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Editorial

Isoflavonoids

Gohiya A.

Flavonoids (from the Latin word flavus meaning yellow, their color in nature) are a class of plant and fungus secondary metabolites.

Chemically, flavonoids have the general structure of a 15-carbon skeleton, which consists of two phenyl rings (A and B) and heterocyclic ring (C). According to the IUPAC nomenclature [1,2] they can be classified into:

1. flavonoids or bioflavonoids.
2. isoflavonoids,
3. neoflavonoids,

Isoflavonoids are a class of flavonoid phenolic compounds, many of which are biologically active. Isoflavonoids and their derivatives are sometimes referred to as phytoestrogens, as many isoflavonoid compounds have biological effects via the estrogen receptor. Isoflavonoids are derived from the flavonoid biosynthesis pathway via liquiritigenin or naringenin. [3]

Isoflavonoids are subclass of flavonoids and have been isolated from a wide variety of leguminous and non-leguminous plants. Isoflavones are present in berries, wine, grains, nuts, soybeans, and other legumes including kudzu root (Pueraria lobata), peanuts (Apiosamericana), and chickpeas (Cicer arietinum).

There are many biological activities associated with the isoflavones, including reduction in osteoporosis, cardiovascular disease, and prevention of cancer and for the treatment of menopause symptoms. Recent data indicate that the protective effect of isoflavonoids may extend beyond their antioxidant activity on molecular and cellular levels and modulating activity of many other enzymes.

Biotechnological approaches have been used to produce isoflavonoids through cell cultures of different species grown in shake flasks and bioreactor using normal and transformed cells.

Isoflavonoids are derived from the phenylpropanoid pathway and are synthesized predominantly in leguminous plants [4]. Simple isoflavonoids are dietary phytoestrogens and their glycosides. The isoflavanoid compounds have been studied intensively and about 1,600 isoflavonoids have been identified. [5]

Isoflavones exist in abundance in the natural sources in precursor form, not active form. Isoflavones are inactive in glycosidic form, their aglycosidic form is active and gets absorbed in the intestinal tract however, it is dependent on so many factors like fibre content of the diet and microflora of the gut [6]. After absorption, isoflavones are reconjugated to glucuronides and excreted unchanged in the urine [7].

Soy is recognized as the major dietary source of phytoestrogens, and soy-based products have been shown to contain significant quantities of total isoflavones. Daidzein and genistein are the two most well-characterized isoflavones [8]

Dietary consumption of foods and food additives containing isoflavone phytoestrogens has been associated with several beneficial properties to human health, such as prevention of coronary heart disease and osteoporosis, reduction of menopausal symptoms, and prevention of distinct cancer forms (e.g., breast, prostate, and colon cancer) [9, 10]. The potential health benefits of isoflavones for humans have been the subject of several reviews that have analyzed clinical, animal, and in vitro evidence for biological activity [11].

According to the USDA survey on isoflavone content, lentils do not contain significant amounts of these isoflavonoids [12]. Chickpeas contain daidzein, genistein, and formononetin & biochanin A. Soybeans have significantly higher levels of daidzein and genistein but contain less amount of formononetin and biochanin compared to chickpeas.

Epidemiological data suggest that a diet rich in isoflavones provides protection against several forms of cancer, particularly those that are hormone-dependent, such as breast, prostate, and lung cancer [13] Genistein, the predominant isoflavones found in soy, has been shown to inhibit the carcinogenesis in animal models. There are growing body of experimental evidence that show the inhibition of human cancer cells by genistein through the modulation of genes that are related to the control of cell cycle and apoptosis. Moreover, it has been shown that genistein inhibits the activation of NF-kappa B and Akt (protein kinase also known as PKB) signaling pathways, both of which are known to maintain a homeostatic balance between cell survival and apoptosis [14]. Genistein causes inhibition of cell growth in breast and prostate cancers in vivo and in vitro [15]. Both genistein and genistin induce cell cycle arrest [16] and are able to induce significant apoptosis.

Isoflavones prevent atherosclerosis; the most cited example in this case is the inhibition of LDL oxidation, formation of which is central in atherogenesis [17]. Genistein upregulates the expression of human endothelial nitric oxide synthase and lowers blood pressure in spontaneously hypertensive rats [18].

Soybean isoflavones may exhibit their cancer preventive function through their antioxidant properties. Genistein, the major component of soybean isoflavones, has been demonstrated to inhibit ultraviolet-B (UVB)-induced skin tumorigenesis in hairless mice. Genistein has also been shown to inhibit hydrogen peroxide production and increase the activity of antioxidant enzymes, such as catalase, superoxide dismutase, glutathione peroxidase, and glutathione reductase. Furthermore, genistein and daidzein can inhibit superoxide anion generation by xanthine/xanthine oxidase [7].

Depending on the type of estrogen receptor on the cells, isoflavones may reduce or activate the activity of estrogen. Isoflavones can compete with estrogen for the same receptor sites thereby decreasing the health risks of excess estrogen. They can also increase the estrogen activity.

One study suggests only modest effects of isoflavones on plasma hormones in postmenopausal women, and no significant effects on vaginal cytology or endometrial biopsy results. Thus, effects of isoflavones on plasma hormones per se are not likely to be significant mechanisms by which soy exerts estrogen-like effects in postmenopausal women [19].

In October 1999, the US Food and Drug Administration authorized the use on food labels of health claims associated with soy protein and the reduced risk of coronary heart disease. Several studies have indicated that a total daily intake of 25 g of soy protein paired with a low-fat diet resulted in clinically important reductions of total cholesterol and low-density lipoprotein (LDL) cholesterol levels. So far, there is no evidence for a stimulatory effect of isoflavones on the endometrium. A few studies reveal a minimal effect of soy on hot flashes, with soy reducing hot flashes 45% and placebo causing a 30% reduction compared with an approximate 70% reduction in hot flashes with estrogen replacement therapy.

Data available from human studies on the effect of isoflavones on osteoporosis are limited, and additional studies are needed to support a role in osteoporosis prevention. To date, no adverse effects of short- or long-term use of soy proteins are known in humans [20].

Current data are insufficient to draw definitive conclusions regarding the use of isoflavones as an alternative to estrogen for hormone replacement in postmenopausal women. Although epidemiological and basic laboratory studies allude to the possible protective effects of soy isoflavones at specific target tissues, randomized, placebo-controlled clinical trials are necessary to address these important issues.

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Original Article

Evaluation of the Results of Volar Plating in the Treatment of Fractures of Distal End Radius

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Investigation performed at Department of Orthopaedics, Unique Super Specialty Center, Indore, Madhya Pradesh, India

Abstract

Background*:* Fractures of lower end radius are most common fractures of the upper extremity. Increased awareness of the complexity of the distal end radius fractures have stimulated a growing interest and promoted new ideas regarding their management. Close reduction and cast immobilization had been the mainstay of treatment of these fractures but poor functional and cosmetic results are not uncommon. The volar plate system has been shown to be reliable for the fixation of distal radius fractures. As open reduction and volar plating ensures more consistent correction of displacement and maintenance of reduction, this prospective study evaluates the anatomical and functional outcome of open reduction and plate fixation in the management of fracture distal end radius.

Method*:* In this study 40 patients with distal end radius fractures were included, informed consent was and clearance from ethical committee of the institute was taken. The study was Prospective, interventional and observational for the methods used for management of the fracture. Patients were evaluated pre operatively and post operatively at the end of first, fourth, sixth week,3 months and then once in 3months up to 12 months.

Results*:* In the prospective study conducted with forty patients,88% anatomical and 93% functional, excellent to good results suggests that stabilizing the fracture fragments with volar plate and screws in the management of the fractures of distal radius, is an effective method to maintain the reduction till union and prevent collapse of the fracture fragments, even when the fracture is grossly comminuted / intra-articular / unstable and / or the bone is osteoporotic.

Conclusion*:* This study concludes that open reduction and internal fixation with volar plating has excellent functional outcome with minimal complications. The procedure is applicable for all types of Frykman fractures in young patients with a good bone stock as well as in elderly osteoporotic patients.

Keywords: Volar Plating, Distal Radius Fractures,distal end radius.

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Introduction

Distal radius fractures remain an injury that fosters considerable interest and debate. Interest in distal radius fractures stems not only from its high incidence but also from developing understanding of outcome variables and influence of technology in evaluation and treatment.

Distal radial fractures have a bimodal age distribution, consisting of a younger group who sustains relatively high-energy trauma

to the upper extremity and an elderly group who sustains both high-energy injuries and insufficiency fractures.

Following a distal radial fracture, the attainment and maintenance of anatomical reduction of the articular surface is crucial to the preservation of wrist function [1]. The degree to which articular step–off, gapping between fragments, and radial shortening can be improved with surgery correlates strongly with improved outcome. Hence, a treatment method that is more likely to achieve these goals will result in better function.

The volar plate system has been shown to be reliable for the fixation of distal radius fractures. The volar approach is less disruptive to the nearby tendon than the dorsal approach, because there is more space available for the plate on the volar surface of distal radius. An advantage of the volar plating technique is the comfort that it provides to patients in initiating early finger and wrist motion. Early rehabilitation possible with the new design, the distal screws are locked to the plate, which stabilizes the screw against lateral movement(toggle) and resist loosening. This provides additional strength to the fixation by constructing a scaffold under the distal radial articular surface. The proximal diaphyseal screws fix the plate strongly to thick cortical bone, completing this stable form of fixation [2].

As open reduction and volar plating ensures more consistent correction of displacement and maintenance of reduction, this study evaluates the anatomical and functional outcome of open reduction and plate fixation in the management of fracture distal end radius.

Materials and Methods

40 patients with distal radius fractures of the treated at Unique Super Specialty Centre, Indore between May 2013 and May 2015 were included in the study.

Inclusion Criteria:

a) Patients with distal radius fractures of wrist

b) Patient age > 18 years

c) Closed fractures

d) Patients willing for treatment and given informed written consent.

Exclusion criteria:

a) Patients <18 years of age

b) Medically unfit cases.

c) Compound fractures

d) Pathological fracture

e) Previously operated & non-functional wrist

f) Patients with local tissue condition making surgery inadvisable

The standard volar approach was undertaken to fix distal radius fracture using volar buttress or locking plate and screws. The ulnar styloid fracture was managed expectantly. The movement of wrist was restricted in slab for 10 days after operation. After 10 days, slab removed and crepe bandage applied and active motion of the wrist consisting of wrist movements, supination, pronation, finger grip were started.

They were followed up at the end of first, fourth, sixth week, 3 months and then once in 3months up to 12 months. During follow-up visits AP and lateral x-rays were taken and patients were instructed about the exercises of the elbow, digits and shoulder.

Patients were assessed, which includes objective grading of function and deformity, comparison of final and initial radiograph. Objective examination included inspection of the wrist for deformity, tenderness, abnormal mobility of the distal radio-ulnar

joint, measurement of the range of movements and grip strength.

The subjective, objective and radiographic findings were quantified by Lidstrom's system and Demerit point system. The outcome of each fracture has been graded as excellent, good, fair or poor

Results

40 patients with distal end radius were enrolled in the study and were treated by volar plating system. The analysis of results showed The mean age of the patients was 39.6 years(range 19-67 years). There were 26 male patients (65%) and 14 female patients (35%) in the study.

Table 1

Age& Sex Distribution

Age (Years)	Male	Female	Total
11-30	7	1	8
31-50	15	9	24
51-70	4	4	8
TOTAL	26	14	40

Table- 2

Frykman classification of fracture

Type	I	II	III	IV	V	VI	VII	VIII
No. of pt.	6	5	8	17	1	1	1	1
%	15	12.5	20	42.5	2.5	2.5	2.5	2.5

ANATOMICAL EVALUATION

Residual dorsal tilt:

The dorsal tilt (from a neutral of 0 degrees) of the distal radial articular surface varied from 4^0 to 28^0. The dorsal tilt decreased from an average of 14^0before the reduction to an average of 0.7^0at the most recent follow up evaluation.

Postoperatively the dorsal tilt could be corrected to the anatomical palmar tilt or at least a neutral angle in 34 patients (85%) while in 6 patients (15%) the dorsal tilt could not be restored even to a neutral angle.

Out of these 6 patients, 2 had Frykman Type Ifracture,2 had Type III fracture while one had Frykman Type IVfracture and one had Frykman Type VII fracture.

At the final follow up, two patients (5%) had some loss of correction of dorsal tilt. These patients had a comminuted intra-articular fractures (Type IV and VII).

In 95% of the patients the correction of tilt achieved at surgery was maintained till healing.

RADIAL LENGTH

The radial shortening varied from 4mm to 27 mm. It decreased from an average of 12 mm before the reduction to an average of 0.7 mm postoperatively and to 0.8 mm at the most recent follow up.

In 1 patient (3%) there was 5 mm of collapse of radial length from the immediate postoperative to the final follow up period. This patient had comminuted fracture Frykman Type VI.

97% of the fractures maintained their postoperative radial length till union.

RADIAL ANGLE

The loss of radial inclination varied from 0^0 to 24^0. (Avg 13^0) it was reduced to an average of 1^0 at the final follow up.

In 2 patients (5%) there was loss 3^0 to 4^0 of correction of radial inclination. These 2 patients had comminuted intra articular fractures.

CLINICAL AND FUNCTIONAL EVALUATION

Residual deformity:

Prominent Ulnar Styloid – 5patients (12%)

Residual Dorsal Tilt – 4 patients (10%)

Radial Deviation of hand – 0 patients (0%)

OBJECTIVE EVALUATION

Table- 3

Objective evaluation

Objective evaluation	No. of pt
Loss of Dorsiflexion(<45^0)	1
Loss of Palmar Flexion (<30^0)	2
Loss of Ulnar Deviation (<15^0)	1
Loss of Radial Deviation (<15^0)	1
Loss of Supination (<50^0)	1
Loss of Pronation (<50^0)	1
Loss of Circumduction	2
Pain at DRUJ	2
Grip Strength <60% of opposite side	1

COMPLICATIONS

Table- 4

Complication

Complication	No. of patient
Reflex Sympathetic Dystrophy	1
Joint Stiffness	2
Paraesthesia in distribution of Radial Nerve	1
Impingement of tendons	0
Median Nerve complications	0
OA wrist	1

5 patients (12.5%) developed complications, however, 35 patients (88.5%) were fre from complications.

Anatomical score of healed fracture:

The scoring was done according to the Sarmiento's modification of Lidstrom Criteria.

Anatomically 25 patients (63%) had excellent restoration of anatomy, 10 patients (25%) had good restoration, 3 had fair (7%) and 2 had poor (5%) restoration of anatomy.

Thus 88% patients had excellent to good alignment of fragments and good reduction could not be achieved in 12% patients resulting in fair or poor results.

Functional end result of healed fracture:

The scoring of healed fracture was done according to the Demerit Point System of Gartland and Werley with Sarmiento et al modification.

Functionally 24 patients (60%) had excellent, 13 good (33%) and 3 patients had fair (7%) restoration of functions. Poor function correlated with residual displacement and poor patient compliance.

The ratio of grip strength of affected hand to normal hand was measured by a standard dynamometer. 24 patients (60%) had excellent grip strength, 11 patients (27.5%) had good grip strength while in 2 patients grip strength measurement was not possible due to bilateral wrist involvement.

Discussion

In 1814, AbrahamColles outlined the treatment of his choice for distal end radius Fracture [1]. Since then there have been numerous studies to outline the ideal treatment for different fracture types.

In this study of 40 patients the mean age of the patients was 39.6 years (range 19-67 years) with male predominance. Chung et al in his study observed mean age of 48.9yrs with male predominance [2].

Chung K C et al in his study of 161 patients reported flexion of wrist in the injured side 86% of the contralateral side, in this study functional results were good to excellent in 93 % patients [2].

Ratio of grip strength of affected hand to normal hand was excellent in 24 patients and good in 11 patients. There was loss of dorsiflexion($<45^0$) in 1 patient and loss of

palmar flexion(30^0) in 1 patient.Flexion of wrist in injured side was 88% of contralateral side after a follow up period of 12 months.

Leung et al conducted a randomized control trial in 137 patients with intra-articular distal radius fracture and compared between external fixation augmented with nails and internal plate fixation of the fractures. At an average of 24 months of follow up period, they reported that the results of plate fixation group were significantly better than the augmented external fixation group [3]. In our prospective study, volar approach for plate fixation in DER fractures also had better functional outcome as well as better alignment of fracture fragments after a 12 month of follow up period.

Figl M et al studied on volar fixed angle plate osteosynthesis of unstable DER fracture with a 12 months follow up in 80 patients.At the time of final follow up, 60 patients(75%) had no radial shortening,20 patients(25%) had a mean radial shortening by 1.8 mm compared to contralateral side. Radial tilt was average 22^0,volar tilt was average 6^0. Grip strength was 65% of contralateral side [4]. In our prospective study, in 95% of the patients the correction of tilt achieved at surgery was maintained till healing. In two patients (5%),there was some loss of correction of dorsal tilt. These patients had a comminuted intra-articular fractures (Type IV and VII). In 1 patient (3%) there was 5 mm of collapse of radial length.

Othman AY conducted a study on fixation of dorsally displaced distal radius fracture with volar plate.16 patients were included in the study .88% of fractures were rated as good or excellent according to Gartland and werley scoring system [5]. In the present study, out of 40 patients enrolled 88% of patients had excellent to good alignment of fracture fragments and functionally, 93% of patients had excellent to good restoration of function. Gruber G et al also reported good or excellent results in more than 90% patients after volar plate fixation [6].

Dillingham C et al reported that supination and pronation returned more quickly than flexion or extension. Supination and pronation was 92% of the uninjured wrist after 3 months. Flexion improved between 3 to 6 months and all wrist ROM improved till 1 year [7]. In the present study, supination and pronation were both around 90% of uninjured wrist after 3 months. At the time of final follow up there was Loss of Dorsiflexion in 1, Loss of Palmar Flexion ($<30^0$) in 2 patients ,Loss of Ulnar Deviation ($<15^0$) in 1, Loss of Radial Deviation ($<15^0$) in 1, Loss of Supination ($<50^0$) in 1, Loss of Pronation ($<50^0$) in 1 and Loss of Circumduction in 2 patients. 35 out of 40 cases, showed excellent to good grip strength after a follow up of 1 year.

Lee YS et al conducted a retrospective study to compare the clinical outcome of volar locking plating(VLP) and percutaneous K-wire(PKW) fixation for treatment of displaced colles' type DER fracture in patients between 50 to 70 years. The results had shown better functional end results with VLP [8]. In the present study, 8 patients were between age 50 and 60 years and 7 patients showed excellent to good functional outcome. However, only one patient had poor outcome with wrist joint stiffness.

Gogna et al conducted a study on osteosynthesis with volar fixed angle locking plates in dorsally comminuted fractures of DER. Final assessment was done as per Demerit point system, which showed 79% (n=26) excellent results,18% (n=6) good and fair in 3% (n=1). 3 patients had loss of reduction but none had tendon irritation or rupture or non-union at the end of one year of follow up [9]. In the present study, Demerit point system yielded excellent functional end results in 60% (n=24) cases, good in 33% (n=13) cases and fair in 7%

(n=3). Residual dorsal tilt was seen in 10%(n=4), none of the cases showed any radial deviation of hand or tendon irritation or rupture or non-union of fracture fragments at the final follow up after one year.

Kamano M et al in his study the complications as follows: 1 case developed RSD, 1 case had mild superficial skin infection [10]. In the present study, 1 patient developed RSD, radial nerve paresthesia was seen in 1 case, 2 patients developed superficial skin infection at the operated site.

Rozental TD et al in his study in reported 44% infection rate [11]. In our study, out of 40 patients, 5% (n=2) cases developed superficial skin infection at the operated site which was managed conservatively. There was no need for plate removal. 5 patients developed post-operative complications. Arora R et al in his study reported complication rate of 27% (n=31). 57% of complication was due to flexor and extensor tendon irritation which included rupture of FPL tendon in 2 cases, rupture of EPL tendon in 2 cases, 4 cases with extensor tendon tenosynovitis, 9 cases of flexor tendon tenosynovitis, 3 case with carpal tunnel syndrome, 5 cases with RSD, loosening of single screw in 2 cases, delayed union in 3 cases, intra-operative intra-articular screw displacement in 1 patient [12]. In our prospective study, none developed any tendon irritation or rupture but in 1 case there was radial nerve paresthesia and 1 patient developed RSD.

Too long screws can penetrate the extensor compartment, very distal palmar plate position can interfere with flexor tendon system and distal screws in comminuted fractures can cut through subchondral bone and can penetrate into the radio-carpal joint. So,careful drilling and choice of screw length is vital to avoid such complications.Placing the plate proximally to the watershed line and removing the plate as soon as the fracture united is necessary to avoid the complication of tendon rupture.

Prommersberger KJ et al evaluated non-union after reconstruction surgery of distal radius fracture in 23 patients and reported that open fractures, severe contamination, infection, tissue interposition, devascularization of bone ends and pathologic lesions are risk factors for non-union [13]. In present study, inspite of development of superficial skin infection in 5% (n=2) cases, no case was reported to have non-union of fracture .

Conclusion

In this prospective study conducted with forty patients, suggests that stabilizing the fracture fragments with volar plate and screws in the management of the fractures of distal radius, is an effective method to maintain the reduction till union and prevent collapse of the fracture fragments, even when the fracture is grossly comminuted / intra-articular / unstable and / or the bone is osteoporotic.

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Original Article

Outcome Following Platelet Rich Plasma Injection In Patients Of Chronic Lateral Epicondylitis

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Abstract

Background: Various modalities of management are available for lateral epicondylitis which is a common cause of pain around elbow. Many studies have suggested the use of prp (platelet rich plasma) as a safe and effective mode of therapy.

Material and Methods: purpose of this study was to assess the efficacy of prp injection in patients of chronic lateral epicondylitis.It was an interventional study of 70 cases with at least 6 months of symptoms and failed conventional therapy. PRP was prepared from 40 ml autologous venous blood by double centrifugation method.Patients were followed upto 6months. An analysis of result with regards to pain (vas score) was done.

Results: Right elbow was predominantly affected in our sample. Mean age of patients was 41 years. Success was defined as reduction of pain (vas) without re-intervention after a follow up of 6 months. In all patients there was improvement in vas score .pre injection mean vas score of patients was 7.04 and at final follow-up it was 1.84. There was 74 % improvement in vas score. There was progressive improvement with no complications.

Conclusion: Treatment of patients with tennis elbow with prp decreases pain and significantly increases function, even after a follow-up of 6 months.

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Introduction

Lateral epicondylitis, or “tennis elbow,” is a frequently reported condition in medical care. The complaint is characterized by pain over the lateral epicondyle of the humerus, which is aggravated with resisted dorsiflexion of the wrist. The incidence is approximately 4 to 7 per 1000 patients per year.

Affected lesion could be common extensor tendon, extensor Carpi radialisbrevis (ECRB), or radial collateral ligament. It is evident that affected tendons have undergone a process of mucoid degeneration and tearing.

Pain may be due to irritation of mechanoreceptors by traction or shear forces or activation of nonreceptive receptors by neurotransmitters such as substance P [(1)] .

Several new treatments have been developed in an attempt to stimulate tissue

regeneration. One of these treatments is an injection of platelet-rich plasma (PRP).

The use of autologous growth factors in the form of platelet rich plasma (PRP) may be just the beginning of a new medical frontier known as ‘‘orthobiologics.’’ Platelet-richplasma (PRP) is a new technology focused on enhancing the healing response afterinjury of different tissue types[(2)].

As PRP is from patient’s own blood, it is free of transmissible diseases and cannot cause hypersensitivity reactions. The minimum platelet count required for a blood clot to qualify as PRP may be arguable but a concentration of about 1 million platelets/μL or about 4 to 7 times the usual baseline platelet count (i.e., 2,00,000platelets/μL) has been shown to provide clinical benefits[(3)].

PRP is created from an autologous whole blood sample through a platelet separation process, which results in an increased platelet concentration compared with the original whole blood sample[(4)]. It is theorized that when PRP is injected into an area of tendinopathy, the platelets release a multitude of growth factors and stimulate a healing response[(5)].

Material and Methods

This Prospective study for assessment of clinical effect of platelet rich plasma in tennis elbow was conducted in Department of Orthopaedics Gajra Raja Medical College and Jayarogya group of Hospital, Gwalior (M.P.).

All patients of “chronic tennis elbow” with atleast 6 month duration of symptoms who came to OPD of Department of Orthopaedics were included in the study.

Total 70 diagnosed cases of tennis elbow on the basis of clinical examination who met the inclusion criteria were included for the study. Patients who did not give consent for the procedure were excluded from the study.

PRP preparation was done from 40 ml of autologus blood. Blood was centrifuged at two levels, first 800 rpm for 10 minutes and second at 2400 rpm for 10 minutes. Patients are analyzed for pain using VAS score.

Inclusion criteria were patients having age between 20 to 70 years, duration of symptoms at least 6 months and pain ranking at least 5 on a 10 point scale.

Exclusion criteria were patients with tendon rupture or post surgical tendon repair, acute inflammatory disease, febrile or infectious disease, malignancy, history of autoimmune platelet disorder, history of consistent use of NSAIDS and systemic steroid use, anemic patients , patients having platelet count less than 150,000 per micro litre, diabetic and pregnant woman.

Injection Technique

2 ml of PRP solution injected directly into the area of maximum tenderness using a 22-g needle into the common extensor tendon using a *peppering technique*.. This technique involved a single skin portal and then 5 penetrations of the tendon.

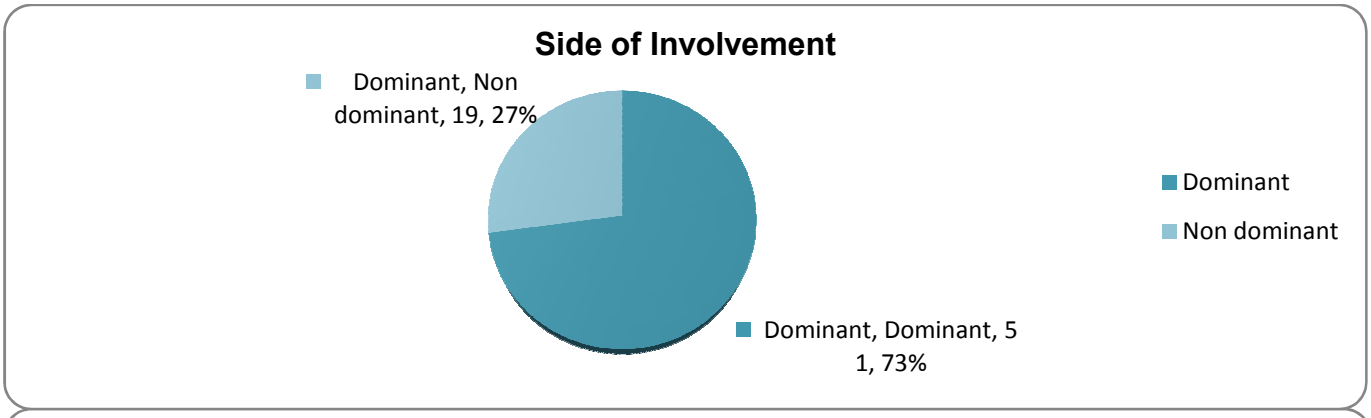
Post Procedure Protocol

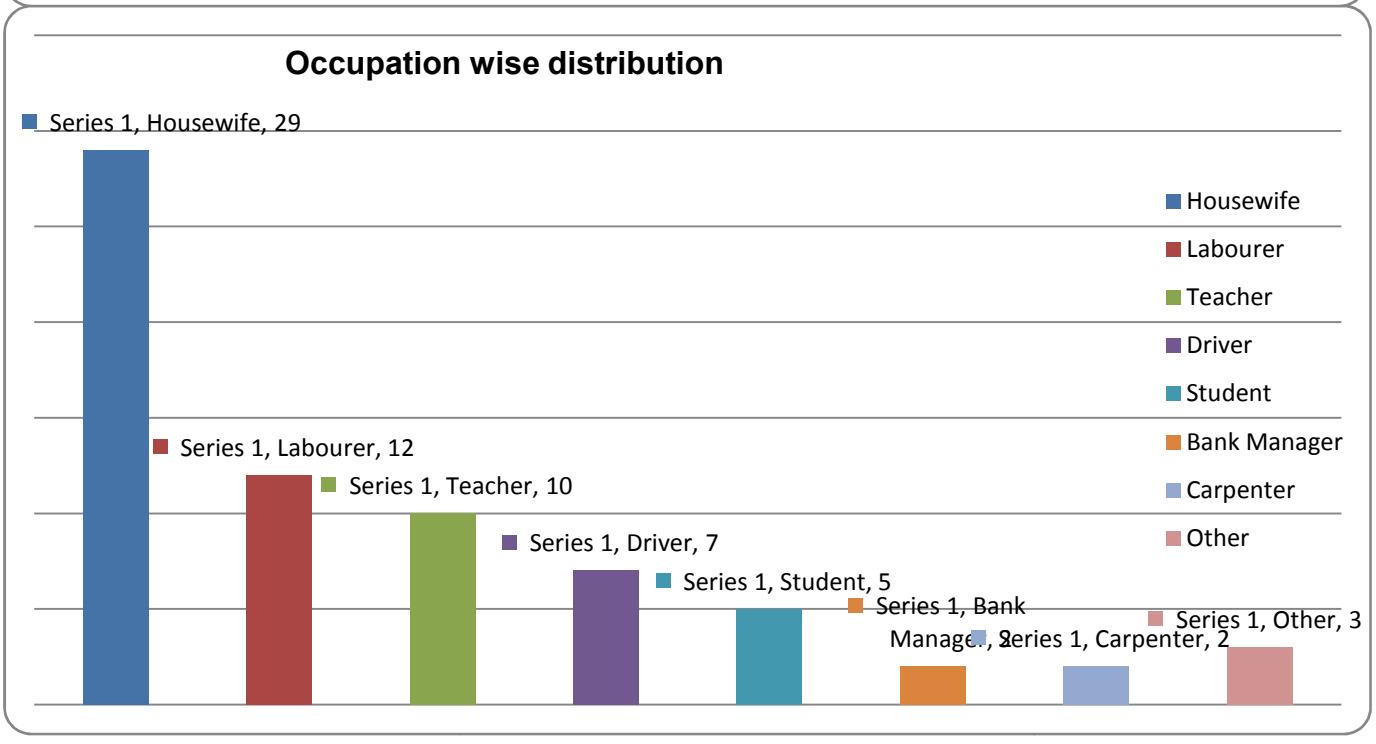
Immediately after the injection, the patient was kept in a supine position without moving the arm for 15 minutes. Patients were sent home with instructions to limit their use of the arm for approximately 24 hours and use acetaminophen for pain. A formal stretching and strengthening exercises of forearm muscles were initiated on 2nd day after injection. At 4 weeks after the procedure, patients are allowed to proceed with normal sporting or recreational activities as tolerated.The patients were examined at 4 weeks, 8 weeks and 6 months after the procedure. A 10-mm visual analog pain

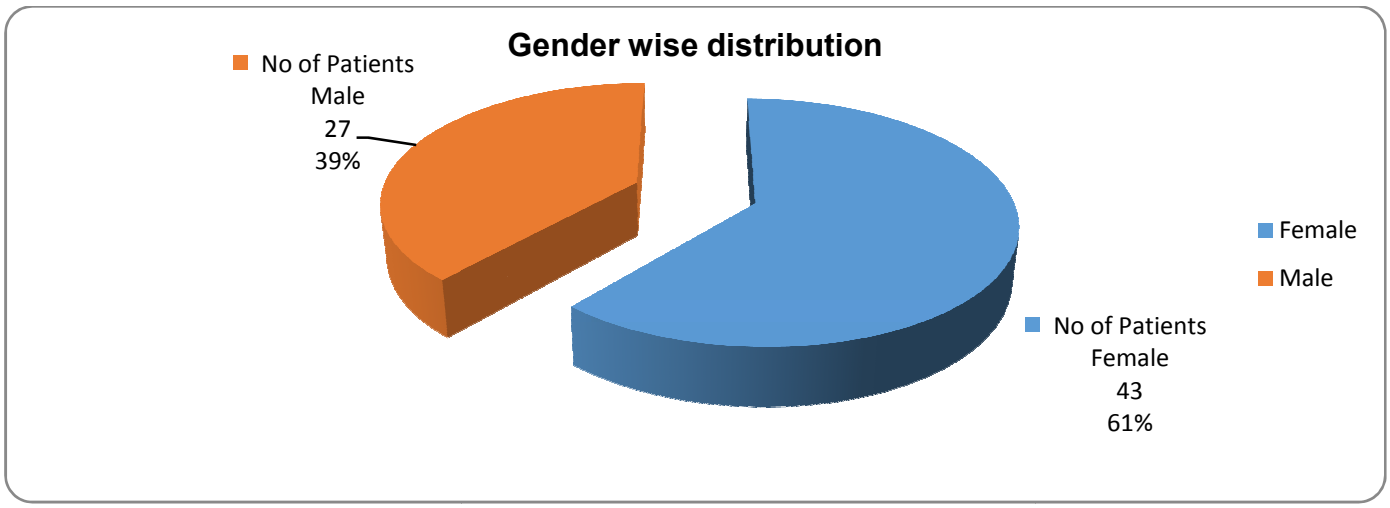
score (0, no pain; 10, worst pain possible) were used as outcome measures.

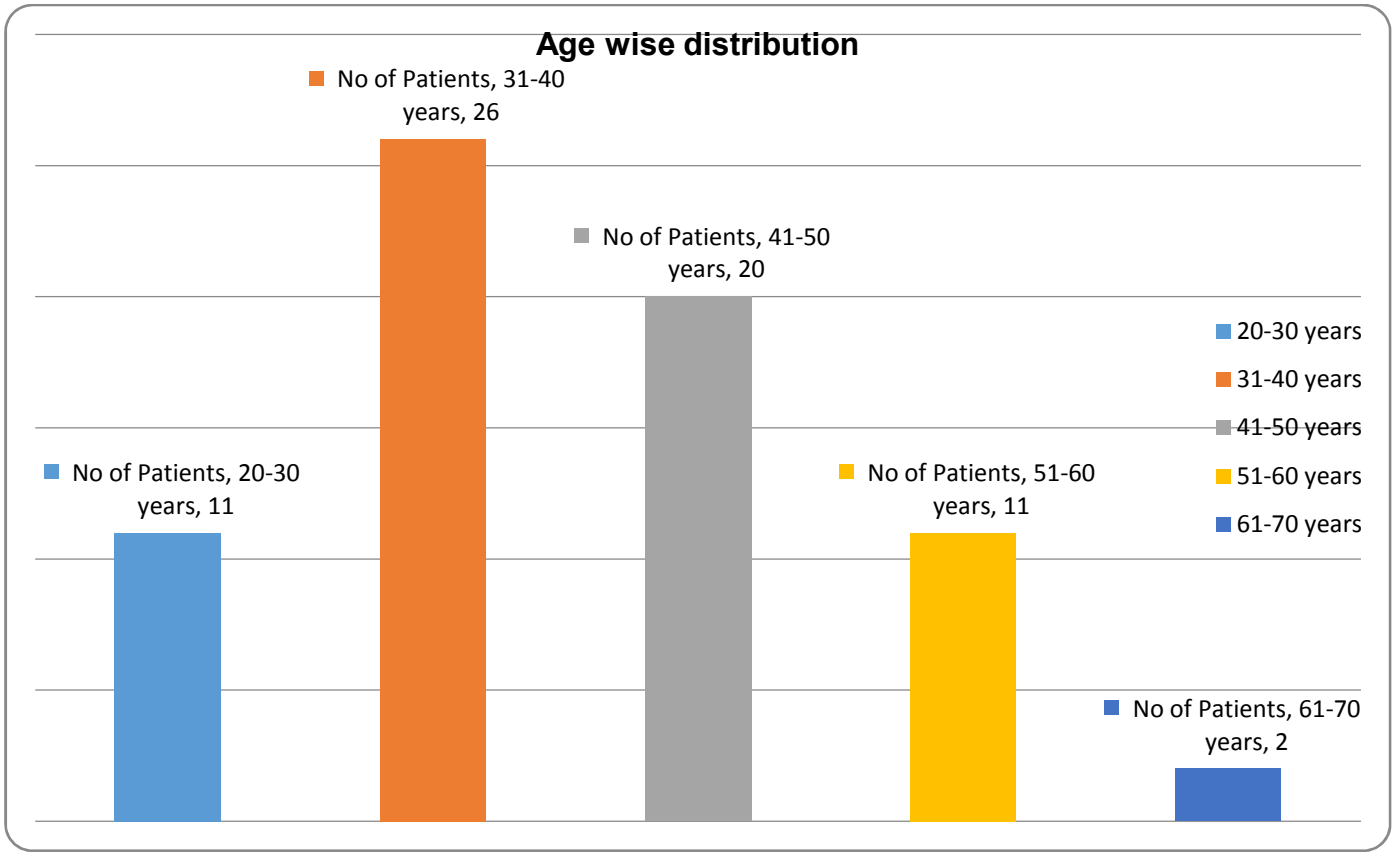
	
After completion of 1st centrifugation step	After completion of 2nd centrifugation step

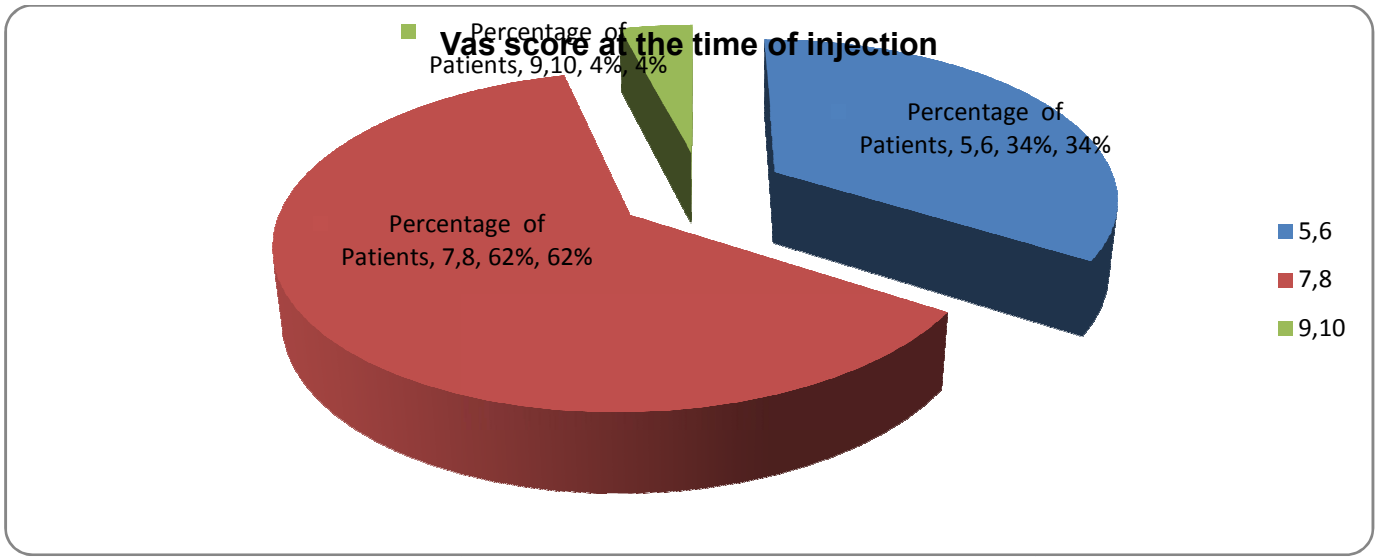
Obsrevations and ResultsA total of 70 patients were included in the study.Age range was 20 to 70 years with mean age of 41 years. Maximum no of patients were in age group of 31-40 years(43 were females and 27 were male). Dominant side was most commonly involved. Analysis revealed a significant improvement in pain starting from 4th week. Success was defined as reduction of pain without re-intervention after a follow up of 6 months.

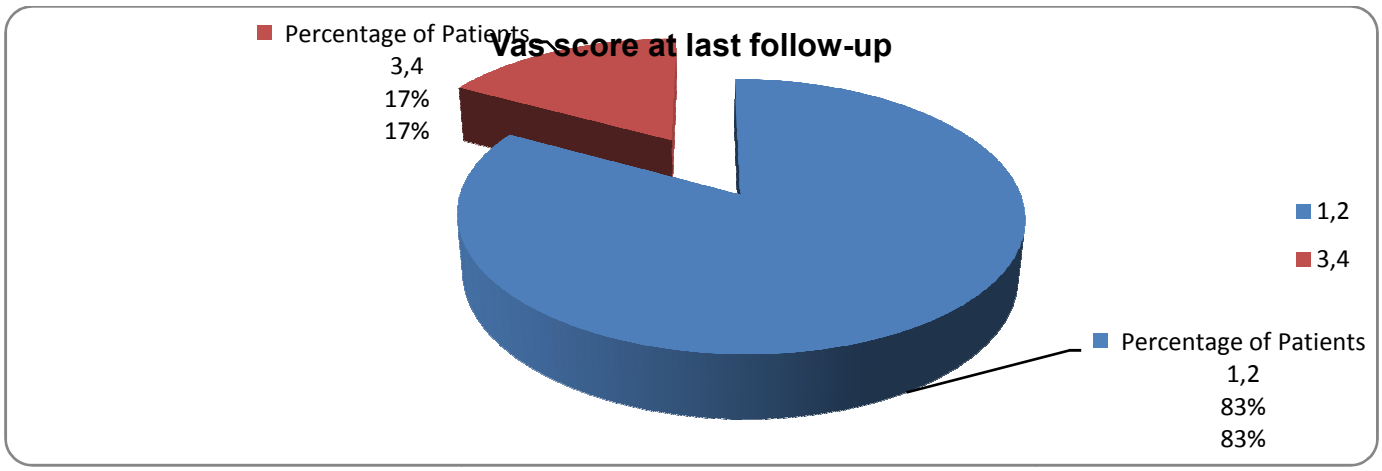


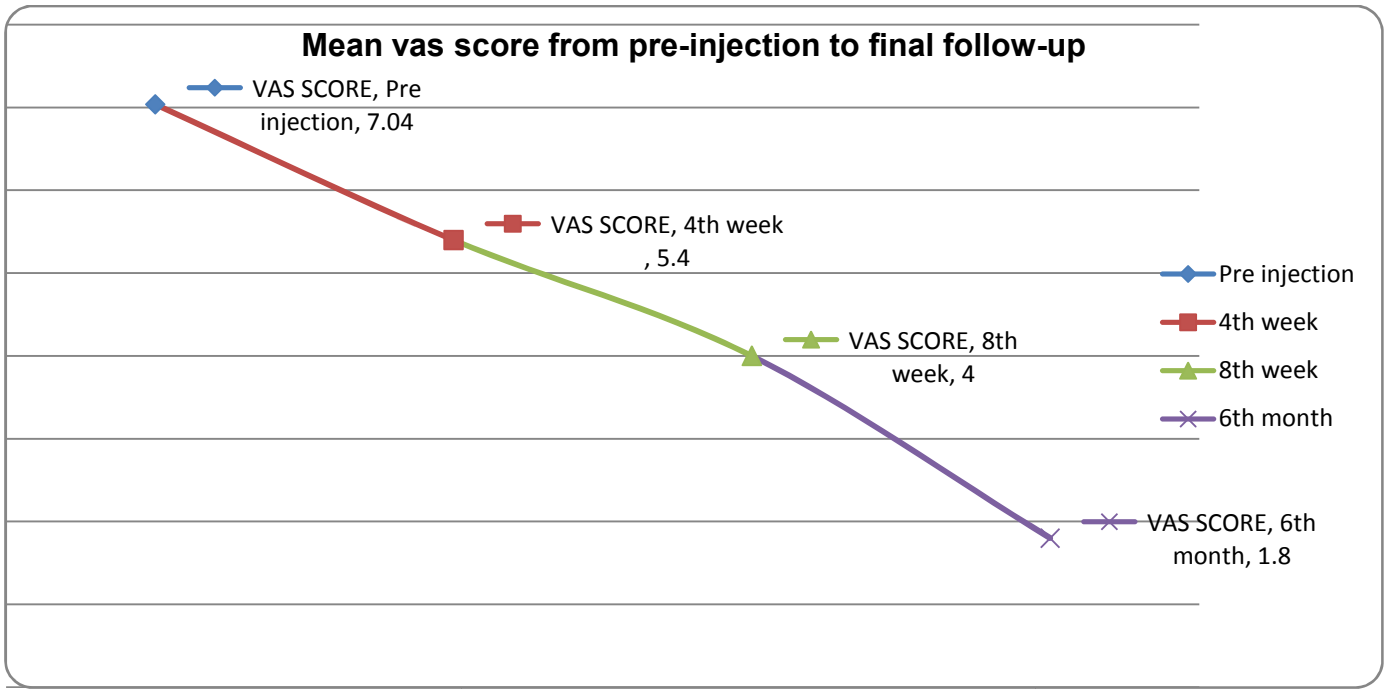



Gender wise distribution
No of Patients Male 27 39%
No of Patients Female 43 61%
Female
Male


Age wise distribution
No of Patients, 31-40 years, 26
No of Patients, 41-50 years, 20
No of Patients, 20-30 years, 11
No of Patients, 51-60 years, 11
No of Patients, 61-70 years, 2
20-30 years
31-40 years
41-50 years
51-60 years
61-70 years


Vas score at the time of injection
Percentage of Patients, 9,10, 4%, 4%
Percentage of Patients, 5,6, 34%, 34%
Percentage of Patients, 7,8, 62%, 62%
5,6
7,8
9,10





Discussion

Elbow epicondylartendinosis is a common problem with many possible treatments.The number of overuse injuries is not exactly known, but in sports medicine, they account for 30 to 50% of all injuries[6].Age-adjusted logistic regression analyses have shown that people who have worked for 25 to 35 years are more likely to develop tendinopathy[7] .

In our study maximum patients were in fourth decade. The mean age group was 41.34 years. Nirschl RP et al[8]in their study found tennis elbow predominance in fourth and fifth decade.Female predominance was present as far as sex ratio of this tendinopathy was concerned with 43 females (61 %)having this pathology compared to 27 males (39 %).Karen Walker-Bone et al[9] in their population based study on occupation and epicondylitis found mean age 45.6 years (range 24.6 - 66.3 years), and (55%) female.Tennis elbow was most commonly found in the people ,who were mostly involved with repetitive forearm movements.

Association of this being common in housewives can be attributable since they are liable for various house hold activities which requires excessive use of forearm supinators and wrist extensors.Ciccotti MG,

Lombardo SJ[10]stated that the cause of lateral epicondylitis is excessive, monotonous use of the wrist extensors and forearm supinators.

Double centrifugation method in our study for the preparation of PRP. AronGonshor[11]described two stage technique for processing PRP and revealed that the platelet concentration was 3 to 5 times the whole blood baseline, the concentration of the platelet derived growth factor (PDGF - AB) was above 500 % and tissue growth factor (TGF β 1) was also greater than 800 %. Pietrzzak WS and EppleyBL[12] used double centrifugation technique. The blood sample is drawn into a tube with anticoagulation factor and then the tube is spun in standard centrifuge cycles. The first spin (soft spin) will separate the red blood cells from the plasma that contains the platelets, white blood cells and clotting factors (Buffy coat). The second spin (hard spin) finely separates the platelet concentrate (PRP) from the platelet-poor plasma.

In our study Comparison of the mean VAS Score with each follow up showed decrease in mean VAS score at the 4th week of injection from 8 to 5.3, at the 8th week of injection the mean VAS score was 4,and at the last follow up at the 6th month of injection the mean vas score was 1.84 Mishra and Pavelko[13]eight weeks post injection the PRP patients reported 60% improvement in visual analogue scale (VAS) pain score. At six months post injection, cases reported 81% improvement in their VAS pain score and at final follow-up patients reported 93% reduction in their VAS pain score.Jonathan T. Finnoff et al. [14]found the mean pain improvements of 58%. Ragab EM, Othman AM[15]in their study found the VAS to improve from 9.1 to 1.6..These findings were found to be comparable with other authors who compared the VAS scores. At the final follow up at sixth months post injection, our cases reported 74 % improvement in their VAS pain score in our study.

It was also concluded that lateral epicondylitis is more common in dominant hand(In our study 51 dominant side and 19 non dominant side) . Kevin Lutsky et al[16]conducted a study to evaluate the effect of hand dominance on function in patients with Common hand disorders such as carpal tunnel syndrome, de Quervain's tenosynovitis , lateral epicondylitis , hand osteoarthritis and trigger finger affect the dominant and nondominant hands in roughly equivalent proportions, whereas Lateral Epicondylitis is more common on the dominant side.

Conclusion

The current investigation represents clinically based outcome study to evaluate the effectiveness of treating Chronic Lateral Epicondylitis (tennis elbow) with PRP injection. Our results suggest that this treatment may be an effective and safe treatment option for patients presenting with tennis elbow. We were also able to evaluate the association between multiple variables, including age, sex, occupation, and VAS score. There is low risk of infection as the whole procedure of platelet separation is done under aseptic conditions and PRP has antibacterial properties. None of our patients had incidence of infection.

The PRP is freshly prepared from patients own blood. There is no chance of adverse reaction as no foreign substance is injected. The time required for clinical improvement was also short with most of the patients showing significant improvement in VAS score within 4 weeks. As PRP can be prepared immediately at the point of care, this makes it simple and inexpensive procedure.

None of the patients reported to have recurrence of symptoms when followed up to 6 months of treatment. PRP injection is the excellent method for treating chronic tendinopathy like tennis elbow.

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Original Article

Is Caudal Epidural Steroid Injection Effective In Chronic Low Back Pain Due To Multiple Lumbar Disc Prolapse? A Prospective Study

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Investigation performed at Department of Orthopaedics, Peoples College of Medical Sciences, Bhopal , Madhya Pradesh, India

Abstract

Background: Chronic low back pain has multiple aetiologies, and multiple bulged or prolapsed lumbar intervertebral discs are a frequent finding on MRI. Epidural steroid injections are an established mode of conservative management, working by spreading up and down the epidural space and reducing inflammation. We prospectively investigated the caudal method of epidural steroid injections for such patients with MR proven multiple disc bulges.

Material and Methods: A cohort of 38 patients was enrolled in the study from May 2014 to April 2015. We included patients older than 18 years with history of chronic low back pain with or without neurological claudication, with MRI findings of multiple prolapsed lumbar intervertebral discs not responding to conservative management. Patients were evaluated at baseline, three weeks, three months and six months using Objective Parameters of Straight Leg Raise test (SLRT) and Claudication distance and subjective parameters of pain using Numeric Pain Rating Scale (NPRS) and Disability using Oswestry Disability Index (ODI).

Results: The 38 patients (27 male and 11 females) had a mean age of 48.34 years, and their mean duration of back pain was 18.2 months. Mean NPRS and ODI improved from 7.21 and 41.8 at baseline to 4.6 and 26.8 respectively at 6 m. Similarly Mean SLRT and Claudication distance improved from 40.8 degrees and 350 m at baseline to 62.9 degrees and 500 m at 6 months. Change in NPRS, ODI and SLRT were statistically significant.

Conclusion: Caudal epidural injections are an effective modality of treatment in managing chronic low back pain due to multiple lumbar disc bulges. They provide significant pain relief, improvement in functional status and facilitate return to work.

Keywords: Caudal Epidural, Low back pain, Multiple disc bulges, Lumbar prolapse.

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Introduction

The importance of Low Back Pain (LBP) is due to its high lifetime prevalence (80%) in the community and its effect on the individual in terms of pain and disability. Thirteen per cent of population suffers with persistent back pain of high intensity, with either

moderate or severe disability [1].

Intervertebral disc is the largest avascular tissue in the body [2], and consists of inner nucleus pulposus, outer annulus fibrosus and cartilage located superiorly and inferiorly. Intervertebral disc resists compression because of the osmotic properties of the proteoglycans. The ability of the disc to resist anterior and lateral shears along with compression and flexion makes the intervertebral disc the most important load bearing component of the spine, beside the facets [3]. Signs of degeneration includes one or all of the following: diminished disc height, narrowing of facet, osteophytes and sclerosis of upper and lower endplates, stenosis of spinal canal, narrowing of lateral recess, real or apparent desiccation, fibrosis, diffuse bulging of the annulus beyond the disc space, extensive fissuring (i.e., numerous annular tears), mucinous degeneration of the annulus, defects and sclerosis of the endplates, and osteophytes at the vertebral apophyses [4].

The most common symptom associated with lumbar disc degeneration is low back pain due to the presence of neural tissue around the intervertebral disc. The main symptom of disc degeneration after low back pain is sciatica. Features suggestive of sciatica are unilateral or bilateral leg pain radiating to the feet and toes, numbness in dermatomes distribution and positive straight leg raising test.

Neurogenic claudication (NC) is described as the classic clinical presentation of lumbar spinal stenosis (LSS), a degenerative condition of the lumbar spine normally affecting adults over the age of fifty [5], [6]. Symptoms of NC are described as pain, paraesthesia or cramping of one or both legs, brought on when walking and relieved in sitting [7]. The effect of posture on symptoms is the primary distinguishing feature of NC- symptoms are typically exacerbated when the spine is extended (in upright stance when standing or walking) and eased when the spine is flexed (stooping forwards or sitting). Clinical symptoms are believed to result from stenotic changes (narrowing) exacerbated by posture-related compression causing neural and microvascular compromise of the cauda equina and lumbosacral nerve roots [8],[9].

Epidural steroid injections are not only the most commonly used procedures in interventional pain management, but also the most contentious and misunderstood modality of treatment [10], [11]. Approaches available to access the epidural space in the lumbosacral spine include the interlaminar, transforaminal and caudal. Numerous publications have appeared in support and some in opposition of epidural injections in managing low back pain or lower extremity pain. Systematic reviews of the effectiveness of epidural steroid injections have also appeared, with conflicting opinions [12]. Perceived advantages and disadvantages of each of the three approaches also have been described [13]. More opinions have been expressed in favour of caudal epidural steroid injections, even though interlaminar lumbar epidural steroid injections have been studied more extensively [12].

The rationale behind injecting glucocorticoid into the epidural space is that it combats the inflammatory response associated with disc herniation and reduces pain. Reports of the effectiveness of epidural corticosteroids have varied from 18% to 90% [14].

The present study was planned to examine the effectiveness of caudal epidural steroid injection (CESI) in patients with back pain due to multiple disc herniation with or without symptoms of neurological claudication, which was non-responsive to

other conservative modes of treatment. Literature regarding the efficacy of such a modality is lacking especially in the Indian context.

Materials and Methods

A prospective study was conducted in the Department of Orthopaedics, People's College of Medical Sciences with the aim of assessing the efficacy of CESI in cases of multiple prolapsed intervertebral discs (PIVD), with or without neurological claudication not responding to conservative management. During Study period (May 2014 to April 2015) Fifty-one such patients were encountered; forty-five patients gave consent for the procedure and were enrolled for the study.

Inclusion criteria: Patients older than 18 years with history of chronic low back pain with or without neurological claudication, with MRI findings of multiple prolapsed lumbar intervertebral discs not responding to conservative management.

Exclusion criteria: Patients not giving consent for the study, with history of previous spine surgery, having spinal structural abnormalities, uncontrolled medical illness or psychiatric disorders precluding assessment were excluded from the study.

All the patients were explained about the procedure. Informed written consent was taken from all patients. Examination of spine and neurological examination was done at admission and subsequent follow-ups. X-ray of lumbosacral (LS) spine and magnetic resonance imaging (MRI) of LS spine, complete hemogram and biochemistry was performed.

Intervention: The patient was made to lie in prone position. A 20-gauge needle was passed through the sacral hiatus and needle placement was confirmed by "whoosh" test [15]. The epidural space was injected with 80 mg (2 ml) of Triamcinolone,1 ml Hyaluronidase and 2 ml of 2% Plain Lignocaine diluted in 15 ml normal saline. Following the injection, the patient remained on bed rest for a day in the hospital with regular monitoring of pulse and blood pressure.

Patients were evaluated at baseline, three weeks, three months and six months using Objective Parameters of Straight Leg Raise test (SLRT) and Claudication distance and subjective parameters of pain using Numeric Pain Rating Scale (NPRS) and Disability using Oswestry Disability Index (ODI).

Straight Leg Raising test: The SLR test causes gliding of lumbar nerve roots which get compressed by the herniated disc proximal to neural foramina leading to radiation of pain down the leg in nerve root distribution [16]. SLR less than 30 degree was considered positive.

Neurological Claudication distance: While walking on level ground, the distance at which symptoms of claudication became unbearable and necessitated sitting or taking rest.

Numeric Pain Rating Scale: It is an eleven-point numerical pain rating scale in which patients rate their pain ranging from zero (no pain) to ten (worst imaginable pain). A two point change on the NRS in patients with LBP represents a clinically meaningful change[17].

Oswestry Disability Index : The Oswestry Disability Index is the recommended condition specific outcome measure for spinal disorders. It has ten sections namely pain intensity, personal care, lifting, walking, sitting, standing, sleep, social life, travelling and employment. Total scores can range from zero (highest level of function) to 50 (lowest level of function). For each section, the total score ranged zero to five according

to the deterioration of function. The total score is expressed in percentage [18].

Statistical analysis was done by appropriate methods. Results were considered significant at $p<0.05$.

Results

Forty-five subjects were enrolled in the study and 7 patients were lost to follow up. 38 patients completed required six-month follow-up period. The age distribution of 38 patients (27 male and 11 females) ranged from 32 to 60 years; average being 48.34 years (Table 1).

	Age in years			
Gender	30-40	40-50	50-60	Total
Male	4	9	14	27
Female	2	5	4	11

Table 1- Age distribution of patients

Duration of back pain ranged from nine months to 36 months, average being 18.2 months (Table 2)

Duration of back pain	No of patients
9-18 m	14 (36.9%)
18-27 m	16 (42.1%)
27-36 m	8 (21.0%)

Table 2- Duration of symptoms

Mean Straight Leg Raising(SLRT), Numeric Pain Rating Scale(NPRS), Owestry Disability Index score and Distance to claudication at baseline was 40.8 degrees, 7.21, 350 meters, and 41.8respectively (Table 3). There was improvement in all the assessment parameters post CESI. A statistically significant improvement in NRS, Mean SLRT and ODI was observed at three weeks post injection. All three parameters did not show any significant change thereafter, meaning patients remained symptomatic relief till 6 months, which was the duration of the study. Maximal improvement was found at 3-week post injection. Eight (8) patients had neurological claudication with a mean claudication distance of 350 meters at baseline. There was no significant improvement in this parameter post – CESI, with the average claudication distance at 6 months being 500m. Larger numbers might be needed to get a statistically significant result.

Parameter	Baseline	3 weeks post CESI	3 months post CESI	6 months post CESI	ANOVA F Value	Significant P value
Numeric Pain rating Scale (1-10)	7.21+/-0.45	3.1+/-0.29	3.0+/-0.88	4.6+/-0.55	429.638	0.001 (HS)
Mean SLRT (in degrees)	40.8+/-4.46	55.6+/-0.78	57.8+/-1.88	62.9+/-2.55	113.745	0.001 (H)

Oswestry Disability Index (0-50)	41.8+/-5.45	23.5+/-1.29	27.0+/-3.88	26.8+/-6.55	113.745	0.001 (H)
Distance to Claudication (in meters)	350+/-55.8	440+/-23.29	450+/-73.88	500+/-62.5	45.643	0.24

Table 3- The four parameters evaluated at baseline and follow up.

Only five patients reported side-effects after receiving CESI. All 5 (13.1%) reported transient mild headache which improved by day two. Three patients with lumbar canal stenosis and neurological claudication had no relief with CESI and opted for surgery at 6-9 months. All three had symptomatic relief after laminectomy.

Discussion

The effects of caudal epidural steroid injections were first reported by Goebert and colleagues [19]. They administered three injections of procaine and hydrocortisone into the epidural space to 239 patients with sciatica and reported greater than 60% relief of symptoms in 58% of the patients. Since that time, the technique and indications of epidural steroid injections have been changing constantly. Various studies have observed the effects of caudal epidural steroid injections on a single prolapsed intervertebral disc, but studies on multiple disc bulges are infrequent. The search term 'caudal epidural steroid in multiple disc bulges' yielded no relevant results on PubMed.

Chronic low backache with MRI findings of multiple disc bulges is a frequent finding in spine clinics across the world. We postulated that a caudally injected steroid would spread throughout the epidural space and relieve inflammation at multiple levels, leading to a clinically significant result.

We observed significant reduction in pain by Numeric Pain Rating scale after CESI at third week follow-up and no significant change in subsequent follow-ups; however, the improvement in the pain score persisted till 6 months. Wilson–MacDonald et al also observed significant early reduction in pain in their study but found no long-term effect [20]. Similar results were obtained by Buchner et al with greatest relief in pain in the initial two weeks and no significant improvement at six weeks and six months follow-up [21].

A statistically significant improvement in Straight Leg Raise was observed in our study which persisted till 6 months. The mean SLRT of 40.8degrees at baseline increased to a mean of 62.9 degrees at 6 months follow up. Buchner et al observed significant improvement in SLR at two weeks and six weeks follow-up but no significant change at six months follow-up [21]. Similarly, Sayeh et al also observed negative SLR in 88% of patients six months post injection [22].

The improvement in the Owestry Disability Index(ODI) in our study was significant at three weeks follow-up. There was minimal change at six weeks and six months follow-up. Significant improvement in ODI was maintained till 6 months. Thus, improvement in ODI score within three weeks showed early improvement in physical function leading to better activities of daily living and quality of life. Manchikanti et al also observed significant improvement in ODI score at three months but no further improvement at six months and one year follow-up [1]. Sayeh et al observed significant change in ODI at one month post

injection with no significant change at one year follow-up [22].

There was no statistically significant difference in claudication distance in our study, though five of eight patients had clinically improved walking tolerance. This finding is in concurrence with Botwin et al, whose 59%patients had an improved walking

tolerance at 6 weeks and, 56% at 6 months and 51% at 12 months [23]. Because of the small number of patients in our study suffering from claudication symptoms, another study with large sample size is needed to comment on the findings.

Conclusion

Caudal epidural injections are an effective modality of treatment in managing chronic low back pain due to multiple lumbar disc bulges. They provide significant pain relief, though there was no statistically significant improvement in claudication distance.

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Original Article

A comparative study of outcome of distal radius fracture frykman type (IV-VIII) treated with distractor fixation versus volar plate

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Abstract

Background*:* Comminuted Distal radius fracture is a common injury with a variety of operative and non-operative management options. There remains debate as to the optimal treatment for a given patient and fracture. Our aim was to compare the functional outcome of patients of distal radius fractures treated with a volar locking plate fixation or wrist spanning distractor.

Method*:* This prospective randomized study comprised 30 patients with displaced intra-articular (Frykman type IV-VIII) distal end radius fractures treated with distractor and 30 patients treated with volar locking plates. The patients were followed up at 2nd week,1 month,6 months and 1 year after surgery. The assessment of pain, range of motion, grip strength and activity was done at each follow-up visit and scored according to the Green and O'Brien scoring system.

Results*:* At the end of 1 year, in volar plate group out of 30 patients, excellent result was achieved in 04 patients (13%), good in 24 patients (80%), fair in 02 patients (7%). No poor outcome seen. In distractor fixation group, out of 30 patients, excellent result was achieved in 01 patients (3%), good in 15 patients (50%), fair in 12 patients (40%) and poor in 02 (07%) patients.

Conclusion*:* volar locked plating showed superiority over distractor fixation after 1 year of surgery.

Keywords: Volar locking plate, distractor, distal end radius fracture, frykman type IV

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Introduction

The fracture of distal radius is a common injury in old patient with osteoporotic bone, but in present scenario the incidence of these injuries is also increasing in working adult [1,2]. The variety of treatment methods are available like cast, external fixator and ORIF with plating [3].

Many complications are seen in these fracture like Malunion and deformity of wrist despite so many available options. Choosing an optimal method of treatment for a given patient and fracture type is a matter of debate [4,5].

Despite the popularity of volar locking plate fixation, there are few large cohort or long term follow up studies to justify this modality.

External fixation with Distractor is an excellent option for the treatment of comminuted fractures associated with bone loss [6]. However, pin tract infection and joint contractures are common complications of this techniques [7]. Internal fixation devices that have been used to treat

these fractures include the distal radius locking/ non locking plate. Distal radius Locking Compression Plate (DR-LCP) is a smaller application device and allowing both locking and compression screw fixation of the complex fracture [8].

In this study, we analyzed functional results of distal radius fracture treated with either distractor or volar locking plate.

Materials and Methods

This study was done prospectively in the Department of Orthopaedics and Trauma Centre, J. A. Group of Hospitals, Gwalior (M. P.) for a period of 2 years. Total of 60 intra articular distal radius fractures, out of which 30 cases were treated with volar plating and remaining with the distractor application.

Fractures were classified using Frykman classification and Randomization was done to allocate the patient to one of the two treatment groups.

Follow-Up: Patients were regularly followed after 2, 6 and 12 weeks, and every 4 weeks thereafter until radiographic healing and function are established.

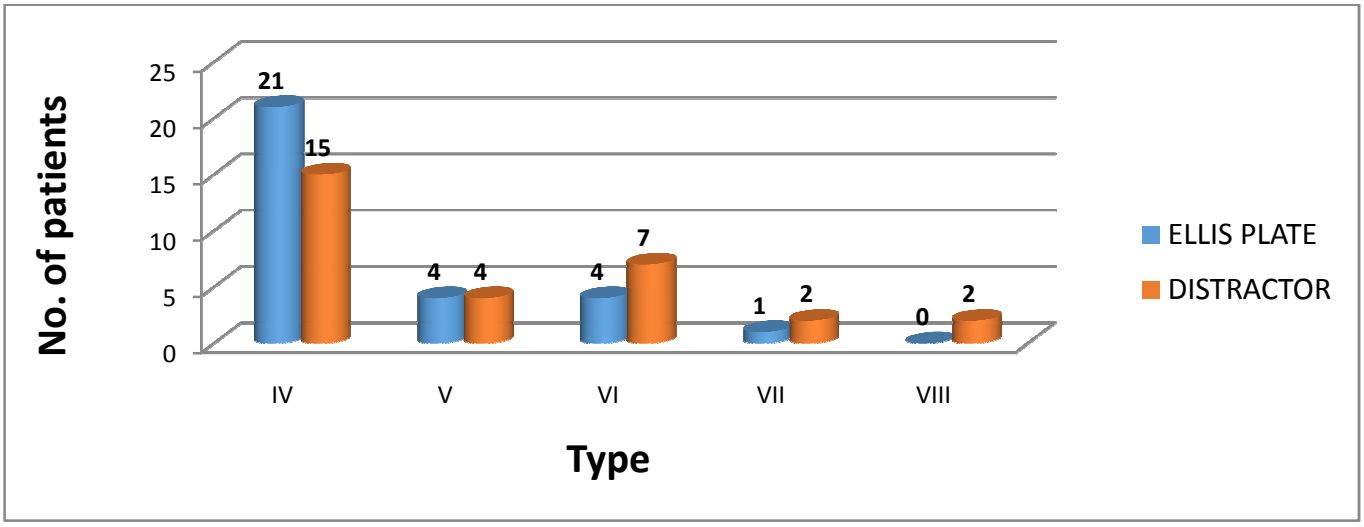
Functional outcome was assessed according to the Green and O'Brien scoring system. Pain, grip strength, wrist range of motion (ROM) and activity were noted at each visit. All the patients were followed up till the radiological union achieved.

Results

This prospective comparative study compared outcome following treatment of distal radius fracture by either volar locking plate or distractor. No. of patients allotted to both groups and their frykman classification was analyzed.

In this study the mean age of the patients was 38 years in distractor group and 31 years in volar locking group. There were 23 males (81%) and 07 females (19%) in volar locking plate and 14 male (47%) and 16 female (53%) in distractor fixation group.

Figure 1 : Frykman Type



In our study, out of 30 patients of distal radius fractures treated by volar plate we had (Frykman) type IV- 21(70%),type V-04(13%), type VI-04(14%), type-VII-01(3%). In Distractor fixation group we had type IV-15(50%), type V-04(13%), type VI-07(23%), type-VII-02(7%) type –VIII-02(07%).In both the groups Frykman type IV was the most common fracture pattern. In volar locking plate group average union time was 8.2 weeks, in distractor fixation group average union time was 10.2 week.

Figure 2 : Time to union

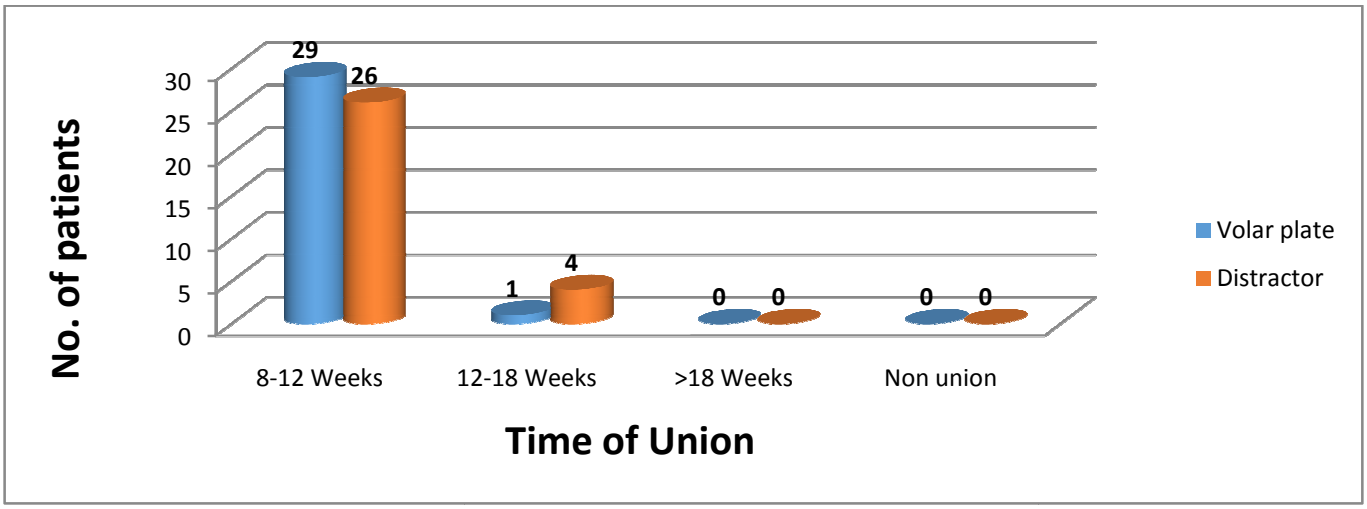


Table 1 : Green and o'brien score in two techniques at 6 months and 1 year follow-up

	Volar plate		
	6 month	**1 years**	**P value**
Pain	18.91 ± 4.6	22.36 ± 2.86	0.0009
ROM	18.36 ± 6.2	22.67 ± 5.4	0.0057
Grip strength	17.91 ± 5.3	18.78 ± 4.3	0.4878
Activity	22.36 ± 4.4	23.67 ± 3.2	0.1924
Final score	77.54 ± 17.7	87.48 ± 11.25	0.0119

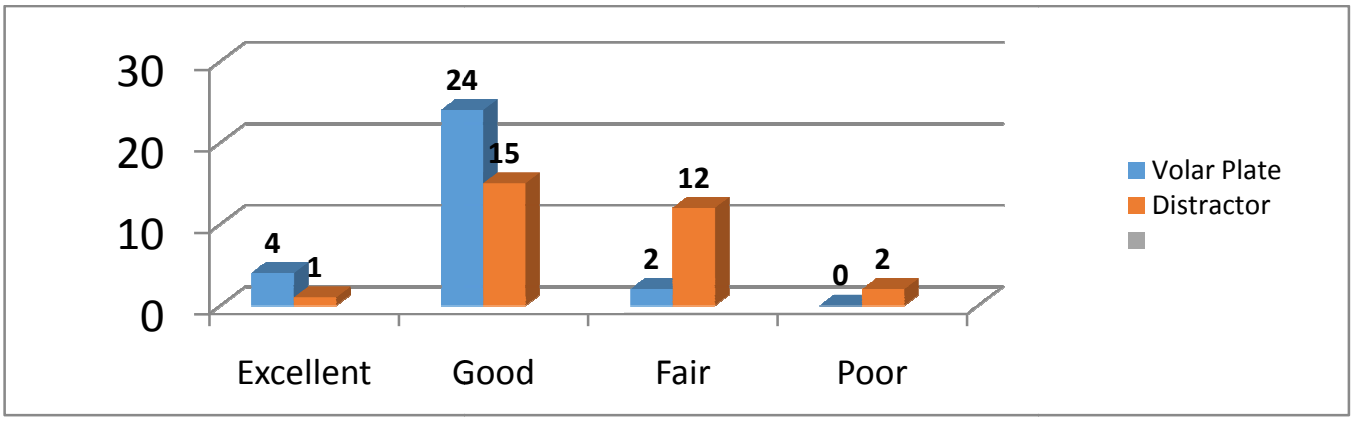
	Distractor fixator		
	6 month	**1 years**	**P value**
Pain	18.36 ± 2.86	20.33 ± 3.5	0.0202
ROM	18.0 ± 4.77	18.89 ± 5.05	0.4856
Grip strength	18.91 ± 5.4	16.89 ± 4.4	0.1176
Activity	21.09 ± 2.6	21.44 ± 2.78	0.6164
Final score	76.36 ± 11.62	77.55 ± 11.327	0.6894

Green and O'Brien score had shown gradual improvement from 6 month to final

follow-up at 1 year postoperatively. Mean Green and O'Brien score was comparable between two groups.

Out of 30 patients of volar plate group, excellent result was achieved in 04 patients (13%), good in 24 (80%), fair in 02 patients (7%). No poor outcome was observed. Out of 30 patients of distractor fixation group, o excellent result was achieved in 01 patient (3%), good in 15 patients (50%), fair in 12 patients (40%) and poor in 02 (07%)patients.

Figure 3 : Functional Outcome



Discussion

Distractor fixation is a commonly used technique for unstable distal radius fractures, its main benefit being its less invasive nature. The Distractor fixator cannot ensure perfect anatomical reduction in all cases because it has no direct control over the bone fragments and has to rely on indirect reduction through ligamentotaxis.

The advent of distal radius locking plates has provided several solutions to these problems. Direct visualization and manipulation of the fracture fragments appears to be the greatest advantage of open reduction and external fixation.

Pattanashetty OB at al in their clinical study done on patients with displaced, comminuted, intra-articular fractures of distal end of radius reported male predominance (M:F – 53%:47 %) [9]. In this study the mean age of the patients was 38 years in distractor group and 31 years in volar locking group. There were 23 males (81%) and 07 females (19%) in volar locking plate and 14 male (47%) and 16 female (53%) in distractor fixation group.,In a study in the Czech Republic, the average age is 59. By the 5th decade the representation of male is higher in all groups of fractures.

Gogna Pet al reported 7 type A3, 8 type C2, and 18 type C3 fractures [10]. Rozental TD in his study consisting of 15 men and 26 women with a mean age of 53 years (17–80years) reported 18 type A fractures (3A2, 15 A3), 4 type B fractures (all B2), and 19 type C fractures (14 C2, 5 C3) [11].

In our study of 60 patients of distal radius fractures frykman type(IV-VIII), In volar plate group we had type IV- 21(70%),type V-04(13%), type VI-04(14%), type-VII-01(3%). In Distractor fixation group we had type IV-15(50%),type V-04(13%), type VI-07(23%), type-VII-02(7%) type –VIII-02(07%). In our study Frykmsn type IV was most common fracture pattern.

Joideep Phadnis et al in his study observed that overall mean time to fracture union was 8.4 weeks (6- 28 weeks) [12]. Rozental TD et reported average time to union - 8 weeks (range, 7–10 wk) [11]. In our study, average time to union was 8.2 weeks (Avg 8-14weeks) in both the groups. In volar locking plate group union time was 8.2 weeks (8-10 weeks) and in distractor fixation union time was 10.2 weeks(10 -14 weeks).

Shukla R et al, in his study of 110 patients (61 females and 49 males) with Cooney's type IV distal radius fractures comparing functional outcome of patients treated with external fixation versus volar locking plate found that there was no difference in pain, ROM and grip strength in two groups; however, there was a significant change in activity and final score at 1 year compared to 6 month follow-up [13]. One year after surgery, In volar plate group we observed, out of 30 patients excellent result was achieved in 04 patients (13%), good in 24 patients (80%), fair in 02 patients (7%).No poor outcome seen according to the Green and O'Brien score.

In distractor fixation group we observed, out of 30 patients excellent result was achieved in 01 patients (3%), good in 15 patients (50%), fair in 12 patients (40%), poor in 02 (07%)patients.

We observed a significant reduction in pain, increased ROM, grip strength, activity and final score after 1-year follow-up compared to that at 6-month follow-up in both the groups. However, the outcome scores were comparable in both the groups at 6 months and 12 months follow-up.

Conclusion

Comminuted Distal radius fracture (Frykman type IV – VIII) treated with either volar locking plate or distractor external fixator gives good functional results and functional outcome is better at 1 yr as compared to 6 months post op. However, there is no difference in the outcome scores among patients treated with either modality.

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Original Article

A study of correlation between radiological and functional outcome of distal radius fracture treated by various modalities

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Abstract

Background*:* Distal radius fractures are one of the most common injuries to the musculoskeletal system. Functional outcome in these fractures depend on many factors. Our main aim was to study if good radiological outcome has any effect on functional outcome and to compare various modalities of treatment of fracture distal end radius

Method*:* We retrospectively studied 120 patients. 30 cases were treated with conservative management & 30 cases with volar plating, percutaneous pinning and JESS fixator (Joshi's External Stabilizing System).

Results*:* Most of the patients were between 40-60 years (Mean 50.35 years). Most common mode of injury was RTA (50.3%), Right side was predominantly affected (60.3%) and most common fracture type was AO type C1. Mean pain score & Function score Patient Rated Wrist Evaluation (PRWE) were less among patients where radiological parameters were restored.

Conclusion*:* From this study, we conclude that restoration of radiological parameters will help in good functional outcome in treatment of intra-articular and extra articular fractures of distal end of radius and volar plating has better results in radiological parameter restoration and functional outcome.

Keywords: Distal radius fractures, extra and intra-articular fractures, Functional outcome, Radiological outcome.

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Introduction

Distal radius fractures are one of the commonest fracture. Good long-term outcome depends on factors like type of fracture and type of treatment used. Therefore, the outcome is not same in all cases after treatment. Treatment should help to restore normal anatomy of wrist with good radiological outcome, prevent loss of reduction and functional rehabilitation of patient. [1,2]

Materials and Methods

We retrospectively studied 120 patients with intra-articular and extra articular distal radius fracture managed with various modalities of treatment at Department of Orthopaedics, SAIMS, Indore. Aims and objective of study

was to find correlation between radiological and functional outcome of distal radius

fractures treated by different modalities of treatment. Inclusion and exclusion criteria were as follows:

Inclusion criteria –

1. Males and females 25 to 80 years of age

Exclusion criteria –

1. Patients with open fractures,

2. Fracture of bilateral distal radius.

3. Associated Fractures shaft of radius or ulna.

The patients who visited the hospital with extra and intra-articular distal radius fractures, who had been managed surgically and came for follow-up (at least six months) were taken up for study after taking consent from them for the study. Post-operative x rays of the wrist in antero-posterior and lateral views were taken.

Radial inclination, volar tilt, residual step, radial height and ulnar variance were analysed. Fracture classification was done based on AO classification. [2] Pain and function score were graded according to PRWE (Patient Rated Wrist Evaluation) [3] (which has 50 points each for pain and function score, being 0 denotes least pain and least difficulty in performing function) and overall results were recorded according to Demerit point system Score [4,5] as poor, fair, good and excellent. Functional grading was made depending on pain, mobility, work, grip strength. Radiological grading was made based on radial height, radial Inclination, volar tilt, ulnar variance and intra articular step.

Results

We retrospectively studied 120 Patients, with intra-articular and extra articular distal radius fracture in which 30 each were managed by volar plating and JESS fixator, 30 by percutaneous pinning and 30 conservatively. Most-common-age group was between 40-60 yrs. which constituted 28.8% of cases. There were 73 males (65%) and 47 females (35%). RTA was the most common mode of injury in our study in young patients and trivial fall in geriatric patients followed by fall from height and assault. AO type C1(31.25%) was the most common fracture followed by, B1(20.8%), C2(20%), B3(12.5%), & B2(8%) andC3 5%

Mean pain score:

There were less pain scores among the patients who retained the radial inclination (P=0.01), radial height (p<0.01), in patients with no intraarticular step (P=0.053), neutral ulnar variance.

Mean function score:

There were less function scores among the patients who retained the radial inclination (p<0.01), radial length (p<0.01), and in patients with no intraarticular step (P=0.003). Among the patients who had intra articular step function scores were less with the patient who had less than 2 mm step(P<.01). Some patients had good function score in spite of radiological parameters being affected. Those were mainly patients with less physical demands. Excellent results were seen in 60% of cases, Good in 15%, fair in 15% and poor in10% of cases. Affection of radiological parameters (radial inclination, radial length, Intra articular step and palmar tilt, ulnar variance) had effect on final outcome.

Excellent results (77% of excellent results were among less than 40 years age group) were more in younger age group (p<0.01). Post-surgery good and excellent results were more among patient where radiological parameters were restored. Better outcome was seen in patients where post-surgery number of radiological parameters restored were more in number (p<0.01).

Discussion

Distal radius fractures are one of the most common fractures treated. Outcome mainly depends on factors like type of fracture and modality used. Treatment should aim to restore radiological parameters, reduction and functional status of patient. Studies have been done to study relationship between anatomical reconstruction and the functional outcome. [1,6]

Functional and radiological outcome, after management in our study depended on age, fracture type, modality of treatment. The time of union was less in younger patients.

Basset concluded that Range of motion was significantly higher in cases that underwent ORIF. Scores (general, work, appearance, final, and MHOC) were significantly higher in cases that underwent ORIF. In subjects who underwent ORIF, pain score was significantly lower. [7] similar observations were made in this study.

Jakim I in his prospective study of 132 patients with an average age of 35 years, with unstable intra-articular fractures of the distal radius treated by external fixator reported only 15 cases required limited open reduction. 83% of patients had good or excellent results. There was a statistically significant correlation between the severity of the fracture and the clinical outcome, irrespective of radiological restoration. [8] In this study mean pain score and mean function score were better in internal fixation group as compared to external fixation group (21.3 and 19.8 respectively as compared to 11.7 and 12.8 in ORIF group) Articular and soft-tissue damage following violent compressive forces may lead to a degree of functional impairment.

Porter in his study identified the factors affecting prognosis following distal radius fracture. One hundred fifteen patients were assessed six months and two years following initial injury. On final assessment, subjectively, 56% had good, 39% had fair, and 5% had poor results. Median grip strength improved from 51% to 78%, range of movement from 87% to 94%, and wrist torque from 93% to 100%. Redisplacement occurred in 59%; only 33% clinically and 19% radiologically had perfect cosmetic results. Radial malunion was important functionally. Only when the dorsal angle exceeded 20 degrees or the radial angle fell below 10 degrees with a 30 degrees mean was there reduction in grip strength ($p = 0.05$). Comminution and intraarticular involvement predisposed to a median loss of movement of 15% and 11%, respectively ($p =$ less than 0.05). Patients requiring physiotherapy formed a poor prognostic group. [9] Similar results were reported in this study. A combination of factors is responsible for poor results. Attention should be directed toward early and adequate rehabilitation of the injured hand and wrist.

Karnezis IA in his study concluded that residual articular incongruity correlates with persisting loss of wrist dorsiflexion and wrist dysfunction contradicts the view that loss of articular congruity is associated with late development of articular degeneration but not with early wrist dysfunction. Additionally, this study failed to show any association between the fracture type and the functional outcome as rated by the patients. [10]

The radiological parameters which were considered in our study were loss of radial inclination and radial height, presence of intra-articular step, volar tilt and ulnar variance. The range of movements was directly related to the number of these parameters affected, in most of our patients.

Loss of volar tilt and radial height, presence of intra-articular step, ulnar variance in wrist and affection of radiological parameters have been reported to affect the functional outcome in many studies. [11]

Conclusion

The radiological parameters have an effect on functional outcome in our study at final follow up especially in young active individuals. The more the number of radiological parameters affected poorer is the functional outcome. Best results were obtained by volar plating followed by percutaneous pinning, jess fixator and conservative management.

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Original Article

Functional & radiological outcome of fracture intertrochanter femur treated by Trochanter Femoral Nail

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Abstract

Background*:* Intertrochanteric fractures with varying fracture geometry pose a significant challenge to the treating orthopaedic surgeon. The aim of the study is to evaluate the radiological union and functional outcome in patients of intertrochanteric fracture femur treated with Trochanteric Femoral Nail (TFN)

Method*:* Study of 33 patients with fracture intertrochanteric femur treated by internal fixation using TFN from June 2011 to September 2013. The results were evaluated by assessing the patients regarding radiological union and functional outcome at follow-up as per Modified Harris Hip Score.

Results*:* Two cases (6.67%) expired during follow up and 1 case (3.33%) did not revert back for follow up. Results were assessed in thirty patients and Harris hip score was excellent in 43.33% patients, good in 36.67% patients and fair in 10 %patients.

Conclusion*:* Trochanter Femoral Nail is a suitable implant for management of intertrochanteric fractures of femur.

Keywords: Trochanter Femoral Nail (TFN), intertrochanteric fractures

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Introduction

Intertrochanteric fractures are one of the commonest fractures especially in the elderly with osteoporotic bones, usually due to low energy trauma. The overall increase in the incidence of trochanteric fracture can be attributed to two factors, one, increased life expectancy which increases the geriatric population, secondly high energy trauma which victimizes more number of young adults.

Trochanter femoral nail (TFN) is a versatile implant for fixation of intertrochanteric fractures which include fractures of different geometry. Development of this nail progressed through various designs. Initial design was called as Mark I. Subsequent designs that followed were called Mark II and Mark III. Initially it was called Halifax Nail after the place where it was developed by Dr. Subhash Haldar. [1] A group of surgeons from Strasbourg changed the name of this nail to a universal one i.e. Gamma Nail as the shape resembled the Greek letter. [2]

But these initial designs were associated with a host of per-operative complications when applied to Asiatic femora like jamming

of nail, impingement of tip of nail on the anterior cortex and fracture of lateral cortex of femur. K. S. Leung in Hong Kong undertook an anthropometeric study on Asiatic femora to circumvent these complications and brought out a design called Asia Pacific gamma nail. [3,4]

The history of treatment of trochanteric fractures has been of changes, modifications and evaluation. Though intertrochnateric fractures have been treated by variety of fixation devices, the present study was carried out by managing the fractures by TFN.

Materials and Methods

Thirty patients with fracture intertrochanteric femur (Evan's type I, II, III, IV, V & R) [5] were treated by internal fixation using TFN over a period of 16 months from June 2011 to September 2013 at Department of Orthopaedics & Traumatology, R D Gardi Medical College & associated CRGH Hospital, Ujjain, M.P. The cases excluded were pathological intertrochanteric fractures, compound intertrochanteric fractures and patient with associated lower limb injuries, vertebral column injuries and incompletely recovered surgical illness as they act as confounding factors. Preoperative assessment of fracture geometry was done using Evan's classification [5]. Intra operatively pattern of reduction achieved was seen on Anteroposterior and Lateral projections by image intensifier. Neck shaft angle measured on pre op & immediate post op x-ray with the help of Goniometer. 1st follow up (4 weeks post op), 2nd follow up (3 months post op) and 3rd follow up (6 months post op) plain radiographs (true AP and true lateral hip with thigh) were obtained to look for signs of union and impaction. Functional results were evaluated after a period of 3rd and 6th months postoperatively using Modified Harris Hip Score. [6]

Results

Distribution of sample by Sex & Age Group

Table No.1

Age group	**Male**	**Female**
45-59 yrs.	6	2
60-74 yrs.	12	6
75yrs & more	2	2
Total	20	10

Mode of trauma in majority of Patients has domestic fall as mode of trauma (n=17), RTA (n=12), Assault (n=1).

Distribution of sample by limb length shortening post-operative (in cm)

Table No 2

Limb Length Shortening (in cm)	**Number of Patients**
0	11
0.5	10
1	7
1.5	2

Distribution of patients on the basis of Modified Harris Hip Score at 6 month

Table No. 3

Modified Harris Hip Score	**Number of Patient**
0-69 POOR	0
70 – 79 FAIR	3
80 – 89 GOOD	11

90–100 EXCELLENT	13

Distribution of sample by complications seen.

Table No 4

Complications	**No. of patients**
Systemic	0
Chest infection	1
Pulmonary embolism	0
Respiratory distress	0
Urinary tract infection	1
Urinary retention	0
Deep vein thrombosis	0
Local complication	0
Superficial wound	1
Deep wound infection	0
Death	0

Distribution by implant related intra-operative complication

Table No. 5

Intra operative complications	**No.of patients**
Ill fitting jig	1
Difficulty in distal locking	00
Inappropriate length of proximal screws	00
Fracture of greater trochanter	00
Fracture below tip of nail	00
Revision surgery	00
Guide wire breakage	1
Reamer Breakage	1

Distribution of sample by functional outcome in various age group.

Table No. 6

Age Group	**Number of cases Harris Hip Score**			
	Excellent	Good	Fair	Poor
45-59yrs	6	1	0	0
60-74yrs	7	10	0	0
75yrs & More	0	0	3	0

Discussion

Most of patients in present study were from age group of 5th to 7th decade of life. Mean age in years for group operated is 63 yrs. This signifies the fact that patients from these age groups are involved in low energy trauma like fall at home.

Gallaghar et al (1980) reported an eight fold increase in trochanteric fractures in men over 80 years and women over 50 years of age. [7]

There was a male preponderance in our patient. Amongst them majority were in 5th-7th decade of life. The ratio of males to female was 2:1. H. B. Boyd and L. L. Griffin in their study of 300 cases found a marked sex difference. 226 (75.8%) of the patients were females and 74 (24.2%) were males.[8] Cleveland et al in their study had 87.7% of female patients. They had given the explanations for their observations which

are females have slightly wider pelvis with a tendency to having coxa vara and they are usually less active and are more prone to senile osteoporosis. [9]

Most of our patients were 50 years and above in them domestic fall (fall at home) and trivial trauma was main reason behind fracture while in road traffic accident (RTA) young patients were affected. In our study, there were 17 cases (56.67%) due to domestic fall while there were 12 cases(40%) due to Road traffic accident(RTA) and 1 case (3.33%), it was due to assault. This may be attributed to the factors as enumerated by Cummings and Nevitt in 1994 as follows, Inadequate protective reflexes, to reduce energy of fall below a certain critical threshold, Inadequate local shock absorbers e.g. muscle and fat around hip and inadequate bone strength at the hip on account of osteoporosis or osteomalacia. [10]

Young patients with intertrochanteric or subtrochanteric fractures sustained trauma either as a result of road traffic accident or fall from height, there by reflecting the requirement of high velocity trauma to cause fracture in the young.

Keneth J. Koval and Joseph D. Zuckerman observed that 90% of hip fractures in the elderly result from a simple fall. Hip fractures in young adults were observed to result most often with high energy trauma such as motor vehicular accidents or a fall from height. [11]

In our study, one patient was found to have chest infection while another patient had complication of urinary tract infection(UTI).

The patient with chest infection was known case of COPD and was a chronic bidi smoker. This complication was noticed in preoperative phase and appropriate treatment was given. The patient who had urinary traction infection was due to prolonged catheterization. Accordingly appropriate treatment in the form of antibiotics was given. Superficial wound infection was seen in 1 case. This may be attributed to low immunity status of patient as the patient was of asthenic built and belonging to low socioeconomic status. In this patient treatment of IV Antibiotics was prolonged.

Average hospital stay was 18 days. During postoperative period as per pain and tolerance of patient, they were made to standup with help of support on 2-3rd post operative day. Partial weight bearing started in 3 weeks. Patients were discharged after suture removal. In the series of B. Mall (30 patients) average time of ambulation was 14 days. [12] In the series of Dr. G.S Kulkarni ambulation was usually started after 11-12 days after the stitch removal. [13]

Average time of union in our series was about 14 weeks (Range:12 to 20 weeks). There is some controversy regarding criteria for time of fracture union in different studies. Some use radiological while some use radiological and clinical union. Assessment of early callus formation at fracture site & its subsequent progress was done with the help of subsequent radiograph. We have used criteria for union as presence of bridging callus at fracture site, most of the fracture circumference with density similar to adjacent cortical bone and clinically absence of pain at fracture site.

Radiological time of union in other series:

Table No. 7

Sr. No.	Series	Radiological union (in weeks)
1	Kevin D. Harrington [14]	16
2	Juluru- P. Rao [15]	18

3	Luis A. Flores [16]	13
4	B. Mall [12]	14
5	Present Series	14

In our study, we observed Average Flouroscopic screening time was 163 seconds. Average blood loss was 138 ml

In the series of Simon H. Bridle et al average blood loss was 162 ml. [17] In series of Christopher I Adams et al average blood loss was 244ml. [18] In recent study in June 2013 by Zhiyong et al the mean intra operative blood loss was 100 ml. [19]

The functional outcome of patient treated with trochanter femoral nail is calculated by the Modified Harris Hip Score, 89% of patients have excellent and good score.

The functional outcome categorization was done on the basis of age group distribution and results showed that patients of 45-59 yrs age group had excellent score irrespective of type of fracture and patients of age group 75 yrs and more had fair score.

Conclusion

It is concluded that TFN in management of intertrochanteric fracture prevents excessive collapse & limb shortening. Thus it helps in achieving overall good functional outcome.

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Original Article

Outcome of Treatment of unstable intertrochanteric fractures with proximal femoral nail: A retrospective study

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Abstract

Background*:* Intertrochanteric fractures occur frequently in older age groups due to osteoporosis. The main aim of surgery is stable fixation that allows to mobilize the patient early. The treatment of choice for trochanteric fracture remains controversial. Treatment of unstable intertrochanteric fracture is still challenging and are being treated successfully with proximal femoral nail.The purpose of this study is to evaluate the functional and radiological outcome and complications of proximal femoral nail in the treatment of unstable intertrochanteric fractures.

Method*:* A retrospective study on 100 patients was conducted with unstable intertrochantric fractures treated with Proximal femoral nail .Fracture were classified according to the AO classification system. The fixation used a proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and a antirotation pin (10-15 mm shorter than the lag screw). Clinical evaluation was done using Harris hip score and radiologically at 6 weeks, 12 weeks, 6 months, 9 months and thereafter every 6 months.

Results*:* Most of the patients were between 40-60 years (Mean 50.35 years). Most commonly the mode of injury, wrist involvement & fracture type were RTA (50.3%), Right side (60.3%) and AO type C1 . Mean pain score & Function score (PRWE) were less among patients where radiological parameters were restored.

Conclusion*:* We have suggested that proximal femoral nail offers advantages for the fixation of unstable intertrochanteric fractures with less operative time. It can be easily inserted and provide stable fixation with less complications.

Keywords: Unstable Intertrochantric Fractures, Proximal Femoral Nail, Outcome

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Introduction

Intertrochanteric fractures occur frequently in older age groups due to osteoporosis. The main aim of surgery is stable fixation that allows to mobilize the patient early. The treatment of choice for trochanteric fracture remains controversial [1,2,3]. There are various extramedullary implants and intramedullary nails available for these type of fractures. The choice of implant mainly depends on the fracture pattern(stable or unstable).Unstable intertrochanteric fractures includes postero - medial cortex comminution or fractures with reverse oblique patterns or fractures with subtrochanteric extension. Fractures without posteromedial cortex disruption or

subtrochanteric extension are considered stable [4,5].Treatment of unstable intertrochanteric fracture is still challenging and are being treated successfully with proximal femoral nail.The purpose of this study is to evaluate the functional and radiological outcome and complications of proximal femoral nail in the treatment of unstable intertrochanteric fractures.

Materials and Methods

A retrospective study on 100 patients was conducted with unstable intertrochantric fractures AO type 31-A2.1, 31-A2.2, 31-A2.3, 31-A3.1, 31-A3.2, 31-A3.3 were included in study and which had been treated with Proximal femoral nail at our institution from 1st August 2014 to 15th September 2017. Patients with facture AO type 31A1.1,31A1.2,31A1.3, patients with medical comorbidities and patients having associated fracture of pelvis of either side or ipsilateral femur were excluded from study. Four patients lost followup after 6 months. Therefore 96 patients were taken for the study. There were 30 females and 18 males with mean age of 62 years (range 34 - 84). 64 patients fractures were caused by trivial trauma and rest were caused by road traffic accident or fall from height .Fracture were classified according to the AO classification system. Fourty fractures were classified as A2 type with 18 patients with A2.1, 12 patients with A2.2 and 10 patients with A2.3 type and rest 56 patients were A3 in which 25 were A3.1 and 10 were A3.2 and 21 patients were of A3.3 A2 and 56 fractures as A3 based on pre-operative radiograph. All surgeries were carried out within a mean of four days (range 2- 12 days) from date of injury .All patients received prophylactic antibiotic within 1 hour of skin incision. Reduction was achieved by closed manipulation and traction under fluoroscopic guidance. Fracture site was minimally exposed only if reduction by closed means was not successful. The fixation used a proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and a antirotation pin (10-15 mm shorter than the lag screw).Cleveland zones [6] and tip apex distance (TAD) [7] was used to assess the placement of lag screw in the femoral head.

The fracture reduction was evaluated on the first post-operative radiograph using the Garden Alignment Index (GAI) [8] and fracture gap (mm) measurement. The results were classified using Garden Alignment Index as very good, good, acceptableor poor[8]. The fracture gap was classified as good (0-3 mm); acceptable (3-5 mm); or poor (> 5 mm).

The active quadriceps strengthening exercises, ankle and toe movements and knee mobilisation exercises were started on the first postoperative day. The mean hospital stay was 5 days (range, 3 - 14). Suture removed on 12th post-operative day. Some complication (intraoperative or postoperative) were also reported during the study period.

The mean follow up period was 12 months (range 9-18). Clinical evaluation was done using Harris hip score [8] and radiologically at 6 weeks, 12 weeks, 6 months, 9 months and thereafter every 6 months. Full weight bearing was allowed once radiological evidence of bone union was evident. Anteroposterior and lateral plain radiographs were taken at every visit to look for the fracture union, tip apex distance, cut-out or lateral migration of lag screw or antirotation pin.

Results

At final follow up, union was found in all patients radiologically trabeculae crossing fracture site atleast three cortices in two views and clinically with no tenderness at fracture site. Average age at time of surgery was 62 years (range 34-84). 60 patients were women and 36 were men. There were

56% left and 44% right side hip fractures. Mean operative time was 36 minute (range 25-90 min). Average length of follow up period was 12 month. The Cleveland zone 8 (central - inferior) was the most favourable position for lag screw on postoperative radiograph.81.4% of cases showed fracture gap of less than 3mm and 14.6% cases showed fracture gap on acceptable range (3-5mm). Very good to good Garden alignment index was found in 75% of cases (Table 1). TAD was less than 25mm in 72% of cases.

Table 1: assessment of fracture gap and garden alignment index.

	No of cases (n)	Percentage (%)
Fracture Gap		
Good (< 3 mm)	78	81.4
Acceptable (3-5mm)	14	14.6
Poor (> 5 mm)	4	4
Garden alignment index (anteroposterior -angle)		
Very good (180^0)	22	22.9
Good (180^0-160^0)	50	52.08
Acceptable (160^0-150^0)	20	20.83
Poor ($<150^0$) / Lat $<180^0$	4	4.16

Reoperation for treatment or implant related complications was required in two patients. One case was treated with wound debridement for infection and another underwent removal of lag screw for lateral thigh discomfort (Z effect or cut out) after fracture union.Delayed healing was observed in two patients with poor reduction. Anterior thigh pain was complained by two patients. Secondary varus developed in one patient on final follow up of 5 degree. None had fractures of femoral shaft and greater trochanter.

Clinical outcome was evaluated by Harris hip score (figure 4) and was excellent to good in 87.5% of cases. At last follow up at time of radiological and clinical union 84 patients were fully satisfied with good to excellent results, they were able to walk independently except six patients which needed support to walk.

Radiological union was reported in all patients with malreduction in four patients with Garden Allignment Index <150 degree in lateral view.

Table 2: Results According to Harris hip Score

Harris hip score	Number (n)	Percentage (%)
Excellent	40	45.8
Good	44	41.7
Fair	10	10.4
Poor	2	2.1

Discussion

Unstable intertrochanteric femoral fractures are quite difficult to manage. Varrious treatment modalities include osteosynthesis with dynamic hip screws or cephalomedullary nail and arthoplasty in selected cases. However, choice of implant for unstable intertrochanteric fracture is still debatable. In our study unstable intertrochanteric fractures treated with proximal femoral nail.Moran et al. reported that a delay in surgery of up to four days in patients without an acute medical comorbidity does not increase postoperative mortality, morbidity, or duration of the rehabilitation (9). In our study, the time from fracture to surgery was on average 3.7 days.

Proximal femoral nail is fixed with two screws; the lag screw give compression at fracture site and carry most of load whereas smaller screw provides rotational stability. If antirotation screw is longer than lag screw, vertical forces would increase on antirotation screw and start to induce cut-out or Z-effect. Schipper IB et al., concluded that if antirotation screw was 10 mm shorter than the lag screw, percentage of total load carried by antirotation screw ranged from 8 to 39% (mean 21%), no cut-out of femoral head or fracture displacement were observed. In our study anti rotation screw was 10-15 mm shorter than the lag screw (10).Geller et al. reported 44% incidence of cut outs in intertrochanteric fractures fixation with TAD of > 25 mm and no cut out seen with TAD of < 25 mm [11]. We observe one cut outs in our series with 72% patients had TAD < 25. Nikoloski et al., also recommended the TAD to be kept between 20-30 mm[12].

Jinet al. [13] preferred long proximal femoral nail over the shorter nail when there is excessive anterior curvature of the femur. In our study, we noticed impingement of tip of nail to the anterior cortex in two cases due to excessive bowing and short femur length in Indians. We use long proximal femoral nail in all cases.

Yaozenget al. reported 6 intra operative femoral shaft fractures in their series of 107 intertrochanteric fractures [14]. In our study, we did not notice any intra operative fracture of shaft femur. Risk of this complication can be reduced by adequate reaming of femoral canal especially when using longer nails. Boopalanet al. [15] reported 21% incidence of intra operative lateral wall fractures in 31 unstable intertrochanteric fracture fixations. Study suggested that lateral wall fracture does not affect fracture union.Gotfried reported 24 cases of lateral wall fractures in their study[16]. He observed varus malalignment with medialisation of femoral

shaft on x-ray in all these cases. We reported 6 cases of intra operative lateral wall fractures, out of which 1 cases developed secondary varus collapse of 5 degrees. None of these fractures required reoperation.

G.N. Kiran Kumar et al evaluate the outcome of proximal femoral nail antirotation II by using Harris hip score and found Excellent and good results were found in 78% of cases [17]. In our study 45.8% Excellent and 41.7% good results were observed. Several studies like Gardenbroek TJ et al, Sahin S et al, Strauss E et al [18,19,20] have reported successful outcome with low complication rates with PFN inunstable intertrochanteric fractures. Our study supports this finding and suggesting that proximal femoral nail is a reasonable treatment option in unstable trochanteric fractures.

Conclusion

We have suggested that proximal femoral nail offers advantages for the fixation of unstable intertrochanteric fractures with less operative time. It can be easily inserted and provide stable fixation with less complications. However, operative technique should be proper for achieving fracture stability and to avoid major complications.

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Case Report

Traumatic Heterotrophic Ossification Of Quadriceps Femoris – A Case Report

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Abstract

Background*:* Formation of mature lamellar bone at unusual sites like soft tissues, which normally does not exhibit properties of ossification is known as Heterotopic ossification (HO). It has a multi-factorial etiology with multiple risk factors. Trauma is one of such inciting event.

Case report- We are reporting a rare case of Heterotopic ossification of right quadriceps femoris in a 26 year old young adult, with severe knee stiffness, with no improvement following conservative treatment, which was successfully treated with surgical excision, obtaining good clinical results.

Key words- Heterotopic ossification, quadriceps femoris, knee stiffness, surgical excision

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Introduction

Heterotopic ossification (ectopic ossification), can be defined as the formation of mature lamellar bone at sites, where normally no ossifications occurs, like muscles and soft tissues [1]. The lesion comprises of fibroblasts and osteoblasts, with a high proliferating potential. It is quiet commonly seen in active young adults, especially among male athletes [2]. Trauma, either acute or chronic is a major cause leading to HO, and lesions adjacent to joints can be seen in some conditions with neurological component. Upon presentation, ossification becomes so extensive that it becomes evident and radiological studies reveal the benign behavior of the lesion.

Connective tissues like involuntary muscles, tendons, fascial sheaths, and ligaments are the sites commonly involved in ectopic bone formation [3]. The flexor of the arm, the hamstrings and quadriceps femoris are the muscles, commonly involved in heterotrophic ossification (HO) [4]. The most common location of the heterotrophic ossification is represented by the pelvic ring, followed by the elbow, shoulder, and knee. Joint stiffness is often the pathognomonic characteristic of this disabling disease [5].

Synonyms for Heterotrophic ossification are myositis ossificans, florid ossification, ectopic ossification, neurogenic ossifying fibro myopathy [6, 7]. The histology of the lesions varies from osteoid osteoma - like features to osteosarcoma-like appearances [2, 8].

We report a case of traumatic heterotrophic ossification of quadriceps femoris, which was successfully managed with surgical resection, and continuous physiotherapy.

Case Report

A case of 26 year old male who, presented in our outpatient department with complaints of generalised swelling in right distal thigh, mild pain, restricted movement in right knee joint and difficulty in walking for 6 months. There was a history of road traffic accident 8 months back sustaining open injury over the right knee following which, he was diagnosed to have undisplaced unicortical fracture of anterior cortex of distal femur. Patient was managed elsewhere with debridement and primary wound coverage. The wound got infected after 10 days, for which repeated debridement with curettage was done. The wound got healed after a month, but patient was left with severe knee stiffness and difficulties in activities of daily living. The patient was then advised physiotherapy on regular basis, but there was no improvement in knee stiffness. The patient then went to a local therapist for massage therapy, but the problem got worsened.

Clinical examination revealed a generalized firm swelling noted in the anterior aspect of right distal thigh extending up to the knee. Overlying skin was non pinchable and puckered. Skin was adhered to underlying bone at one point. Range of motion (ROM) at knee was 0-10° with a normal ROM at hip (figure 1). Patient was on continuous physiotherapy for 6 months, but had no improvement. X-rays revealed a well ossified mass anterior to anterior cortex of the right distal femur with some lateral extension, with a radiolucent cleft separating the ossified mass from cortex (figure 2).

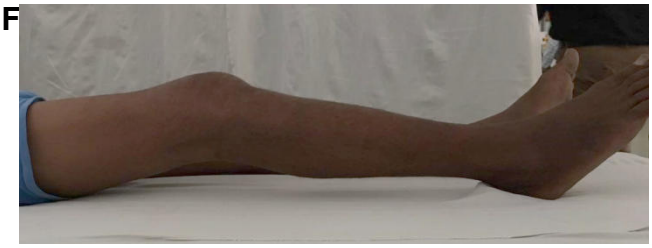
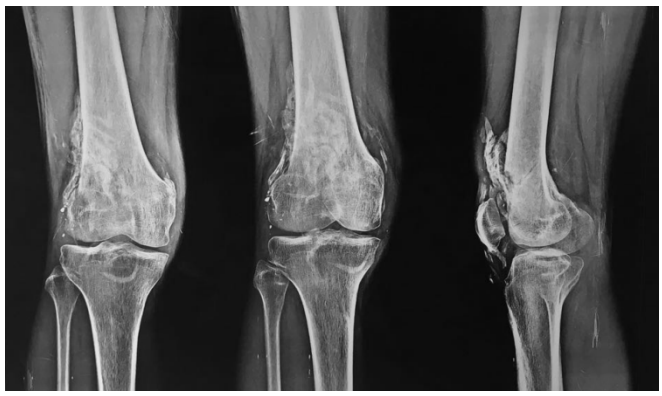


Figure 2



As conservative measures produced no improvement in the patient, hence, surgical excision of the lesion was planned. Surgical resection of the ectopic ossified mass was done using a standard anterior approach to the knee joint. A well-defined mass (5cmX3cmX3cm) was excised from within the substance of rectus femoris posteriorly and mass on the lateral aspect of vastus lateralis was nibbled. Only easily resectable mass, was excised without causing much damage to overlying and underlying muscles. The adhesions were released from over the quadriceps and under the patella. Intra operatively knee flexion of 90 degrees was obtained after mass excision as shown in Figure 3.

Figure 3

The skin was closed over a drain which was removed with first dressing. The excised mass was sent for histopathological

examination and was confirmed to be a calcified mass, hence confirming heterotrophic ossification. Figure 4 shows the post-operative X rays.

The knee flexion improved to almost 90 degrees immediately after surgery. Active assisted physiotherapy including hamstrings and quadriceps exercises were initiated from day one, along with continuous passive motion of the knee joint under. Meanwhile patient developed wound complication (small area of skin necrosis), and ROM gradually got worsened.

Figure 4

Continuous physiotherapy was maintained with extended period of intravenous antibiotics for 3 weeks, along with regular dressings of the wound. The wound got healed and patient was then started on continuous passive motion. Follow up of patient was done regularly once in 6 weeks. The knee ROM on discharge was 0-100°. After 6 months knee ROM improved to 0-120°. After a follow up period of 1 year, the patient had no recurrence and achieved satisfactory range of knee movements, resuming back to activities of daily living. Figure 5 shows the ROM in the post-operative period and at 6 months follow up.

Figure 5

Discussion

The usual sites for muscular heterotrophic ossification are the quadriceps femoris and brachialis muscle [9]. HO arising within the muscle occurs at all age, but adolescents and young adults are at significantly higher risk [10]. The earliest manifestations are typically localized swelling, local rise of temperature, mild to moderate pain and limited ROM of the nearby joints [9,11]. The pain, warmth, and swelling subside with the maturity of the lesion [12]. It usually takes 6 to 18 months for a HO lesion to form a trabecular bone [11].

Plain roentgenograms reveal either mature ossified masses forming a ring like pattern centralized over a radiolucent area or homogenous calcified lesions [13].The serum alkaline phosphatase level and 24-hour urinary excretion of PGE2 are the important biochemical markers for heterotrophic ossification.[14]

No exact cause has been found describing the pathophysiology of heterotrophic ossification. A number of theories have been proposed for the development of heterotrophic ossification, but none is specific. Majority cases of HO within the muscles are posttraumatic type [15]. The idiopathic sort of HO is rare and occurs especially in those with no predisposing factors, like trauma [16].

Craven and Urist in their study concluded that primitive mesenchymal cells, transforming into osteogenic cells within the soft tissues was responsible for the development of HO [17]. Chalmers et al. concluded that osteogenic precursor cells, inducing agents and a permissible environment were the 3 conditions necessary for HO formation [18]. All these

would incite the conversion of primitive mesenchymal cells into osteoid-forming cells, under the effect of bone morphogenic proteins (BMPs)[19].

Heterotrophic ossification developing within muscles is usually a self-limiting condition and resolves spontaneously. It is more likely to occur in smaller upper extremity lesions [20]. Non operative management including subsequent clinical and radiographic follow-up should be considered in early stages [10] Surgical excision is the treatment of choice, if the pain does not subsides, or if a prominent mass is felt, or if adjacent joint has limited range motion. Lesion should be excised only after attaining maturity, typically after 8-12 months of the inciting event. Premature excision can lead to a rapid local recurrence [12].

Conclusion

Heterotopic ossification though not a very common disease, but has particular characteristics with debilitating consequences. The disease may result in severe stiffness, restricted range of movement, and severe reduction in the functioning of the affected joint. Surgical excision is treatment of choice, when non-operative measures produce no satisfactory results. In this patient, excision of mass was done because of restricted knee ROM, and good clinical results were obtained, without any recurrence.

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