and quality of fracture reduction are the factors that have been found to affect the end result [8, 9]. The appropriate treatment for non-union of a femoral neck fracture depends on the age of the patient, his or her medical status, viability of the femoral head, size of the remnant femoral neck, osteoporosis, duration of the disease and finally the state of joint space. In patients younger than 55 years who are in good general medical condition, with no osteoporosis and with a reasonable size of femoral neck and normal joint space, it is desirable to preserve the femoral head, particularly if the patient's lifestyle and social and religious customs require squatting and sitting in a cross-legged position [10]. Treatment options for femoral neck non-union with preservation of the femoral head include refixation of the fracture, refixation and bone grafting, a pedicle graft to provide blood supply, or a valgus osteotomy with fixation. Cortical bone grafts have been associated with dis-impaction or angulations of the head leading to failure [11]. The initially reported success of Meyer's procedure has not been reproduced in a large series and the procedure has been considered unreliable [12]. Arthrodesis has a high failure rate but, when successful, it leads to a functional but immobile hip. Different techniques of vascularized bone grafting have been introduced, often with excellent results [13, 14], but the usefulness of these techniques is limited because of donor-site morbidity and limb length discrepancy with residual varus deformity.

We believe, that valgus osteotomy acts as a biological stimulus for healing of these fractures, promoting osteogenesis as a result of conversion of shearing forces to compressive forces across the fracture site. The osteotomy is relatively easy to perform, cost effective, provides stability and often is definitive one-time surgery. Valgus osteotomy and internal fixation with dynamic hip screw and angle barrel plate plays a twofold role, it converts the shearing forces into the compression forces by placing the fracture site perpendicular to the resultant of body weight forces; and it buttresses the head of femur

from below to improve stability provided by the internal fixation. Osteosynthesis with dynamic hip screw in its optimum position in the femoral head, supplemented by the buttressing effect of the distal osteotomy fragment, maintains coaptation and immobilization of the fragments and provides a high degree of stability. Following osteotomy, valgus orientation of the proximal femur decreases the lever arm and therefore increases contact pressure on the head. keeping in mind the facts of above-mentioned studies, it seems that performing valgus osteotomy in a hip with changes of AVN may lead to progression of disease and a painful hip later on, and therefore we excluded these patients from our study. Many authors have reported that preoperative presence of osteonecrosis is not a contraindication for osteotomy [17].

There is a criticism about the difficulty in performing THR in these patients, when required at a later stage. However, Marti et al. [17] reported no such problems. Kirby [18] stated that the standard prosthesis could be used for THRs in majority of the cases.

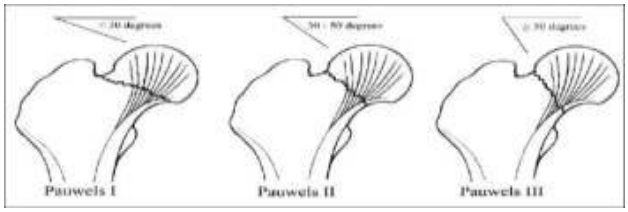


Figure 1: Pauwels classification for femoral neck fractures

Material and method

This Study is conducted in Department of Orthopaedics, Netaji Subhash Chandra Bose Medical College & Hospital, Jabalpur (M.P.) India from 1st December 2022 to 31st December 2023. This prospective study and functional analysis of Pauwels' osteotomy in fracture neck of femur in type II and type III, was done on 10 subjects. Patients with fracture neck of femur, non-union fracture neck of femur under age group 25 to 70 years were included in the study. Patient not included in the study were patients not willing to be operated, pathological fracture of neck of femur, fracture neck femur with secondary osteoarthritis of hip joint, patients with advanced Avascular Necrosis (AVN) changes on plain radiography, patients with significant resorption of femoral neck with proximal fragment less than 2.5 cm.

Pauwels osteotomy: This procedure makes use of the Pauwels principle which states that, if the fracture inclination is reduced to less than 30°, the forces acting on the fracture are converted into compression forces making the fracture unite. Here, a laterally based wedge is removed at the level of lesser trochanter and when the osteotomy is closed, the fracture line will become more horizontal. The fracture and osteotomy are fixed stably using AO 145°, AO 150° and AO 155°, angled blade plate or DHS. The preoperative Pauwels' angle will be calculated for each fracture and the osteotomy will be planned in such a manner so as to achieve a Pauwels' angle of 30° or less. The goal of osteotomy is to achieve compression at the fracture site. The site of osteotomy is at the level of lesser trochanter and desired wedge will be resected depending on Pauwels' angle as described by Pauwels F and later modified by Mueller ME.

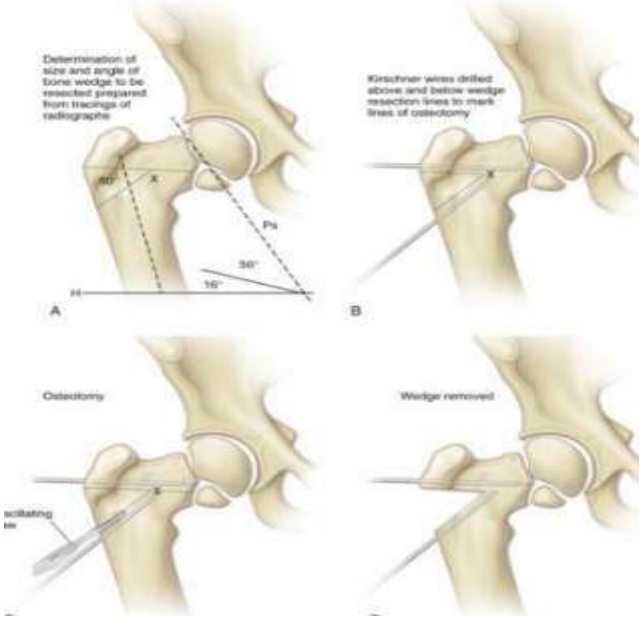


Figure 2: Steps of Pauwels Osteotomy

The patient is taken on fracture table and manual reduction achieved under C-ARM guidance. Lateral incision given from 2cm above the greater trochanter to 6-7 cm distally. Superficial and deep dissection done and greater trochanter exposed.


A

B

C

D

Figure 3: A, B, C, D Intra-operative c-arm pics


A

B

C

D

E

Figure 4: A, B, C, D, E, Case-1: 45 year old male, DOI- 12/06/2023, Operated on- 28/08/2023


A

B

C

D

E

Figure 5: A,B,C,D,E, Case-2: 38 year old male, DOI- 26/04/2023, Operated on 18/06/2023

K wire inserted to fix the reduction temporarily followed by Richards screw insertion and then k wires are used to mark the osteotomy site and angle with the help of pre-operative angle calculations and under C-ARM guidance and the wedge is resected and then abduction of the leg done and traction is released and using AO 145°, AO 150° and AO 155°, angled blade plate or DHS plate is fixed with cortical screws. Surgical site washed with normal saline and betadine 5% solution and suturing done in layers. post operative 2nd and 5th day check dress was done. post-operative physiotherapy was started. Suture removal done at post operative 14th day. Patient was advised non weight bearing for 6 weeks.

Observations

Patients presented with pain over affected hip and inability to walk being the most common complaints. Radiographic images confirmed the diagnosis and MRI was done for evaluation of the femoral head vascularity.

Table 1: Age of the patients

Age	No of cases	Percent
25-35	2	20
35-45	4	40
45-55	1	10
55-65	3	30
65-75	0	0
Total	10	100

Table 2: Sex of patients

Sex	No of cases	percent
Female	2	20
Male	8	80

Table 3: Harris hip score at final follows up

Case	HHS
Case-1	96%
Case-2	82%
Case-3	87%
Case-4	75%
Case-5	59%
Case-6	85%
Case-7	83%
Case-8	71%
Case-9	51%
Case-10	64%

Results

There were 10 patients in our study, 20% cases in our study belongs to age group 25-35years, 40% belongs to 35-45years, 10% belongs to 45-55years and rest 30% belongs to age 55-65 (mean 45.3 years). Eight were males and two females. The majority of patients were in the age group of 35-45 years (Four patients). Mean duration of injury was 9.8 weeks with a range of 3—20 weeks at the time of osteotomy and fixation. There were 7 type 2 and 3 type 3 fractures according to Pauwels' type. Out of 10, union was achieved in 8 patients and 2 patients were lost to follow. None of the fractures was complicated by intra-articular penetration of blade. The average time of union following procedure among different Pauwels' types are shown in Table below. Average time of union of fracture was 15 weeks. There was no statistically significant difference in the time taken in weeks to unite following procedure between type 2 and type 3. There was no relation to the type of fracture, degrees of wedge resection for the osteotomy and the abduction restriction. All patients who had lengthening had wedge resection of 20-30 degree. However, all the patients were able to squat, sit cross-legged and stand up on one leg.

Table 4: Average time of union of fracture

No. of cases	UNION TIME(WEEKS)
1	14
2	14
3	15
4	17

Discussion

Pauwels' recognized that non-union of femoral neck fracture would consolidate within few months, if shearing force acting on non-union fracture site were transformed into compression forces [15]. Good results had been reported in femoral neck fracture treated with primary osteosynthesis and valgus intertrochanteric osteotomy [16, 17]. Marti et al. [17] reported 86% union in 50 patients at an average of 3.6 months, treated by this method alone. Sameer Gupta et al (19) operated 60 patients (mean age, 35 years) by valgus subtrochanteric osteotomy and repositioning of the osteotomy and fixation with a dynamic hip screw and a 135° single-angled barrel plate for closed un-united femoral neck fractures after failed internal fixation (n=27) or neglected (>3 weeks) fractures (n=33). Bone union was achieved in 56 patients after a mean of 3.9 (range, 3-5.5) months. The mean Harris hip score improved from 65 to 87.5. Outcome was excellent in 30 patients, good in 24, and poor in 6. Four of the patients developed avascular necrosis; 2 of whom nonetheless achieved a good outcome (19). In our study, follow-up did not reveal any avascular necrosis and subchondral collapse. Postoperatively we achieved an average fracture plane of 30 degree (25–40 degree), as we aimed for fracture plane of less than 30 degrees. This technique resulted in union in 8 of 10 patients as the use of dynamic hip screw added compression at the fracture site. In dynamic hip screw fixation, powered instruments could be used, which saves time and reduces blood loss. In our present study, because of the delay in intervention and the young age of patients, Pauwels' osteotomy was performed as a head-salvaging procedure. Union was achieved in 80% of our patients, which is quite good for any surgical intervention as 2 patients were

lost to follow up. Among the united fractures, all were able to sit cross-legged, squat and stand on affected leg, which are needed in day-to-day life. This is also another advantage over the head-replacing procedure. Follow-up period of 1.5 year in our study was a limitation in this regard and longer follow-up is required for evaluation of collapse in femoral head.

Conclusion

We conclude by stating that valgus osteotomy and fixation with dynamic hip screw and angle barrel plate has high success rate in young patients with neglected and ununited intracapsular fracture neck of femur as far as the union of fracture is concerned, and internal fixation with dynamic hip screw and angle barrel plate is technically simple, with additional advantage of compression at fracture site by hip screw.

References

1. Barnes JT, Brown JT, Garden RS, Nicoll EA (1976) Subcapital fractures of the femur: a prospective review. J Bone Joint Surg 58B:2–24
2. Ballmer FT, Ballmer PM: Pauwels' osteotomy for non-unions of femoral neck fractures. OrthopedicClinics of North America 21 (4): 759-767,1990.
3. Bombelli R: The role of osteotomy as a consequent therapy. In: Osteoarthritis of the Hip. 2nd ed., Berlin: Springer-Verlag, pp. 49-119, 1983.
4. Braune W, Fischer 0: Rotations of the hip line: experiments on man, loaded and unloaged. In The Human Gait. Berlin: Springer-Verlag, pp. 94-103,1987.
5. Marti RK, Schüller HM, Raaymakers EL. Intertrochanteric osteotomy for non-union of the femoral neck. J Bone Joint Surg Br 1989;71:782-7
6. King T (1939) Closed operation for intracapsular fracture of the neck of the femur. Br J Surg 26:721
7. Lu-Yoa GL, Keller RB, Littenberg B, Wenliberg JE (1994) Outcomes after displaced fractures of the femoral neck. A metaanalysis of one hundred and six published reports. J Bone Joint Surg Am 76:15–23
8. Garden RS (1964) Stability and union in subcapital fractures of the femur. J Bone Joint Surg Br 46:630–647
9. Dalen N, Jacobson B (1986) Rarefied femoral neck trebecular patterns, fractures displacement and femoral head vitality in femoral neck fractures. Clin Orthop 207:97–98
10. Hammer AJ (1992) Nonunion of subcapital femoral neck fractures. J Orthop Trauma 6:73–7
11. Baksi DP (1986) Internal fixation of ununited femoral neck fracture combined with muscle pedicle bone grafting. J Bone Joint Surg Br 68:239–245
12. Zukerman JD, Koval KJ (1993) Hip trauma. In: Frimoyer JW (ed) Orthopaedic knowledge update 4. American Academy of Orthopaedic Surgeons, Rosemont, pp 525–538
13. LeCroy CM, Rizzo M, Gunneson EE et al (2002) Free vascularised fibular bone grafting in the management of femoral neck non union in patients younger than fifty years. J Orthop Trauma 16:464–472
14. Nagi ON, Dhillon MS, Goni VG (1998) Open reduction, internal fixation and fibular autografting for neglected fracture of the femoral neck. J Bone Joint Surg Br 80-B:798–804
15. Pauwels F (1935) Der Schenkelhalsbruch ein mechanisches Problem: Grundlagen des Heilungsvorganges, Prognose and kausale Therapie. Ferdinand Enke Verlag, Stuttgart
16. Rinaldi E, Marengh P, Negri V (1984) Osteosynthesis with valgus osteotomy in the primary treatment of subcapital fractures of the neck of the femur. Ital J Orthop Traumatol 10(3):313–320
17. Marti RK, Schuller HM, Raaymakers EL (1989) Intertrochanteric osteotomy for nonunion of the femoral neck. J Bone Joint Surg Br 71:782–787
18. Kirby H (2002) Femoral neck non-union: osteotomy or arthroplasty. Tech Orthop
19. Sameer Gupta, Sunil Kukreja, Vivek Singh,Valgus osteotomy and repositioning and fixation with a dynamic hip screw and a 135º single-angled barrel plate for un-united and neglected femoral neck fractures, Journal of Orthopaedic Surgery 2014;22(1):13-7

Functional and radiological outcome of long proximal femoral nail in subtrochanteric femur fracture

Singh V, Rathore S S, Patidar A, Jain A, Bhinde S, Agrawal A, Jain P

Study performed at Department of Orthopaedics, R. D. Gardi Medical College & C. R. G. Hospital & Associated Charitable Hospital, Ujjain (M.P.)

Abstract

Introduction: Treatment of subtrochanteric fracture is always a challenge for orthopaedic surgeons. Use of proximal femoral nail helps to prevent excessive fracture impaction and consecutive limb shortening in unstable intertrochanteric and subtrochanteric fractures. Our study is aimed to observe the results of Subtrochanteric fractures treated by Long Proximal Femoral Nail.
Material and Method: This observational study was conducted in Department of Orthopaedics of R D Gardi Medical College & associated CRGH, Ujjain during the year July 2016 to June 2018. In this study, 32 cases of fracture subtrochanteric femur (Seinsheimer type I, II, III, IV, V) were admitted and treated by internal fixation using long PFN.
Results: Out of these 32 cases, 1 patient expired and 1 patient was lost in follow up, so our study is aimed at remaining 30 cases. Results were assessed by Modified Harris Hip Score. Modified Harris Hip Score at final follow up (6 months) was Poor in 2 (6%) cases, Fair in 3 (10%) cases, Good in 11 (37%) cases and Excellent in 14 (47%) cases. Mean Modified Harris Hip Score was 87.16.
Conclusion: Our conclusion is that in subtrochanteric fracture, Long PFN helps in achieving good biological reduction, provides stability and prevents excessive collapse & limb shortening. Thus, it helps in achieving overall good functional outcome.

Keyword: long proximal femoral nail, subtrochanteric femur fracture, intertrochanteric fractures, subtrochanteric fractures

Address of correspondence:
Dr Siddharth Singh Rathore, Assistant Professor, Department of Orthopaedics
R. D. Gardi Medical College, Ujjain
Email-dr.siddharthrathore31@gmail.com

How to site this article
Singh V, Rathore S S, Patidar A, Jain A, Bhinde S, Agrawal A, Jain P. Functional and radiological outcome of long proximal femoral nail in subtrochanteric femur fracture. Ortho J MPC. 2023; 29 (2):37-43
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/176

Introduction

There has been increase in incidence of subtrochanteric fractures in the last few decades and it will, probably continue in the future due to rising age of the population.[1] The rapid industrialization and changing lifestyle has increased the frequency of road traffic accidents in the world causing significant increase in trauma in general and fracture femur in particular. Trochanteric fractures are one of the common injuries occurring due to low energy trauma in elderly patients with osteoporotic bones.[2]

Lower vascularity along with high biomechanical stress concentration leads to high chances of implant failure and non-union seen in subtrochanteric femur fracture.[6] Therefore, these fractures need special consideration because defective union of this fracture can lead to high disability levels for an individual [8]. Not much attention was paid to trochanteric fractures till 19th century and the mortality rate of trochanteric fracture was about 80%, those who survived remained morbid due to bed sores, cystitis, joint stiffness, deep vein thrombosis, hypostatic pneumonia, shortening and coxa vara [9]. In early 19th century, Hibbs treated subtrochanteric fractures conservatively in the position of flexion, external rotation and abduction [2]. Couple of years later Sarmiento, Seinsheimer Jc De Lee, T.O.Clanton & C.A.Rockwood and Waddel emphasized the role of traction treatment [7]. Ideal anatomical and functional result could

not be achieved even after improvement and modification in conservative line of treatment. In the 1950s, operative treatment for trochanteric fractures was introduced to improve the union rate and a decrease the complications associated with immobilization and prolonged bed rest.[11]

Several methods of internal fixation were advocated in the treatment of subtrochanteric fractures like Moore-Blount plate, Neufled plate, Lorenzo screw, Kuntcher Cloverleaf Nail, Jewett nail, AO blade plate, Sliding hip screw, Interlocking intramedullary nails, Russel Taylor nail, Gamma nail, Proximal femoral nail and PFNA2 by AO – ASIF GROUP. Nowadays, interest is increasing in intramedullary nailing. Though technical difficulty occurs in intramedullary devices, they have biomechanical advantage over extramedullary devices such as close reduction, less blood loss and less soft tissue dissection.[9]

AO/ASIF group devised proximal femoral nail in 1996 with antirotation hip screw, small diameter, fluting of tip and less valgus angle and it seems to be a promising implant in trochanteric and subtrochanteric fractures.[11] Dynamic Hip Screw (DHS) and Proximal Femoral Nail (PFN) both have their own advantages & disadvantages and various meta-analysis studies conducted to compare both have concluded superiority of PFN over DHS10 in subtrochanteric femur fractures. Use of proximal femoral nail helps to prevent excessive fracture impaction and consecutive limb shortening in unstable intertrochanteric and subtrochanteric fractures.

Material and Method

This observational study was conducted in Department of Orthopaedics of RD Gardi Medical College & associated CRGH, Ujjain during the year July 2016 to June 2018. In this study, 32 cases of fracture subtrochanteric femur (Seinsheimer type I, II, III, IV, V) were admitted and treated by internal fixation using long PFN. Out of these 32 cases, 1 patient expired and 1 patient was lost in follow up. So, our study is aimed at remaining 30 cases. Upon admission, a careful history was elicited from the patient and/or attenders to reveal the mechanism of injury and the co-morbidities. Ambulatory status and activities of daily living (ADL) before trauma was recorded. The patient's general condition was assessed with the vital signs and systemic examination done. Fractures at other sites were ruled out. All these necessary clinical details were noted on a specially designed proforma prepared for this study. Informed written consent from patient was obtained prior to their inclusion in study.

Inclusion criteria was patients with subtrochanteric femur fractures (Seinsheimer type I, II, III, IV, V) was, all skeletal mature patients (>18years) and patients willing to give consent for surgery. Exclusion criteria was patients of age less than 18 yrs, patient's refusal for the procedure, patients who are medically unfit for surgery, pathological fractures, compound fractures, patient having other fractures in same limb, vertebral fracture and patients with head injury.

All the necessary routine investigations done and patient were operated after written and inform consent. Results were assessed by Modified Harris Hip Score. The youngest patient in our series was 42 years old and the oldest was 84 years. Maximum numbers of patient in this study were of elderly age group and the mean age was 60.38 years. In the present study, it was seen that the incidence of subtrochanteric femur fractures is more in males (19) as compared to females(13) and the ratio is 3:2. Incidence of subtrochanteric fractures was more on right side (18) as compared to left (14). Most common mode of trauma was due to fall (19) and RTA (11). Incidence of type IIA fracture was 12.5%, type IIB was 15.6%, type IIC was 3.1%, type IIIA was 31.3%, type IIIB was 9.4%, type IV was 21.9% and type V was 6.3% according to Seinsheimer classification. Intra operatively reduction of the fracture was achieved through closed means in (28) 87% of cases. Open reduction was performed in only (4)13% cases. Intra operatively reduction of the fracture was good in (29) 90.6% of cases. Reduction was poor in only (3) 9.4% cases. Intra operative complication was ill fitting of jig in 1 case while 7 cases had difficult reduction during intra op period. In the present series, it was seen that 1 case (3.1%)

had superficial wound infection, 1 case (3.1%) had chest infection and 1 case (3.1%) had urinary tract infection while remaining 27 cases had nil complication. Post-op limb length shortening was <1cm in 53.1 % (17) cases, 1cm in 37.5% (12) cases and >1cm in 9.4% (3) cases. Modified Harris Hip Score at 3 months was <=69 (Poor) in 17% cases, 70 – 79 (Fair) in 33% cases and 80 – 89 (Good) in 50% cases. Mean Modified Harris Hip Score was 78.7. Modified Harris Hip Score at final follow up (6 months) was <=69 (Poor) in 6% cases, 70 – 79 (Fair) in 10% cases, 80 – 89 (Good) in 37% cases and 90 – 100 (Excellent) in 47% cases. Mean Modified Harris Hip Score was 87.16. In this series, patients <60 years had excellent to good results while older age group patients had relatively good to fair results. Patients of type IIB, IIIA and IV had more proportion of excellent results as compared to others. Average time of union is 14 weeks. It was seen that knee pain and stiffness was present in 13.8% (4) cases, Z effect in 3.4 % (1) cases, Reverse Z effect in 3.4% (1) cases and Screw cutout in 3.4% (1) cases. Mean admission and operation time interval was 6.2 days. Average number of C-arm shoots was 168. Mean duration of operation was 87 minutes. Mean blood loss was 144 milliliters.

Discussion

Various types of implants are available for subtrochanteric fracture but recently techniques of closed intramedullary nailing have gained popularity. Closed intramedullary devices have benefits of minimal surgical exposure, more efficient load transfer through calcar femorale and decreased tensile strain on the implant because of its shorter lever arm. This makes Long Proximal Femoral Nail a good choice of implant for subtrochanteric fractures of the femur. Various studies have considered Long Proximal Femoral Nail as an acceptable minimally invasive implant for subtrochanteric fracture.

Most of patients in our study were from age group of 5th to 7th decade of life, the average age being 60.38 years. Maximum numbers of cases (40.6%) were found in the age group between 61 to 70 years. This was significantly lower compared to that quoted by other authors in literature.

Velasco and Comfort et al.[17] studied 82 patients and found that 63% of Subtrochanteric fractures occurred in patients from 51 to more than 70 years old. Alyassari et al.[18] studied 70 patients and average age was 84 years showing trochanteric fractures were more common in higher age group. In Boldin et al.[14] study the average age was 73 years while Pavelka T, Kortus Jand Linhart M et al.[16] has showen average age was 69 years. In I.B.Schipper Series [15] it was 82.2 years. In our study the average age was 60.38 years.

There was a male preponderance in our patient. The ratio of males to female was 3:2, reflecting the higher incidence of subtrochanteric fractures of femur in male population due to their more active lifestyles. This variation of sex ratio may be due to smaller sample size in present study.

Table.1. Sex distribution

Sex Distribution.	**Boldin et al.[14]**	**I.B.Schipper Series[15]**	**Pavelka T, Kortus J and Linhart M et al.[16]**	**Present study**
Male (%)	30	18	40.1	59.4
Female (%)	70	82	59.9	40.6

Among 32 patients, 18 were found to have fractures on the right side while 14 on the left side. Side fracture distribution of the present study was comparable to all of the above series.

Table.2- Side distribution

	I.B.Schipper Series[15]	**Chopra BL et al.[19]**	**Ashish Vinod Batra et al.[20]**	**Present study**
Right (%)	52	52	57.5	56.2
Left (%)	48	48	42.5	43.8

In the present study, there were 19 cases (59.4%) due to fall while there were 11 cases (34.4%) due to Road traffic accident (RTA), 1 case (3.1%) was due to hit by cow and 1 case (3.1%) due to assault.

Table.3. Mode of trauma

Mode of trauma	W.M.Gadegone series[30]	Ahmad et al.[21]	Ashish Vinod Batra et al.[20]	Present study
Fall	75	57.5	32.5	59.4
RTA	25	42.5	67.5	34.4
Others	0	0	0	6.2

Keneth J. Koval and Joseph D. Zuckerman (1996) observed that 90% of hip fractures in the elderly result from a simple fall. Hip fractures in young adults were observed to result most often with high energy trauma such as motor vehicular accidents or a fall from height.

Fractures were classified according to Seinsheimer classification. Type IIIA fracture pattern constituted the highest percentage 31.25 % (10 cases) of all fracture patterns. Seinsheimer [7] in his original study also noted high incidence of type III A fracture pattern (38.29%) than other fracture patterns.

Table-4 Seinsheimer Classification-

Seinsheimer type of fracture	Ashish Vinod Batra et al.[20]	S Laxmi Narayana et al.[22]	Tiwari Mukesh et al.[23]	Present study
Type I	0%	0%	0%	0%
Type IIA	12.5%	10%	3.3%	12.5%
Type IIB	20%	20%	26.6%	15.6%
Type IIC	20%	20%	13.3%	3.1%
Type IIIA	32.5%	40%	13.3%	31.3%
Type IIIb	12.5%	10%	6.6%	9.4%
Type IV	2.5%	0%	10%	21.9%
Type V	0	0%	26.6%	6.3%

Admission-operation interval in the study varied from 3-18 days. Mean interval was high in the series. It was 6.2 days which was more when compared to I. B. Schipper series [15] where it was 2 days. Most of the patients with delayed injury-operation interval had preexisting uncontrolled medical problems.

Intra operatively fracture reduction was achieved by closed means in 87.5% (28 cases) of patients and 12.5 % (4 cases) with delayed injury-operation interval required open reduction. In the study, poor reduction was noted in 9.3 % of patients (3 cases) and was associated with poor outcome while in Schipper et al [15] reduction was good and acceptable in 96.2% and poor reduction only in 2.9% of their patients. Intra operative fracture reduction of the present study was comparable to all of the above series.

Table 5- Fracture reduction

Fracture reduction	Boldin et al.[14]	Alyassari et al.[18]	Chopra BL et al.[19]	Present study
Closed	90%	87%	97.2%	87.5%
Open	10%	13%	2.8%	12.5%

Mean duration of surgery (skin to skin) was 87 min (range 60-110 min). Operating time in various studies- Wang et al, Ekstrom [24] et al and Menzes [25] et al was 90 min, 105 min & 76 min respectively. In the study duration of surgery was longer in the initial operated cases. With frequent use of proximal femoral nail surgery, the duration decreased.

Table 6- Duration of surgery

Duration of surgery	Dominigo et al.[26]	Fogagnolo et al.[27]	Boldin et al.[14]	Present study
No. of patients	105	155	55	32
Duration of surgery(min)	77	76	68	87

Average number of C-arm shoots taken was 168. Mean operative blood loss measured by mop count (each mop was weighed pre operatively and post operatively).

Table 7- Mean intra operative blood loss

Mean blood loss	Zhiyong et al.	Chopra BL et al.[19]	Tiwari Mukesh et al. [23]	Present study
Mean intra operative blood loss (in ml)	100	126	130	144

Patients were discharged after suture removal with instruction of mobilization with support (walker was advised to be purchased for home use).

Table-8- Period of hospitalization

Period of hospitalization	I.B.Schipper series[15]	Fogagnolo et al.[27]	S Laxmi Narayana et al.[22]	Present study
Period of hospitalization (days)	19	17	19.33	18

In this study 1 patient was found to have chest infection, 1 patient had complication of

urinary tract infection (UTI) and 1 patient had superficial wound infection.

I.B.Schipper [15] noted 4.1% superficial infections and 2.5% deep infections. We did not encounter any deep infections in the series.

Werner et al. [28] was the first who introduced the term Z-effect, detected in 5 (7.1%) of 70 cases. The Z-effect phenomenon is referred as a characteristic sliding of the proximal screws to opposite directions during the postoperative weight-bearing period. In our study we had Z-effect in 1 case (3.1%). This complication was noticed when patient came for follow up and this complication was demonstrated on X rays. He was advised surgery and screw was removed.

The reverse Z-effect described by Boldin et al. [14] occurred with movement of the hip pin towards the lateral side, which required early removal. The mechanism was similar, but here the hip pin is sliding back, whereas the neck screw remains impacted to the hole of the nail. In their prospective study of 55 patients with unstable intertrochanteric or subtrochanteric fractures, they had 3 cases with Z effect and 2 with reverse Z effect. The authors in an effort to prevent the Z-effect phenomenon suggest the use of a 'ring' in the lateral side of the hip pin. In our study we had 1 case with reverse Z-effect (3.1%) seen in follow-up and screw was removed by surgery.

Table-9-Mechanical complications of PFN

Mechanical complications	**C Boldin et al.[14]**	**Domingo et al.[26]**	**Fogagnolo et al.[27]**	**Simmermacher et al.[29]**	**Present study**
No. of patients	55	295	46	191	32
Screw Cut out	2	4	5	1	1
Z effect	3	-	-	-	1
Reverse Z effect	2	-	-	-	1

Average time of union in the present of 30 patients was about 13.4 weeks. (Range- 11 to 17 weeks). Assessment of early callus formation at fracture site & its subsequent progress was done with the help of subsequent radiograph.

Table-10- Average time of fracture union

	I.B.Schipper series[15]	**Chopra BL et al.[19]**	**S Laxmi Narayana et al.[22]**	**Present study**
Average time of fracture union (weeks)	20	20	19.33	14

The functional outcome of patient treated with Proximal Femoral Nail was calculated by the Modified Harris Hip Score. Overall, 47% of patients had excellent results, 37% of patients had good results, 10% of patients had fair results and 6% cases had poor results. The mean Harris Hip score in our series was 87.16.

Table-11- Mean Harris Hip Score

	I.B.Schipper series[15]	**Ashish Vinod Batra et al.[20]**	**S Laxmi Narayana et al.[22]**	**Present study**
Mean Harris Hip Score	77.6	85.7	89.8	87.16

Conclusion

Majority of patients of subtrochanteric femur fracture treated with Long PFN had excellent to good outcome. The mean Harris Hip Scoring System appears to be useful tool for clinical evaluation of patients of subtrochanteric femur fracture. Therefore, it is our conclusion that in Subtrochanteric fracture, Long PFN helps in achieving good biological reduction, provides stability and prevents excessive collapse & limb shortening. Thus, it helps in achieving overall good functional outcome. Almost immediate post operative mobilization does play role, in better rehabilitation. It can be done on a routine basis with minimum complications like knee stiffness, infection, malunion and non-union.

References

1. Sonu Mehta, Shoaib Shaikh. "Comparison of Intertrochanteric Nail vs Proximal Femoral Nail in Proximal Femoral Fractures." A Prospective Comparative Study, Journal of research in Medical and Dental Science 2017 Volume5 No2.

2. Browner BD, Levine AM. Skeletal trauma: basic science, management and reconstruction, 2009 Volume 1.
3. Parker MJ, Pryor GA. Gamma vs Dhs Nailing for extracapsular femoral fractures. Int Orthop. 1996:20(3):163-168.
4. Anil Kumar Gulia, S.L. Munde. "Functional outcome of Peritrochanteric fractures fixed with Proximal Femoral Nail in a Tertiary Rural Centre." International Journal of Enhanced Research in Medicines and Dental Care ISSN: 2349-1590, Vol. 2 Issue 7, July-2015
5. Sims SH. Subtrochanteric femur fractures. Orthop Clin Am. 2002;33:113-26.
6. Barquet A, Mayora G, Fregiero J, Lopez L, Rienzi D, Francescoli L. The treatment of subtrochanteric nonunions with the long gamma nail: twenty six patients with a minimum 2-year follow-up. J Orthop Trauma. 2004;419:185-8
7. Sensheimer F. Subtrochanteric fractures of the femur. J Bone Joint Surg Am. 1978;60:300-6
8. Parker MJ, Dutta BK, Sivaji C, Pryor GA. Subtrochanteric fracture of the femur. Injury. 1997;28:91-5.
9. Reddy KR, Dasaraiah CV, Shaik M. A study on management of extracapsular trochanteric fractures by proximal femoral nail. Journal of Orthopaedics and Allied Sciences. 2016;4:58-64
10. Umesh M. Shivanna, Girish H. Rudrappa. "A Comparative Study of Functional Outcome between Dynamic Hip Screw and Proximal Femoral Nail in Surgical Management of Per-Trochanteric Fractures". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 43, May 28; Page: 7489-7498.
11. Jaswinder Pal Singh Walia Himanshu Tailor, H S Mann, Avinash Chander Gupta, Jagdeep Singh Rehncy, Sargun Singh. A comparative study of 30 cases of trochanteric fracture femur treated with dynamic hip screw and proximal femoral nailing.Pb Journal of Orthopaedics Vol-XIV, No.1, 2013 6
12. Kaufer, Matheull and Sonstegard, INJURY: volume 35 Issue 10 Oct 2004
13. K. Harsha Kumar1 A study of the management of open fractures of tibia by unreamed interlocking nail, 2015Month :SeptemberVolume :4Issue :71Page :12428-12446
14. Christian Boldin, Franz J Seibert, Florian Fankhauser.: etal.: "The proximal femoral nail (PFN)—a minimal invasive treatment of unstable proximal femoral fractures . Acta Orthop Scand 2003; 74(1): 53 - 58.
15. Schipper I B etal Treatment of Unstable trochanteric fractures :JBJS 2004; 86 B : 86 – 94
16. Pavelka T, Kortus J, Linhart M. Osteosynthesis of proximal femoral fractures using short proximal femoral nails. Actachir Orthop Traumatol Cech. 2003; 70(1):31-8
17. Velasco RU, Comfort TH. Analysis of treatment problems in subtrochanteric fractures of the femur. J trauma. 1978;18(7):513-23
18. Al-yassari G, Langstaff RJ, Jones JW, AL-Lami M. The AO/ASIF proximal femoral nail for the treatment of unstable trochanteric femoral fracture. Injury. 2002;33(5):395-9.
19. Chopra B.L.et al. Proximal Femoral Nail – outcome and complications: a prospective study of 125 cases of proximal femoral fractures. Int J Res Orthop. 2017 Sep;3(5):973-978
20. Batra AV et al. Our experience of management of subtrochanteric fractures of femur by proximal femoral nail. Int J Res Med Sci. 2015 Sep;3(9):2164-2168
21. Shakeel Ahmad, Rajinder Singh et al. Management of Subtrochanteric Fractures with Long PFN : Union Rates and Functional Results. Int J Cur Res Rev Vol9 Issue 9 May 2017
22. S Laxmi Narayana, M Anil Kumar et al. Intertrochanteric and subtrochanteric fractures outcome on surgery. IAIM, 2016; 3(8): 228-235.
23. Dr. Mukesh Tiwari, Dr. Gaffar Khan et al. A prospective study of functional & radiological outcomes of subtrochanteric femur fractures treated by proximal femoral nailing. IJOS 2016; 2(4): 278-284.
24. Ekstrom W, Karlsston-Thur C, Larsson S. Functional outcome in treatment of unstable trochanteric and subtrochanteric fractures with the proximal femoral nail

and the Medoff sliding plate. J Orthop Trauma. 2007;21(1):18-25.
25. Menzes DF, Gamulin A, Noesberger B. Is the proximal femoral nail a suitable implant for treatment of all trochanteric fractures? Clin Orthop Relat Res. 2005;439:221-7.
26. Domingo LJ, Cecilia D, Herrera A, et al. Trochanteric fractures treated with a proximal femoral nail. Int Orthop 2001;25(5):298-301.
27. 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(1):31-7.
28. Werner-Tutschku W, Lajtai G, Schmeidhuber G, Lang G PFN. Unfallchirurg. 2202;105:881-885.
29. Simmermacher RK, Bosch AM, Van der Werken C. The AO/ASIF proximal femoral nail: A new device for the treatment of unstable proximal femoral fractures. Injury. 1999;30:327-32
30. W.M. Gadegone, Y.S. Salphale. : Proximal femoral nail – An analysis of 100 cases of Proximal femoral fractures with an average follow up of 1 year.; International Orthopaedics 2007; 31 : 403 – 408
31. Seinsheimer, F ., III: Subtrochanteric fractures of the femur. J.Bone Jt. Surg., 60-A: 300-306, 1978.

Supracutaneous LCP as a definite fixation method in compound metaphyseal and intraarticular fractures of tibia

Bajoria R S

This study is performed in Department of Orthopedics, GRMC, Gwalior

Abstract

Introduction: Open fractures of distal and proximal tibia are common injuries encountered by orthopedic surgeons. Metaphyseal compound fractures are not suitable for ORIF with greater chances of infection, soft tissue complications and risk of plate exposure. With external fixator, treatment & fracture healing period usually increased & complication rates are quite high, so we managed these fractures by supracutenous LCP as external fixator; and results evaluated. We find out it a better alternative method to conventional external fixator. We evaluated the feasibility of supracutenous LCP as definite fixation methods in open fractures.

Material and methods: This study conducted from April 2020 to October 2023. Total 30 cases were included in this study. Open GA II & IIIA of tibia metaphyseal fractures in 18 cases and intra articular tibia fractures in 12 cases included in this study. Debridement & LCP plates fixation was done in external fixator manner. Proximal & distal tibia LCP fixed with long screws. Most fixations were done within 1 - 5 days of trauma. Patients were followed up till bony union. Minimum follow up was 6 months.

Results: 8 cases united in 4 months, 8 cases united in 6 months, 9 cases united in 6-9 months and 5 cases went in non-union. Average duration of union was 5.6 months. Functional outcomes evaluated by AKSS score for proximal fractures & by AOFAS for distal fractures. 15 cases have shown excellent results; with union, 11 cases have shown good results; soft tissues reconstruction required, 4 cases had bad results; due to infection. Overall, 26 cases were had good to excellent results.

Conclusion: We observed that external fixation in open fractures usually results in infection, delayed or non-union, requirement of further surgeries. Supracutaneous LCP as primary definite fixation can give excellent results in terms of stable & rigid fixation, early fracture union, less chances of second surgery, cost effective and better patient compliance & better functional outcomes.

Keyword: Supracutaneous LCP, definite fixation, compound fractures of tibia

Address of correspondence:
Dr R S Bajoria, Professor, Department of Orthopedics, Gajra Raja Medical College, Gwalior (M.P.)

Email-rs_bajoria@yahoo.co.in

How to site this article
Bajoria R S. Supracutaneous LCP as a definite fixation method in compound metaphyseal and intraarticular fractures of tibia. Ortho J MPC. 2023; 29 (2):44-49
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/177

Introduction

Primary plating as an external fixator of compound fracture is a good method of management. There is a high rate of union with a low complication rate when using external locked plating for open fractures of distal femur and proximal tibia[1].

LCP can be used as a definitive external fixator for compound tibial fractures as it gives good results and low complication rates, with satisfactory stability. It also has the advantage of facilitating wound healing. It is also cosmetically acceptable and non-cumbersome while mobilization as it does not strike the opposite leg. It allows easy assessment of

fracture healing on x rays due to non-overlapping of the implant[2].

The consistent good outcome using this "Supracutaneous technique" support our opinion of using Locking compression plate as external fixator in distal tibial fractures which are very well tolerated by patients and address the challenging problems of compound wound healing, non-union and osteomyelitis[3,4].

Material and Method

This study is conducted from April 2020 to October 2023. Total 30 cases were operated. Open GA II & IIIA metaphyseal fractures in 18 cases and intra articular fractures in 12 cases were included in this study. Debridement, & LCP plates fixation was done in external fixator manner. Proximal and distal tibia LCP fixed with long screws. Most fixations were done within 1 - 5 days of trauma. Patients were followed up till bony union. Minimum follow up was 6 months. In intraarticular fractures fixed with preliminary k-wire fixation and 2-3 cc screws are used for articular reduction. 1-2 k wires used for metaphyseal fractures. Long LCP is measured & both ends fixed with k wires. Proximal & distal ends of plate stabilized by 4 screws on both sides. Maintained a 1- 2 cm space on surface between skin & plate for better soft tissue care.

Locking compression plate (LCP) applied as an external fixator achieves indirect reduction & gives early union & maximum function. Its fixed-on surface of skin so is called as Supracutaneus plating (Giovannini et al. 2016). This can be an important tool in armamentarium of an orthopaedic surgeon especially in metaphysical fractures with open injury Giovannini5 et al. or closed injuries with precarious soft tissue Kerkhoffs [6] et al.

For compound metaphysial fracture, debridement is done and closed reduction & temporary fixation is done by percutaneous K wires. Long LCP plating is selected & fixed in bridging fashion.

In intraarticular fracture, condylar reduction is done and fixation is achieved by sub articular cancellous screw fixation (1-3 screws). Followed by supracutenous LCP fixation.

Secondary soft tissue surgery, if required is done by plastic surgeon in form of skin grafting or free or vascular flap. Secondary bony procedure, if required, is done in form of bone marrow injection or bone grafting. In some cases, secondary surgery in form of external fixator or intramedullary nailing is done. Follow up of every patient is done at weekly for 1 month, bimonthly for 3 months and monthly till 6-8 months or until union is achieved at fracture site.

1

2

Figure 1 & 2 - Intra operative picture

Figure-3 Plate application

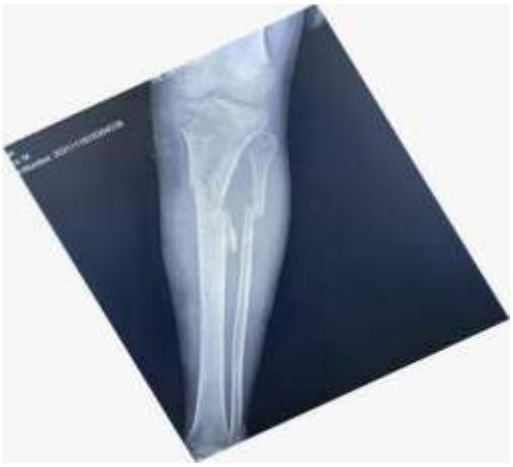
Figure-4 Post operative X-ray

5

6

7

Figure-5 Pre op x ray, Figure-6 Post op xray Figure 7- Follow up



8

9

Figure 8 & 9- Follow up xray at 6 months

Table 1- Union time

Number of cases	Union time
8	4 months
8	6 months
9	6-9months
5	Non-union

Results: 8 cases united in 4 months, 8 cases united in 6 months, 9 cases united in 6-9 months and 5 cases went in non-union. Average duration of union was 5.6 months. Functional outcomes evaluated by AKSS score for proximal fractures & by AOFAS for distal fractures. 15 cases shown excellent results; with union, 11 cases shown good results; soft tissues reconstruction required, 4 cases had bad results; due to infection. Overall, 26 cases were had good to excellent results.

Discussion

In an observational study by Panda [1] et al of eight patients with compound injuries to distal femur and proximal tibia or both during a period of one year. Total 8 fractures were treated by external fixation i.e precontoured anatomical locking plate application. Out of 8 cases 7 had full range of motion (87.5%) and 1 had terminal lag of movements (12.5%). The final outcome of the study based on knee society score was, 4 excellent (50%), 3 good (37.5%) and 1 fair (12.5%).

Bansal [2] et al prospectively evaluated 30 cases of fresh compound tibial fractures. The mean fracture healing time was 14 week (range, 12-18 weeks) for proximal tibia, 24 weeks (range, 18-26 weeks) for tibial diaphysis / multi segmental fractures, 18 weeks (range, 14-20 weeks) for distal tibia. Once biplaner radiographic cortical bridging was observed, full weight bearing for 1 month before implant removal was advised. According to the Johner and Wruhs7 criteria results were excellent in 75%, good in 18% and poor in 7% cases.

In a study by Venkatesh [3] et al total of five (05) patients underwent "supracutaneous plating" of the tibia using a metaphyseal locking compression plate. In all five patients the plate was kept in place until there was complete consolidation both clinically and radiologically. At the latest follow-up (average 15 months). All patients were fully weight bearing with a fully healed tibia.

In the study by Rajshekharan [4] et al, four patients with Grade II compound fractures of the tibia included. The average age of the patients was 52 years (range 45-60). The average time of presentation was 36 hours

(range 10 h - 3 days). The plate was in situ for average 20 weeks. In all patients, plate was removed after radiological and clinical union. No screw tract infection found.

Results of our study are comparable to other studies.

Conclusion

We observed that external fixation in open fractures usually results in infection, delayed or non-union, requirement of further surgeries. Supracutaneous LCP as primary definite fixation can give excellent results in terms of stable & rigid fixation, early fracture union, less chances of second surgery, cost effective and better patient compliance & better functional outcomes.

References

1. Panda Shakti S., Panda Damodar and Suri Nikhil, Supracutenous plating: Use of locking
2. compression plate as external fixator for intra-articular compound fractures, International Journal of Medical Research & Health Sciences, 2016, 5, 8:62-67
3. Akhil Bansal, Sourabh Alawa, Deependra Sonkar, Arvind Karoria, Anshul Khare and Sanjiv Gaur Supracutaneous locking compression plate as an external fixator in compound metaphyseal and diaphyseal fractures of tibia, International journal of orthopedics science 2020; 6 (3);633-636
4. S. K. Venkatesh Gupta, Shyam Prasad Parimala, Open journal of orthopaedics 2013, 106-109
5. Supracutenous locking compression plate for grade 1 & 2 compound fractures of distal tibia – A case series
6. Rajasekharn , Jai kumar SC, locking compression plate for grade 2 compound fractures of
7. tibia –a case series, International journal of science study 2016,original article;
8. Francesca Giovannini 1, Luigi de Palma 2, Andrea Panfighi 2, Mario Marinelli 2, Intramedullary nailing versus external fixation in Gustilo type III open tibial shaft fractures: a meta-analysis of randomised controlled trials, Strategies Trauma Limb Reconstruction, 2016 Apr;11(1):1-4. doi: 10.1007/s11751-016-0245-7. Epub 2016 Feb 26.
9. Rademakers, Kerkhoffs, Sierevelt, Raaymakers, Marti, Operative Treatment of 109 Tibial Plateau Fractures: Five- to 27-Year Follow-up Results, Journal of Orthopaedic Trauma 21(1):p 5-10, January 2007.
10. Johner R, Wruhs O. Classification of tibial shaft fractures and correlation with results after rigid internal fixation. Clinical orthopaedics and related research. 1983; (178):7 - 25.

Core decompression and non-vascularized iliac crest graft in avascular necrosis of hip

Khare A

This study is conducted in Global hospital, Ujjain

Abstract

Background: Avascular necrosis of femoral head occurs due to impaired blood supply of the head of femur. Core decompression with non-vascularized iliac crest graft has been the treatment of choice in cases of early AVN.

Material and Method: This prospective, interventional study was conducted in Global hospital, Ujjain from jan-2022 to march -2023. We studied 20 hips having AVN of the femoral head treated by core decompression and autologous cancellous bone grafting with a graft taken from the iliac crest. Total number of 20 patients with AVN of the femoral head (up to grade 2b of Ficat and Arlet classification) were treated by use of non-vascularized bone graft.

Results: The mean HHS was 69.45 preoperatively and 83.55 at six months postoperatively ($p \leq 0.0003$). Out of 20 hips, 14 had excellent (HHS >90) to good (HHS 80-90) outcomes, while six had fair (HHS 70- 80) to poor (HHS >70) outcomes. The mean VAS score was 6.3 preoperatively and 3.8 at six months postoperatively ($p \leq 0.0001$). On radiographic and clinical evaluation, the patients showed significant improvement on the six-month follow-up.

Conclusion: Our study suggests that core decompression with autologous cancellous bone grafting might not reverse AVN progression, but can delay the progression of AVN, avoid collapse, reduce pain, and provide improvement in functional outcomes at least in the short term.

Keyword: Core decompression, iliac crest graft, avascular necrosis of hip

Address of correspondence:
Dr Ajay Khare, Director, Global Hospital, Ujjain

Email-Khareajay13@gmail.com

How to site this article
Khare A, Core decompression and non-vascularized iliac crest graft in avascular necrosis of hip. Ortho J MPC. 2023; 29 (2):50-55
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/178

Introduction

Avascular necrosis of femoral head occurs due to impaired blood supply to the head of femur. It can be caused by fractures, dislocations, chronic steroid use, chronic alcohol use, coagulopathy, congenital causes and many other factors. But most common cause is Idiopathic. (1-4) The use of a non-vascularized bone graft is more attractive in treating the early stages of avascular necrosis of femoral head than vascularized graft because, it is significantly less technically demanding. (5,6)

Non-vascularized autologous bone grafting has several theoretical advantages. this method leads to the decompression of the avascular lesion and the elimination of the necrotic bone, breaking the cycle of ischemia and intraosseous hypertension in addition to providing growth factors from the graft [7].

The regenerative properties due to the presence of osteoblasts in the trabecular bone and the ability to procure a large amount of graft make the iliac crest the gold standard site of cancellous bone graft harvesting. [8,9]

core decompression can be considered an effective treatment modality in the early stages (up to stage 2b) of AVN of the femoral head [10]. Therefore, this study was conceptualized

to study the effect of core decompression along with cancellous bone grafting on cases of AVN of the femoral head.

Material and method

This prospective, interventional study was conducted in Global hospital, Ujjain from jan-2022 to march-2023. We studied 20 hips having early AVN of the femoral head treated by core decompression and autologous cancellous bone grafting with a graft taken from the iliac crest. AVN of femoral head (up to grade 2b of Ficat and Arlet classification) who met the inclusion and exclusion criteria are included in this study.

Inclusion criteria was patients with avascular necrocis of the femoral head up to stage 2b (Ficat and Arlet), patients aged between 18 and 60 years and patients giving consent for the surgical procedure and participation in the study.

Exclusion criteria was patients with previous infection of the hip Joint, neuromuscular disorder of the hip joint and severe osteoporosis

AVN stage was confirmed preoperatively using an X-ray of the pelvis with both hip joints and an MRI of both hips. A preoperative workup was done. After taking written and informed consent, patients were taken for the operation theatre.

Patients were placed on a traction table in a supine position. Sterile painting and draping were done. Subsequently, a 2-3 cm mid- lateral longitudinal incision was made over the subtrochanteric region. The tensor fascia lata was split in the direction of its fibers, and the vastus lateralis muscle was elevated. Under C-arm guidance, a 3.2 mm threaded guide pin was inserted through the lateral cortex into the affected part of the femoral head, with the entry point between the lesser trochanter and greater trochanter. The guide pin was directed toward the centre of the necrotic area of the femoral head. The guide pin was over-reamed with an 8 mm reamer. The cancellous bone graft was taken from the outer table of the iliac crest of the patient.

The gap created with the cancellous bone graft was packed. Both the operative sites were washed thoroughly with normal saline and layer-wise closure was done with vicryl and ethilon. Finally, sterile dressing was done.

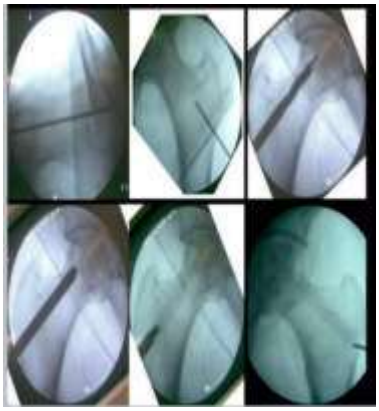


Figure 1: Core decompression of femoral head & bone grafting

Post operative management-Intravenous (IV) antibiotics were given till the third postoperative day, followed by oral antibiotics until suture removal. Dressing was done on the first, third, and fifth postoperative days. Physiotherapy started on day one which included knee mobilization, static quadriceps exercises, ankle pump, and toe movement. After one-week, partial weight bearing was started.

Follow-up was done at 1.5 months, three months, and, finally, six months. Patients were assessed using the Harris Hip Score (HHS) and Visual Analog Scale (VAS) scores at follow-up.

Results

In our study, the majority (50%) of patients were in the 20-30-year age group, making it the most common age group, followed by the 31- 40-year age group (40%).

There was a male predominance, with 17 out of 20 patients being male. All patients became symptomatic within the last year (range = 2-12 months). Of 20 patients, 11 presented to us within three months of developing symptoms (Table 1). Out of 20 patients, 10 were able to sit cross-legged, squat, and climb stairs without any significant problems. Four patients were not able to sit cross-legged or squat, while five patients were not able to climb stairs. Life style modification was advised to all patients. Five

patients who were alcoholics were advised to stop taking alcohol. Seven patients had a history of steroid use due to COVID-19 infection. No specific aetiology was identified in eight patients

Table 1- Age distribution, sex distribution and duration of pain (in months)

Characteristics	Parameters	Number of patients
Age distribution (in years)	20-30 31-40 41-50 51-60	10 8 1 1
Sex distribution	Male Female	17 3
Duration of pain (in months)	0-3 months 4-6 months 7-9 months 10-12 months	11 6 2 1

Table 2- Risk factor/ Etiology

Risk factors/Etiology	Number of patients
Idiopathic	8
Steroid	7
Alcohol	5

Table 3- The mean HHS was 69.45 preoperatively and 83.55 at six months postoperatively ($p \leq 0.0003$)

Degree	Preoperative	At 6 months
≤70	9	4
70-80	7	2
81-90	4	5
>90	0	9

Table 4: Visual Analog Scale score preoperatively and at six months postoperatively. The mean VAS score was 6.3 preoperatively and 3.8 at six months postoperatively ($p \leq 0.0001$)

Vas score	Preoperative	At 6 months postoperatively
0-3	0	12
4-6	14	4
7-9	6	4

Overall, 30% of patients developed secondary arthritis after six months and progressed to Ficat and Arlet stage 3/4. In total, 17 patients had pain at the donor site immediately after surgery. After three months, only one patient had pain at the donor site which was managed with analgesics. After six months, no patients had pain at the donor site. Apart from this, no significant donor site morbidity was seen.

Table 5- Complications

Complication	Number of patients
Secondary arthritis	6
Pain at the graft donor site (postoperatively)	17
Pain at the donor site (at 1.5months)	5
Pain at the donor site (at 3months)	1
Pain at the donor site (at 6months)	0

Figures 2-6 are the radiographic images of one of the study patients showing preoperative, postoperative, and follow-up X- rays. On radiographic evaluation, the patient operated on for AVN of the femoral head with core decompression and cancellous bone grafting showed significant improvement on the six-month follow up.

Figure 2: Preoperative X-ray of the patient showing avascular necrosis of the femoral head.

Figure 3: Immediate postoperative X-ray.

Figure 4: X-ray at 1.5 months of

Figure 5: X-ray at three months of follow-up.

Figure 6: X-ray at the final follow-up.

Discussion

The blood supply of the femoral head is so tenuous that even a slight vascular injury can predispose to AVN. Hence, AVN is commonly seen in the femoral head. Studies have shown that core decompression can arrest or even reverse the process of AVN and can avoid femoral head collapse and its sequelae. Core decompression can preserve the femoral head at an early stage of the pathology [4,5]. Steinberg et al. reported that 92% of patients who underwent non-operative management had femoral head collapse at the end of two years. They found that patients with early-stage AVN who had undergone core decompression and cancellous bone graft had about a 70% success rate [11]. Core biopsies were performed in the early sixties in a small number of patients with AVN of the femoral head to examine the pathological changes. The increased intraosseous pressure was relieved by core decompression, thereby providing pain relief to the patient.

According to Steinberg, treating early AVN of the femoral head with core decompression and cancellous bone grafting is a safe and efficient method [12]. We studied 20 hips having AVN of the femoral head treated by core decompression and autologous cancellous bone grafting with a graft taken from the iliac crest. In a study, Babhulkar [13] treated 32 patients with AVN of the femoral head by core decompression and iliac crest grafting and reported pain relief in all patients. Similar results were found in our studies as well. At the final follow-up, 16 patients had pain relief.

Core decompression with vascularized fibular graft has been the treatment of choice in cases of early AVN. Vascularized fibular grafting not only provides subchondral support but also vascularization at the site. However, the disadvantage is morbidity at the donor site and the need for microvascular anastomosis [14]. Therefore, a cancellous graft from the iliac crest has been considered as an alternative. Osteogenesis and osteoinduction are two of the key characteristics of bone grafts, and they are frequently attributed to cancellous grafts rather than cortical grafts. This makes it advantageous for revascularization as well. Moreover, it avoids donor site morbidity associated with fibular graft. A densely filled graft may provide structural stability [15,16]. Therefore, we preferred core decompression with autologous cancellous bone grafting with a graft taken from the iliac crest. In our study, all patients were kept non- weight bearing for 1.5 months, and after that partial weight bearing for 1.5 months. This was done because the femoral head would need enough time for regeneration after core decompression. Therefore, if weight bearing is started before sufficient bone growth, it could result in a collapse of the femoral head due to stress [13].

In our study, 90% of the patients were in the 20-40-year age group, and the remaining 10% of patients were in the 41-60-year age group. Our study showed a male predominance as 17 (85%) patients were male. Similar male predominance was also reported by Babhulkar [13] where 81.25% of patients were males. Activities of daily living were assessed by cross-legged sitting, squatting, and stair climbing. Overall, 50% of patients faced difficulty in these activities, suggesting that activities of daily living are affected even in the early stages of AVN.

The most common stage according to Ficat and Arlet classification at which the patients presented was stage 2B (45%), followed by stage 2A (40%) and stage 1 (15%). No

difference was noted in the preoperative and postoperative MRI stages in 11 patients over six months. Three patients reverted from stage 2B to 2A on MRI grading. Six patients showed progression to later stages on MRI grading. The mean HHS was 69.45 preoperatively and 83.55 at six months postoperatively. Out of 20 hips, 14 had excellent (HHS >90) to good (HHS 80-90) outcomes, while six had fair (HHS 70- 80) to poor (HHS >70) outcomes. The mean VAS score was 6.3 preoperatively and 3.8 at six months postoperatively. Out of 20 patients, 16 had excellent to good outcomes and four had fair to poor outcomes in terms of pain relief.

Although no significant improvement was seen in the MRI findings, as interpreted by HHS results, excellent functional outcomes were found in 66% of grade 1 patients, 50% of grade 2A patients, and 33% of grade 2B patients. Poor outcomes were found in 33% of grade 1 patients, 12.5% of grade 2A patients, and 22% of grade 2B patients.

Conclusion

Our study suggests that core decompression with autologous cancellous bone grafting might not reverse AVN progression but can delay the progression of AVN, avoid collapse, reduce pain, and provide improvement in functional outcomes at least in the short term. The study had a relatively shorter follow-up period of six months. Probably, a longer follow-up is needed for evaluating long-term functional outcomes. A shorter follow-up period was because of time constraints. Another limitation was the small sample size as overestimation of treatment effect is more likely in a small sample compared to a large sample. Patient compliance was also a limitation of our study. The limitation of the surgical method was that it could only be done in the early stage of the disease (Ficat and Arlet stages I and II) and did not have any significant outcomes, if done in the advanced stages of the disease (Ficat and Arlet stages III and IV). Other surgical treatments such as muscle pedicle bone grafting and vascular grafting were not done due to time, technical, and financial constraints. Core decompression with cancellous bone grafting is a promising procedure in stages 1 and 2 as it reduces the symptoms in the majority of cases and provides improvement in functional outcomes.

References

1. Mont MA, Jones LC, Hungerford DS: Nontraumatic osteonecrosis of the femoral head: ten years later. J Bone Joint Surg Am. 2006; 88:1107-29.
2. Sharma D, Maulik Jhaveri D, Urang Patel D, Jha A, Shah P, Golwala P: Pain relief with core decompression and autologous bone graft in osteonecrosis of femoral head in grade 2. Int J Orthop Sci. 2019, 5:369-72. 10.22271/ortho.2019.v5.i4g.1699 06, 88:1117-
3. Hua KC, Yang XG, Feng JT, Wang F, Yang L, Zhang H, Hu YC: The efficacy and safety of core decompression for the treatment of femoral head necrosis: A systematic review and meta analysis, journal ortho surg research, Sept 2019 14.1.306
4. Lavernia CJ, Sierra RJ: Core decompression in atraumatic osteonecrosis of the hip. J Arthroplasty. 2000, 15:171-8. 10.1016/s0883-5403(00)90132-3
5. Urbaniak JR, Coogan PG, Gunneson EB, Nunley JA: Treatment of osteonecrosis of the femoral head with free vascularized fibular grafting. A long-term follow-up study of onehundred and three hips. J Bone Joint Surg Am. 1995, 77:681-94.10.2106/00004623-199505000-00004
6. Mont MA, Hungerford DS. Non-traumatic avascular necrosis of the femoral head. J Bone Joint Surg Am. 1995; 77:459.
7. Lavernia CJ, Sierra RJ, Grieco FR. Osteonecrosis of the femoral head. J Am Acad Orthop Surg. 1999;7(4):250-61.
8. Steinberg ME. Diagnostic imaging and role of stage and lesion size in determining outcome in osteonecrosis of the femoral head. Tech Orthop. 2001;16:6-15.
9. Harkess JW.Arthroplasty of hip.,Campbells Operative Orthpeadics, Edited by Crenshaw AH, 8th edition, Vol. 1: CV Mosby Company, St. Louis, Washington DC, Torto, 1982.
10. Eftekhar NS. Total hip replacement using principles of lowfriction arthroplasty: The hip surgery of the musculoskeletal system, Edited by CM Evarts, Vol.3: Churchill Livingston, 1983.
11. Steinberg ME, Larcom PG, Strafford B, Hosick WB, Corces A, Bands RE, Hartman KE: Core decompression with bone grafting

for osteonecrosis of the femoral head. Clin Orthop Relat Res. 2001, 71-8. 10.1097/00003086- 200105000-00009
12. Steinberg ME: Core decompression of the femoral head for avascular necrosis: indications and results. Can J Surg. 1995, 38 Suppl 1:S18-24.
13. Babhulkar S: Osteonecrosis of femoral head: treatment by core decompression and vascular pedicle grafting. Indian J Orthop. 2009, 43:27- 35. 10.4103/0019-5413.45320
14. Yoo MC, Kim KI, Hahn CS, Parvizi J: Long-term followup of vascularized fibular grafting for femoral head necrosis. Clin Orthop Relat Res. 2008, 466:1133-40. 10.1007/s11999-008-0204- 9
15. Sen RK: Management of avascular necrosis of femoral head at pre- collapse stage. Indian J Orthop. 2009, 43:6-16. 10.4103/0019-5413.45318
16. Sanap A, Rabari YB, Teja V, Shah S: Management of avascular necrosis of famoral head by core decompression, International journal of research in orthopaedics, vol.4, no. 3, May- June 2018

Comparative study between dynamic hip screw and trochanteric femoral nail in intertrochanteric femur fracture

Singh V, Nagle A, Patidar A, Jain A, Bhinde S, Agrawal A, Jain P, Soni A

Study performed at Department of Orthopaedics, R. D. Gardi Medical College & C. R. G. Hospital & Associated Charitable Hospital, Ujjain (M.P.)

Abstract

Introduction: The incidence of intertrochanteric fracture has been rising with an aging population in many parts of the world and the number of hip fractures is expected to increase year after year. Reduction of fracture is the goal of treatment so that near anatomic alignment and normal femoral anteversion are obtained. Surgical treatment with stable reduction and fixation allows early mobilization and reduces complications. There are two main types of fixations for intertrochanteric fractures- the extramedullary plate fixation and intramedullary nail.

Aims and Objective: The main objective of this study was to compare outcome of Dynamic Hip Screw and Trochanchanteric Femoral Nail in patients of intertrochantric femur fracture.

Material and Methods: In this study, 50 patients of intertrochanteric fracture were admitted and randomly divided into two groups. 25 patients operated with Dynamic Hip Screw and other 25 were undergone Trochanteric Femoral Nail fixation. Outcome after the surgery such as average duration of surgery, blood loss, hospital stay and functional outcome were assessed using Harris Hip Score.

Results: The study findings reveal that there was a significant difference in mean operative time between both study groups with $p<0.05$. Hence in dynamic group mean operative time was 2.26±0.44 hours and in trochanteric femoral nailing mean operative time was 1.96±0.2 hours. Blood loss was more significant in patients with DHS as compared with TFN $p<0.05$. In dynamic group mean Harris score was 81.76±9.49 and in trochanteric femoral nailing mean Harris score was 87.12±7.74.

Conclusion: Surgical management of intertrochanteric fractures is the preferred treatment to avoid complications of prolonged immobilization. Dynamic Hip Screw (DHS) has been the gold standard. Our study indicates that TFN may be better choice when compared to DHS in unstable intertrochanteric fractures.

Keywords: Dynamic Hip Screw, Trochanteric Femoral Nail fixation, Intertrochanteric fracture

Address of correspondence:
Dr Ankit Nagle, Resident,
Department of Orthopaedics, R. D. Gardi Medical College, Ujjain
Email-97drank.it@gmail.com

How to site this article
Singh V, Nagle A, Patidar A, Jain A, Bhinde S, Agrawal A, Jain P, Soni A. Comparative study between dynamic hip screw and trochanteric femoral nail in intertrochanteric femur fracture. Ortho J MPC. 2023; 29 (2):56-61
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/179

Introduction

The incidence of intertrochanteric fracture has been rising with an aging population in many parts of the world and the number of hip fractures is expected to increase year after year.[1]

Though conservative treatment yields good results, it necessitates prolonged immobilization leading to complications like bed sores, deep vein thrombosis, fracture disease and pulmonary embolism. Another feature of conservative management is the possibility of varus drift and shortening in spite of an adequate period of immobilization. Therefore,

surgery is the mainstay of treatment. Reduction of fracture is the goal of treatment so that near anatomic alignment and normal femoral anteversion are obtained.[2]

Surgical treatment with stable reduction and fixation allows early mobilization and reduces complications. There are two main types of fixations for intertrochanteric fractures- the extramedullary plate fixation and intramedullary nail. Dynamic hip screw (DHS) or sliding hip screw (SHS) has been the gold standard implant in treating intertrochanteric fractures.[3]

Dynamic hip screw (DHS) also known as Sliding Screw Fixation is a type of orthopaedic implant which is designed for fixation of specific types of hip fractures which allows controlled dynamic sliding of the femoral head component along the whole construct. It is the most commonly used implant for extra capsular fractures of the hip which are common in older osteoporotic patients. The concept behind the dynamic compression is that the head of the femur is allowed to move along one plane; since bone responds to dynamic stresses, the femur may undergo healing by primary intentions, cells joining along boundaries, resulting in a concrete joint requiring no remodeling.[4]

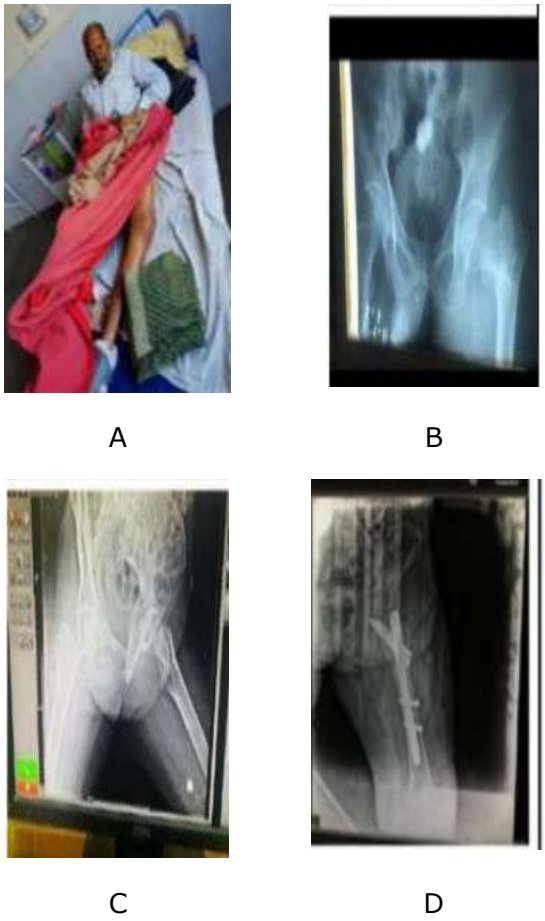
Implants like Gamma nail & TFN consists of a dynamic sliding screw, which passes through a short intramedullary nail. This design allows sliding between the two parts to create impaction, as in the sliding screw. The proposed theoretical advantages of the Gamma nail are reduced blood loss due to the percutaneous technique, minimal tissue damage, and shorter operation time[5]. Internal fixation of intertrochanteric fractures was a significant innovation. It allows early mobilization of the patient and reduced deformity due to malunion.[6-7]

Aim & objectives

Aim and objective of this study was to compare the clinical and functional outcomes of Dynamic Hip Screw and Trochanteric Femoral Nail in the patients with intertrochanteric hip fracture using Harris Hip Score.

Material and methods

This study was done prospectively on patients presenting with intertrochanteric fracture in the Department of Orthopaedics, R.D.Gardi Medical College, Ujjain for a period of 2 years from August 2020 to July 2022. A total 50 patients with inter trochanteric fracture of femur were selected and randomly allocated to two groups with equal number of participants. 25 patients were operated with Trochanteric femoral nailing and other 25 were operated with Dynamic hip screw and plate. Patients with Boyd and Griffin type I, II, III & IV trochantric fracture and who were above 18 years of age were included in the study. Patients with neurovascular injury, critically ill or having malignancy, patients with fracture of other parts of same limb and pathological fractures were excluded from the study. All patients were informed about the study and informed consent was received from each participant.

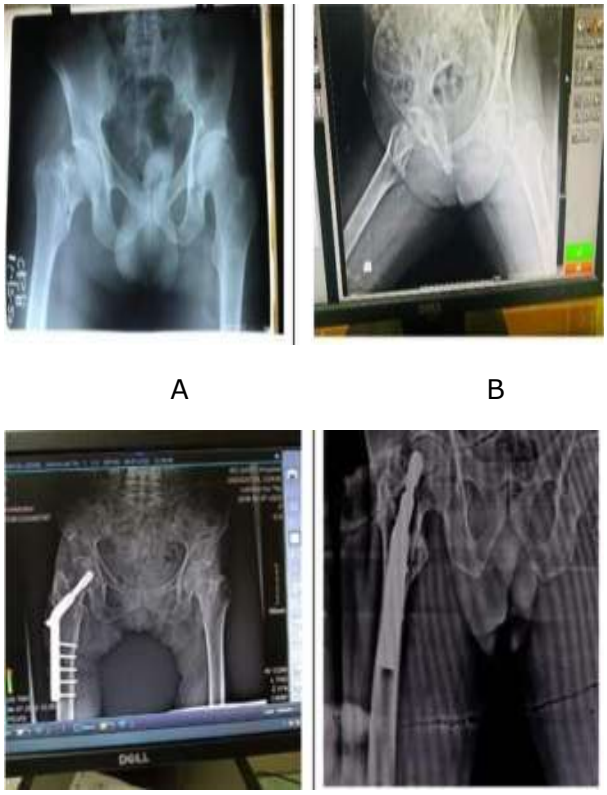


A B C D

Figure-1, A, B, C, D Pre op and post op x-ray of TFN patient

A thorough pre-operative assessment like history, clinical & radiological examination and

routine investigations of the patient was done. Intra-venous antibiotics was given before the induction of anaesthesia and continued for 3 days postoperatively. Appropriate physiotherapy as tolerated by patient was started from first operative day, as soon as patient came out from anaesthesia. Partial weight bearing with the help of walker started, as tolerated by patients. Patients were followed up after 6, 10 and 14 weeks postoperatively. Full weight bearing was allowed after seeing bony union on X-ray. Bony union was assessed by radiographs of bilateral hip with pelvis-AP and Lateral views taken on 6-, 10- and 14-weeks. The results were assessed using Harris Hip Score. At the end of the study, both the groups were compared and analysed using descriptive statistical methods like the Pearson correlation, Chi square test and T-test.



A B C D

Figure 2- A, B, C, D Pre op and post op x-ray of DHS patient

Results

Fig 3 shows, in the present study, mean age of the cases was 57.98±16.68 years, minimum age was 20 years and maximum age was 85 years. Fig 4 shows, out of 50 cases, according to Boyd & Griffin classification 13 (26.0%) had type I, 28 (56.0%) had type II, 6 (12.0%) had type III and 3 (6.0%) had type IV fracture.

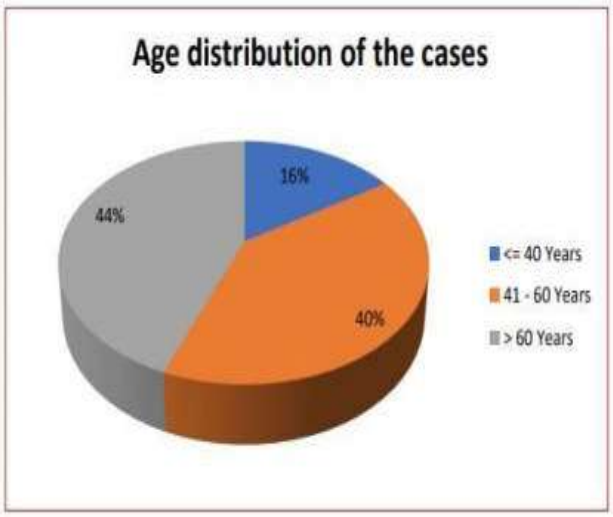


Figure 3: Age distribution of cases

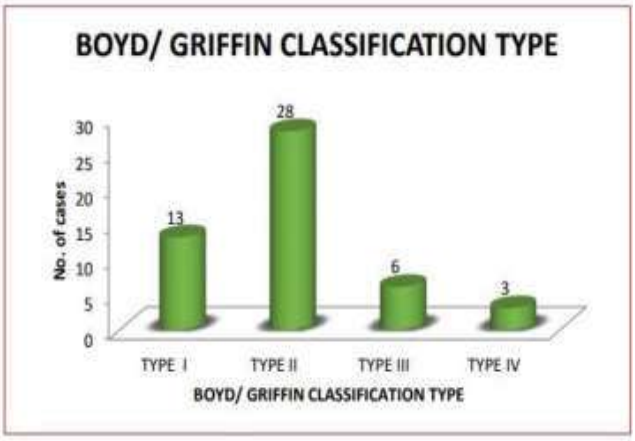


Figure 4: Boyd/ Griffin Classification of cases

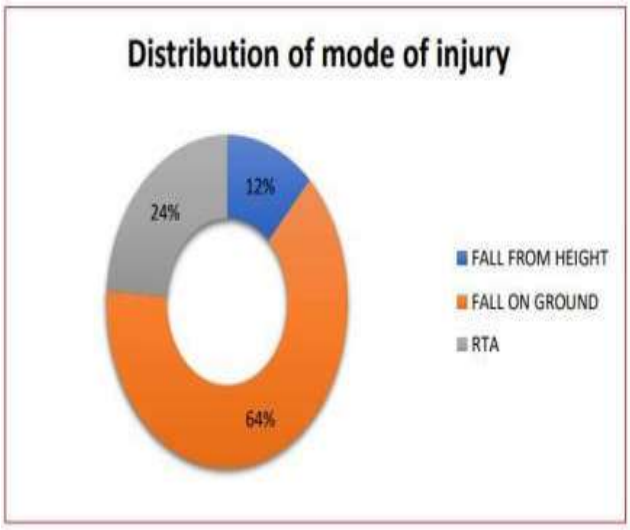


Figure 5 shows that out of 50 cases, majority of cases 32 (64.0%) fall on ground, 12 (24.0%) had RTA and 6 (12.0%) cases fall from height.

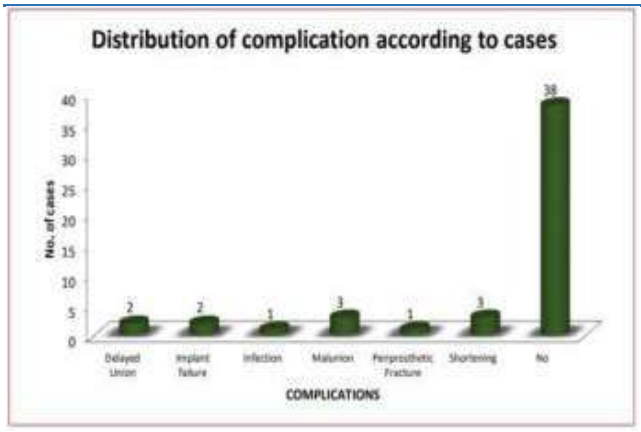


Figure 6 depicts that out of 50 cases 3(6%) had shortening, 3(6.0%) had malunion, 2(4.0%) cases had delayed union and implant failure respectively, 1(2.0%) cases had infection and periprosthetic fracture respectively and 38(76%) had no complications.

Table 1: Outcome distribution of the cases

Outcome	N	%
Poor	4	8.0
Fair	8	16.0
Good	13	26.0
Excellent	25	50.0
Total	50	100.0

Table 1 shows out of 50 cases, 25(50.0%) cases had excellent result, 13(26.0%) good, 8(16.0%) had fair result and 4(8.0%) had poor result.

Table 2: Association between outcome and study groups

Outcome	Group		Total
	DYNAMIC HIP SCREWS	TROCHANTERIC FEMORAL NAILING	
Poor	3	1	4
	12.0%	4.0%	8.0%
Fair	6	2	8
	24.0%	8.0%	16.0%
Good	7	6	13
	28.0%	24.0%	26.0%
Excellent	9	16	25
	36.0%	64.0%	50.0%
Total	25	25	50
	100.0%	100.0%	100.0%
Chi-square= 5.03, p= 0.03			

Table 2 shows that there was significant outcome difference between both study groups with p<0.05. Dynamic group 9 (36.0%) had excellent outcome and trochanteric femoral group 16 (64.0%) had excellent outcome, in dynamic group 7 (28.0%) had good outcome and in trochanteric femoral group 6 (24.0.0%) had good outcome, in dynamic group 6 (24.0.0%) had fair outcome and in trochanteric femoral group 2 (8.0%) had fair outcome and in dynamic group 3 (12.0%) had poor outcome and in trochanteric femoral group 1 (4.0%) had poor outcome.

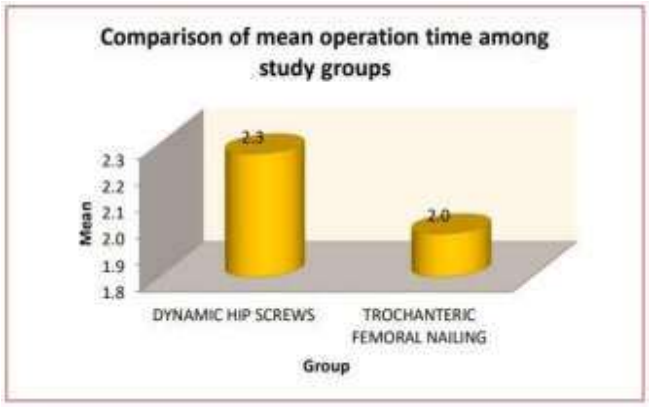


Figure 7 shows that, significant mean operative time difference was found between both study groups of the cases with p>0.05. Hence in dynamic group mean operative time was 2.26±0.44hours and in trochanteric femoral nailing mean operative time was 1.96±0.2hours.

Table 3: Comparison of mean blood loss among study groups

Group		N	Mean	SD	t	p
BLOOD LOSS	DYNAMIC HIP SCREWS	25	270	43.3	6.041	0.000
	TROCHANTERIC FEMORAL NAILING	25	189.6	50.54		

Table 3 shows that, there was significant mean blood loss (in ml) difference between both study groups of the cases with p<0.05. In dynamic group mean blood loss was 270±46.3 ml and in trochanteric femoral nailing mean blood loss was 189.6±50.54 ml.

Table 4: Comparison of mean Harris score comparisons between groups

Group		N	Mean	Std. Deviation	t	p
HARRIS H/P SCORE MAX SCORE -100 (3MONTHS - 14 weeks)	TROCHANTERIC FEMORAL NAILING	25	87.12	7.742	2.180	0.031
	DYNAMIC HIP SCREWS	25	81.76	9.497		

Table 4 shows that there was significant mean Harris score difference was found between both groups of the cases with p<0.05. In dynamic group mean Harris score was 81.76±9.49 and in trochanteric femoral nailing mean Harris score was 87.12±7.74.

Discussion

The study results reveal that, there was no significant age difference found between both study groups with p>0.05. Hence both groups were comparable on the basis of age of the cases. Out of 50 cases 31(62.0%) were males and 19(38.0%) were females. There was no significant gender difference found between both study groups with p>0.05. Hence both groups were comparable on the basis of gender of the cases.[8]

Out of 50 cases, according to Boyd & Griffin classification 13 (26.0%) had type I, 28 (56.0%) had type II, 6 (12.0%) had type III and 3 (6.0%) had type IV classification. In the present study out of 50 cases, majority were 32 (64.0%) fall on ground, 12 (24.0%) had RTA and 6 (12.0%) cases fall from height. In present study, out of 50 cases 26 (52.0%) cases had right side injury and 24(48.0%) had left side injury. S. Mandal I (2019)9 revealed that major trauma (road traffic accident) was the commonest aetiology (55%), whereas 45% fractures occurred due to accidental fall from height especially in elder population. According to complications, out of 50 cases 3 (6%) had shortening, 3 (6.0%) had malunion, 2 (4.0%) cases had delayed union and implant failure respectively, 1 (2.0%) case had infection and periprosthetic fracture respectively and 38 (76%) had no complications. Regarding complications, in case of incidences of various complications our study was statistically similar with the study of S.H.Bridle et al (1991)[10].

Present study there was significant mean operative time difference was found between both study groups of the cases with p>0.05. Hence in dynamic group mean operative time was 2.26±0.44 hours and in trochanteric femoral nailing mean operative time was 1.96±0.2 hours. Subhadip Mandal et. al. (2015)[9] revealed that the mean ± SD operative time was significantly longer in the group TFN (87.05 ± 17.36 min) than in the group DHS (68.55 ± 14 min) (P < 0.05). In this series mean operative time was 10 minutes shorter with TFN (50.7 minutes) compared with DHS (60.4 minutes) that is comparable with the study of P. Bienkowski et. al. (2006)[11] In this series mean operative time was significantly longer in DHS group that is comparable with the study of H.M. Klinger et. al. (2005)[12].

In our study there was significant mean blood loss (in ml) difference was found between both study groups of the cases with p< 0.05). Mean blood loss during surgery was significantly lower in the TFN group. This observation was comparable with the study of J. Pajarinen et. al. (2005)[13] and Hu W et al (2006)[14]. There was significant outcome difference was found between both study groups with p<0.05. Hence in both groups outcome of the cases was found similar. In dynamic group 9 (36.0%) had excellent outcome and in trochanteric femoral group 16 (64.0%) had excellent outcome, in dynamic group 7 (28.0%) had good outcome and in trochanteric femoral group 6 (24.0.0%) had good outcome, in dynamic group 6 (24.0.0%) had fair outcome and in trochanteric femoral group 2 (8.0%) had fair outcome and in dynamic group 3 (12.0%) had poor outcome and in trochanteric femoral group 1 (4.0%) had poor outcome. Subhadip Mandal et. al. (2019)[8] revealed that among TFN group regarding Harris Hip Score, at 10 weeks 75% of cases scored fair to good results and at 14 weeks 90% cases scored more than 70 and most of them were in excellent to good category. Two cases (8%) showed poor result. Results of our study are comparable to the other studies.

Conclusion

Surgical management of intertrochanteric fractures is the preferred treatment to avoid complications of prolonged immobilization. Dynamic Hip Screw (DHS) has been the gold standard. Intramedullary devices have biomechanical advantage as they are near to the mechanical axis of hip joint. Fifty patients with intertrochanteric fractures were treated with either DHS or Trochanteric Femoral Nail, 25 with DHS and 25 with TFN. Results were compared for average duration of surgery, blood loss, hospital stay and functional outcome according to Harris Hip score. The

duration of surgery, blood loss and hospital stay were significantly lower in TFN group. Our study indicates that TFN may be better choice when compared to DHS in unstable intertrochanteric fractures.

References

1. Radford JP, Needoff M, Webb JK (1993) A prospective randomised comparison of the dynamic hip screw and the Gamma locking nail. J Bone Joint Surg [Br] 75:789–793.
2. Cummings SR, Rubin SM, Black D. The future of hip fractures in the United States. Numbers, costs, and potential effects of postmenopausal estrogen. Clinical Orthopaedics and Related Research. 1990; 252:163-166.
3. Bridle Sh, Patel AD, Bircher M, Calvert PT (1991) Fixation of intertrochanteric fractures of the femur: a randomised prospective comparison of the gamma nail and the dynamic hip screw. J Bone Joint Surg [Br] 73:330–334.
4. Halder SC (1992) The Gamma nail for peritrochanteric fracture. JBone Joint Surg [Br] 74:340–344 T. Brammar et al. Reverse obliquity and transverse fractures of the trochanteric region of the femur; a review of 101 cases; Injury; 2005.
5. Cooper, Campion, G. Campion, and LJ 3rd Melton. "Hip fractures in the elderly: a world-wide projection." Osteoporosis international a. (1992): 285-289. Simmermacher RK, Bosch AM, Van der Werken C.
6. Sadowski C, Lu bbeke 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 screwplate: a prospective randomized study. J bone Joint Surg Am 2002;84(3):372-81.
7. Cooper A. Sir Astley Cooper on Fracture of the Neck of the Femur. The Boston Medical and Surgical Journal. 1834;10(21):332-334.
8. Subhadip Mandal et al. (2015) "Comparative Analysis of the Results of Trochanteric Femoral Nail and Dynamic Hip Screw in Treatment of Comminuted Unstable Trochanteric Fractures – a Prospective Randomised Controlled Trial on Indian Population", Journal of Indian Orthopaedic Rheumatology Association July-December 2015:1(1);12-19.
9. S. Mandal, U. Banerjee, A.S. Mukherjee, P. Saha, S. Mandal, S. Kund (2019) "Results of "Trochanteric Femoral Nailing (TFN)" in comminuted unstable trochanteric fractures", Acta Orthopedica Belgica, Vol. 85 - 4 – 2019
10. Bridle SH, Patel AD, Bircher M, et al. Fixation of intertrochanteric fractures of the femur. A randomised prospective comparison of the gamma nail and the dynamic hip screw. J Bone Joint Surg Br. 1991; 73: 330 – 334
11. Beinkowsky P, Reindl R, Berry G K, Harvey E J (2006): A new intramedullary devices for the treatment of inter trochanteric hip fractures; J Trauma; 2006 Dec; 61(6): 1458- 62.
12. H M Klinger, HM Baums, M Eckert, and R Neugebauer (2005): A comparative study of unstable per and intertrochanteric femoral fractures with DHS and PFN and TSP; Zentralbl chir, 2005 130.
13. J. Pajarinen, J Lindahl, O Michelson, E Hirvensalo (2005): Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail; jbjs, vol 87-B, 76-81.
14. Hu W, Luo Y, Fang H (2006): comparision of various kinds of internal fixation in unstable intertrochanteric fracture; Zhongguo Xiu Fu Chong 2006 July;20(7): 690-4.

A rare case of popliteal pterygium syndrome

Hans A, Bajoria R S, Singhal V

This study is performed in Department of Orthopedics, GRMC, Gwalior

Abstract

Popliteal Pterygium Synrdome is an extremely rare genetic disorder which can present with multiple body anomalies, especially the musculoskeletal anomalies.

The very striking characteristic is presence of popliteal pterygium contracture; this connective tissue band can extend from ischial tuberosity to the calcaneum which can severely restrict range of motion, knee extension, abduction and rotation. This case report presents a case of 3-year-old girl child with significant unilateral deformity in left lower limb. Examination revealed extensive popliteal web/contracture left side with associated deformity at left ankle. Serial surgical correction was done with uniplanar ex fix (Distractor) application followed by Tendo Achillis tenotomy and serial splinting with regular follow-ups done. The child was treated successfully with satisfactory results

Keyword: popliteal pterygium syndrome, rare genetic disorder, musculoskeletal anomalies

Address of correspondence:
Dr R S Bajoria, Professor, Department of Orthopedics, Gajra Raja Medical College, Gwalior (M.P.)
Email-rs_bajoria@yahoo.co.in

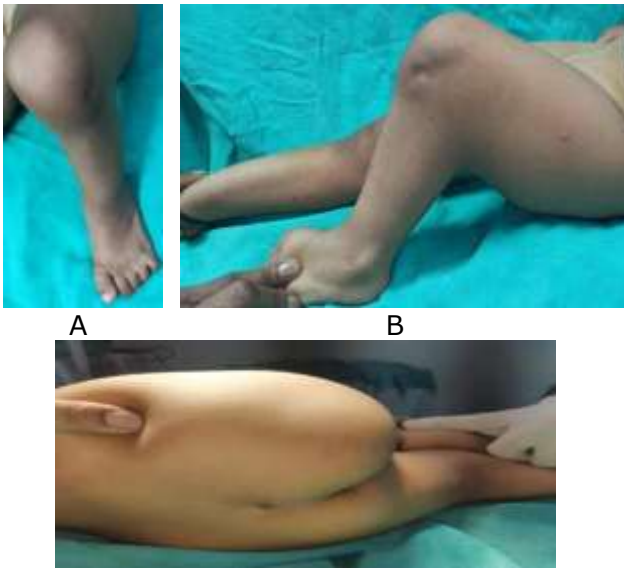
How to site this article
Hans A, Bajoria R S, Singhal V. A rare case of popliteal pterygium syndrome. Ortho J MPC. 2023; 29 (2):62-63
Available from:
https://ojmpc.com/index.php/ojmpc/article/view/180

Introduction

Popliteal pterygium syndrome is a rare cause of congenital knee flexion in children associated with joint stiffness and retraction of the posterior soft tissues with a popliteal scar contracture posing therapeutic difficulties. Hereby reporting a case of 3 years old child of popliteal pterygium syndrome treated surgically with 6 months of follow up.

Case report

A 3-year-old girl admitted to orthopaedics department with complain of congenital left lower limb deformity; diagnosed with Congenital Popliteal Pterygium without significant family history of Popliteal Pterygium Syndrome. Child had normal general physical examination. Clinical examination revealed extensive left sided popliteal web extending from ischial tuberosity to calcaneum. Webbing prevented extension at the left knee with the flexion angle of 100 degrees of flexion with equinovarus deformity in left foot and contralateral adaptive knee flexion.

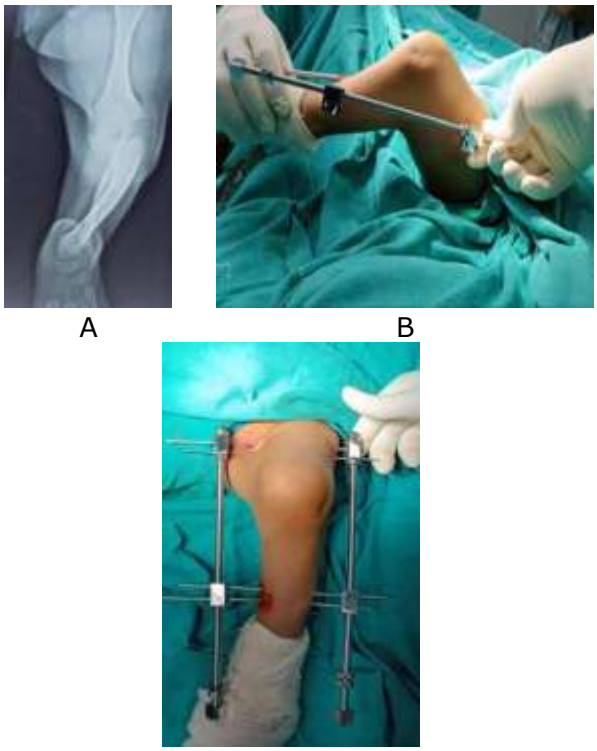


A B C

Figure 1- A, B & C- Clinical picture

Spinal pit was also observed. Uniplanar external fixator (distractor) was applied for 3 months with 1 mm (0.5 daytime and 0.5 mm nighttime) daily distraction. After 3 months distractor was removed and Tendo Achillis

tenotomy was done for equinus correction followed by corrective cast application.



A B C

Figure 2- A, B & C Pre op Xray and intra op picture

A B

Figure 3- A & B – Post op x-ray

Result

Almost complete flexion deformity correction was achieved with remaining 10 degrees of flexion deformity. Left sided significant shortening was present. Patient is on regular physiotherapy for remaining correction. Further improvement is still expected with time, with regular splinting and follow up.

A B

Figure 4- A & B, 6 weeks follow up

A B C

Figure 5- A, B & C, 12 week follow up after implant removal

Conclusion

Popliteal Pterygium Syndrome is a rare genetic disorder, inherited as an autosomal dominant trait. The correction of fixed flexion of the knees in patients with PPS is very difficult. A Doppler Ultrasound and MRI can help formulating the preoperative plan, based on exact neurovascular position. Early Surgical correction is advisable.

References

1. Gorlin RJ, Sedano HO, Cervenka J. Popliteal pterygium svndrome. Pediatrics. 1968; 41: 503– 9.
2. Escobar V, Weaver D. Popliteal pterygium syndrome. A phenotypic and genetic analysis. J Med Genet. 1978; 15: 35– 42.
3. Kalay E, Sezgin O, Chellappa V, Mutlu M, Morsy H, Kayserili H, et al. . Mutation in RIPK4 Cause the autosomal recessive form of popliteal pterygium syndrome. Am J Hum Genet. 2011; 90: 76– 85.

ORTHOPAEDIC JOURNAL OF M. P. CHAPTER

An official publication of Madhya Pradesh Chapter of Indian Orthopaedic Association

Author Guidelines

Manuscript submitted should be easy to read & edit. Detailed instructions are available on the website www.icmje.org , which gives guidelines for uniform requirements for manuscripts submitted to biomedical Journals.

All manuscripts submitted to the journal must be original research submitted to Orthopaedic Journal of M P Chapter (OJMPC) alone, must not be previously published, already accepted for publication, or under consideration for publication elsewhere, and, if accepted, must not be published elsewhere in similar form, without the consent of editor-in-chief or publisher. All the manuscript submitted to the journal receives individual identification code and would initially be reviewed by the editors then undergoes a formal double blind peer review process before publication.

Article Proof

Manuscripts accepted for publication are copy edited for grammar, punctuation, print style, and format. Page proofs are sent to the corresponding author through e-mail. They must carefully check and return the revised manuscript within 72 hours. It is the responsibility of the corresponding author to ensure that the galley proof is to be returned without delay with correction. In case of any delay, authors are responsible for the contents appeared in their published manuscripts.

Categories of Articles

Article can be sent as Research/Original article, Review article, brief reports, Case report & Letter to editors.

(a) Original article

Original articles should contain original research relevant to Orthpaedics and allied specialties and includes case control studies, cohort studies, interventional studies, experimental study. Text of study is usually divided into sections introduction, methods, Results & Discussion. Manuscripts should be accompanied with an abstract (divided into Background, Methods, Results and Conclusion) in not more than 250 words. Four to five key words in alphabetical order should be provided for indexing along with abstract.

The typical text length for such contribution in 2500-3500 words (excluding Title page, abstract, tables, figures, acknowledgements, & references)

(b) Review Article

Journal encourages submission of review article on topic of general interest. The typical length should be about 3000 words (excluding tables, figures & references) manuscript should be accompanied with Abstract of less than 250 words.

(c) Case Report

Clinical case highlighting uncommon condition or presentation are published as care reports. The Text should not exceed 1000 words & is divided into sections i.e. abstract, Introduction, case report and discussion. Include a brief abstract of about 100 words.

(d) Brief Report

Short account of original studies are published as brief reports. The text should be divided into section i.e. abstract, introduction, methods, results & discussion.

A series of cases can also be considered as brief report, provided the number of cases is reasonably large. Abstract should be 100-150 words with 3-5 keywords. Text should not contain more than 1500 words.

(e) Letter to Editor(s)

The editor welcomes and encourage correspondence relating to articles published in journal. Letter may also relate to other topic of interest to medical professional. Letter should not be more than 300 words.

Preparation of Manuscript

Title: The title of the article should be approximately 10-15 words (this may be changed with the author's approval). The first character in each word in the title has to be capitalized

Authors: The full names, qualifications, designation and affiliations of all authors should be listed at the beginning of the article. E mail id of all author is must. Your Manuscript should be typed, double-spaced on standard-sized – A 4 paper with 1" margins on all sides. You should use 12pt Arial font for manuscript, Subheadings should be in 12 point Bold Arial.

A research paper typically should include in the following order

Abstract : (Limit of 250 Words) a brief summary of the research. The abstract should include a brief introduction, a description of the hypothesis tested, the approach used to test the hypothesis, the results seen and the conclusions of the work. It can be a structured like Background, Methods, Results, Conclusion.

Key Words: write no more than six keywords. Write specific keywords. They should be written left aligned, arranged alphabetically in 12pt Arial.

Introduction: Description of the research area, pertinent background information, and the hypotheses tested in the study should be included under this section. The introduction should provide sufficient background information such that a scientifically literate reader can understand and appreciate the experiments to be described. The specific aims of the project should be identified along with a rationale for the specific experiments and other work performed.

Material & Methods: Materials and/or subjects utilized in the study as well as the procedures undertaken to complete the work. The methods should be described in sufficient detail such that they could be repeated by a competent researcher. The statistical tool used to analyze the data should be mentioned. All procedures involving experimental animals or human subjects must accompany with statement on necessary ethical approval from appropriate ethics committee.

Results: Data acquired from the research with appropriate statistical analysis described in the methods section should be included in this section. Results should be organized into figures and tables with descriptive captions. Qualitative as well as quantitative results should be included if applicable.

Discussion: This section should relate the results section to current understanding of the scientific problems being investigated in the field. Description of relevant references to other work/s in the field should be included here. This section also allows you to discuss the significance of your results - i.e. does the data support the hypotheses you set out to test? This section should end with new answers/questions that arise as a result of your work.

Conclusion: This should have statement regarding conclusion drawn from your study only.

Tables:

- Tables should be self-explanatory and should not duplicate text material.
- Tables with more than 10 columns and 10 rows are not acceptable.
- Number tables, in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.
- Place explanatory matter in footnotes, not in the heading.
- Explain in footnotes all non-standard abbreviations that are used in each table.
- Obtain permission for all fully borrowed, adapted, and modified tables and provide a credit line in the footnote.
- For footnotes use the following symbols, in this sequence: *, †, ‡, §, ||,¶ , **, ††, ‡‡
- Tables with their legends should be provided at the end of the text after the references. The tables along with their number place in the text.
- Figures:
- The maximum number of figures should be limited to four.
- Upload the images in JPEG format. The file size should be within 4 MB in size while uploading.
- Figures should be numbered consecutively according to the order in which they have been first cited in the text.
- Labels, numbers, and symbols should be clear and of uniform size.
- Titles and detailed explanations should be written in the legends for illustrations, and not on the illustrations themselves.
- Send digital X-rays, digital images of histopathology slides, where feasible.
- If photographs of individuals are used, authors should take written permission to use the photograph.
- If a figure has been published elsewhere, acknowledge the original source and submit written permission from the copyright a credit line should appear in the legend for such figures.
- If the uploaded images are not of printable quality, the publisher office may request for higher resolution images which can be sent at the time of acceptance of the manuscript. Ensure that the image has minimum resolution of 300 dpi or 1800 x 1600 pixels.
- The Journal reserves the right to crop, rotate, reduce, or enlarge the photographs to an acceptable size.
- Acknowledgments: Limit to 100 words.
- References:
- The references / bibliography should be in Vancouver style. For full details on this refer to the following link to university of Queensland http://www.library.uq.edu.au/training/citation/vancouv.pdf .
- The titles of journals should be abbreviated according to the style used in Index Medicus.
- Use the complete name of the journal for non-indexed journals.
- Avoid using abstracts as references.
- Information from manuscripts submitted but not accepted should be cited in the text as "unpublished observations" with written permission from the source.
- Journal article: list first six author followed by et al. eg (Dumbre Patil SS, Karkamkar SS, Dumbre Patil VS, Patil SS, Ranaware AS. Reverse distal femoral locking compression plate a salvage option in nonunion of proximal femoral fractures. Indian J Orthop 2016;50:374-8)
- Books and Other Monographs

Personal author(s): Ringsven MK, Bond D. Gerontology and leadership skills for nurses. 2nd ed. Albany (NY): Delmar Publishers; 1996.

Editor(s), compiler(s) as author: Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingstone; 1996.

Chapter in a book: Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, editors. Hypertension: pathophysiology, diagnosis, and management. 2nd ed. New York: Raven Press; 1995. pp. 465-78.

..... Lets Live an Active Life !

NUDOLO® Gel

Diclofenac Diethylamine + Linseed Oil +
Methyl Salicylate + Menthol + Capsaicin Gel

When you require a quad force to attack

Nudolo®-Plus

(Bromelain 90mg + Trypsin 48mg + Rutoside 100mg + Diclofenac Sodium 50mg Tablets)

In all types of peripheral neuropathies

Melex®-Plus Capsule

(Mecobalamine, ALA, Folic Acid, B_1 and B_6 Capsule)

Approved by USFDA

In GERD, NUD, Gastritis & Drug Induced Reflux Disease

NURAB®-40 I.V.

(Pantoprazole 40mg I.V.)

Lextra Pharmaceuticals

Let's give Life an extra boost !

EDITOR

Dr Vivik Singh

Dept Of Orthopaedics,

R D Gardi Medical College, Ujjain, MP

ASSOCIATION

Indian Orthopaedic Association

CHAPTER

Madhya Pradesh

PUBLISHER

Madhya Pradesh Chapter

of Indian Orthopaedic Association

CORRESPONDENCE

Dr Vivek Singh (Editor)

Email: editor@ojmpc.com

WEBSITE & E-PUBLISH BY

SYSNANO INFOTECH

Web Development, Hosting Servers

(+91)-755-4246-222, (+91)-99931-77-656

info@sysnano.com www.sysnano.com