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A prospective study to assess the functional outcome of AO Type 23.B3 distal radius fractures treated with volar locking plate osteosynthesis

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Abstract

Purpose: To study and evaluate the clinical and radiological outcome of open reduction and volar locking plate fixation in AO Type 23B3 fracture of the distal end of radius.

Method: 20 patients operated for AO Type 23B3 fracture of the distal end of radius were prospectively studied and the functional outcome were assessed using the Gartland-Werley functional scoring system.

Result: The overall anatomical result using the criteria of sarmiento's modification of lidstrom's classification was fourteen patients (70%) with excellent results, four patients (20%) with good result and two patients with fair results (10%). Based on the functional criteria as described by Gartland and Werley the overall functional results were excellent in twelve patients (60%), good in 6 patient (30%) and fair in two patients (10%). In the present series grip strength was good in eighteen patients (90%) fair in two patients (10%). There were two patients (10%) with complications and eighteen patients (90%) who had no complications.

Conclusion: AO Type 23B3 fracture of the distal end of radius has excellent outcome with volar locking plate fixation, which allows for a anatomical reduction and early mobilization. This improves the wrist function and final outcome significantly.

Keywords: AO type 23.B3 fracture, volar locking plate fixation, distal radius, Gartland and Werley scoring system

Introduction

The most common fracture in the upper limb sustained either due to high velocity trauma or a simple trivial fall are the distal radius fractures of the forearm. Most commonly sustained due to fall on an out stretched hand. With the increase in the high velocity trauma, there has been a definite change in the age, incidence and the fracture patterns, in the sense that more and more young individuals with good bone stock sustain this injury with intra articular involvement as well. The conservative form of management has its own complications such as radial shortening, stiffness and wrist joint arthritis are the common sequelae. Because the distal radius is important in the kinematics of the radiocarpal and radioulnar joints, open reduction of the articular surface and restoration of the radial length, volar angulation, and radial inclination are the prerequisites for good clinical outcome. Because the distal radius is the foundation of the wrist joint and an indispensable part of ligamentous support, reconstruction of articular congruity and stable fixation reduces the incidence of post-traumatic osteoarthritis and allows early functional rehabilitation. There are many potential advantages to internal fixation including direct fixation of articular fragments, early range of motion of the joint, and avoidance of constrictive dressing. It is proposed to manage unstable comminuted distal radius fracture by open reduction and internal volar plate fixation for direct restoration of the anatomy, stable internal fixation, a decreased period of immobilization and early return of wrist function.

Materials and Methodology

The patients were followed up at specific intervals and functional outcome were assessed using the Gartland-Werley functional scoring system.

The overall anatomical restoration was evaluated using the criteria of sarmiento's modification of lidstrom's classification.

Inclusion criteria

1. AO Type 23.B3 distal radius fractures

2. Age between 18 to 75 years
3. Patient medically fit for surgery

Exclusion criteria

1. Pre-existing wrist arthritis/ disability
2. Previous fracture to the affected wrist
3. Associated skeletal/soft tissue injuries to the same limb
4. Compound fractures of the distal radius
5. Any undelaying medical illness

Table 1: Sarmiento's modification of lidstrom criteria

	Residual deformity	Loss of palmar tilt (degrees)	Radial shortening (millimeters)	Loss of radial deviation (degrees)
Excellent	No/ Insignificant	0	<3	5
Good	Slight	1-10	3-6	5-9
Fair	Moderate	11-14	7-11	10-14
Poor	Severe	At least 15	At least 12	>14

Table 2: Demerit point system of Gartland & Werley with sarmiento *et al.* modification (Functional evaluation)

Residual deformity	
Prominent ulnar styloid	1
Residual dorsal tilt	2
Radial deviation of hand	2-3
Point range	0-3
Subjective evaluation	
Excellent	
No pain, disability or limitation of movement Good	0
Occasional pain, slight limitation of motion, no disability Fair	2
Occasional pain, some limitation of motion, feeling of weakness in the wrist, no particular disability if careful, activities slightly restricted	4
Poor	
Pain, limitation of motion, disability, activities more or less markedly restricted	6
Objective evaluation	
Loss of dorsiflexion	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of palmarflexion	1
Loss of radial deviation	1
Loss of circumduction	1
Loss of pronation	2
Pain in DRUJ	1
Grip strength - 60% or less of opposite side	1
Point range	0-5
End result point ranges	
Excellent	0-2
Good	3-8
Fair	9-20
Poor	21 and above

Result

The patients were selected at random for the study and they were followed up for a minimum of three months. Out of twenty patients who were followed up the mean age was 44.75 years. There were six females – 30% and fourteen males – 70%. The fractures were classified according to mullers classification. The patients selected were the ones with unstable, comminuted fractures of the distal radius.

Pain following the fracture was moderate during the first week after surgery. Residual pain was completely absent in 95% of the patients. Swelling of the fingers and the wrist subsided within a week and residual swelling was almost nil in all patients. In the present series grip strength was good in eighteen patients (90%) fair in two patients (10%). There were two patients (10%) with complications and eighteen patients (90%) who were alright.

The overall anatomical result using the criteria of sarmiento's modification of lidstrom's classification was fourteen patients (70%) with excellent results, four patients (20%) with good result and two patients with fair results (10%) based on the functional criteria as described by gartland and werley the overall functional results were excellent in twelve patients (60%), good in 6 patient (30%) and fair in two patients (10%)

From this we infer anatomical reduction and maintenance of the same leads to excellent functional and subjective results. Whereas poor reduction leads to poor anatomical, functional and subjective results. It confirms that anatomical restoration is necessary for restoration of good function.

The effects of residual tilt on movement especially dorsi flexion and palmar flexion showed at six weeks nearly 66% of recovery and at three months 90% recovery. The more the dorsal tilt the poorer the recovery of function.

Case 1



Fig 1: Pre Op X-Ray

Fig 2: Post Op X-Ray

Fig 3: Follow Up



Fig 4: Clinical follow up

Case 2



Fig 5: Pre Op X-Ray

Fig 6: Post Op X-Ray

Fig 7: Follow Up



Fig 8: Clinical follow up

Discussion

The initial union in the comminuted distal radius will be a fragile bridge on the volar aspect and a central cavity filled with fibrous tissue. If consolidation is not sound the power of grip and function of wrist will be inhibited until sound

consolidation has been achieved. "The best way to functional recovery is by striving primarily for sound osseous union and any factor which will delay osseous consolidation carried the danger of some permanent joint function.

In our study treating unstable comminuted distal radius

fracture with volar plating has shown excellent to good functional and anatomical outcome. It has proved to be a better alternative to our dynamic young and middle aged Indian patients who have a good bone stock. In elderly patients with osteoporotic bone it has proved likewise. Patients were motivated and explained about the outcome of treatment. Periodic checkup showed excellent to good outcome.

The complication encountered during this study were, mild radio carpal osteo arthrosis and sudecks dystrophy which were rehabilitated to provide good functional outcome.

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