

International Journal of Orthopaedics and Bone Disorders

ISSN Print: 2664-8946
ISSN Online: 2664-8954
Impact Factor: RJIF 5.46
IJOB 2023; 5(1): 01-09
www.orthopedicsjournals.net
Received: 02-12-2022
Accepted: 06-01-2023

Dr. Sujay Gupta
Post Graduate Resident,
Department of Orthopaedics,
Government Medical College,
Kota, Rajasthan, India

Dr. Lokesh Jangir
Senior Resident, Department
of Orthopaedics, Government
Medical College, Kota,
Rajasthan, India

Dr. Ram Prasad Meena
Senior Professor and Head,
Department of Orthopaedics,
Government Medical College,
Kota, Rajasthan, India

Dr. Dinesh Kumar Bairwa
Associate Professor and Head,
Department of Orthopaedics,
RVRS Medical College,
Bhilwara, Rajasthan, India

Dr. Mahendra Meena
Senior Resident, Department
of Orthopaedics, Government
Medical College, Kota,
Rajasthan, India

Corresponding Author:
Dr. Sujay Gupta
Post Graduate Resident,
Department of Orthopaedics,
Government Medical College,
Kota, Rajasthan, India

A prospective study of functional outcome of posterior tibial spine chip fractures treated with screw fixation

Dr. Sujay Gupta, Dr. Lokesh Jangir, Dr. Ram Prasad Meena, Dr. Dinesh Kumar Bairwa and Dr. Mahendra Meena

DOI: <https://doi.org/10.33545/26648946.2023.v5.i1a.23>

Abstract

Aim: To study the functional outcome of posterior tibial spine fractures treated with threaded Cannulated cancellous Screw fixation.

Materials and Methods: This is a prospective study of Posterior Tibial Spine Avulsion fractures in the age group 15-60 years admitted in Government Medical College, Kota, during the period from August 2020 to December 2022. The cases were classified under Modified Meyers and Mckeever classification. Patients with associated vascular Injury and skeletally immature and age group more than 60 years were excluded. Through Burks and Schaffer approach, avulsion fractures of Posterior Tibial Spine were fixed with 4mm partially threaded Cannulated cancellous Screw.

Discussion: In our study, the mean age group of the patient was 33 years with a male preponderance. Road traffic accidents and accidental fall were the commonest mode of injury and the mean operating time was 43.5 minutes. Post operatively the knee flexion was around 120 degrees in average. And 15 patients had excellent outcome with Lysholm knee scoring scale and 5 had good outcome with no patients with fair or poor outcome.

Results: Open reduction and internal fixation of Posterior Tibial Spine avulsion fractures through Burks and Schaffer approach had yielded excellent results in our study. A displaced avulsion fracture of Posterior Cruciate Ligament with more than 10 mm posterior tibial translation should be reduced and fixed in order to stabilise the joint and to prevent non-union.

Keywords: Posterior, tibial, fracture, cannulated, cancellous, screw

Introduction

Various clinical, biomechanical and anatomic studies have been done to investigate the function of anterior cruciate ligament of knee and its treatment [1]. These studies helped in better understanding of the function of anterior cruciate ligament and improved outcome following its treatment. In contrast, the Posterior Cruciate Ligament has been given less attention regarding its anatomical and biomechanical roles in knee function. The lack of scientific data may be explained in part due to the poorer clinical outcomes following Posterior Cruciate Ligament injury compared to those of anterior cruciate ligament [2]. Posterior Cruciate Ligament is an important ligament which stabilises the knee joint [3]. Posterior cruciate ligament injuries are estimated to account for 5-25 % of ligament injuries of the knee. The incidence is higher especially in high energy trauma such as motorcycle and car accidents. Posterior Cruciate Ligament injuries are classified as Isolated (Posterior Cruciate Ligament only) or Combined (Injury to one or more ligaments) 12-15. Isolated injuries are considered to have a relatively benign course and have traditionally been treated nonoperatively [4]. However further studies have shown that patients who were treated nonoperatively can develop increased instability and arthritic changes over time [5]. A variety of treatment approaches for Posterior Cruciate Ligament avulsion fractures are there but it is still a fact of debate regarding optimal treatment plan and operative method [6]. Posterior translation of tibia on clinical examination more than 10 mm and the fracture dimensions dictate the treatment plan. It is generally recommended that a displaced avulsion of Posterior Cruciate Ligament should be reduced and fixed in order to stabilise the joint and to prevent non-union [7].

To prevent instability and arthritic changes it is better to go for surgical fixation. The aim of the study is to analyse the functional outcome of posterior Tibial Spine fractures treated with cancellous cannulated screw fixation.

Methodology

This is a Prospective single centre clinical study done from August 2020 to Dec 2022-20 patients with Displaced Posterior Tibial Spine avulsion fractures with Posterior Tibial Translation more than 10mm admitted to Orthopaedic wards at Government Medical College, Kota were taken up for the study after getting a valid and informed written consent from them. A detailed history was taken, systemic examination is done and all the basic investigations and the required x-rays taken. Patients were assessed using Lysholm knee scoring scale.

Inclusion criteria

1. Patients with displaced Posterior Tibial Spine avulsion fracture
2. Age group > 15 years and <60yrs
3. Associated with other fractures

Exclusion criteria

1. Nondisplaced Posterior Tibial Spine avulsion fracture
2. Age < 15 years and > 60 years
3. Associated with Vascular Injury
4. Patients Unfit /Not willing for surgery.

A careful history was elicited from the patient and/or attenders to know the nature of injury and extent of the trauma. General condition of the patient was assessed and resuscitation with Intravenous Fluids, Parenteral analgesics and Blood transfusion were provided according to the associated injuries. Head to foot examination was done to identify the other injuries and fractures. Injured limb was examined to look for any open injuries and distal neurovascular status of the limb was checked. Limb was immobilized in a Tube/cylindrical slab.

Operative technique

Preoperative antibiotic (1 gm Cefotaxime) was administered to all cases after sensitivity testing and given 1 hour prior to skin incision. All surgeries were performed under spinal anesthesia with tourniquet control using the Burks and Schaffer approach.

Patient position

Patient was placed in prone position with tourniquet applied and it was ensured all osseous prominence were well padded.

Skin incision

The skin incision was made in an "inverted L" fashion over the posteromedial corner of the knee joint with the vertical component at the medial edge of the gastrocnemius muscle and the transverse component just distal to the joint line.



Fig 1: Inverted L shaped skin incision

Superficial Dissection



Fig 2: The deep fascia over the medial Gastrocnemius were cut in the line of skin incision.

Deep Dissection

The interval between Semimembranosus tendon and medial Gastrocnemius was identified. The division was carried bluntly with finger and subsequent retraction of

Gastrocnemius laterally, allowing for protection of popliteal neurovascular structures and exposure to posterior aspect of capsule.



Fig 3: Deep Dissection

The middle geniculate artery, which lies over mid capsule was ligated whenever necessary. The motor branch of tibial nerve was preserved which supplies medial head of Gastrocnemius. The medial head of Gastrocnemius was retracted laterally thus protecting neurovascular structures. Recession of tendinous origin of medial head of Gastrocnemius needed to be carried out for enhancing exposure. Slight flexion of the knee was done in almost all the cases for better visualisation. The level of joint was

identified by gentle flexion extension movements of the knee and posterior knee joint capsule incised which gave good exposure of the avulsed fragment.

Insertion of the guide wire

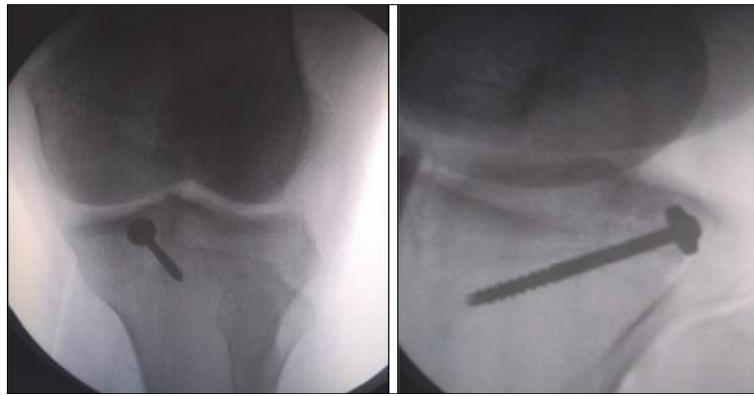
The avulsed bony attachment of posterior cruciate ligament was pushed down and had to be secured with a Kirschner wire and verified under fluoroscopic guidance with alignment in an orthogonal orientation to the fracture line.

**Fracture fixation**

The avulsed fracture fragment was then fixed with one or two 4 mm partially threaded cancellous screws

in a standard AO fashion after appropriate drilling and measurement of screw size.

Placement of washer



Using a washer helps to capture more of comminuted fracture fragments and improves osseous purchase and hence was used as per the fracture morphology. The screw position was again confirmed under fluoroscopy and if found adequate, wound wash was given.

Closure

The skin was closed after approximating subcuticular layers.

Postoperative care and rehabilitation

A long leg hinged knee brace was applied and locked in extension to keep the tibia translated anteriorly and to shield the posterior cruciate ligament from stress. Active range of motion as tolerated and gentle passive range of motion at near extension (0-40 degree) with isometric quadriceps, hamstring, and hip exercises were initiated on postoperative day 1. Weight bearing was permitted with the brace locked in extension. Closed chain quadriceps strengthening was initiated at 2 weeks and active hamstring activation was avoided for 6 weeks. Full weight bearing was allowed at 6 weeks without a brace and a progressive running

programme was started as soon as 3 months after surgery. Patients were followed up at 6th week, then monthly for first 3 months and then at 6th month and at 1 year. During each visit functional outcome was assessed.

Observation and Results

Age distribution

25 % of patients in our study were in the 35-40 age group. 20 % of the patients were in 25 -30 and 30-35 years age group.

Table 1: Age distribution

Age group in years	No. of patients	Percentage
15-20	1	5
20-25	2	10
25-30	4	20
30-35	4	20
35-40	5	25
40-45	3	15
45-50	1	5

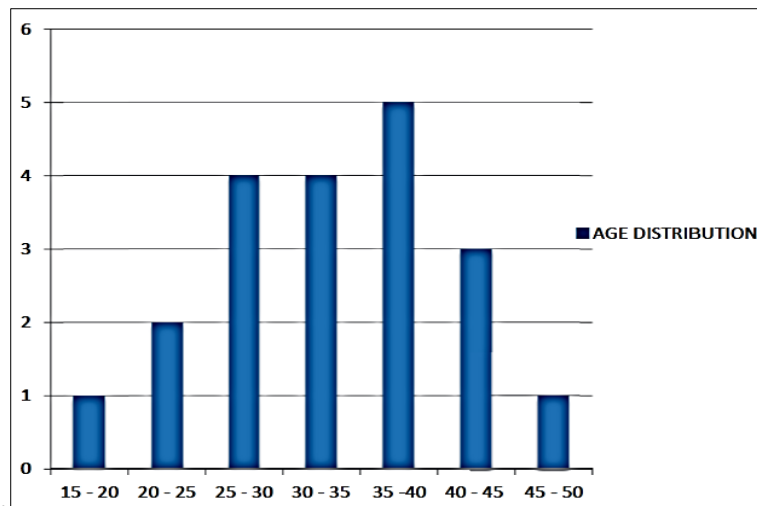


Fig 1: Age distribution

Sex Distribution

The predominant population in our study are the male patients.

Table 2: Sex Distribution

Sex	No. of Patients	Percentage
Male	19	95
Female	1	5

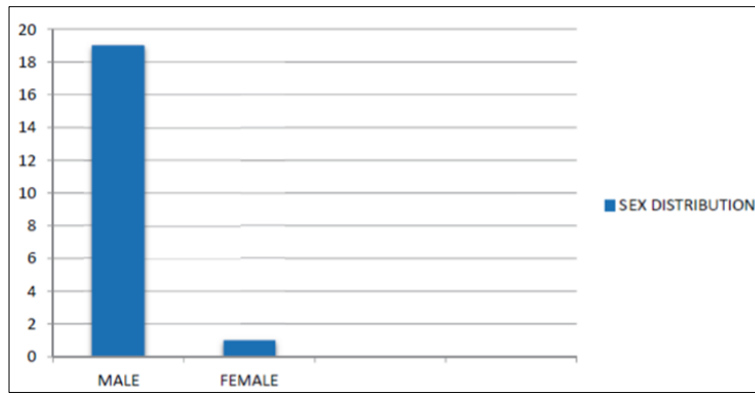


Fig 2: Sex Distribution

Side Involved

There was a right sided predilection seen in the study

Table 3: Side Involved

Side involved	No. of patients	Percentage
Right	12	60
Left	8	40

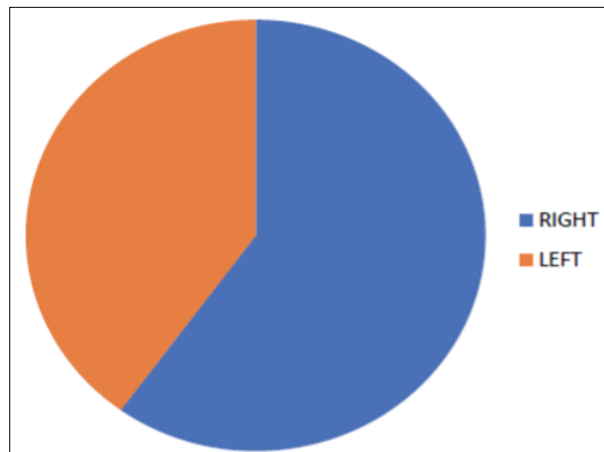


Fig 3: Side Involved

Mode of Injury

The majority of patients in our study sustained avulsion fractures of Posterior Tibial Spine due to Road Traffic Accidents with accidental fall next to it.

Table 4: Mode of Injury

Mode of injury	No. of patients	Percentage
RTA	14	70
Fall	4	20
Sports related	2	10

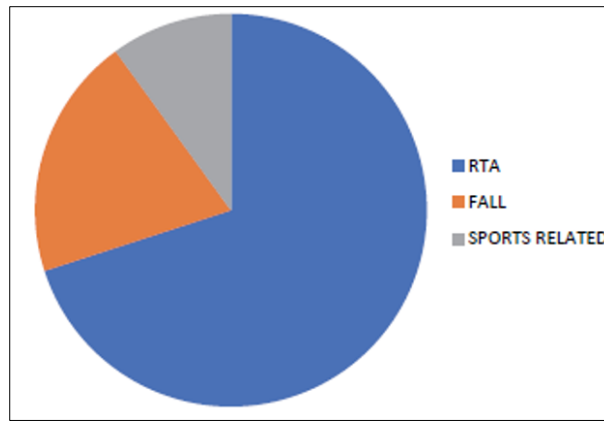


Fig 4: Mode of Injury

Injury To Surgery Interval

The mean injury to surgery interval for internal fixation of Posterior Tibial Spine avulsion fracture in our study was 4 days. The delay in interval to surgery was due to associated injuries and comorbidities of the patient.

Table 5: Injury to Surgery Interval

Interval to surgery	No. of patients	Percentage
< 3 Days	2	10
3 – 5 Days	13	65
> 5 Days	5	25

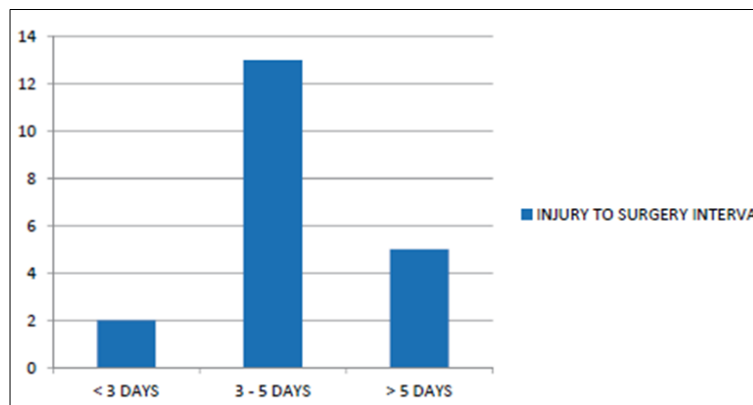


Fig 5: Injury to Surgery Interval

Duration of surgery

The average duration of surgery was 43.5 minutes. Patients who had associated injuries were operated for Posterior Tibial Spine avulsion fracture after completion of other procedures considering the need for prone position.

Table 6: Duration of surgery

Duration of surgery	No of patients	Percentage
40 – 50 MIN	17	85
50 - 60 MIN	3	15

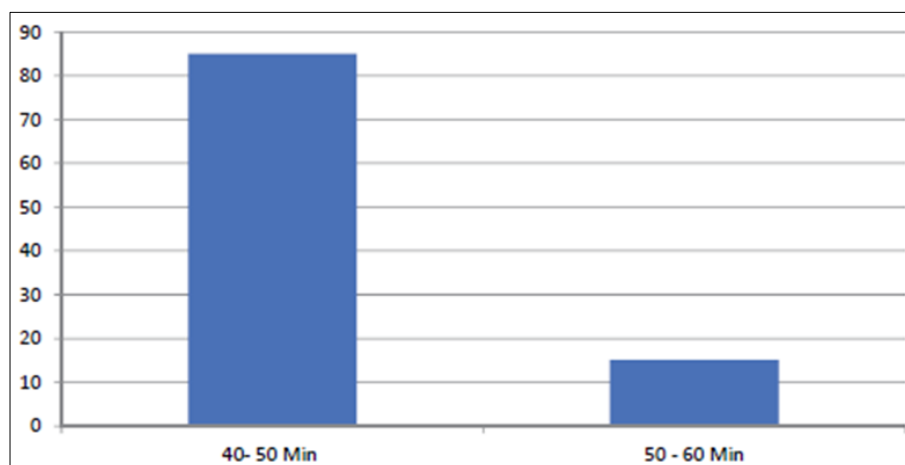


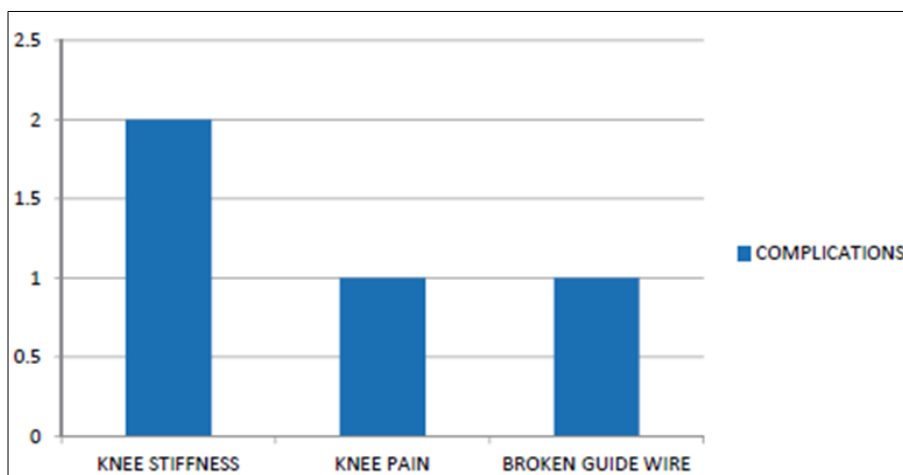
Fig 6: Duration of surgery

Complications

The complications encountered in our study were knee stiffness, intermittent knee pain and broken guide wire.

Table 7: Complications

Complications	No of patients	Percentage
Knee stiffness	2	10
Knee pain	1	5
Broken guide wire	1	5
Nil	16	80



Lysholm knee scoring scale of patients in our study
Majority of patients in our study had Excellent outcome.

Table 8: Lysholm knee scoring scale of patients in our study

Lysholm knee scoring scale	No. of patients	Percentage
Excellent	15	75
Good	5	25
Fair	0	0
Poor	0	0

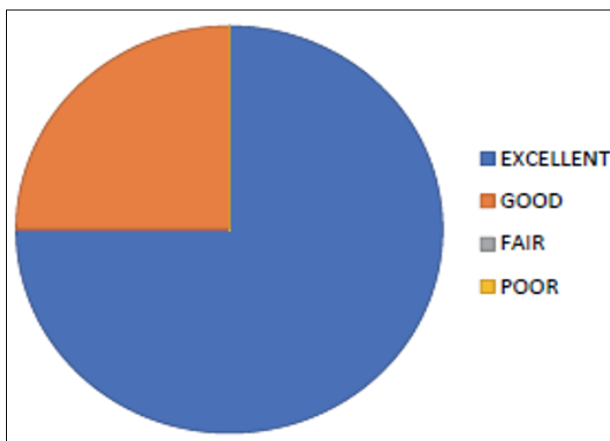


Fig 8: Lysholm knee scoring scale of patients in our study

Between August 2020 to December 2022, 20 patients aged from 18 to 45 years underwent open reduction and internal fixation with 4mm partially threaded cannulated screw and washer was used as per the fracture morphology. Mean follow up period was 10 months. There was a predilection for male sex and majority of them sustained avulsion fracture of Posterior Tibial Spine due to Road Traffic

Accidents. In our study, the mean interval to surgery time was 4 days and surgery was delayed mostly due to the associated injuries which was operated first considering the need for prone position in Burks and Schaffer approach. The mean surgery time was 43.5 minutes Associated injuries include patella fracture, femoral and tibial condyle, shaft of femur and degloving injury thigh in one case. Femoral shaft fracture was fixed by closed reduction with ILN Femur and Tension band wiring was done for patella fracture and k wire fixation done percutaneously for lateral femoral and tibial condyle considering the articular alignment and undisplaced nature of fracture. CT scan was done as an adjunct to x-rays in all cases. Posterior tibial spine avulsion was fixed with one 4mm partially threaded cannulated cancellous screw in 14 cases, two 4mm partially threaded cannulated cancellous screw in 6 cases and washer was used in 10 cases. Except for two patients all others regained 100 degree knee motion within 6 weeks of surgery. For the patients who had less than 100 degree of knee flexion one had associated femoral condyle, tibial condyle, neck of fibula and patellar fracture and the other had shaft of femur and patella fracture. Full flexion to 110 degree or higher was achieved at the end of 4 months in 90 percent of patients. 90% achieved full range of motion within 6 months postop follow up. No instability of knee were recorded in any of the patients. Complications encountered were knee stiffness in 2 cases but both the patients had associated injuries, one patient had intermittent knee pain and guide wire got broken inside proximal tibia in one case. It occurred when we tried to change the direction of guide wire perpendicular to fracture pattern without retrieving back properly. In subsequent cases care was taken while placing guide wire. 75 percent of patients in our study had excellent outcome and 25 percent had good outcome.

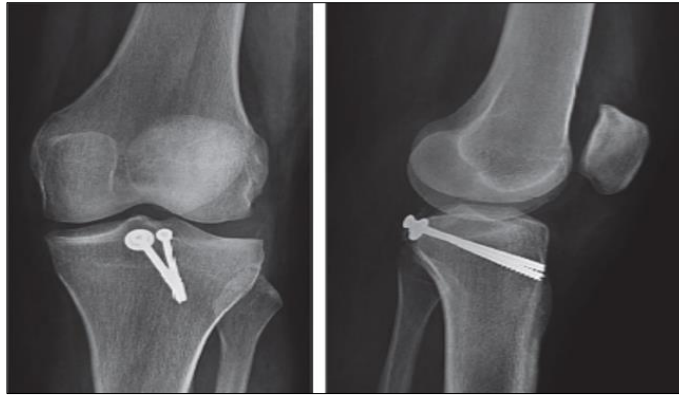


Fig 9: Immediate Post-operative Xray after the procedure

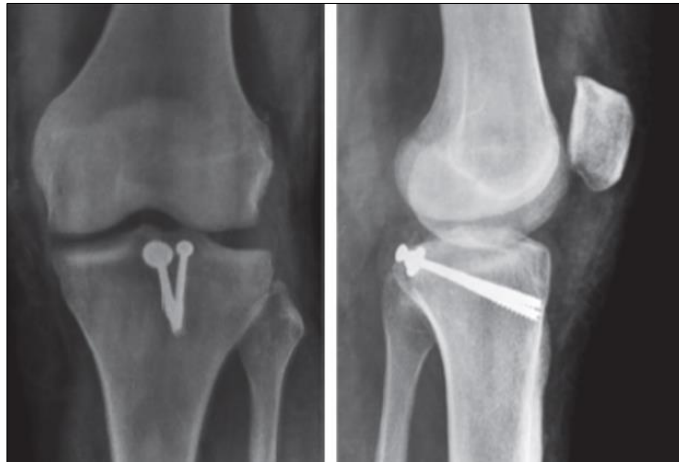


Fig 10: Post-operative Xray after 1 year the procedure



Fig 11: Functional outcome of the patient 1 year after the procedure

Discussion

In patients presenting to emergency department with history of dashboard injury and long bone fractures of lower limb and patella fracture, Posterior Tibial Spine avulsion fracture should be ruled out. There is a high chance that the avulsion fracture may be missed in the initial setup and the fixation of only the associated injuries may lead to knee instability and early arthritis. CT as an adjunct to radiograph in this

situation is a good option. The Burks and Schaffer technique has a much lower surgical time. Due to the lack of complexity of the procedure as encountered with prior approaches and the fact that the vessels and nerves got protected with the retraction of medial head of Gastrocnemius laterally, only fewer complications have been known. Approaching the posterior tibial spine through the medial side of popliteal fossa is therefore relatively safe.

Though the surgeries were performed in the acute stage of injury, there was no arthrofibrosis probably due to the short injury to surgery time interval and adequate physiotherapy. Even though open reduction and internal fixation can be done with multiple available implants, 4mm partially threaded cannulated cancellous screw is an easily available implant which all the patients can afford and the ease of its fixation and the fact that the comminuted fragments can be held with the help of an added washer, gives it major advantage over other implants. The mean duration of

surgery in our study was 43.5 minutes. Lysholm knee scoring scale was used to stratify our results and 75 % of our cases had excellent outcome and 25% had Good outcome. Fair and Poor outcomes were not recorded in any of our cases. Mean Lysholm score in our study was 96.15. No instability were recorded in any of our cases and all they had high patient satisfaction. Our study had a Lysholm score and functional outcome which is in range with previous studies conducted.

Study	No. of patients	Mean follow up in months	Implant Utilised	Mean Lysholm Score
Meyers <i>et al.</i>	6	12	Screw	91
Inoue <i>et al.</i>	31	36	Screw	89.4
Joshi <i>et al.</i>	14	13.5	Screw	97
Khatri <i>et al.</i>	27	22	Screw	90
Our Study	20	10	Screw	96.15

Conclusion

Posterior Tibial Spine fractures treated by screw fixation through Burks and Schaffer approach has very good clinical results. The ease of the approach and fewer complication during exposure and fixation with an easily available and affordable implant and the placement of screw perpendicular to the fracture site with the help of a guide wire and the comminuted fracture fragments can be held with an added washer outweighs the technique over other approaches and fixation implants. Diagnosis of Posterior Tibial Spine avulsion fractures in the acute set up and early surgical fixation through Burks and Schaffer approach with screw fixation will result in excellent functional outcome.

Acknowledgement

Not available

Author's Contribution

Not available

Conflict of Interest

Not available

Financial Support

Not available

References

- Harner CD, Olson J, Irrgang JJ, Silverstein S, Fu FH, Silbey M. Allograft versus autograft anterior cruciate ligament reconstruction. *Clin Orthop.* 1996;324:134-144.
- Shelbourne KD, Grey T. Anterior cruciate ligament reconstruction with autogenous patellar tendon graft followed by accelerated rehabilitation. A two- to nine-year follow-up. *Am J Sports Med.* 1997;25:786-795.
- Shelbourne KD, Nitz P. Accelerated rehabilitation after anterior cruciate ligament reconstruction. *Am J Sports Med.* 1990;18:292-299.
- Rezazadeh S, Solooki S, Aboulhasani S, Reza Vosoughi A. Midterm results of open reduction and internal fixation of isolated posterior cruciate ligament avulsion fracture. *Eur Orthop Traumatol.* 2011;1:191-195.
- Khatri K, Sharma V, Lakhota D, Farooque K. Posterior cruciate ligament tibial avulsion treated with open reduction and internal fixation through the burks and schaffer approach. *Malays Orthop J.* 2015;9:2-8.
- Bianchi M. Acute tears of the posterior cruciate ligament: clinical study and results of operative treatment in 27 cases. *Am J Sports Med.* 1983;11:308-314.
- Jung YB, Tae SK, Lee YS, Jung HJ, Nam CH, Park SJ. Active non-operative treatment of acute isolated posterior cruciate ligament injury with cylinder cast immobilization. *Knee Surgery, Sports Traumatology, Arthroscopy.* 2008 Aug;16(8):729-33. [PubMed]
- Meyers Mh, Mckeever Fm. Fracture of the intercondylar eminence of the tibia. *JBJS.* 1970 Dec 1;52(8):1677-84.
- Abbott LC, CARPENTER WF. Surgical approaches to the knee joint. *JBJS.* 1945 Apr 1;27(2):277-310.
- Trickey EL. Rupture of the posterior cruciate ligament of the knee. *The Journal of Bone and Joint Surgery. British.* 1968 May;50(2):334-41.
- Ogata K. Posterior cruciate reconstruction using iliotibial band. Preliminary report of a new procedure. *Arch Orthop Trauma Surg.* 1980;51:547.
- Burks RT, Schaffer JT. A simplified approach to the tibial attachment of the posterior cruciate ligament. *Clin Orthop.* 1990;254:216-9.
- Gavaskar AS, Karthik B, Gopalan H, Srinivasan P, Tummala NC. A novel MIS technique for posterior cruciate ligament avulsion fractures. *The Knee.* 2017 Aug 1;24(4):890-6. [PubMed]
- Sabat D, Jain A, Kumar V. Displaced posterior cruciate ligament avulsion fractures: a retrospective comparative study between open posterior approach and arthroscopic single-tunnel suture fixation. *Arthroscopy: The Journal of Arthroscopic & Related Surgery.* 2016 Jan 1;32(1):44-53.

How to Cite This Article

Gupta S, Jangir L, Meena RP, Bairwa DK, Meena M. A prospective study of functional outcome of posterior tibial spine chip fractures treated with screw fixation. *International Journal of Orthopaedics and Bone Disorders* 2023; 5(1): 01-09.

Creative Commons (CC) License

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.