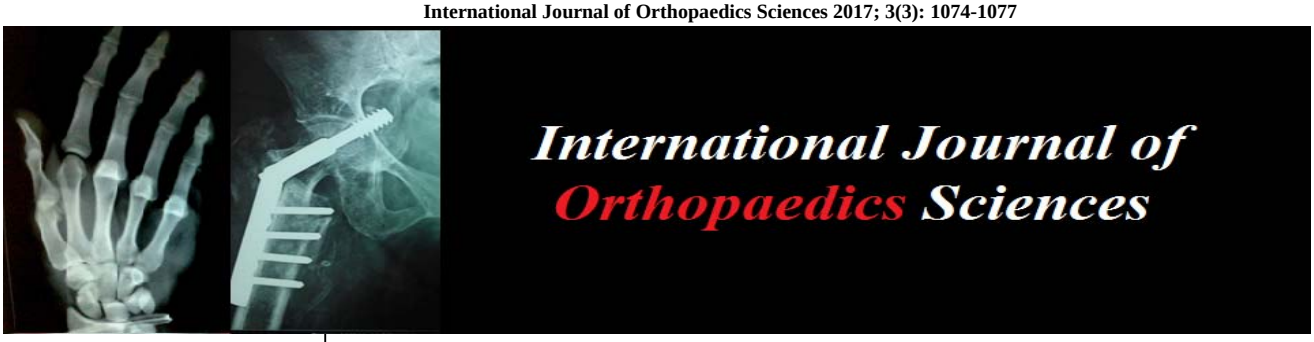

ISSN: 2395-1958
IJOS 2017; 3(3): 1074-1077

www.orthopaper.com
Received: 27-05-2017
Accepted: 28-06-2017

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Functional outcome of fixation of unstable distal end radius fracture with volar buttress plating, A prospective study

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DOI: https://doi.org/10.22271/ortho.2017.v3.i3o.157

Abstract
Background: Distal end of radius fracture accounts for 17% of all fractures in adults. The primary goal of treatment is to return the patient to his or her pre fracture functional status and to independent to carry out there daily needs. There are multiple options for distal end radius treatment, CRIF with K wire / external fixator, But there are disadvantages like malunion, pin tract infection, which may results in poor range of movement. Hence ORIF with volar plating is commonly done for unstable distal end radius.
Materials and methods: In this study 30 patients with age above 18 years with distal end radius fractures treated with ORIF with volar plating. same post operative protocol, complications of surgery Intra operative and post operative were observed, functional outcome of all patients were recorded at regular follow up assessed with modified Gartlad & Werley's wrist grading system.
Results: In ORIF with volar plating, we noted patient with poor outcome of 10%, fair outcome of 23.33%, good outcome of 50% and excellent outcome of 16.67% at the end of 6 months. With mean range of movement Flexion =66.5^0, Dorsiflexion = 69.83^0, Radial deviation =18.83^0, Ulnar deviation =27.17^0, Pronation 70^0, Supination =72.67^0 and patient with satisfactory ROM with no complications.
Conclusion: ORIF with volar plating is a successful procedure for distal end radius fractures. Early return to pre morbid level of activity and functions occurs very swiftly.

Keywords: Distal end radius fracture, ORIF with volar plating, Modified Gartland and Werley's wrist scoring system

Introduction
Distal radius fractures are the most common fractures of the upper extremity in adults. Thousands of articles were published after Abraham colles[1] described a very common fracture of the distal end radiusin 1814 in Edinburgh Medical and Surgical journal, have not yet created a consensus as treatment programme. The fractures of the lower end of radius crush the mechanical foundation of man's most elegant tool the hand. No other fracture has a greater potential to devastate hand function.
A thorough understanding of the pathophysiology and treatment of distal radius is important as high energy trauma to distal radius in adults is becoming more common and long term functional results are unclear, these common injuries must be evaluated thoroughly and treated adequately. The cause of injury are fall on outstretched hand, work related accidents, car accidents, sports injuries.
For comminuted intra-articular fractures most authors combine fixation with kirschner wires, cancellous bone graft and external fixation after closed or open reduction and report good to excellent results (Axelrod *et al* 1988; Bradway *et al* 1989; Edwards 1991; Fernandez and Geissler 1991; Jupiter and Lipton 1993; trumble *et al* 1994). The long period of immobilisation and prolonged rehabilitation, however can be a major problem in this type of management.
This study is intended towards the study of different types of fracture of distal radius in adults, their management with open reduction and internal fixation with volar plating and relative complications. OA classification for distal end radius fracture will be considered in this study.

Methods

This study was done in S. nijjallingappa medical college, bagalkot to study the clinical outcome of distal and radius fractures treated with volar plating.

In this study all the cases of distal and radius fractures in adults admitted under orthopaedics department during the period from Jan 2015-dec 2015 about 30 cases will be studied.

Case selection done was criteria of history, clinical examination and radiological examination. The diagnosis was mainly based on clinical examination and was supported by radiological examination.

Inclusion Criteria

1. Adults over 18 years of age, both male and female with distal end radius fracture with or without other associated injuries.
2. Patient medically fit for surgery.
3. Patient willing for surgical treatment and have given informed written consent.
4. Unstable distal end radius coming under AO classification.

Exclusion Criteria

1) Patient below 18 yrs of age.
2) Patient medically not fit for surgery.
3) Compound fracture associated with vascular injury.
4) Patient not willing for surgery.

In all the cases routine investigation like complete blood count, urine routine and microscopic examination, X-ray examination, blood sugar level, serum creatinine and blood urea were carried out. Initially radiographs of the distal radius shoud consist of good posterero-anterier and lateral views.

The surgery was carried out under general anesthesia or brachial block after thorough preparation of the part. A standard volar henry approach was used. After the surgery, the operated limb was supported with an anterior or posterior splint and was kept elevated for 3 days till the edema subsided. All the patients received antibiotics, analgesics and antiinflammatory drugs. Active movements of the fingers, elbow and shoulder were started on the first post-operative day

On fifth post-operative day most of the patients were discharged. First follow up 1 week for suture removal, second follow up was at three week where most of the patient immobilised were advice for slab removal and physiotherapy was started, the next followed after 1 month and then follow up at 6 monthes.

Sutures were removed on 10-12th post-operative day. The splints were discarded and were replaced by a crepe bandage.

Clinical examination regarding the movements at the wrist and fingers were done. Careful examination was done to rule out any infection. Radiological examination consisted of assessing the consolidation of the fracture site, collapse at the fracture site and any displacement of the implant. The final evaluation was done at the end of the 6th month. The patients were evaluated according to standard objective and subjective criteria using demerit-point system of Gartland and Werley [2].

Results

The quality of recovery was determined by range of motion pre and post operative complication patient satisfaction and clinical evaluation modified Gartland and Werleys wrist grading system[2]. AP and lateral x-rays of wrist were used for various measurement and classification, the radiographs made at the time of the latest followup evaluated for joint congruity

The result for each fracture was graded as excellent, good, fair and poor. This include average flexion - extension arc of $>120^0$ and average supination pronation arc of $>150^0$.

There were no any complication noted. And patient satisfaction was consistently high. Majority of patient retain to their former activity of daily living with no significant limitation. Thus ORIF with Volar plating for distal and radius fracture used with through knowledge of the fracture type, proper fixation of the fracture with good anatomical reduction and adequate physiotherapy gives a functional wrist in the fracture of distal and radius.

The final result in our series after an average follow up of 7 months (6-10 months) showed that 5 patients (16.67%) had excellent result, 15 had good results (50%), 7 had fair results (23.33%) and 3 had poor results (10%).

Table 1: Gender Distribution

Gender	Frequency	Percent
Female	10	33.33
Male	20	66.67
Total	30	100.00

Table 2: Age-group of Patients

Age Group	Frequency	Percent
20 – 30	13	43.33
31 – 40	6	20.00
41 – 50	6	20.00
51 – 60	2	6.67
61 – 70	1	3.33
71 – 80	2	6.67
Total	30	100.00

Table 3: Side of operation

Side	Frequency	Percent
Left	10	33.33
Right	20	66.67
Total	30	100.00

Table 4: Descriptive Statistics of Post operative range

Post-Operative range	N	Minimum	Maximum	Mean	Std. Deviation
F	30	50	75	66.5	7.21
E	30	51	75	69.83	6.09
RD	30	15	20	18.83	2.15
UD	30	20	30	27.17	3.64
P	30	55	75	70.00	6.43
S	30	60	75	72.67	4.87

Table 5: Post-operative progress

Result	Frequency	Percent
Excellent	5	16.67
Fair	7	23.33
Good	15	50.00
Poor	3	10.00
Total	30	100.00

Table 6: Association between Gender and Post operative progress result

Gender	Result				Total
	Excellent	Good	Fair	Poor	
Female	2	5	3	0	10
Male	3	10	4	3	20
Total	5	15	7	3	30

Table 7: Type of Fracture AO Classification of patients

Type of Fracture	AO Classification	Frequency Percent
23A2.2	1	3.33
23A2.3	2	6.67
23B2.1	1	3.33
23B2.2	2	6.67
23B2.3	2	6.67
23B3.1	1	3.33
23B3.2	6	20.00
23B3.3	3	10.00
23C1.1	1	3.33
23C1.2	5	16.67
23C1.3	2	6.67
23C2.3	1	3.33
23C3.1	2	6.67
23C3.2	1	3.33
Total	30	100.00

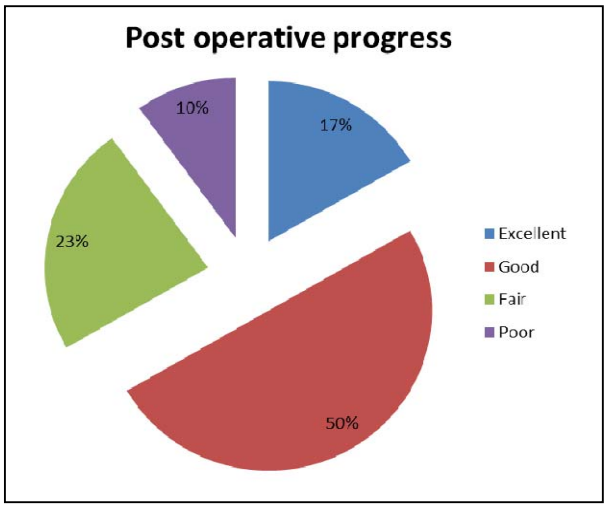

Chart 1

Discussion

The injuries to the lower end of radius are not only encountered in the emergency department setting but also in OPD, the mobility and delicate function requirements of the hand makes accurate diagnosis and treatment crucial to avoiding long term loss of functional and disability.

Heightened awareness of the complexity of the distal end radius fracture has stimulated a growing interest and promoted new ideas regarding their optional management.

A thorough study of the nature of fracture, the extend of the fracture, the type of fracture and planned approach towards the fracture treatment and with anticipitated results, the treatment of distal end radius fracture by using ORIF with Volar plating will always be fruitful.

In this study we have brought together and observational report of 30 cases of distal end radius fracture treated with ORIF with Volar plating in our hospital in one year of the study with an average follow up of 7 months.

K. Murakami, Yoshihiro Abe and K. Takahashi [3] in their study of 24 patients, 20 patients were beyond of 40 years of age and 4 patients were between 30-40 years. Also in this study they had 8 males and 16 female patients. In this study the age group considered was 18 years and above of which from 20 -30 years were the most commen age group affected. Number of males patient were more than female patients.

K. Murakami [3] in his series had 55% of patient with fracture involving the right (dominant side). In this study right side involvement were more than left side.

K. Egol, M. Walsh, w. Tejwani [4] and others in their prospective trial of bridging external fixation and supplementary Kirschner wirefixation got the following functional results in volar plate group at end of 12 weeks. Dorsiflexion -72%, palmarflexion -67%, radial deviation - 69%, ulnar deviation - 67%, supination -81%, pronation - 94%.

CM. Rizzo, B.A Katti, J.T. Carotheres [5] in their study had an average of 69^0 dorsiflexion, 64^0 of palmar flexion, 23^0 radial deviation, 34^0 ulnar deviation, 76^0 supination and 78^0 pronation in the locked volar plate group. In this study the mean range of movement was as follows Dorsiflexion 69.83^0, palmar flexion 66.5^0, radial deviation 18.830, ulnar deviation 27.17^0, supination70^0, pronation 72.67^0.

In this study functional outcome is graded using Modified Gartland & Werley [2] wrist grading system. In which excellent are 16.67%, good are 50%, fair are 23.33% and poor are 10%.

Conclusion

The preliminary results demonstrate the option of early functional treatment using ORIF with Volar plating, most of the patients had a good to excellent range of motion of the injured wrist which resulted in an early return to normal activity.

1. 66.67% were males as compared to 33.33% of the females.
2. 43.33% patients were in the age group 20-30 years followed by 20% in the age group 31- 0, 20% patients in age group 41-50 years, 6.67% patients in the age group 51-60 years. 3.33% of 61-70 years and 6.67% of 71-80 years.
3. Right side was more commonly involved than the left.
4. With AO classification B 3.2(20%) followed with C 1.2(16.67%) were the commonest types encountered.
5. No complication occurred in any of patients.
6. ROM mean dorsiflexion-69.83^0, palmar flexion- 66.5^0, radial deviation 18.83^0, ulna rdeviation 27.17^0, pronation 70^0, supination72.67^0.
7. Patients had excellent result (16.67%), 15 patients had good results (50%), 7 patients showed fair results (23.33%), 3 patients had poor results (10%).
8. Fractures of the distal radius are not simple injures and thus required careful evaluation of the radio carpal joints, DRUJ, and carpal bones. However educated decision making based on objective data and patients profile can leads to optimal outcome of these challenging fractures.
9. Important aspect of this classification system can be summarized as followed; an intact volar buttress is the key to a stable reduction. When disrupted this buttress must be restored. The intra articular fractures in young adult is a complex injury with a considerable associated morbidity, it needs to be managed appropriately.
10. Every patient is unique and the ultimate treatment plan should be based on individual needs and expectation.
11. The use of the ORIF with Volar palting for distal end radius fracture with thorough knowledge of the fracture type, proper fixation of the fractures with the good anatomical reduction and adequate physiotherapy gives a functional wrist, however the surgeons personal preference do vary as a treatment plan is considered.

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