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Review of Current Concepts in Managment of Distal Radius Fractures

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Introduction

Fractures of the distal radius continue to be one of the commonest skeletal Injuries treated by Orthopedic or Trauma Surgeons and account for one sixth of all injuries seen in casualty rooms. These fractures are now recognized as serious disruptions of wrist anatomy, which have a considerable incidence of complications .It is now well accepted that functional recovery closely parallels the accuracy of skeletal restoration. Optimal management requires an accurate restoration of skeletal anatomy by either closed or open treatment and a skilled rehabilitation programme to ensure the best out comes for patients.

The treatment of distal radius fractures continues to evolve. Improved understanding of biomechanics and fracture anatomy, as well as redesigned hardware for internal fixation, has led to new approaches to the surgical management of these fractures. Today there are indeed effective and exciting ways to treat these potentially complicated fractures.

Most distal radius fractures can be effectively treated with closed reduction. Unstable fractures, however, continue to present a formidable challenge to orthopedic surgeons, as operative treatment does not guarantee a successful outcome. External fixators restore and preserve radial length, but are unreliable in restoring palmar tilt. Dorsal plates are associated with tenosynovitis and attrition ruptures. Palmar plates, Locking compression plates, small implants, combined Internal + external fixation are among the options that are now available. Arthroscopy is a new addition to the options available to assist reducation and diagnose soft tissue injuries.

As a result, the outdated "one-size-fits-all" approach to surgical management of these fractures (external-fixation vs open reduction with T-plate) has been replaced with a fracture-pattern-specific approach. Since different mechanisms of injury result in distinct fracture patterns, each subtype of distal radius fractures merits a unique approach.

The column theory (radial, ulnar, intermediate columns) of distal radial anatomy has resulted in abandonment of the traditional dorsal/volar approach to implant placement. Now the focus is on columnar stabilization. The Triad of improved articular congruency, stable internal fixation, and postoperative rehabilitation are vital requisites in the attainment of successful outcomes.

Classifications and their relevance

While Numerous Classifications have been proposed for these fractures over the years, the Frykman (1976) and the AO (1987) classifications have been the most commonly in use. The Universal Classification (1990) offers the most practical and treatment oriented approach to these fractures

Frykman : This divides fractures from type I to VIII, with types I and II being extrarticular and Types II to VII denoting intra articular fractures with increasing complexity. The problem with this classification is that it does not distinguish between the displaced and undisplaced intrarticular fractures, which may have different treatment modalities and outcomes.

AO : This classification divides the fractures into extra articular (A), partial articular (B) and complete articular (C). Each type is further divided into further 3 subtypes denoting increasingly

complex patterns. These can be further subdivided to reflect the morphological complexity, difficulty of treatment and prognostic factors.Although this classification is very systematic, it does not attempt to correlate all treatment options with the types.

Universal : combines the intra and extra articular anatomical and the stable and unstable mechanical concepts and also offers treatment options to the types

Type	Treatment option
Type I Non Articular non displaced	Cast Immobilization
Type II Non Articular displaced	
A) Reducible Stable	Cast Immobilization
B) Reducible Unstable	Percutanous Pins
C) Irreducible	Open Reduction/External Fixation
Type III Articular non displaced	Cast Immobilization/Percutanous Pins
Type IV Articular displaced	
A) Reducible stable	Closed reduction Percutanous pins (K wires)
B) Reducible unstable	Closed reduction External fixation + Percutanous pins
C) Irreducible	Open Reduction + P.C.Pins + Ext.Fixation
D) Complex	Open Reduction + Ext.Fixation Plate Fixation + Bone grafting

While newer and improved designs of plates and fixation systems are fast replacing external fixators as treatment options their basic use is still most relevant to type IV fractures.

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X Ray of the wrist, preferable in 4 views, should be performed in every patient with a distal radius fracture acutely as well as during follow up. The technique is easy to perform, universally available and inexpensive.

Advanced imaging techniques such as **CT scan,** or MRI should not be first choice modalities in patients with distal radius fractures and should be used only when conventional X Rays are inconclusive.

CT Scan is useful for the confirmation of occult fractures and is superior for the preoperative evaluation of complex comminuted distal radius fractures, depicting the distal radial articular surface, size and position of fracture fragments, as well as for the assesment of fracture healing. CT is imaging technique of choice for the correct diagnosis for the subluxations of the radioulnar joint.

MRI is an important diagnostic technique for the evaluation of suspected injuries of soft tissues related to distal radius fractures, such as median nerve, and for the early diagnosis of necrosis of the scaphoid or lunate. Other indications include identification of triangular fibro-catilage perforations, ruptures of carpal ligaments, and demonstration of contents of the carpal tunnel.

Scintigraphy can be helpful for diagnosing occult fractures, for documen-ting fracture healing and ligamentous or cartilaginous post-traumatic disorders as well as for diagnosis and follow-up of reflex sympathetic dystrophy. A disadvantage of scintigraphy is its poor specificity.

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Closed Reduction and Cast Immobilisation

Most stable fractures can be satisfactorily treated with closed reduction and cast immobilization. The methods of reduction are well documented and need no elaboration. The methods of immobilization range from the usual pronation,palmar flexion and ulnar deviation (still enjoying a consensus) to supination (Sarmiento) and

dorsiflexion (Gupta). The Smith fracture is treated with the immobilization in a above elbow cast with the wrist held in supination and dorsiflexion.

While cast immobilization can produce predictable results, careful supervision is required to detect and treat redisplacemnt, vigilance and diligence is needed for prevention of the numerous complications that can occur.

External Fixation

External fixation of unstable intra-articular fractures of the distal radius has become an effective tool in the management of these difficult injuries. Careful assessment of the fracture pattern, appropriate patient selection, meticulous surgical technique, the appropriate choice of fixation device and pins, recognition of the need for augmentation with limited internal fixation or bone grafting, and aggressive postoperative rehabilitation provide the foundation for successful management of these fractures while minimizing complications. The surgeon must remember that the pin-bone interface is the link between the patient and the fixator. He or she must ensure a stable environment for this interface by providing a clean, tight purchase of the pin in bone with minimal damage to the bone and its surrounding soft tissues at the time of operation. Postoperatively, the surgeon must convey to the patient the importance of maintaining a healthy environment for this pin-bone interface. An appropriately chosen external fixation device can be expected to provide overall stability while maintaining length as well as angular and rotational alignment.

Ligamentotaxis

The principle of ligamentotaxis obtained by longitudinal traction is useful in restoring skeletal length to distal radial fractures. Using external skeletal fixation to translate the hand in radial-ulnar and dorsal-palmar directions, ligamentotaxis in two additional planes aligns and tilts the distal radius fragment and its articular surface. Following restoration of palmar tilt by palmar translation, wrist position can be adjusted into neutral or extention to help avoid finger stiffness and carpal tunnel syndrome without compromising fracture reduction.

Augmented External Fixation

External fixation and/or ligamentotaxis cannot always be expected to provide precise small fragment control and restoration of articular congruity. This must be achieved by precise reduction and limited internal fixation using Kirschner wires while prevention of late collapse is afforded by subarticular bone grafting of the metaphyseal defect.

Adherence to these principles should provide a satisfactory outcome with a significant reduction in the rate of complications when external fixation is used for the management of complex fractures of the distal radius.

Percutanous Pin Fixation

Per cutanous and intra focal pinning using 2 or 3 pins is a safe and simple technique for the treatment of unstable fractures of the distal radius without significant inta-articular involvement, volar comminution, or advanced osteopenia

It is an excellent choice for physiologically younger individuals, because a high percentage of good and excellent radiological results can be achieved. Reduction is more difficult to maintain in elderly patients using this technique and results in a higher percentage of poor or fair radiographic results. Nevertheless, although some loss of reduction can be expected in the elderly population, clinical results are not likely to suffer. Therefore, intra focal pinning in the older patient cannot be condemned.

While the data regarding the advantages of plates and other Open reduction systems over percutanous pinning is inconclusive there is an increasing preference for these devices in recent times.

Open Reduction and Internal Fixation

Operative Treatment

The devices used for fixation after Open reduction have ranged from the dorsal plates (AO dorsal oblique. Pi Plates. Forte plates, SCS plates, LoCon plates.