

# 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.ojmpe.com](http://www.ojmpe.com)

Index Copernicus International

ICV  
71.64

Indexed

2023  
Jan-Jun

Volume  
29

Issue  
1



**Special Task Force**  
to  
**Counter Attack Tough Pathogens**

**STF-625**

Amoxicillin & Potassium Clavulanate with LB Tabs



Available in Mono carton pack of 6 Tab.



**To Counter Attack Severe Bacterial Infection**

**CEFGEM-T<sup>TM</sup>**

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

**The Powerful Coalition Forces**  
**CEFGEM-PT<sup>TM</sup> INJ.**  
(Piperacilline 4gm & Tazobactum 0.5gm Injection)

*Strike Hard !!!*



Let's give Life an **eXtra** boost !

# EDITORIAL TEAM

**EDITOR** Dr Vivek Singh, Ujjain

**ASSOCIATE EDITORS** Dr. Saket Jati, Indore  
Dr. Anand Ajmera, Indore  
Dr. Pradeep Chaudhari, Indore  
Dr. Saurabh Jain, Indore

**ASSISTANT EDITORS** Dr. Abhishek Pathak, Bhopal  
Dr. T.N.S Gaur, Datia  
Dr. Ashish Sirsikar, Jabalpur

**ADVISORY BOARD** Dr. Anil.K.Jain, Delhi  
Dr. Ish.K.Dhammi, Delhi  
Dr. Alok.C.Agrawal, Raipur  
Dr. D.K.Taneja, Indore  
Dr. Sameer Gupta, Gwalior  
Dr. Sanjiv Gaur, Bhopal  
Dr. Alok Verma, Indore

**SPECIALIST** Dr. Aseem Negi (Trauma)  
Dr. Abhishek Shrivastav (Spine)  
Dr. Pankaj Jindal (Hand)  
Dr. Sunil Rajan (Arthroplasty)  
Dr. Taral Nagda (Paediatrics)  
Dr. Milind Chaudhary (Deformity)  
Dr. Rajiv Raman (Arthroscopy)  
Dr. Manish Purthi (Oncology)

**OVERSEAS BOARD** Dr. Vikram Chatrath, USA  
Dr. Ajay Malviya, UK  
Dr. Dinesh Thawrani, USA  
Dr. Arunangshu Mukherjee, UK  
Dr. Ashish Devan, Australia  
Dr. Yogesh Agrawal, Dubai

**EDITORIAL BOARD** Dr. Deepak Mantri, Indore  
Dr. K.K.Pandey, Jabalpur  
Dr. Rahul Verma, Bhopal  
Dr. Sachin Jain, Gwalior  
Dr. Rajeev Kelkar, Indore  
Dr. Hemant, Surat

# **M.P. ORTHOPAEDICS ASSOCIATION**

## **2022-23**

**PRESIDENT DR SUNEET TONDON, Bhopal**

**PRESIDENT ELECT DR SAKET JATI, INDORE**

**PAST PRESIDENT DR PRAMOD NEEMA, INDORE**

**VICE PRESIDENT DR TNS GAUR, DATIA**  
**DR ABHISHEK PATHAK, Bhopal**

**HON SECRETARY DR R S BAJORIA, Gwalior**

**PAST SECRETARY DR 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. PRADEEP CHAUDHARY, INDORE**

**ASSIST SURGEON WELFARE COMMITTEE DR. D. K. SHARMA, INDORE**

**EXECUTIVE MEMBERS**  
**DR MILIND SHAH, INDORE**  
**DR RAMVILAS MEENA, GUNA**  
**DR LOKESH BISEN, SEONI**  
**DR UTSAV KATAKWAR, Jabalpur**  
**DR ABHILESH JAIN, SAGAR**  
**DR LALIT SHARMA, SEOPUR**  
**DR RAHUL JAIN, Vidisha**  
**DR SACHIN JAIN, Gwalior**  
**DR MAHESH GUPTA, Bhopal**

**ADVISOR DR D K TANEJA**  
**DR N SHRIVASTAVA**  
**DR PRADEEP BHARGAVA**  
**DR J JAMDAR**  
**DR S K LUNAWAT**

# ORTHOPAEDIC JOURNAL OF M. P. CHAPTER

VOLUME 29 | ISSUE 1 | JAN-JUN 2023

## INDEX

S.No.	Title	Author	Page no.
<b>Editorial</b>			
1.	Orthopaedic Residency Program	Singh V	1
<b>Original article</b>			
2.	Prospective study on outcome of distal radius treated with closed reduction and percutaneous pinning	Maravi L S, Sirsikar A, Vidyarthi A, Agam Kant	2-6
3.	Functional and radiological outcome of surgically treated tibial plateau fractures	Singh V, Patidar A, Bhinde S, Agrawal A, Jain P, Jain A, Chouhan R, Kothari N	7-11
4.	A prospective study for initial assessment of functional outcome of high tibial osteotomy in active young adults in early osteoarthritis of knee	Bajoria R S, Parihar Y S, Priyadarshi S	12-17
5.	Fluoroscopic guided capsular distention with and without suprascapular nerve block in frozen shoulder patients a prospective comparative study	Peepra D, Lodhi J S, Gajbhiye S, Vidyarthi A, Chauhan H	18-22
6.	Comparative study between laminectomy and fenestration surgery in lumbar prolapsed intervertebral disc (PIVD)	Singh V, Mehta R, Patidar A, Bhinde S, Agrawal A, Jain P, Soni A, Rathore S S, Gupta N	23-28

## Orthopaedic Residency Program

**Singh V**

*Department of orthopaedics, R D Gardi Medical College, Ujjain, (M.P), India*

There should be one standard orthopaedics residency program to develop competent, qualified and highly skilled orthopaedics residents. Numerous new budding orthopaedic surgeons are coming in the orthopaedics department who are taking their training very casually. This can be prevented by strict orthopaedics residency program which can make them efficient. Basic course of Advance Trauma Life Support (ATLS) should be taught in very first year of residency so that they can apply it in emergency patient management. Thesis review should be done in once in every three months. Journals, seminars and case presentations should be done at daily basis. Complete and comprehensive teaching program can improve the academic skill of the residents. Post graduate residents should be encouraged to attend as many as conferences in their tenure to improve their knowledge. Paper presentation and publication is now essential part of their training, so complete guidance should be given to them. A compulsory anatomy dissection posting should be mandatory for every junior resident. Hands-on cadaver and simulation workshops should be made more accessible to residents at least once in 6 months to improve their surgical skill. e.g., arthroscopy, spine and AO type models. A Basic statistics knowledge is essential, and every orthopaedic trainee should have passed a certified basic statistics examination. There should be one team of one junior resident, one senior resident and one consultant for three years which can monitor the progress of post graduate resident and if any correction is required, can be done immediately. Maintenance of a logbook which should be checked and verified by the respective mentor assigned, is essential. Logbooks serve as a road map of the academic journey of an orthopaedic trainee. The trainee should be assessed and graded at regular intervals, with respect to knowledge, clinical skills, operative skills, personality and ethics. Three years of compulsory senior residency program should be enforced before an orthopaedic surgeon is allowed to practice independently as it would be the best time for a fresh orthopaedic surgeon to decide on the subspecialty of his interest, which he would practice for his lifetime. Further prospects like focussed subspecialties should be encouraged. Orthopaedic surgery is a specialty that has an intense reputation. It's known for being competitive, for having a hard training process and incredibly busy schedule, and for requiring a good deal of personal sacrifice in order to meet the demands of the profession.

### 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, Orthopaedic Residency Program, Ortho J MPC. 2023; 29 (1):1

Available from:

<https://ojmpc.com/index.php/ojmpc/article/view/167>



1. Indian J Orthop. 2021 May; 55(Suppl 1): 209–216 Orthopedic Residency in a Tertiary Care Hospital of India: Positives, Negatives and Perspectives for Change Aman Hooda,1 Mandeep Singh Dhillon,1 Deepak Neradi,1 Deepak Kumar,1 Pulak Vatsya,2 and Akshay Shetty1
2. What Is An Orthopaedic Surgery Residency Really Like? May 6, 2019 by Amy Rakowczyk, [www.studentdoctor.net](http://www.studentdoctor.net)



## Prospective study on outcome of distal radius treated with closed reduction and percutaneous pinning

Maravi L S, Sirsikar A, Vidyarthi A, Agam Kant

Study performed at Department of orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, MP

### Abstract

**Background:** Vast majority of fractures of distal radius are articular injuries that result in disruption of both radiocarpal and radioulnar joints. Therefore, this study evaluates the functional and radiological outcomes of distal radius fractures treated by percutaneous pinning in ulno-carpal joint and distal radius.

**Methodology:** A Prospective Interventional Study conducted at Department of Orthopaedics, N.S.C.B. Medical College and Hospital, Jabalpur (M.P.) with the study population of patients attending OPD and casualty diagnosed with distal Radius fracture from the duration of 1st March 2021 to 31st June 2022. Total of 50 Sample size was taken estimated through the formula  $n = z^2 * pq / d^2$ . Data analysis was done through the IBM software SPSS and the statistical association was found with the Confidence Interval of 95% and  $p$ -value  $> 0.5$ .

**Results:** Total of 50 patients, 30 were male, and 20 were females, who were assessed through follow-up. According to Sarmiento score of range of motion, 6 Patients have excellent score (0-2), 12 patients have good score (3-8), 12 patients have fair (9-20), and 5 patients have poor (above 21).

**Conclusion:** Closed reduction and percutaneous K-wire fixation is a less intrusive, safer, and successful approach to preserve the reduction, avoid radial collapse during healing, and maintain DRUJ stability even when the fracture is extensively comminuted, intra-articular, or unstable.

**Keywords:** Prospective Interventional Study, Percutaneous Pinning technique, Distal Radius fracture, Sarmiento score.

### Address of correspondence:

Dr. Ashok Vidyarthi, MS (Orthopaedics),  
Professor & Head, Department of  
Orthopaedics, Netaji Subhash Chandra  
Bose Medical College, Jabalpur (M. P.)  
E-mail: vidyarthi\_ashok@rediffmail.com

### How to site this article

Maravi L S, Sirsikar A, Vidyarthi A, Agam kant. Prospective study on outcome of distal radius treated with closed reduction and percutaneous pinning. Ortho J MPC. 2023; 29 (1):2-6  
Available from:  
<https://ojmpc.com/index.php/ojmpc/article/view/168>



### Introduction

The development of knowledge about a variety of orthopaedic trauma diseases can be seen in the history of distal radius fractures. Prior to Petit, Pouteau, and Colles, it was thought that a dislocation of the distal radio-ulnar joint (DRUJ) or a carpal injury was the underlying nature of distal radial injury. After writing his thoughts in "On the Fractures of the Carpal Extremity of the Radius" in 1814, Abraham Colles became the first author to describe distal radius fractures in English literature. [1] Although 20% of all fractures treated in

emergency rooms are distal radial fractures, many are not "totally exempt from discomfort" following treatment. More than 1000 peer-reviewed papers have been published on the topic over the previous few decades, yet there is no agreement on the best treatment. The extent to which the anatomy is restored, the quality of the bone, the development of new techniques and devices, the experience and skill of the surgeon, and the results in older populations are just a few of the many confounding factors that exist. [2] The early technique of cast immobilisation and closed reduction has led to malunion, rigid joints, and

deformity. By interfering with the extrinsic hand musculature's mechanical advantage, it has a negative impact on how the wrist and hand work. [3-5] Radius collapse and DRUJ subluxation are frequently caused by closed reduction and POP immobility. [6]

One of the first methods of fixation, percutaneous pinning adds more stability. Depalma described a 45° angle in ulno-radial pinning. [7] Stein recommends adding a second, 2-mm dorsal K-wire with radio-ulnar pinning. [8] Raycheck advised ulno-radial pinning in addition to the fixation of the DRUJ, while Kapandji described double intrafocal pinning into the fracture surface using 2-mm K-wires. [10]

Ligamentotaxis and joint-spanning external fixation immediately neutralize the axial load over the radius and minimize the impacted articular fragments indirectly. [11] For unstable intra-articular fractures, Ruch and Ginn, Schumr, and numerous others described open reduction and internal fixation of the distal radius. [12] Doi et al provided an explanation of arthroscopically guided fracture reduction. [13] Therefore, this study evaluates the functional and radiological outcomes of distal radius fractures treated by percutaneous pinning in ulno-carpal joint and distal radius.

## Methodology

The present study was conducted at the department of orthopaedics, N.S.C.B. Medical College and hospital, Jabalpur (M.P.), after obtaining informed and written consent from the study subjects. Study Design was prospective interventional and study period was from 1st March 2021 to 31st June 2022. Study Population was all the patient attending OPD and casualty of Orthopaedic department with diagnosed distal radius fracture. Convenient sampling method was used and sample size was of 50 patients.

The adequate required sample size was estimated using following formula:

$$n = z^2pq / d^2, \text{ where } -$$

n = sample size

z = 1.96 (considering 0.05 alpha, 95% confidence limits and 80%beta) p = assumed probability of occurrence or concordance of results

q = 1 - p; and d = marginal error (precession)

Inclusion Criteria was patients with fracture of the distal radius (comminuted extra-articular and intraarticular), patients age is of over 55 years and fracture should be operated within 14 days of trauma. Exclusion Criteria was fractures which require open reduction, pathological fractures are ruled out and if there is evidence that the patient will be unable to adhere to trial procedures or complete questionnaires, such as in cognitive impairment.

Base line data collection done by radiological, Biochemical and pathological investigations like X-ray forearm with wrist joint true anteroposterior view and lateral view, complete blood counts, random blood Sugar, serum Uric Acid, serum Creatinine, Liver function tests: SGOT, SGPT, ESR, CRP, Chest X Ray and ECG and HIV/HBsAg/HCV.

The patient was positioned supine on the OT table, with the limb on a side table. Under Regional Anaesthesia (If unsuccessful then it was converted to General Anaesthesia at the discretion of the anaesthetist), the parts were painted and draped. The fracture alignment was achieved by traction – counter traction, and the reduction confirmed by the image intensifier. 1.5- or 2-mm k-wires were passed from the radius styloid crossing the fracture site obliquely to exit the dorso-ulnar cortex of the radius shaft. Another K-wire was passed from the dorso-ulnar aspect of the distal radius between the 4th and 5th extensor compartments and directed to engage the volar radius cortex of the proximal fragment. The exposed ends of the K-wires were then either bent or the ends were inserted into metal balls. The pin sites were then dressed. Then a below elbow slab was applied on the volar surface with the wrist in neutral position.

The limb was raised for 3 days after surgery. After anesthetic wore off, the patient was urged to move his fingers. Three days later, patient allowed to move elbow. Inspection and



dressings of pin locations was done. The patient was discharged, if pin sites and mobilization were good. Weekly pin site inspection and follow-up was required. At four weeks, the pins and slab were withdrawn if there were sufficient symptoms of union, and the patient was given a crepe bandage. Patient was told to gently move his wrist at home. If the union wasn't adequate after four weeks, the patient was observed at five and six weeks. After removing the k-wires, the patient was instructed to move his wrist. No cases showed insufficient union at 6 weeks. After a month, the patient's wrist range of motion was evaluated. If patient's range of motion wasn't adequate, physiotherapist was consulted.

The study was conducted after getting ethical permission taken from the IEC committee of the medical college. Also, the written informed consent from the patients were taken prior to enrolling them for the study.

## Results

Table 1 depicts the Socio-demographic characteristics and clinical presentation of participants, the mean age of participant was  $59 \pm 4.5$  years, where there is predominance of male gender (60%), and 40% were female. Most of the fracture i.e., 56% were in right side while 44% in left side. According to AO classification, 56% were extra articular, 32% were partially articular and only 12 % were completely articular.

Table 1: Demographic characteristic and clinical presentation of study participant

Particulars	Sub particulars	N
Mean Age (in years)	Mean $\pm$ Std Deviation	$59 \pm 4.5$
Sex	Female	20
	Male	30
Affected Side	Left	22
	Right	28
Fracture type (AO Classification)	Extra Articular A	28
	Partially Articular B	16
	Completely Articular C	6

The Table 2 presents the distribution of Sarmiento score with Mean  $\pm$  SD of various groups, where Group A:  $1.68 \pm 1.156$ , Group B:  $10.94 \pm 4.864$  and Group C:  $23.5 \pm 1.049$ . While comparing among three groups, however,

there was statistically significant difference between three groups ( $p > 0.5$ )

Table 2: Distribution of Mean Sarmiento Score

Variable	Group	N	Mean	SD	p-value
SARMIENTO SCORE	A	28	1.68	1.156	0.001
	B	16	10.94	4.864	
	C	6	23.5	1.049	
	Total	50	7.26	7.912	

\*ANOVA TEST

Table 3 concluded the distribution of Excellent Percentage of Sarmiento's Modification of Lindstrom Criteria. In Group A: 89.3%, Group B: 12.5% and Group C: 0%. Distribution of Percentage of Fair Sarmiento's Modification of Lindstrom Criteria in Group A: 75%, Group B: 0% and Group C: 24%. Distribution of Good Percentage of Sarmiento's Modification of Lindstrom Criteria in Group A: 10.7%, Group B: 12.5% and Group C: 0%. Distribution of Poor Percentage of Sarmiento's Modification of Lindstrom Criteria in Group A: 0%, Group B: 0% and Group C: 100%. Meanwhile, there was Statistically highly significant difference between all groups ( $p < 0.001$ ).

Table 3: Distribution of Sarmiento's Modification of Lindstrom Criteria among Subjects

Variable	Group			Total
	A	B	C	
Excellent	25	2	0	27
	89.3%	12.5%	0%	54%
Fair	0	12	0	12
	0%	75%	0%	24%
Good	3	2	0	5
	10.7%	12.5%	0%	10%
Poor	0	0	6	6
	0%	0%	100%	12%
Total	28	16	6	50
	100%	100%	100%	100%

\*Pearson Chi-square value: 85.013a;

\*p-value  $< 0.001$  (highly significant)

Table 4 depicts the demerit point system of Gartland and Werley with Sarmiento et al.'s modification in which 42% (21) participant were having excellent score, 24% (12) cases were having good score and 24% (12) were having fair score and only 8% (05) were having poor score.

Table 4: Distribution based on demerit point system of Gartland and Werley with Sarmiento modification.

Particulars	Score	No. of cases
Excellent	0-2	21
Good	3-8	12
Fair	9-20	12
Poor	>21	05

## Discussion

All the fifty cases of distal radius fractures united in an average period of 6.8 weeks. Excellent results were observed in 21 patients (42%), good results in 12 cases (24%), while 12 cases (24%) had fair results and 5 cases (10%) were having poor results. The duration from the date of injury to the date of operation ranged from 1 to 14 days (average 5.50 days).

Our study's consequences included wrist post traumatic arthritis (n = 2), inferior radio-ulnar joint subluxation (n = 2), Sudeck's osteodystrophy (n = 1), and malunion (n = 2). Due to a lack of infrastructure, closed reduction and POP immobilization are still used in many areas. However, because it cannot stop early radial collapse and its associated consequences of malunion, wrist discomfort, and stiffness, this treatment has a high failure probability in unstable distal radius fractures. [15] According to Sarmiento, it is appropriate for stable extra-articular distal radius fractures.

An intra-articular incongruity greater than 2 mm is primarily associated with misalignment and unsatisfactory results. Loss of wrist flexibility and function is linked to dorsal angulation more than 20 degrees. Loss of forearm rotation is linked to radial shortening of > 4 mm, while ulnar wrist pain is linked to radial shortening of > 5 mm. [16]

Therefore, a sustained decrease with 1-2 mm of articular displacement, 10o of dorsal angulation, and 2-3 mm of radial shortening are appropriate treatment objectives for an active person. [16] By using ligamentotaxis, external fixation can maintain the radial length and inclination but not the palmar tilt. According to Sanders et al. (1991) and Chang (1999), complications like infection and tendon injury are directly attributable to the pin placement in as many as 55% of cases.

The well-known procedure of closed reduction and percutaneous pinning was first described by Kapandji in 1976. [9] He has backed traditional double intrafocal pinning for distal radius fractures that are unstable. The identical fracture was pinched by Nonnenmaclor and Kempfe in 1988 and then Green in 1992, both of whom reported successful outcomes. [17] In 1997, Naidu et al. discovered that the cross pinning of a distal radius fracture is a biomechanically robust construct in both torsion and cantilever bending stresses. [18] Depalma described ulno-radial pinning drilled at a 45° angle, 4 cm proximal to the ulnar styloid, in cases of distal radius fracture with unstable DRUJ. [7]

Ulna-radial pinning with DRUJ fixation was described by Rayhack. [10] While Py and Desmanet have recommended elastic pinning for comminuted unstable distal radius fractures to successfully stop the secondary displacement of shattered pieces. In the previous decade, orthopaedic surgeons worldwide advocated open reduction and internal fixation for comminuted, intra-articular distal radius fractures. Volar and dorsal plating with newer implants and procedures gives secure fixation and early functional improvement. Tamara D. Rozental's investigations reveal that percutaneous pinning and plating are both effective in long-term functional outcome. [19]

## Conclusion

Closed reduction and percutaneous K-wire fixation is a less intrusive, safer, and successful approach to preserve the reduction, avoid radial collapse during healing, and maintain DRUJ stability even when the fracture is extensively comminuted, intra-articular, or unstable. Patients treated with closed reduction and percutaneous pinning for distal radius fractures had excellent range of motion, normal range of the Arm, Shoulder, and Hand scores and no significant differences in the radiographic parameters between fracture fixation and fracture healing. Complications were few. Furthermore, Pinning is an efficacious, low-cost treatment option for 2- and 3-part distal radius fractures with excellent long-term results.

As the study was done in public sector hospital setting, all the strata of community not available in equal size, most of participants were either from lower or lower middle class. There was a smaller number of follow-up patients as some of them were went-through the loss to follow-up, and also minimal sample size could not make the results to get generalized on the larger scale.

## References

- 1 McQueen MM. Rockwood and Greens Fractures in Adults. 8th ed., Vol. 1. Lippincott William and Wilkins: Fractures of the Distal radius and Ulna; 2014. p. 1057.
- 2 Terry Canale S, Beaty JH. Campbell's Operative Orthopaedics. 12th ed., Part 15, Fractures and Dislocations in Adults. Mosby: Distal Radius Fracture; 2012. p. 3147.
- 3 Zemel NP. The prevention and treatment of complications from fractures of the distal radius and ulna. *Hand Clin* 1987;3:1-11.
- 4 Gofton W, Liew A. Distal radius fractures: non-operative and percutaneous pinning treatment options. *Orthop Clin North Am* 2007;38:175-85.
- 5 Fernandez DL, Jupiter JB, editors. Fractures of the distal radius: A practical approach to management. New York, NY: Springer-Verlag; 1996
- 6 Arora J, Kapoor H, Malik A, Bansal M. Closed reduction and plaster cast immobilization Vs. external fixation in comminuted intra-articular fractures of distal radius. *Indian J Orthop* 2004;38:113-7.
- 7 Depalma AF. Comminuted fractures of the distal end of the radius treated by ulnar pinning. *J Bone Joint Surg Am* 1952;24 A: 651-62.
- 8 Stein AH Jr., Katz SF. Stabilization of comminuted fractures of the distal inch of the radius: Percutaneous pinning. *Clin Orthop Relat Res* 1975;108:174-81.
- 9 Kapandji A. Internal fixation by double intrafocal pinning: Functional treatment of nonarticular fractures of the distal radius [French]. *Ann Chir Main* 1987;6:57.
- 10 Rayhack JM, Langworthy JN, Belsole RJ. Transulnar percutaneous pinning of displaced distal radial fractures: A preliminary report. *J Orthop Trauma* 1989;3:107-14.
- 11 Nagi ON, Dhillon MS, Aggarwal S, Deogaonkar KJ. External fixators for intra-articular distal radius fractures. *Indian J Orthop* 2004;38:19-22.
- 12 Ruch DS, Ginn TA. Open reduction and internal fixation of distal radius fractures. *Op Tech Orthop* 2000;13:138-43.
- 13 Doi K, Hattori Y, Otsuka K, Abe Y, Yamamoto H. Intra-articular fractures of the distal aspect of the radius: Arthroscopically assisted reduction compared with open reduction and internal fixation. *J Bone Joint Surg Am* 1999;81:1093-110.
- 14 Meena S, Sharma P, Sambharia AK, Dawar A. Fractures of distal radius: An overview. *J Family Med Prim Care* 2014;3:325-32.
- 15 Kim JY, Tae SK. Percutaneous distal radius-ulna pinning of distal radius fractures to prevent settling. *J Hand Surg Am* 2014;39:1921-5.
- 16 Srinivas C, Vadlamani K V P, Moorthy G V S, Satish P. Functional outcome of unstable distal radius fractures-Treated by closed reduction and percutaneous K-wire fixation. *J Evolut Med Dent Sci* 2015;4:14989-97.
- 17 Green DP. Pins and plaster treatment of comminuted fractures of the distal end of the radius. *J Bone Joint Surg Am* 1975;57:304-10.
- 18 Naidu SH, Capo JT, Moulton M, Ciccone W 2nd, Radin A. Percutaneous pinning of distal radius fractures: A biomechanical study. *J Hand Surg Am* 1997;22:252-7.
- 19 Alexa O, Popia I. Py-Desmanet pinning in distal radius fractures. *Rev Med Chir Soc Med Nat Iasi* 2009;113:1155-9.

## Functional and radiological outcome of surgically treated tibial plateau fractures

Singh V, Patidar A, Bhide S, Agrawal A, Jain P, Jain A, Chouhan R, Kothari N

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

### Abstract

**Background:** Tibial plateau fractures are difficult to treat. The spectrum of treatment ranges from simple casting and bracing to skeletal traction and open reduction and internal fixation.

**Material and Method:** The present study included 30 patients (17 males; 13 females, mean age 40.33±12.7 years; range, 18 to 65 years) with tibial plateau fractures who were treated with various modalities. In our series, all patients were treated operatively out of which 15 (50.0%) were managed by ORIF with lateral plate, 8 (26.7%) patients were managed by CRIF with CC screw, 4 (13.3%) ORIF with lateral plate with CC screw, 2 (6.7%) ORIF with medial plate and 1 (3.3%) CRIF with CC screw. In all patients, similar standard physical rehabilitation therapy was followed. All complications including intra and post-operative were assessed and recorded.

**Results:** The functional outcome was assessed using Harkonen-Jarvinen criteria after a mean follow-up of 8 months. The statistical analysis was done using the paired t-test. All patients showed excellent or good results according to H J criteria. In the present study, there were no cases of secondary loss of reduction, failure of the implant, malunion, or non-union.

**Conclusion:** The surgical management of tibial plateau fractures is an orthopaedic challenge and needs a comprehensive understanding of fracture, soft tissue, time interval from injury to surgery and post-operative rehabilitation. Modalities like LCP in MIPPO and bone grafting can give excellent results in desirable patients but requires an optimum learning curve.

**Keywords:** H J criteria; Functional and radiological outcome; tibial plateau fracture.

### 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, Patidar A, Bhide S, Agrawal A, Jain P, Jain A, Chouhan R, Kothari N. Functional and radiological outcome of surgically treated tibial plateau fractures. Ortho J MPC. 2023; 29 (1):7-11

Available from:  
<https://ojmpc.com/index.php/ojmpc/article/view/169>



### Introduction

Tibial plateau fractures occur when proximal tibia experiences an excessive axial load. The mechanism of injury and the energy required to cause these fractures are age dependent. Younger patients tend to sustain these fractures secondary to high energy trauma such as fall from height and motor vehicle accidents, while older patients sustain tibial plateau fractures secondary to low energy trauma such as low-level fall or stumble. The management of these types of injuries has for long been subject of controversies. The spectrum of

treatment ranges from simple casting and bracing to skeletal traction and early motion to open reduction and internal fixation.<sup>1,2</sup> Moreover, the appropriate treatment for injuries of different severities is unclear. A brief review of literature reveals that different avenues are being explored for these fractures. Ali, et al reported a 31% fixation failure for tibial plateau fracture in their elderly population.<sup>3</sup> Stevens et al noted that only 57% of cases showed good functional outcome after surgical management of tibial plateau fractures in less than 40 years age.<sup>4</sup>

Open reduction and internal fixation has a significant complication rate.<sup>5,6</sup> So a middle path of minimally invasive technique of closed reduction by ligamentotaxis and stabilizing the fracture by limited internal fixation was developed and practised to overcome the drawbacks of non-operative and operative modalities.<sup>7-9</sup> These techniques utilize percutaneous screws and Kirschner wires (K wires), external fixation frames or combination of external fixation with limited internal fixation.<sup>7-10</sup> The minimally invasive technique of closed reduction by ligamentotaxis and fixation with percutaneous screws and K wires, combines attributes to both operative and non-operative philosophies.

Therefore, there are various modalities for surgical management of tibial plateau fractures ranging from percutaneous screw fixation to plating (unicondylar to bicondylar), MIPO technique of fixation to external fixator application. Various studies have shown efficacy of these methods of fixation with satisfactory results but no general consensus exists as to which modality is best in terms of results and functional outcome and proving superiority of one over the other. With this aim in mind, this study was conducted to determine the efficacy of different practiced methods of fixation of proximal tibial plateau fractures and if one method was superior to other.

### Material and method

This is a prospective study done to assess the functional and radiological outcome of proximal tibial fractures treated by surgical method of treatment in 30 patients over the period of 2 ½ years from August 2020 to December 2022 at Department of Orthopaedics, CR Gardi Hospital at Ruxmaniben Deepchand Gardi Medical College and Hospital, Ujjain(M.P.).

After obtaining clearance and approval from the institutional ethical committee and patients fulfilling the inclusion / exclusion criteria were included in the study after obtaining informed consent.

Inclusion criteria was patients willing for surgical method of treatment, age of patient greater than 18 years, medically and surgically fit patients, patients who were ambulatory

before injury, radiologically diagnosed tibial plateau fractures and patients consenting to participate in study.

Exclusion criteria was skeletally immature patients having age < 18 years, patients who are medically and surgically unfit or with life threatening illness or having neurovascular injury, patients treated with non-surgical modality of treatment and patients not consenting to participate in study.

30 cases of tibial plateau fractures were treated with various surgical modalities and were followed up for a period of 2 and half years and their functional outcome was evaluated using H-J criteria.



Figure 1: Preoperative x-ray of 50-year-old Male, Schatzker type – 4 operated with lateral condyle locking plate



Figure 2: Immediate post operative x-ray



Figure 3: X-ray at 6 Month follow up





Figure 4-Six months follow up showing good range of movements

## Results

A total 30 number of cases were included in this study. Majority of patients were male 17 (56.7%) mostly because the most common mode of injury was road traffic accident (80%) and males are more involved in outdoor activities. Twenty-two patients were operated within less than 5 days of injury and showed excellent to good results.

Table 1: Age, gender, mode of injury, side of injury and surgery interval distribution

		N	%
Age groups	< = 30 years	9	30.0%
	31 - 40 years	7	23.3%
	41 - 50 years	6	20.0%
	> 50 years	8	26.7%
Sex	Female	13	43.3%
	Male	17	56.7%
Mode of injury	Fall from height	6	20.0%
	RTA	24	80.0%
Side injured	Left	11	36.7%
	Right	19	63.3%
Injury to surgery interval (in days)	<= 5 days	22	73.3%
	> 5 days	8	26.7%

Table:2 Schatzker type, procedure, follow up, surgery duration and outcome of the cases

		N	%
Schatzker type	1	8	26.7
	2	15	50.0
	3	4	13.3

Procedure	4	2	6.7
	5	1	3.3
	CRIF with CC screw	8	26.7
	ORIF with bicondylar plate	1	3.3
	ORIF with lateral plate	15	50.0
Surgery duration (in min)	ORIF with lateral plate with CC screw	4	13.3
	ORIF with medial plate	2	6.7
Surgery duration (in min)	<= 45 min.	16	53.3%
	>45 min	14	46.7%
Follow up time (in month)	<= 6 months	17	56.7%
	> 6 months	13	43.3%
Functional Outcome (H-J Criteria)	Poor	1	3.3%
	Average	5	16.7%
	Good	8	26.7%
	Excellent	16	53.3%

The distribution of patients according to Schatzker classification and their outcome of treatment are summarized. In our series all patients were treated operatively, out of which 22 (73.3%) were managed by CRIF with cannulated cancellous screws, 8 (24.7%) patients were managed by ORIF with various modalities. 16 (53.3%) cases were operated in less than 45 min. and 14 (46.7%) in more than 45 min. 17 (56.7%) followed less than 6 months and 13 (43.3%) more than 6 months. By H-J criteria in 16 (53.3%) cases excellent result, 8 (26.7%) good, 5 (16.7%) fair and 1 (3.3%) poor were found.

## Discussion

Tibial plateau fractures, one of the commonest intra articular fractures, are major traumatic injury occurring due to road traffic accidents, fall from height, violence etc. It is sometimes associated with other bony or soft tissue injuries. Any fracture around the joint (especially weight bearing joint in the lower limb) is of paramount importance as it would result in significant morbidity and quality of life. Hence, the treatment of upper tibial fractures with intra articular extension has become a challenge for orthopaedic surgeons. Keeping this aim at high, we presented the clinical study of surgical treatment of 30 closed tibial plateau fractures. The analysis of the results was made in terms of age, sex distribution, mode of violence, analysis of the type, modalities of



treatment, complications and the functional outcome. We have endeavoured to present the various types of tibial plateau fractures in our Indian setup. It is found that the zeal of modernization, mechanization and industrial development made more automobile accidents due to increase in population and automobiles. The majority of fractures occur between 20 to 50 years of age with maximum incidence involving productive age group of 30 to 50 years (43%). The mean age in this study was 40.33 years. In a similar study done by Rasmussen et al the average age of patients was 45 years.<sup>11</sup> In our series the majority of patients were male (56.7%). This can be attributed to our Indian set up where the female population largely remains indoors and is less prone to automobile accidents. In this study the commonest mode of injury was road traffic accident (80%) and next being fall. This correlates well with previous study by Chiaux et al who in their series reported that 71% of the injuries occurred due to RTA. (12) There was a significant preponderance to the right side in laterality of the fracture (63.3%). In this series we studied 30 cases of simple tibial plateau fractures treated only by surgical method. Different authors use different criteria for surgical management of these fractures. Seppo E Honkkoenen in his series of 130 tibial plateau fractures, conducted surgery taking into consideration condylar widening of >5 mm and lateral condyle step off >3 mm.(13) The indication for surgery in these types of injuries has evolved steadily with time. Burri, et al in his study in 1979 advised internal fixation at 1 mm of depression, Hohl et al and Segal et al advocated fixation at 5 mm of depression and Honkonen et al took 3 mm of depression in consideration in his study in 1993.<sup>13-16</sup> In our series 8 patients were classified as Schatzker's type I, 15 patients were classified type II, 4 patients were classified type III, 2 patients were type IV and 1 patient was classified as Schatzker's type V fractures. Functional outcome by H-J criteria excellent results in 16 (53.3%) cases, good in 8 (26.7%), fair in 5 (16.7%) and poor in 1 (3.3%) case. These results are at par with other documented studies. Ebraheim et al in his series of 117 tibial plateau fractures had excellent results in 68% of cases, good in 13%, fair in 11% and poor in 8% of the patients.<sup>17</sup>

## Conclusion

The surgical management of tibial plateau fractures is an orthopaedic challenge and needs a comprehensive understanding of fracture, soft tissue, time interval from injury to surgery and post-operative rehabilitation. Modalities like LCP in MIPPO and bone grafting can give excellent results in desirable patients but requires an optimum learning curve. The functional outcome is inversely proportional to the severity of the fracture. Bicondylar fractures, compound fractures, advanced age are less likely to have favourable results as compared to unicondylar fractures, closed fractures and younger age group patients. Infection rates are minimal in MIPPO as there is minimal soft tissue injury and preservation of vascularity and fracture hematoma. Malunion is one of the complications and therefore careful attention has to be given to overcome this by achieving anatomical reduction and stable implant fixation.

## References

1. De Coster TA, Nepola JV, el-Khoury GY. Cast brace treatment of proximal tibia fractures. A 10 year follow up study. Clin Orthop Relat Res. 1988;231:196-204.
2. Apley AG. Fractures of tibial plateau. Clin Orthop North Am. 1979;10:61-74.
3. Ali AM, El-Shafie M, Willet KM. Failure of fixation of tibial plateau fractures. J Orthop Trauma. 2002;16(5):323-9.
4. Stevens DG, Beharry R, McKee MD, Waddell JP, Schemitsch EH. The long-term functional outcome of operatively treated tibial plateau fractures. J Orthop Trauma. 2001;15(5):312-20.
5. Schatzker J, McBroom R, Bruce D. The tibial plateau fracture: the Toronto experience 1968-1975. Clin Orthop. 1979;138:94-104.
6. Yong MJ, Barrack RL. Complications of internal fixation of tibial plateau fractures. Orthop Rev. 1994;23(2):149-54.
7. Keogh P, Kelly C, Cashman WF, McGuinness AJ, O'Rourke SK. Percutaneous screw fixation of tibial plateau fractures. Injury. 1992;23(6):387-9.
8. Duwelius PJ, Rangitsch MR, Colville MR, Wall TS. Treatment of tibial plateau fractures by

- limited internal fixation. *Clin Orthop Relat Res.* 1997;339:47-57.
9. Marsh JL, Smith ST, Do TT. External fixation and limited internal fixation for complex fractures of tibial plateau. *J Bone Joint Surg Am.* 1995;77(5):661-73.
  10. Mikulak SA, Gold SM, Zinar DM. Small wire external fixation of high energy tibial plateau fractures. *Clin Orthop Relat Res.* 1988;356:230-8.
  11. Rasmussen PS. Tibial condyle fractures. Impairment of knee joint stability and indication for surgical intervention. *J Bone Joint Surg Am.* 1973;55(7):1331-50.
  12. De Mourgues G, Chiasson D. Treatment of tibial plateau fractures. *Rev Chir orthop Reparatrice Mot.* 1969;55(6):575-6.
  13. Honkonen SE. Indications for surgical treatment of tibial condyle fractures. *Clin Orthop Relat Res.* 1994;302:199-205.
  14. Burri C, Bartzke G, Coldewey J, Muggler E. Fractures of tibial plateau. *Clin Orthop Relat Res.* 1979;138:84-93.
  15. Bowes DN, Hohl M. Tibial condyle fractures. Evaluation of treatment and outcome. *Clin Orthop Relat Res.* 1982;171:104-8.
  16. Segal D, Malik AR, Merrick J, Wetzler MJ, Franchi AV, Whitelaw GP. Early weight bearing of lateral tibial plateau fractures. *Clin Orthop Relat Res.* 1993;294:232-7.
  17. Ebraheim NA, Sabry FF, Hama SP. Open reduction and internal fixation of 117 tibial plateau fractures. *Ortho Blue Journal.* 2004;27(12):1281-7.

## A prospective study for initial assessment of functional outcome of high tibial osteotomy in active young adults in early osteoarthritis of knee

Bajoria R S, Parihar Y S, Priyadarshi S

Study performed at Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior (M. P.)

### Abstract

**Introduction:** Knee osteoarthritis is typically the result of wear and tear and progressive loss of articular cartilage. Common clinical symptoms include knee pain, stiffness and swelling that worsens over time. Osteoarthritis commonly affects the medial compartment of knee giving rise to varus deformity. High tibial osteotomy (HTO) is a valuable treatment modality in correcting malalignment and thereby relieving the symptoms associated with medial unicompartmental osteoarthritis.

**Methodology:** Twenty-eight young patients with complaints of knee pain were screened and those diagnosed as early knee osteoarthritis (grade I-III on Kellgren-Lawrence grading scale) were operated by high tibial osteotomy. Follow-up evaluation was done at 3, 6 and 9 months by Knee Society Scoring Scale and Visual Analogue Scale (VAS) for pain.

**Results:** The mean knee score was 53.3 pre-operatively and post-operatively the score improved gradually to the mean of 83.2 at 9 months. The visual analog scale for pain in all patients showed a significant improvement at the final follow-up.

**Conclusion:** High tibial medial opening wedge osteotomy is a good option in the treatment of unicompartmental osteoarthritis knee. It relieves pain and improves functional outcome. Accurate preoperative planning and good surgical technique gives better results.

**Keywords:** High tibial osteotomy, active young adults, early osteoarthritis of knee.

### 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, Parihar Y S, Priyadarshi S. A prospective study for initial assessment of functional outcome of high tibial osteotomy in active young adults in early osteoarthritis of knee. Ortho J MPC. 2023; 29 (1):12-17

Available from:

<https://ojmpc.com/index.php/ojmpc/article/view/170>



### Introduction

Knee osteoarthritis (OA), also known as degenerative joint disease, is typically the result of wear and tear and progressive loss of articular cartilage. It is most common in the elderly. Knee osteoarthritis can be divided into two types, primary and secondary. Primary osteoarthritis is articular degeneration without any apparent underlying reason. Secondary osteoarthritis is the consequence of either an abnormal concentration of force across the joint as with post-traumatic causes or abnormal articular cartilage, such as rheumatoid arthritis (RA).[1]

Osteoarthritis of knee is chronic debilitating disease-causing considerable disability which is increasing in incidence even in younger population. Global statistics reveal that osteoarthritis accounts for 3% of total global 'years lived with disability' and is associated with significant health and welfare costs. On an average 3.62 per hundred yearly prevalence was found, it increased from 3.31 (2011) to 3.91 (2014). Females were 63%, whereas males were 37%. Among overall prevalent cases, 4.23% were undergone total knee arthroplasty surgeries. Compared to males, odd for females was found at high risk (1.393) Common clinical symptoms include knee pain that is gradual in onset and worse with activity,

knee stiffness and swelling, pain after prolonged sitting or resting, and pain that worsens over time. Treatment for knee osteoarthritis begins with conservative methods and progresses to surgical treatment options when conservative treatment fails.[2]

Osteoarthritis commonly affects the medial compartment of knee giving rise to varus deformity in majority of cases. Significant varus deformity further aggravates the pathology due to medialization of the weight bearing axis. High tibial osteotomy (HTO) is a valuable treatment modality in correcting malalignment and thereby relieving the symptoms associated with medial unicompartmental osteoarthritis.

The goals of HTO are twofold: 1) to reduce knee pain by transferring weight-bearing loads to the relatively unaffected lateral compartment in varus knees; and 2) to delay the need for a knee replacement by slowing or stopping destruction of the medial joint compartment. This is achieved by a partial unloading of the medial compartment with a slight overcorrection of the mechanical axis (from 6 to 10° of valgus). Hence this study is done to assess the functional outcome in active young adults with early osteoarthritis knee undergoing High Tibial Osteotomy using knee society score.

## Material and Method

It is a prospective interventional single center study conducted in Department of Orthopaedics, Gajra Raja Medical College, Gwalior, during the period between 2022 to June 2023 after permission from Institutional Ethical committee. The young patients between the age group of 40-60 years attending the OPD with complaints of knee pain and disability resulting from osteoarthritis were screened and those classified in grade I to III on the Kellgren-Lawrence grading scale (early knee osteoarthritis) were chosen for the study. Exclusion criteria was patients with secondary osteoarthritis, tumors, metabolic diseases of bone, patient receiving steroid injection within past 6 months, more than 20 degrees of correction needed and hemoglobin less than 10 mg%. Twenty-eight patients were included in the study after prior well-informed written consent and were assessed preoperatively and

postoperatively with Knee Society score. All the data are entered into the protocol proforma and are analyzed by statistical analysis using SPSS version 16. Mean, Standard Deviation, Chi-square test are used to analyze the result and test the significance.

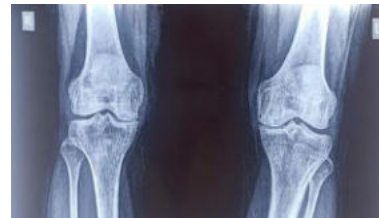


Fig 1. X-ray image of bilateral knees showing early osteoarthritis changes.



Fig 2. Pre-operative scannogram of the patient.

**Surgical technique:** A skin incision made on the medial aspect of proximal tibia, longitudinal incision starting just below the joint line between the medial border of patellar ligament and posterior margin of tibia, subcutaneous tissue dissected and pes anserinus retracted posteriorly. this exposes medial collateral ligament and dissected until posteromedial cortex of proximal tibia is exposed then leg is placed in full extension and knee joint is placed in exact AP view under fluoroscopy. 2 mm K-wire is passed starting from medial cortex about 4 cm below joint line to proximally towards lateral cortex about 1 cm below joint line. Second k-wire is passed parallel and anterior to first one than osteotomy cut is made along the k wires leaving 1 cm of lateral cortex intact. Attention must be given to complete the osteotomy of posteromedial tibial cortex. Osteotomy site is opened with valgus stress. It should be opened slowly in order to prevent fracturing of the lateral cortex. After opening the osteotomy site, HTO plate along with

attached metal block is inserted and locked with locking screws.



Fig 3. C-arm image of K-wire insertion.



Fig 4. C-arm image of osteotome insertion.



Fig 5. Intra operative of HTO plate fixation

Post operative protocol was static quadriceps and ankle pumping exercises started on the day of surgery. Non weight bearing walking advised for 6 weeks and partial weight bearing for 6 to 12 weeks. Complete weight bearing started after 12 weeks. Follow-up evaluation at 3, 6 and 9 months is done by knee society scoring scale and VAS for pain.

## Results

### Patient 1



Fig 6. Post operative 6 month follow up scannogram



Fig 7. Post operative 6 month follow up xray Patient 2

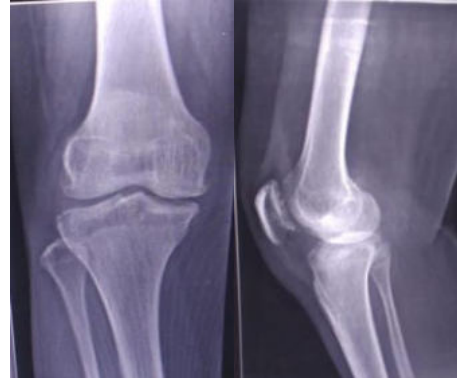


Fig 8. Pre op xray of patient 2



Fig 9. Post of 6 month follow up



Fig 10- post op 9 month follow up of patient

Table 1 shows that the age of the patients had ranged from 40 – 60 years with a mean age of 50.3 years and maximum number of patients were in the age group of 51-55 years (35%). Among the 28 patients 18 were females and 10 were males. For majority of the patient's right side of the knee (58%) was involved and in 5 patients bilateral knee was involved. 53.5% of the patients had grade III type of Osteoarthritis followed by grade II type (35.8%) of Osteoarthritis (Table 3).



The grading of the knee society was done as score below 60 was considered as poor, score 60 – 69 was considered as fair, score 70 – 79 was good and score 80 – 100 is excellent. The mean knee score was 53.3 pre-operatively which was considered as poor. All the patients were followed at the interval of 3, 6 and 9 months and the patients knee score were assessed using the standard orthopedics knee society protocol. Table 4 shows that the patients total knee score gradually improved over the period. The score was initially in the range of fair to good i.e.  $62.1 \pm 3.5$  at 3 months and  $74.5 \pm 5.3$  at 6 months and at the 9<sup>th</sup> month it was excellent ( $83.2 \pm 6.2$ ) which was proven to be statistically significant ( $p < .0001$ ). On visual analogue scale for pain, the score of 0 was considered as no pain, score 1-3 was mild pain, score 4-6 was moderate pain and 7-10 was severe pain. The pVAS also showed gradual improvement from  $5.1 \pm 0.9$  at 3 months,  $3.5 \pm 1.2$  at 6 months to  $2.2 \pm 0.9$  at 9 months which was proven to be statistically significant ( $p < .0001$ ).

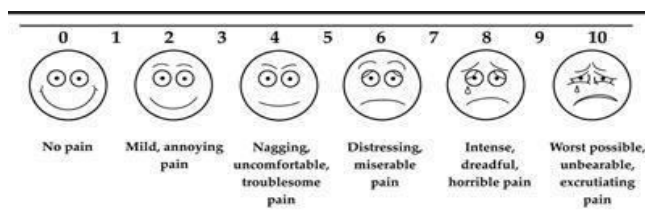


Table 5 shows that the patients who were in the grade of poor based on the total knee score before the high tibial osteotomy had improved to excellent after the surgery. The average pVAS in all patients improved from  $7.4 \pm 1.5$  points preoperatively to  $2.2 \pm 0.9$  points at the final follow-up.

In our study, the medial tibio-femoral joint space was increased and there was radiological benefit as valgus angle was increased.

Out of 28 patients, complications were noted in total 6 patients (table 6). Infection was reported in 2 patients and was the most common complication in our study. There was loss of angle correction radiologically in 2 patients on follow-up, despite the on-table angle correction. Impinging of implant was reported in 1 patient. Deformity at the joint was noted in 1 patient on follow-up.

**Table 1:** Age wise distribution of the study population.

Age in years	Frequency	Percentage
40-45	4	14
46-50	5	18
51-55	10	35
56-60	9	33
Total	28	100
<b>Mean age (in years)</b>	50.3	

**Table 2:** Gender wise distribution of the study population.

Gender	Number	Percentage
Male	10	36
Female	18	64
<b>Total</b>	<b>28</b>	<b>100</b>

**Table 3:** Distribution of the study population based on grading of Osteoarthritis by Kellgren and Lawrence

Grading of Osteoarthritis	Frequency	Percentage
I	3	10.7
II	10	35.8
III	15	53.5
<b>Total</b>	<b>28</b>	<b>100</b>

**Table 4:** Mean and Standard Deviation of the knee society score among the study population after high tibial osteotomy.

Score	Postoperative period (Mean±SD)			P value
	3 months	6 months	9 months	
<b>Knee Society Score</b>	$62.1 \pm 3.5$	$74.5 \pm 5.3$	$83.2 \pm 6.2$	<.0001
<b>Visual Analogue Scale (VAS) for pain</b>	$5.1 \pm 0.9$	$3.5 \pm 1.2$	$2.2 \pm 0.9$	<.0001

**Table 5:** Mean and Standard Deviation of the Knee society Score before and after high tibial osteotomy.

Score (Mean±SD)	Before surgery	After surgery (end of 9 months)	P value
<b>Knee Society Score</b>	$53.3 \pm 2.1$	$83.2 \pm 6.2$	<.0001
<b>Visual Analogue Scale (VAS) for pain</b>	$7.4 \pm 1.5$	$2.2 \pm 0.9$	<.0001

P value derived by applying paired T test



**Table 6:** Post-operative complications in study population.

Complication	Number of patients	Percentage
Infection	2	7.1
Loss of angle correction	2	7.1
Impingement of implant	1	3.5
Deformity	1	3.5

## Discussion

The present study had shown a favorable outcome for high tibial osteotomy and the 28 osteoarthritis patients with varus deformity had shown a statistically significant improvement in knee society score at 9 months follow-up following the surgery.

Ivarsson et al. [3] performed 99 lateral closing wedge High Tibial Osteotomy, fixed with staples and immobilized in a cast. They reported 75% of good and acceptable outcomes at 5.7 years and 60% at 11.9 years.

Asik et al. [4] performed 65 open wedge osteotomies fixed with the Puddu plate. They reported significant improvement of pain and knee function at an average follow-up of 34 months.

In our study there was significant improvement in pain with improvement on VAS from  $7.4 \pm 1.5$  to  $3.50 \pm 1.2$  in 6 month follow up to  $2.2 \pm 0.9$  in 9 month follow up

Giuseffi, Steven A. et al (2015) [5] did 100 medial high tibial osteotomies and stated that pain was minimal or mild in 65% of patients, moderate in 16%, and severe in 19% in a mean follow up period of 4 years.

Schuster P et al. (2018) [6] studied that subjective International Knee Documentation Committee [IKDC] score significantly improved from  $44 \pm 11$  preoperatively to  $70 \pm 13$  at one,  $66 \pm 15$  at three,  $66 \pm 15$  at five, and  $65 \pm 17$  at ten years ( $P < .001$  at any point of follow-up).

Britt Ollivier et al (2021) [7] in their study found that the 5-year, 10-year, 15-year and 20-year survival rates, respectively, ranged from 86 to 100%, 64-97.6%, 44-93.2% and 46-85.1%. The anatomical and mechanical tibiofemoral axis were, respectively, corrected

to a mean of  $7.3^\circ$ - $13.8^\circ$  of valgus and  $0.6^\circ$ - $4^\circ$  of valgus.

In our study the pVAS showed improvement from  $7.4 \pm 1.5$  points preoperatively to  $2.2 \pm 0.9$  points at the final 9 months follow-up. Similar improvement was also noted in the retrospective study done by Kim et al. (2019) [11] where the average pVAS in all 66 patients improved from  $7.1 \pm 1.7$  points preoperatively to  $1.0 \pm 0.8$  points at the  $35.9 \pm 22.0$  months follow-up.

In the study by Britt Ollivier et al (2021) [7], the subjective scoring systems showed an improvement postoperatively that was maintained until mean follow-up of more than 10 years.

In our study there was significant improvement in knee society score from  $53.3 \pm 2.1$  to  $83.2 \pm 6.2$ , there was increase in range of motion with satisfactory motion in 9 month follow up.

A medial compartment osteoarthritis in a young patient with good arc of motion is expected to give satisfactory motion, better function with less pain in 80% of the time after five years. This would, however, deteriorate with time [8].

In our study 18 (64 %) out of 28 patients were female and 10 (36%) out of 28 were male.

According to study by zhang Y et al. among adults 60 years of age or older the prevalence of symptomatic knee OA is approximately 10% in men and 13% in women (2). The number of people affected with symptomatic OA is likely to increase due to the aging of the population and the obesity epidemic.[9]

Arthroplasty, however, despite excellent pain relief and improved function, would not be a life-long remedy for a young person [10]. In addition, it is expensive and also imposes some functional limitations-things which are not always acceptable in developing countries. Open medial wedge osteotomies preserve better bone stock, and cause less patella infra, thus providing an easier future conversion to knee arthroplasty [11].

High Tibial Osteotomy in social settings, where floor sitting (rather than chair sitting) and use

of toilets without seat are common, and also where economy, in terms of health insurance coverage, are important issues, is one of the useful armamentariums in the hand of an orthopedic surgeon.

### Conclusion

The main improvements seen in initial assessment in this study were related to pain reduction and an increase in the knee score [12] after high tibial osteotomy and it also delays the need for total knee replacement. Hence it is indisputable that appropriate patient selection, precise surgical planning and various operative techniques provide a favorable outcome of HTO in medial knee arthritis in young or middle-aged active patients.

### References

1. Lundgren-Nilsson Å, et al. Patient-reported outcome measures in osteoarthritis: a systematic search and review of their use and psychometric properties. *RMD Open*. 2018 Dec 16;4(2):e000715.
2. Rivero-Santana A, et al. Effectiveness of a decision aid for patients with knee osteoarthritis: a randomized controlled trial. *Osteoarthritis Cartilage*. 2021 Sep;29(9):1265-1274.
3. Ivarsson I, Myrnerets R, Gillquist J. High tibial osteotomy for medial osteoarthritis of the knee. A 5 to 7 and 11 year follow-up. *J Bone Joint Surg Br*. 1990; 72:238-244.
4. Asik M, Sen C, Kilic B, Goksan SB, Ciftci F, Taser OF. High tibial osteotomy with Puddu plate for the treatment of varus gonarthrosis. *Knee Surg Sports Traumatol Arthrosc*. 2006; 14:948-954. DOI: 10.1007/s00167-006-0074-1.
5. Giuseffi, Steven A.; Replogle, William H.; Shelton, Walter R. (2015). Opening-Wedge High Tibial Osteotomy: Review of 100 Consecutive Cases. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, S0749806315004156. doi:10.1016/j.arthro.2015.04.097
6. Schuster P, Geßlein M, Schlumberger M, Mayer P, Mayr R, Oremek D, Frank S, Schulz-Jahrsdörfer M, Richter J. Ten-Year Results of Medial Open-Wedge High Tibial Osteotomy and Chondral Resurfacing in Severe Medial Osteoarthritis and Varus Malalignment. *Am J Sports Med*. 2018 May;46(6):1362-1370. doi: 10.1177/0363546518758016. Epub 2018 Mar 28. PMID: 29589953.
7. Ollivier B, Berger P, Depuydt C, Vandenneucker H. Good long-term survival and patient-reported outcomes after high tibial osteotomy for medial compartment osteoarthritis. *Knee Surg Sports Traumatol Arthrosc*. 2021 Nov;29(11):3569-3584. doi: 10.1007/s00167-020-06262-4. Epub 2020 Sep 9. PMID: 32909057.
8. Meding JB, Kearing EM, Ritter MA et al. Total knee arthroplasty after high tibial osteotomy. *Clin orthop*. 2000; (375):175-84.
9. Zhang Y, Jordan JM. Epidemiology of osteoarthritis. *Clin Geriatr Med*. 2010 Aug;26(3):355-69 doi: 10.1016/j.cger.2010.03.001. Erratum in: *Clin Geriatr Med*. 2013 May;29(2):ix. PMID: 20699159; PMCID: PMC2920533.
10. Wright RJ, Sledge CB, Poss R et al. Patient-reported outcome and survivorship after Kinemax total knee arthroplasty. *J Bone Joint Surg Am*. 2004; 86-A:2464-70.
11. Patond KR, Lokhande AV. Medial open wedge high tibial osteotomy in medial compartment osteoarthritis of the knee. *Natl Med J India*. 1993; 6:104-8.
12. Kim, M., Ko, B. & Park, J. The proper correction of the mechanical axis in high tibial osteotomy with concomitant cartilage procedures—a retrospective comparative study. *J Orthop Surg Res* 14, 281 (2019).

## Fluoroscopic guided capsular distention with and without suprascapular nerve block in frozen shoulder patients a prospective comparative study

Peepra D, Lodhi J S, Gajbhiye S, Vidyarthi A, Chauhan H

Study performed at Department of orthopaedics, Netaji Subhash Chandra Bose Medical College, Jabalpur, MP

### Abstract

**Background:** In general practise, frozen shoulder is a common condition, in which pain and gross restriction of movement around affected shoulder joint occur. Aim of our study is to compare the effectiveness of fluoroscopic guided capsular distention with and without suprascapular nerve block to relieve pain and improve range of movement.

**Material & method:** An observational study of 60 patients of frozen shoulder to compare capsular distention with steroid, local anaesthetic and normal saline in 30 patients with suprascapular nerve block (group A). Capsular distention with steroid, local anaesthetic and normal saline without suprascapular nerve block in 30 patients (Group B). After capsular distention all patients advised physiotherapy, ranges of movement and pain over shoulder joint were assessed over a 12-week period.

**Results:** In comparison to fluoroscopic guided capsular distention without suprascapular block (Group B), fluoroscopic guided capsular distention with suprascapular block (group A) has a more decreased SPADI and VAS score

**Conclusions:** According to this study, suprascapular nerve block is a more safe and effective method of treating frozen shoulder than distention with no nerve block.

**Keywords:** adhesive capsulitis; frozen shoulder; suprascapular nerve block;

### Address of correspondence:

Dr. Hemendra Chauhan  
PG Resident, Department of  
Orthopaedics, Netaji Subhash  
Chandra Bose Medical College,  
Jabalpur (M. P.)

Email: hscmgm84@gmail.com

### How to site this article

Peepra D, Lodhi J S, Gajbhiye S, Vidyarthi A, Chauhan H.  
Fluoroscopic guided capsular distention with and without  
suprascapular nerve block in frozen shoulder patients a prospective  
comparative study. Ortho J MPC. 2023; 29 (1):18-22

Available from:  
<https://ojmpc.com/index.php/ojmpc/article/view/171>



### Introduction

Frozen shoulder (also known as adhesive capsulitis) is characterized by a painful, progressive loss of both active and passive glenohumeral motion as a result of persistent fibrosis and eventual contracture of the glenohumeral joint capsule. [1,2] Because of the inconsistent reporting of the disease stage, variable nomenclature, and wide range of treatments, the approach to manage is unclear and contradictory. [1] There are numerous treatments that have been mentioned in the literature, including rest, non-steroidal anti-inflammatory drugs (NSAIDs), active and passive mobilization, physiotherapy, intra-articular corticosteroids, hydro dilatation, manipulation under anesthesia, arthroscopic capsular release, intra-articular hyaluronate injection, regional nerve block, and others. [3-9]

Pain relief and the restoration of normal shoulder function are the common treatment objectives for frozen shoulder. Therapeutic activities and patient's co-operation are essential to achieving this goal. The main barrier preventing people from engaging in active exercise is pain. Both chronic and recent pain can be effectively treated with a regional nerve block. [2,10] One of several effective, simple, and helpful nerve block techniques for treating shoulder pain is the suprascapular nerve block. [2,11-13] It is possible to place the needle in a clinic using anatomical cues. [14]

Hence the present study was tried to find out clinical effectiveness and safety of suprascapular block as well as capsular distention in the treatment of frozen shoulder using anatomical landmarks.

### Material and Method

After approval from Institutional Ethics Committee (IEC) between 2020-2022 all the patient who were fit in our inclusion criteria and ready to give written informed consent were included in the study. 60 patients were enrolled in the study. They were randomly allocated in two groups i.e., capsular distention with steroid, local anaesthetic and normal saline without suprascapular nerve block in 30 patients (Group A).



**Figure -1**



**Figure -2**



**Figure -3**

In group B suprascapular nerve block followed by capsular distention done with steroid, local anaesthetic and normal saline in 30 patients. After capsular distention all patients advised physiotherapy, range of movement and pain over shoulder joint were assessed over a 12-week period for evaluation of pain VAS scale and SPADI score were calculate

## Results

In our study among 60 participant 26 were female and 34 were male while in Group – A

and group B the gender composition is same 17 male and 13 female in both the groups, in both the groups most of the cases belong to age group 46-55, in group A- 13 patients and in group B – 15, followed by age group 35-45 years in which number of participants were 9 and 8 in group A and group- B respectively, followed by 56-65 years group in which number of participants were 8 and 7 in group A and group- B, respectively. The mean age of participant in group A and B was  $51.1 \pm 5.79$  and  $50.13 \pm 6.34$ , respectively. The mean BMI of participants in group A was  $27.27 \pm 3.41$  while in group B was slightly higher  $29.62 \pm 4.90$ . In our study in group A right side was mostly affected while in group- B the distribution was equal, in both the groups the most of patient were having symptoms from past 7-9 months.

Table 1- Demographic characteristic and clinical presentation of study participants

Particulars	Sub particulars	Group A (Without Block)	Group B (With Block)
		Number of Patients	Number of Patients
Age (in years)	35-45	9	8
	46-55	13	15
	56-65	8	7
	Total	30	30
Sex	Female	13	13
	Male	17	17
BMI	Mean $\pm$ Std Deviation	$27.27 \pm 3.41$	$29.62 \pm 4.90$
Affected Side	Left	12	15
	Right	18	15
Duration of illness in months	Mean $\pm$ Std Deviation	$6.47 \pm 1.89$	$6.40 \pm 1.69$

Most of the patients were belong to age group of 46-55 years, male are predominant in study subjects in both group BMI is more than normal in both the groups,,right side affected more in group A while while in group b both are equal.mean duration of illness is same in both group

Table 2- Comparison of VAS and SPADI Score among Group- A and Group –B at Pre-procedure,15 Days, 1 Month and 3Months

VAS (With and Without Block)		Pre - procedure	15 days	1 month	3 months
Mean $\pm$ Std.Deviation	Group A (Without Block)	$6.2 \pm 0.92$	$5.23 \pm 0.57$	$3.7 \pm 0.59$	$3.33 \pm 0.48$



	<b>Group B (With Block)</b>	7.03 ± 0.76	5.5 ± 0.73	4.6 ± 0.56	3.5 ± 0.57
<b>t - value</b>		-3.47	-1.16	-5.83	-1.3
<b>p - value</b>		<.001	<.001	<.001	0.10893

The Means VAS score was statistically significantly difference between preprocedure and follow up at 15 days and 1 month

<b>SPADI (With and Without Block)</b>		<b>Pre-procedure</b>	<b>15 days</b>	<b>1 month</b>	<b>3 months</b>
<b>Mean ± Std.Deviation</b>	<b>Group A (Without Block)</b>	74.37 ± 6.07	65.93 ± 5.55	51.6 ± 3.65	3.33 ± 0.48
	<b>Group B (With Block)</b>	77.07 ± 4.74	66.57 ± 4.42	58.07 ± 4.22	3.5 ± 0.57
<b>t - value</b>		-1.99	-0.53	-6.19	-4.65
<b>p - value</b>		<.001	<.001	<.001	<.001

The Means SPADI score was statistically significant difference between preprocedure and follow up at 15 days, 1 month and 3 month

Table 3- Comparison Of abduction, flexion and external rotation degree among Group- A and Group -B at Pre-procedure, 15 Days, 1 Month and 3 Months

<b>Abduction (With and Without Block)</b>		<b>Pre-procedure</b>	<b>15 days</b>	<b>1 month</b>	<b>3 months</b>
<b>Mean ± Std.Deviation</b>	<b>Group A (Without Block)</b>	66.83 ± 10.13	108.17 ± 16.68	141.5 ± 14.81	170.67 ± 8.28
	<b>Group B (With Block)</b>	70.33 ± 13.58	99.67 ± 10.98	125.33 ± 12.52	158 ± 11.26
<b>t - value</b>		-1.09	2.73	4.37	5.92
<b>p - value</b>		<.001	<.001	<.001	<.001

The Mean abduction degree Among Group- A And Group -B At Preprocedure, 15 Days 1 Month And 3Month was statistically different

<b>Flexion (With and Without Block)</b>		<b>Pre-procedure</b>	<b>15 days</b>	<b>1 month</b>	<b>3 months</b>
---	--	----------------------	----------------	----------------	-----------------

<b>Mean ± Std.Deviation</b>	<b>Group A (Without Block)</b>	44.5 ± 21.59	112.5 ± 20.92	142.83 ± 17.15	168.67 ± 9.37
	<b>Group B (With Block)</b>	55.5 ± 16.83	99.67 ± 13.77	128.33 ± 13.67	160.33 ± 8.89
<b>t - value</b>		-1.96	2.57	3.39	3.78
<b>p - value</b>		<.001	<.001	<.001	<.001

Mean flexion degree Among Group- A And Group -B At Preprocedure, 15 Days 1 Month And 3Month was statistically different

<b>ER (With and Without Block)</b>		<b>Pre-procedure</b>	<b>15 days</b>	<b>1 month</b>	<b>3 months</b>
<b>Mean ± Std.Deviation</b>	<b>Group A (Without Block)</b>	43.5 ± 6.84	58.33 ± 8.02	75.5 ± 6.07	84.5 ± 4.61
	<b>Group B (With Block)</b>	39.5 ± 6.74	56.17 ± 5.83	67.17 ± 6.78	77.33 ± 6.79
<b>t - value</b>		2.11	1.27	5.76	4.68
<b>p - value</b>		<.001	<.001	<.001	<.001

Mean degree of External Rotation Among Group- A And Group -B At Preprocedure, 15 Days 1 Month And 3Month was statistically different

### Discussion

The main clinical manifestations of frozen shoulder are shoulder pain and restricted glenohumeral movements. Recovery occurs at a varying and frequently incomplete rate. [2,19] In long-term follow-up studies, 7% to 15% of patients had functional disability, and 33% to 61% of patients still had some residual motion restriction. [19] Pain management and therapeutic exercises for early mobilization are the most crucial elements of treatment for better outcome. [2]

Suprascapular nerve block (SSNB) is a quick and efficient method for treating shoulder pain. **Haque R et al.** [21] stated that suprascapular nerve block helped in effective mobilization and increased the tolerability of pain in the patients. Additionally, it was easy to perform as an outpatient procedure, with minimal complications. **Shanahan EM et al.** [22] concluded that SSNB improved pain and reduced the duration of frozen shoulder by 6 months.

Hydrodilatation is used to dilate contracted capsule and to increase range of motion. **ElKardosy et al (2021) [23]**, in their study, performed hydrodilatation of the glenohumeral capsule, and observed improvement in VAS, ROM and SPADI score. **Debeer P et al [24]** concluded that hydrodilatation resulted in continuous improvement of pain and range of movements. It also significantly improved depression and anxiety in these patients.

Injection of steroids directly into the joint capsule causes anti-inflammatory effect and reduces pain. **Goyal T et al [25]** observed that corticosteroid injections administered in the sub-acromial and gleno-humeral joint provided relief in pain, as well as, improved function in patients with a frozen shoulder. The improvement was statistically significant at 3,6,12 weeks and 6 months.

Our study comprised of performing all three procedures i.e. hydrodilatation (which consisted of injecting 5 ml of 2% lignocaine, 5 ml of injection triamcinolone 40mg and 20 ml Normal Saline) after giving supraclavicular nerve block, thus increasing patient compliance for painless procedure. Also, here block effect wears off after 5-6 hours. Thus, patient gets time to perform active painless shoulder ROM. It was also observed that by combining these three procedures, the duration of pain relief was greater than by the use of isolated procedures. The reduction in pain and disability was statistically and clinically significant. This benefit was extended in duration, and it persisted through the fourth week. Our findings are comparable with **Gencer Atalay Ket al [26]**, who studied SSNB and intra-articular corticosteroid injection and concluded that it led to immediate relief in pain and functional improvement. **Dai Z et al [27]** observed that a combined approach of arthroscopic release and corticosteroid hydrodilatation yielded better results in terms of ROM and function as compared to corticosteroid hydrodilatation alone.

There are also various limitations to the study. Although the study was adequately supported, only a small number of patients were included in the analysis. The follow-up duration of the patients was also less, so long term effects could not be analysed.

## Conclusion

This study provides evidence that Capsular distention with Suprascapular nerve block is better than capsular distention without suprascapular nerve block. Both procedure are safe, effective, and well tolerated treatment for patients with frozen shoulder.

## References

1. Neviasser AS, Hannafin JA. Adhesive capsulitis: a review of current treatment. *Am J Sports Med* 2010;38:2346-56.
2. Karata GK, Meray J. Suprascapular nerve block for pain relief in adhesive capsulitis: Comparison of 2 different techniques. *Arch Phys Med Rehabil* 2002; 83:593-7.
3. Dias R, Cutts S, Massoud S. Frozen shoulder: clinical review. *Br Med J* 2005;331:1453-6.
4. Saqlain HA, Zubari A, Taufiq I. Functional outcome of frozen shoulder after manipulation under anesthesia. *J Pak Med Assoc* 2007;57:181-5.
5. Lorbach O, Anagnostakos K, Scherf C, Seil R, Kohn D, Pape D. Nonoperative management of adhesive capsulitis of the shoulder: oral cortisone application versus intra-articular cortisone injections. *J Shoulder Elbow Surg* 2010;19:172-9.
6. Loebenberg MI, Rosen JE, Ishk C, Jazrawi LM, Zuckerman JD. A survey of decision making process in treatment of common shoulder ailments among primary care physicians. *Bull Hosp Joint Dis* 2006;63:137-44.
7. Lee HJ, Lim KB, Kim D Y, Lee KT. Randomized controlled trial for efficacy of intra-articular injection for adhesive capsulitis: ultrasonography-guided versus blind technique. *Arch Phys Med Rehabil* 2009;90:1997-2002.
8. Harris JD, Griesser MJ, Copelan A, Jones GL. Treatment of adhesive capsulitis with intra-articular hyaluronate: A systematic review. *Int J Shoulder Surg* 2011;5:31-7.
9. Taskaynatan MA, Yilmaz B, Ozgul A, Yazicioglu K, Kalyon TA. Suprascapular nerve block versus steroid injection for non specific shoulder pain. *Tohoku J Exp Med* 2005;205:19-25.
10. Boyles RE, Flynn TW, Whitman JM. Manipulation following regional



- interscalene anesthetic block for shoulder adhesive capsulitis: a case series. *Man Ther* 2005;10:80-7.
11. Dahan TH, Fortin L, Pelletier M, Petit M, Vadeboncoeur R, Suissa S. Double blind randomized clinical trial examining the efficacy of bupivacaine suprascapular nerve blocks in frozen shoulder. *J Rheumatol* 2000;27:1464-9.
  12. Wassef MR. Suprascapular nerve block: a new approach for the management of frozen shoulder. *Anaesthesia* 1992;47:120-4.
  13. Shanahan EM, Smith MD, Wetherall M, Lott CW, Slavotinek J, FitzGerald O, et al. Suprascapular nerve block in chronic shoulder pain: are the radiologists better? *Ann Rheum Dis* 2004;63:1035-40.
  14. Yasar E, Vural D, Safaz I, Balaban B, Bilge, Ahmet Y, Goktepe AS, Alaca R. Which treatment approach is better for hemiplegic
  15. Shanahan EM, Ahern M, Smith M, Wetherall M, Bresnihan B, FitzGerald O. Suprascapular nerve block (using bupivacaine and methylprednisolone acetate) in chronic shoulder pain. *Ann Rheum Dis* 2003;62:400-406.
  16. Dangoisse MJ, Wilson DJ, Glynn CJ. MRI and clinical study of an easy safe technique of suprascapular nerve blockade. *Acta Anaesth Belg* 1994;45:49-54.
  17. Bal A, Eksioğlu E, Gülec B, Aydog E, Gurcay E, Cakci A. Effectiveness of corticosteroid injection in adhesive capsulitis. *Clin Rehabil* 2008;22:503-12.
  18. Ryans I, Montgomery A, Galway R. A randomized controlled trial of intra-articular triamcinolone and/or physiotherapy in shoulder capsulitis. *Rheumatology* 2005; 44:529-35.
  19. Shaffer B, Tibone JE, Kerlan RK. Frozen shoulder: a long term follow-up. *J Bone Joint Surg Am* 1992;74:738-46.
  20. Moore DC. Block of suprascapular nerve. In: Thomas CC, ed. *Regional nerve Block*. 4th ed. Springfield, 1979;9:300-303.
  21. Haque R, Baruah RK, Bari A, Sawah A. Is Suprascapular Nerve Block Better Than Intra-articular Corticosteroid Injection for the Treatment of Adhesive Capsulitis of the Shoulder? A Randomized Controlled Study. *Ortop Traumatol Rehabil*. 2021 Jun 30;23(3):157-165. doi: 10.5604/01.3001.0014.9152. PMID: 34187937.
  22. Shanahan EM, Gill TK, Briggs E, Hill CL, Bain G, Morris T. Suprascapular nerve block for the treatment of adhesive capsulitis: a randomised double-blind placebo-controlled trial. *RMD Open*. 2022 Nov;8(2):e002648. doi: 10.1136/rmdopen-2022-002648. PMID: 36418088; PMCID: PMC9685228.
  23. ElKardosy M, Mahmoud A, Zidan A, Elsayy G. Role of interventional radiology in Management of Chronic shoulder pain. *Al-Azhar International Medical Journal*. 2021;
  24. Debeer P, Commeyne O, De Cupere I, Tijskens D, Verhaegen F, Dankaerts W, Claes L, Kiekens G. The outcome of hydrodilatation in frozen shoulder patients and the relationship with kinesiophobia, depression, and anxiety. *J Exp Orthop*. 2021 Sep 30;8(1):85. doi: 10.1186/s40634-021-00394-3. PMID: 34591188; PMCID: PMC8484410.
  25. Goyal T, Singh A, Negi P, Kharkwal B. Comparative functional outcomes of patients with adhesive capsulitis receiving intra-articular versus sub-acromial steroid injections: case-control study. *Musculoskelet Surg*. 2019 Apr;103(1):31-35. doi: 10.1007/s12306-018-0538-8. Epub 2018 May 23. PMID: 29796762.
  26. Gencer Atalay K, Kurt S, Kaplan E, Yağcı İ. Clinical effects of suprascapular nerve block in addition to intra-articular corticosteroid injection in the early stages of adhesive capsulitis: A single blind, randomized controlled trial. *Acta Orthop Traumatol Turc*. 2021 Dec;55(6):459-465. doi: 10.5152/j.aott.2021.21071. PMID: 34967732.
  27. Dai Z, Liu Q, Liu B, Long K, Liao Y, Wu B, Huang W, Liu C. Combined arthroscopic release with corticosteroid hydrodilatation versus corticosteroid hydrodilatation only in treating freezing-phase primary frozen shoulder: a randomized clinical trial. *BMC Musculoskelet Disord*. 2022 Dec 17;23(1):1102. doi: 10.1186/s12891-022-06065-3. PMID: 36528565; PMCID: PMC9758809.

## Comparative study between laminectomy and fenestration surgery in lumbar prolapsed intervertebral disc (PIVD)

Singh V, Mehta R, Patidar A, Bhide S, Agrawal A, Jain P, Soni A, Rathore S S, Gupta N

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

### Abstract

**Background:** Comparative study between laminectomy and fenestration surgery in lumbar prolapsed intervertebral disc (PIVD).

**Material and method:** In this study, 44 cases of Lumbar Prolapsed Intervertebral Disc (PIVD) were admitted and divided into two procedure groups, i.e; laminectomy and fenestration and operated via either of the procedure and the outcome after the surgery was assessed by the Oswestry Disability index (ODI).

**Results:** In Present study, the fenestration group's ODI score was significantly decreased post-operatively after one month and after 6-12 months with  $p < 0.05$  with ODI values pre-operatively, post-operatively after one month and after 6-12 months with mean  $28.05 \pm 4.03$ ,  $4.68 \pm 2.42$  and  $3.50 \pm 4.11$ , respectively. In present study, the laminectomy group's ODI score was Significantly decreased post-operatively after one month and after 6-12 months with  $p < 0.05$  with ODI score values pre-operatively, post-operatively after one month and after 6-12 months with mean  $30.05 \pm 4.01$ ,  $6.27 \pm 3.27$  and  $5.14 \pm 5.51$  respectively.

**Conclusion:** No significant difference was found in post-operative after one month and post operative 6-12 months ODI scores between both study groups laminectomy and fenestration with  $p > 0.05$ . Fenestration is advantageous over Laminectomy in perioperative parameters, i.e; less soft tissue injury, less blood loss, less duration of surgery, good spinal function, smooth patient recovery, early rehabilitation

**Keywords:** Laminectomy, Fenestration, Oswestry Disability index

### 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, Mehta R, Patidar A, Bhide S, Agrawal A, Jain P, Soni A, Rathore S S, Gupta N. Comparative study between laminectomy and fenestration surgery in lumbar prolapsed intervertebral disc (PIVD). Ortho J MPC. 2023; 29 (1):23-28

Available from:

<https://ojmpc.com/index.php/ojmpc/article/view/172>



### Introduction

Low back pain is a very common condition. About 90% of people suffer from it at some point in their lives.[1] It is the second leading cause of medical consultation in the primary care setting and the leading cause of disability worldwide.[2] 80-90% of patients with low back pain usually recover fully within 3 months.[3,4] Among the remaining 10-20%, however, less than 50% return to work, [3,5] but when symptoms persist more than 2 years, the probability of returning to work drops to almost zero.[3,5] Intervertebral disc (IVD) degeneration is the most common cause of

chronic back pain.[6-9] PIVD usually occurs dorsally or dorsolaterally in the back, between the fourth and fifth lumbar vertebrae, or between the fifth vertebra and the sacrum.[10]

A laminectomy is a surgical procedure in which the entire posterior (posterior) part of the spinous bone, called the lamina, and/or sometimes the attached ligaments and part of the spinous process is removed to allow visualization of the underlying nerve elements (spinal cord and/or nerve roots emerging from it branches) and intervertebral disc. It is often performed to relieve pressure (compression) on a nerve root or spinal cord that is causing

radiating pain and weakness, as a potential disadvantage of a lumbar laminectomy is that by removing parts of the ligaments and joints, it could lead to lumbar instability that may require a lumbar fusion in the future. [11]

Fenestration with disc excision is quite a reasonable method for surgical treatment of indicated cases of herniated disc. Fenestration offers complete visualization of the nerve root and complete removal of the problematic disc. This procedure does not require much know-how, expertise in instrumentation and techniques.

Love described the extradural herniated disc and invented the interlaminar fenestration for the treatment of lumbar disc prolapse.[12] It is a very safe, effective and reliable surgical technique for the treatment of properly selected patients with a herniated disc. This approach is free of the spinal instability and membrane formation resulting from laminectomy. Disc excision through fenestrations is a procedure that most neurosurgeons and orthopedic surgeons can perform even in small peripheral centers. Thus, this study was conducted to compare the results of laminectomy and fenestration for lumbar PIVD.

### Material and method

The study was conducted in the department of orthopaedics of R.D Gardi Medical College and associated C.R.G.H, Ujjain during the year August 2020 to July 2022. In this study, 44 cases of Lumbar Prolapsed Intervertebral Disc (PIVD) were admitted and divided into two procedure groups, i.e; Laminectomy and Fenestration and operated via either of the procedure and the outcome after the surgery was assessed by the Oswestry Disability index (ODI).

Inclusion criteria was patients who opt for surgical treatment of back pain with radiculopathy (MRI proved PIVD with significant compression on either/ both nerve roots), patients not responding to conservative treatment for 6 weeks, all patients of PIVD > 18 years and both sex involved and patients with PIVD associated with neurological deficit.

Exclusion criteria was age < 18 years, patient unwilling for surgery and post-surgery lifestyle modifications, patient medically unfit for surgery, patient with dynamic instability, patients with infection and bleeding disorders and patient who needed revision surgery.

### Results

In present study mean age of the cases was  $46.75 \pm 12.15$  years, median age 46.50 years, minimum age 18 year and maximum age was 70 years. Out of 44 cases, 24 were males and 20 were females. Out of 44 cases majority of 18 cases presented L4-L5 segment involved, 11(25.0) with L4-L5, L5-S1, 6 (13.6%) with L5-S1, 5 (11.4%) with L3-L4, L4-L5 respectively and remaining minority at other lumbar levels. Out of 44 cases 7 cases had neurological deficit. Out of 44 cases, 14 cases needed bone graft.

**Table 1**

SEGMENT INVOLVE D	Group		Total
	LAMINECTOM Y	FENESTRATIO N	
L2-L3,L3-4, L4-L5	1 4.5%	0 0.0%	1 2.3%
L3-L4	2 9.1%	0 0.0%	2 4.5%
L3-L4,L4-L5	4 18.2%	1 4.5%	5 11.4%
L4-L5	5 22.7%	13 59.1%	18 40.9%
L4-L5,L3-L4	1 4.5%	0 0.0%	1 2.3%
L4-L5,L5-S1	8 36.4%	3 13.6%	11 25.0%
L5-S1	1 4.5%	5 22.7%	6 13.6%
<b>Total</b>	<b>22</b> <b>100.0%</b>	<b>22</b> <b>100.0%</b>	<b>44</b> <b>100.0%</b>

Chi-square= 14.295, p= 0.027

There was significant association in segment involved of the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ .

There was significant association in using bone graft among the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . In laminectomy group 14 cases used bone graft and no cases in fenestration group. There was significant association in skin incision among the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . In laminectomy group 22 (100.0%) cases had

more than 5 cm skin incision and 1 (4.5%) case in fenestration group with more than 5 cm skin incision.

There was significant association in complication of the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . In laminectomy group 6 (27.39%) cases had complications and 3 (13.6%) case in fenestration group had complications.

In present study ODI score for all cases there was significantly decreased ODI score post-operatively after one month and after 6-12 months with  $p < 0.05$  in both the groups. There was no significant difference found in between both study groups with  $p > 0.05$ .

In laminectomy group, According to ODI, post operative ODI after one month 10 (55.6%) had mild disability who had severe disability pre-operatively and after 6-12 month ODI score 2 (9.1%) had moderate disability and 5 (22.7%) had mild disability. In fenestration group, according to ODI, post operative ODI after one month 6 (27.3%) had mild disability pre-operatively who had severe disability and after 6-12 month ODI score 1 (4.5%) had moderate disability pre-operatively who had severe disability.

## Discussion

In present study mean age of the cases was  $46.75 \pm 12.15$  years, median age 46.50 years, minimum age 18 year and maximum age was 70 years. Hence the outcomes of both groups were comparable. Similar findings were observed in, **Parisa Azimi et al. (2015)** [13] showed that mean age of the cases was 52.1 years, in fenestration groups cases mean age was 51.9 years and male cases were 46.6% and female 53.4%, in laminectomy groups cases mean age was 52.7 years and male cases were 44.4% and female 55.6%. **Dennis Antony (2016)** [14] revealed that, Majority (80%) of the patients were males. The mean age of the participants was 40.6 years. The mean age of the male patients was 40.75 years (range 32 - 54 years). The female patients had a mean age of 40 years (range 28 - 58 years).

In our study, out of 44 cases, 16 (36.4%) were home maker, 15 (34.1%) were farmer and 13 (29.5%) were laborer. There was no significant

association in occupation of the cases between fenestration and laminectomy discectomy groups with  $p > 0.05$ . In laminectomy group 6 (27.3%) cases were laborer, 8 (36.4%) were farmer and 8 (36.4%) cases were home maker, fenestration group 7 (31.8%) cases were laborer, 7 (31.8%) were farmer and 8 (36.4%) cases were home maker. Findings of other studies similar to our study **Dennis Antony (2016)** [14] revealed that, 56% of the patients were engaged in strenuous work. **Deepak C D et al. (2014)** [15] showed that 30% cases were engaged in heavy work, 25% were farmer, 25% cases were house wife, 10% were merchant and 10% were clerk/office work.

In our study. out of 44 cases majority, i.e; 18 (40.9%) cases presented L4-L5 segment involved, 11 (25.0) with L4-L5, L5-S1, 6 (13.6%) with L5-S1 respectively and remaining at the other lumbar levels. There was significant association in segment involved of the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . **Mohammad Aslam et al. (2015)** [16] showed that, the most common level of involvement was L4-L5 followed by L5-S1. On MRI, disc protrusion was commonest finding followed by disc bulge, disc sequestration and disc extrusion.

There was no significant association in neurological deficit of the cases between fenestration and laminectomy discectomy groups with  $p > 0.05$ . In laminectomy group 4 (18.2%) cases had neurological deficit and 18 (81.8%) cases had no neurological deficit, in fenestration group 3 (13.6%) cases had neurological deficit and 19 (86.4%) cases had no neurological deficit. **Deepak C D et al. (2014)** [15] showed that 16 (80%) patients had neurological deficits. L4-5 disc prolapse was the commonest in this study with 95% of the prolapse occurred at this level.

In our study, out of 44 cases, 24 (54.5%) cases had 101-150 ml blood loss, 14 (31.8%) cases had less than 100 ml blood loss and 6 (13.6%) had more than 150 ml blood loss. There was significant association in blood loss among the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . In laminectomy group 5 (22.7%) cases had more than 150 ml blood loss and 1 (4.5%) case in



fenestration group with more than 150 ml blood loss. Similar finding observed in **Nagi et al.** [17] fenestration had the added advantages of less intraoperative blood loss as compare to laminectomy. On comparing fenestration with laminectomy as described by **Nahar et al(2013)** [18] fenestration had the added advantages of less intraoperative blood loss.

In our study, out of 44 cases 24 (54.5%) cases operated in more than 120 min and 20(45.5%) in less than 120 min. There was significant association in duration of the surgery of the cases between fenestration and laminectomy discectomy groups with  $p < 0.05$ . In laminectomy group 20 (90.9%) cases had more than 120 min duration of surgery and 4 (18.2%) case in fenestration group with more than 120 min duration of surgery. **Nagi et al.** [17] said fenestration had the added advantages of less operative time as compare to laminectomy. On comparing fenestration with laminectomy as described by **Nahar et al(2013)** [18] fenestration had the added advantages of less operative time.

In Present study ODI score for all cases there was significantly decreased pre- operatively, post-operatively after one month and after 6-12 months with  $p < 0.05$ . ODI score was significantly decreased pre-operatively, post-operatively after one month and after 6-12 months with mean  $29.05 \pm 4.10$ ,  $5.48 \pm 2.95$  and  $4.32 \pm 4.87$  respectively. Present study in laminectomy group ODI score was significantly decreased pre-operatively, post-operatively after one month and after 6-12 months with mean  $30.05 \pm 4.01$ ,  $6.27 \pm 3.27$  and  $5.14 \pm 5.51$ , respectively. Present study in fenestration group ODI score was significantly decreased pre-operatively, post-operatively after one month and after 6-12 months with  $p < 0.05$ . ODI score was significantly decreased pre-operatively, post- operatively after one month and after 6-12 months with mean  $28.05 \pm 4.03$ ,  $4.68 \pm 2.42$  and  $3.50 \pm 4.11$  respectively.

There was no significant difference was found in pre-operative ODI category between both study groups with  $p > 0.05$ . In our study, there was no significant difference was found in post-

operative after one-month ODI category between both study groups laminectomy and fenestration with  $p > 0.05$ . These results are consistent with our findings in both groups. There was no significant difference was found in post-operative after 6- 12 months ODI category between both study groups laminectomy and fenestration with  $p > 0.05$ . In laminectomy group, According to ODI post operative ODI after one month 10 (55.6%) had mild disability who had severe disability pre-operatively. No disability after 6-12 month was seen in 15 (68.2%), mild disability in 5 (22.5%) and moderate in 2(9.5%)



Figure1: Fenestration



Figure2: Laminectomy

**Table 2:** Comparison of laminectomy outcome

Studies	Good	Fair	Poor
Ganz et al. [19]	86%	14%	0
Herron et al. [20]	82%	18%	0
Present study	68.2%	22.7%	9.1%

In fenestration group, According to ODI, post operative ODI after one month 6 (27.3%) had mild disability pre-operatively who had severe disability. According to ODI post operative ODI after 6-12 months 1 (4.5%) had moderate disability pre-operatively who had severe disability. No disability after 6-12 month was seen in 20 (90.9%), mild disability in 1 (4.5%) and moderate in 1 (4.5%)

**Table 3:** Comparison of Fenestration outcome

Studies	Good	Fair	Poor
Richard davis et al [21]	89%	7.7%	3.3%
Pappas et al[22]	77.3%	15.5%	6.6%
Kumaravel.S[23]	86.7%	13.3%	0.0%



Present study	90.9%	4.5%	4.5%
---------------	-------	------	------

## Conclusion

There was no significant difference found in post-operative after one-month ODI category between both study groups laminectomy and fenestration with  $p > 0.05$ . There was no significant difference was found in post-operative after 6-12 months ODI category between both study groups laminectomy and fenestration with  $p > 0.05$ .

Fenestration is advantageous over laminectomy in perioperative parameters, i.e; less soft tissue injury, less blood loss, less duration of surgery, good spinal function, smooth patient recovery, early rehabilitation

## References

- Nasser MJ. How to approach the problem of low back: An overview. *Journal of Family Community Med.* 2005 Jan-Apr; 12(1):3-9. Izzo R
- Popolizio T, D'Aprile P, Muto M. Spinalpain. *Eur J Radiol.* 2015 May; 84(5):74
- Anderson GBJ. Epidemiological features of chronic low-back pain. *Lancet.* 1999 Aug 14; 354(9178):581-5.
- Croft PR, Macfarlane GJ, Papageorgiou AC, Thomas E, Silman AJ. Outcome of low back pain in general practice: a prospective study. *BMJ.* 1998 May 2; 376(7141):1356-9.
- Spitzer WO, LeBlanc FE, Dupuis M. Scientific approach to the assessment and management of activity-related spinal disorders: A monograph for physicians. Report of the Quebec Task Force on Spinal Disorders. *Spine.* 1987; 12 S
- Adams MA, Roughley PJ. What is intervertebral disc degeneration, and what causes it? *Spine.* 2006 Aug 15; 31(18):2151-61.
- Deyo RA, Weinstein et al. Low back pain. *N Engl J Med.* 2001; 344: 1644-45.
- Hughes SPF, Freemont AJ, Hukins DWL, McGregor AH, Roberts S. The pathogenesis of degeneration of the intervertebral disc and emerging therapies in the management of
- Nachemson AL. Newest knowledge of low Back pain. A critical look Stockholm: The Swedish Council of Technology Assessment in Health Care. *ClinorthopRelat Res.* 1992 Jun; (279):8-20.
- Vroomen PC, de Krom MC, Knottnerus JA. Diagnostic value of history and physical examination in patients suspected of sciatica due to disc herniation: a systematic review. *J Neuro*
- ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification), [<http://www.mdguidelines.com/laminectomy-or-lamin.>]
- Love JG. Root pain resulting from intraspinal protrusion of vertebral discs: diagnosis and treatment. *J Bone Joint Surg.* 1939; 19:776-80.
- Parisa Azimi1\*, Hassan-Reza Mohammadi1, Hossein Nayeb- Aghaei1, Shirzad Azhari1, Hossein Safdari, Ghandehari1, Sohrab Sadeghi, "Functionality Status and Surgical Outcome of Fenestration versus Laminotomy Discectomy in patients with lumbar disc herniation. *IrJNS.* 2015;1(1)
- Davis RA. A long-term outcome analysis of 984 surgically treated herniated lumbar discs. *Journal of neurosurgery.* 1994; 80(3):415- 21.
- Method Deepak C D1 , Abdul Ravoof2 , Manjappa CN2 , Vijay C3, Jobin Alex Mohan4, "Role of Open Discectomy in the Management of Lumbar Disc Prolapse by Fenestration (Laminotomy)", *International Journal of Health Sciences & Research* ([www.ijhsr.org](http://www.ijhsr.org)) 98 Vol.4; Issue: 4; April 2014
- Mohammad Aslam1, Fauzia Rehman Khan2, Najmul Huda3, Ajay Pant3, Mohd. Julfiqar1, Akshat Goel4, "Outcome of Discectomy by Fenestration Technique in Prolapsed Lumbar Intervertebral Disc", *Annals of International Medical and Dental Research*, Vol (1), Issue (3).
- Nagi ON, Sethi Anil, Gill SS. Early results of discectomy by fenestration technique in lumber disc prolapsed. *Indian Journal of Orthopaedics.* 1985;19(1):15-19
- Nahar K, Srivastava RK. Prospective study of prolapsed lumbar intervertebral disc treatment by fenestration. *Int J Res Med.* 2013; 2(2); 170-173.
- Ganz JC. Lumbar spinal stenosis: Postoperative results in terms of preoperative posture-related pain. *J Neurosurg.* 1990;72:71-4 13.
- Herron LD, Mangelsdorf C. Lumbar spinal stenosis: Results of surgical treatment. *J Spinal Disord.* 1991;4:26-33.

21. Richard A, Davis MD. A long-term outcome analysis of 984 surgically treated herniated discs. *J Neurosurg.* 1994; 80(3):415-21
22. Pappas CT, Harrington T, Sonntag VK. Outcome analysis in 654 surgically treated lumbar disc herniations. *Neurosurgery.* 1992; 1,30(6):862-6
23. Dr.Kumaravel. S, D, "Outcome analysis of fenestration discectomy in symptomatic young lumbar disc disease patients", *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* e-ISSN: 2279- 0853, p-ISSN: 2279-0861. Volume 19, Issue 8 Ser.9 (August. 2020), PP 50-55.

# 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](http://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 Orthopaedics 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<sup>®</sup> Gel

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



*When you require a quad force to attack,*

# Nudolo-Plus<sup>®</sup>

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

*In all types of  
peripheral neuropathies*

# Melex-Plus<sup>™</sup>

Capsule

(Mecobalamine, ALA, Folic Acid, B<sub>1</sub> and B<sub>6</sub> Capsule)



Approved by **USFDA**

*In GERD, NUD, Gastritis & Drug  
Induced Reflux Disease*

# NURAB-40<sup>®</sup> I.V.

(Pantoprazole 40mg I.V.)



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](mailto:editor@ojmpc.com)**

## **WEBSITE & E-PUBLISH BY**

---

**SYSNANO INFOTECH**

Web Development, Hosting Servers

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

[info@sysnano.com](mailto:info@sysnano.com) [www.sysnano.com](http://www.sysnano.com)