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Management of rare Fractures of Wrist and Hand: A Case Series

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Abstract

The main functions of hand and wrist are not only gross and fine motor skills but also main tool for sensing and understanding the immediate surroundings and also essential for physical manipulation of their surrounding environment. They not only give the ability to grasp but also differentiates from other animals by an opposing thumb. Hand and wrist fractures are most common upper limb fractures which present at emergency and to orthopaedic clinics. Hence, proper evaluation at initial presentation, as well as during their management, can prevent both disability and morbidity to the patient significantly. These decisions are based on wide range of factors including age, mechanism of injury, severity of injury, hand dominance, occupation, type of fracture, co-morbidities and associated injuries. Delayed presentations and treatment cause variety of complications which tamper the activities of daily living. However, there is potential for several different types of rare fractures and complications based on the mode of injury.

The optimal treatment of these rare fractures of hand and wrist requires a multidisciplinary approach. Primary assessment should include thorough medical history, stabilization of the patient, clinical examination from head to toe, followed by appropriate radiological imaging. Immediate Stabilisation of the joint allows fractures to unite, definitive treatment, early mobilisation of hand and wrist will maximise the functional restoration of the hand. In this series, 5 cases of rare fractures of wrist, hand and their complications along with management has been discussed.

Keywords: Rare, Fracture; Wrist; Complications; Hand.

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INTRODUCTION

The upper limb has specified and sacrificedloco motor function for mobility, stability, dexterity, precision. The hand and wrist consist total of 27 bones arranged to roll, spin, and slide allowing the hand to explore and control the environment and objects. The hand is a combination of complex joints which function to manipulate, grip and grasp, all made possible by the opposition of the thumb[1]. Some biologists believe that thedevelopment of our large and complex brain waslead indirectly by the development of human hand because hand's existence promoted brain development by allowing to manipulate, explore, and gain information fromand interact with environment. This complex brain permitted us in turn to make and use tools and to develop language leading to an elaborate system of shared meanings, what we know as culture.[2]

Wrist Anatomy: A Brief Review

The wrist joint also referred to as the radiocarpal joint is a synovial condyloid joint that connects and acts as a transition point between the forearm and hand. A condyloid joint is a modified ball and socket joint which allows for extension, flexion, adduction, and abduction movements. The function of the wrist joint is to provide range of motion to adequately perform daily functions while maintaining a physiologic level of inherent stability which is accomplished by the osseous articular components at the wrist creating a condyloid joint that permits simultaneous movement in two perpendicular planes, in this case, radioulnar and dorsopalmar.[3]

The joint itself is formed through the articulations between the scaphoid, lunate, triquetrum and distal radius. The proximal articulation forms a concave shape composed of a combination between the articular disk and distal end of the radius whereas the distal articulation is more convex and made by the scaphoid, lunate, and triquetrum bones. We have to make a point that the distal ulna is not part of the wrist joint itself, as it articulates with distal end of radius via DRUJ, the distal radio ulnar joint.[4,5]

Hand Anatomy - A Brief Review: The hand consists of a main body known as the palm and five digits - a thumb and four fingers. Hand consist of 27 bones in total, arranged into three distinct groups - carpals, metacarpals and phalanges. The carpal bones form the base of the hand and the wrist joint, there are eight in total which are arranged into two separate rows, with the proximal row forming part of the wrist joint and the distal row articulating with the base of the metacarpal bones in the palm of the hand. The metacarpal bones are numbered one to five, with one corresponding to the thumb and five the little finger. Each metacarpal has a base that articulates with the distal row of carpal bones. The shaft of each metacarpal is curved which gives the palm of the hand its characteristic cup shape. The heads of the metacarpals are prominent structures and can easily be felt especially when the hand is made into a fist. These metacarpal heads articulate with the proximal phalanx to form the metacarpal-phalangeal joints (MCPJ) of each digit. Fingers are formed by three phalanges - proximal, middle and distal phalanx which are joined with two joints, the proximal and distal interphalangeal joints (PIPJ, DIPJ). These are hinge joints allowing each finger to have two separate points of flexion and extension along its length. On its volar aspect,the joint capsule is reinforced to form a thickened ligament known as the volar plate which prevents hyperextension of the joint.

Hands are one of our body main tools which are capable of variety of functions like touching, feeling, caressing, grasping, manipulating and so much more. They are an important part of what we live our life each day and how we see ourselves. Static functions of hand are grasping and pinching whereas the dynamic funtions include manipulation, prehension and play occupations. Grasping and pinching require palm andfingers whereas manipulation requires not only the ability to grasp and pinch but also in combination with prehension and coordination with the wrist, elbow, shoulder and body movements.

The fractures of hand and wrist are very common and encompass a range of injuries which commonly occurs in the wrist (distal end radius fracture) when people try to catch themselves during a fall on an outstretched hand on land hard. Other common hand and wrist fractures include a scaphoid fracture, a metacarpal fracture, or phalangeal fracture. Majority fractures of the hand and wrist arewith injuries to the phalanges and metacarpals. All injuries must be addressed as early as possible since they can cause a disproportionate amount of morbidity from missed diagnosis because of their subtlety and frequent association with significant ligamentous disruption. Delayed diagnosis or delayed treatment will result in inadequate fracture care, which places at risk of complications and disabling sequelae. These case review focuses of pathophysiology, examination, early diagnosis, andon the current concepts in treatment of some of the rare fractures of hand and wrist.

Following are the management of five Rare fractures of hand, wristand complications which were done in Department of Orthopedics, KAHER, J N Medical College, KLES Dr. Prabhakar Kore Hospital & MRC, Belagavi.

CASE 1

A case of maluniting neck of 2nd metacarpal fracture

A 45 year old, right hand dominant man, labourer by worker came to OPD with history of fall from 2 wheeler on closed fist 20 days back with complaints of pain over the neck of index finger. On physical examination the patient is unable to actively flex or extend fingers due to pain. The skin and soft tissue are normal with no wounds but there is localized swelling, and tenderness on palpation over distal 2nd metacarpal region. MCP joint depression with loss of normal joint contour is present. Other deformities that are noted are shortening of 2nd ray compared to the contralateral hand. A rotational deformity some degrees of external rotation in affected finger is appreciated with the fingers in extension, however testing them in flexion revealed no deformity. Finally, a neurovascular examination is done showing normal findings distal capillary refill of one second and two point discrimination distance of 5 mm.

Anteroposterior view, lateral view and oblique view radiographs of the affected digit are obtained showed displaced fracture of neck of 2nd metacarpal with approximately 20 degrees of apex volar angulation and 5 mm of shortening (Fig. 1). There was no significant comminution seen on x-rays.

and fracture debris and soft callus was debrided. Provisional reduction achieved was fixed with two obliquely oriented 1.5mm K-wires. The 2 mm Metacarpal T Plate System selected was applied on the dorsal aspect of the shaft of metacarpal. The plate was provisionally fixed with bone reduction forceps proximally and distally. A 2 mm Lag Screw was placed through one of the kwire hole and C-arm fluoroscopy was used to confirm proper plate and lag screw placement. The two distal-most screws and one of the proximal screws were placed and the C-arm was again used to confirm position of screws in the metacarpal head. The digits were then examined to confirm appropriate rotational alignment of metacarpal with all fingertips pointing towards the distal pole of the scaphoid while making a fist and no overlap. After confirming acceptable reduction and appropriate plate position, the remaining shaft screws were placed in locked fashion (Fig. 2). The periosteum and fascia that were elevated are closed over the plate with interrupted absorbable sutures which allows tendons to glide above the plate. The skin

Fig. 1: Anteroposterior view, lateral view and oblique view radiographs of the affected digit are obtained showed displaced fracture of neck of 2nd metacarpal.

The patient was shifted to operating theatre and was placed supine position on the operating table with a hand table attachment. Under brachial block closed reduction was tried but couldn't be achieved since it was almost 3 weeks old. Plan of Open reduction and internal fixation with Plate and screws was opted. A longitudinal incision was made along the long axis of the second metacarpal which was purposefully made to not be in line with the underlying extensor tendons. The extensor tendons were retracted laterally and interosseous muscles and the dorsal aspect of the metacarpal were exposed. The periosteum on the ulnar aspect of the dorsal metacarpal was sharply incised with a beaver blade and full thickness flaps periosteum and interosseous fascia were carefully raised and preserved for the coverage of plate with these flaps during closure. Then fracture site was identified was closed with continuous monocryl sutures and skin staples applied.

Fig. 2: post-op x-ray showing 2nd metacarpal neck fracture fixed with one lag screw and 2mm T plate system

Discussion

Hand fractures represent 10% of all fractures and metacarpal fractures represent about one-third of hand fractures.[6] Most of the metacarpal fractures are seenin active working population; young adults and adolescents, which are documented to have a large economic impact in terms of the cost of treatment and disability.[7] Metacarpal shaft fractures can be described as transverse, short oblique, spiral, and comminuted. The correction of shortening, dorsal angulation, and rotation are the main three objectives for treatment of displaced metacarpal shaft fractures.[8] The treatment is decided based on the location of fracture, the displacement, stability of the fracture, the resultant deformity, rotational malalignment and number of metacarpal fractures.[9] The most important objective is to correct rotation as rotational deformity is poorly tolerated. Operative management includes closed reduction and percutaneous fixation with Kirschner (K)-wires for undisplaced and minimally displaced fractures, open reduction and fixation by intramedullary rods for displaced but no deformity, open reduction and internal fixation with plate and screws for displaced and deformed fractures, and fixation by using mini external fixatorfor comminuted and open fractures.[9-12] ORIF is indicated when the unstable fractures cannot be reduced by closed manipulation, multiple fractures, concomitant soft tissue injuries, and the subcapital spiral oblique fractures, which if allowed to heal in the shortened position may result in impingement at the metacarpophalangeal joint.[13] We recommend the use of minilocking plate for fixation of periarticular, comminuted, and osteoporotic metacarpal fractures. Plate offers rigid fixation fracture allowing early mobilization, lowering the risk or incidence of joints stiffness and adherence of tendons which in turn maximizes the hand function,

CASE 2

A case of right scaphoid non-union

A 40 year old right hand dominant male who gave history of injury to his right wrist 4 months prior after falling on an out stretched hand. The patient told that he suffered a fracture at that time and the x-rays done showing it was right sided scaphoid fracture. He was then treated initially with immobilization in a cast for 4 weeks. Over the next 1 to 2 weeks he had mild pain which subsided after taking medications. Now patient presented with continuous pain and limitation of movement since 3 weeks. The patient was further evaluated for his persistent wrist pain and increasing limitations in his daily activities. There was no recent history of trauma. On physical exam of his wrist, he had mild tenderness over the anatomical snuff box and radioscaphoid joint dorsally which was worsening with motion and difficulty to grip. Wrist range of motion (ROM) showed wrist extension to 45 degrees and flexion to 70 degrees, pronation to 80 degrees, and supination of 70 degrees. He had a normal motor, sensory and neurovascular exam.

Radiographs were done anterposterior, lateral and scaphoid view of wrist showing non-union of the waist of the scaphoid with mild cystic changes

Fig. 3: Showing non-union at waist of scaphoid

of the proximal scaphoid fragment. (Fig. 3)

Patient was taken to the operating room for open reduction and internal fixation of his scaphoid non-union with a nonvascularized iliac crest bone graft. An incision was made over the volar radial aspect centered over the scaphoid and sheath of flexor carpi radialis. The FCR tendon was elevated retracted ulnarly, opening the floor of the sheath. A clear non-union of the scaphoid was found with complete instability oftwo fragments. There was no evidence of radioscaphoid arthritis with well maintained joint space. One K-wire was placed in each fragment of the scaphoid and used as joysticks to expose. The non-union site was exposed freed of debris and drilled with a 1mm drill wire and irrigated. This induced bleeding from the cancellous bone of the proximal and distal fragments. Next, the iliac crest bone graft was taken from a 5 cm incision over the anterior iliac crest. A 6 × 5 × 10 mm corticocancelloustricortical graft was obtained. Additional cancellous graft was taken from between the outer and inner tables of the ilium. The cancellous graft was first placed in the interstices of the proximal and distal scaphoid poles, both the fragments are reduced and fixed with two 1mm kwires - one in the centre and one just beside which acts as derotation wire. The corticocancellous graft was then fashioned to fit the resulting structural defect and was impacted into place. Fluoroscopy showed a normal scapholunate angle and good restoration of the alignment of the scaphoid, The central kwire is removed and fixed with a headless Herbertscrew in the central portion of the scaphoid. The other K-wire used for derotation was removed. (Fig. 5). The left over cancellous graft was packed in and around the non-union. The incisions on the wrist and iliac crest were closed in standard fashion. Sterile dressing was done for all wounds, and well-fitting thumb spica splint was applied.

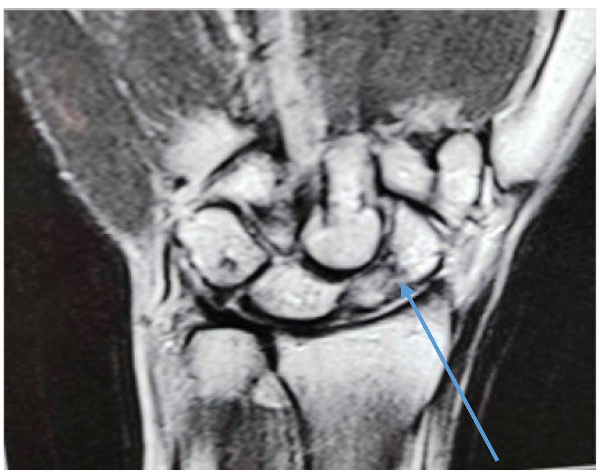

Fig. 4: MRI was done. T1-weighted MR images were evaluated which showed despite immobilization, a fracture line through the scaphoid waist (arrow) remains visible. The proximal pole of the scaphoid demonstrates abnormal, diffusely low signal intensity for which patient was placed in a moderate-to-high risk for Avascular Necrosis (AVN) category

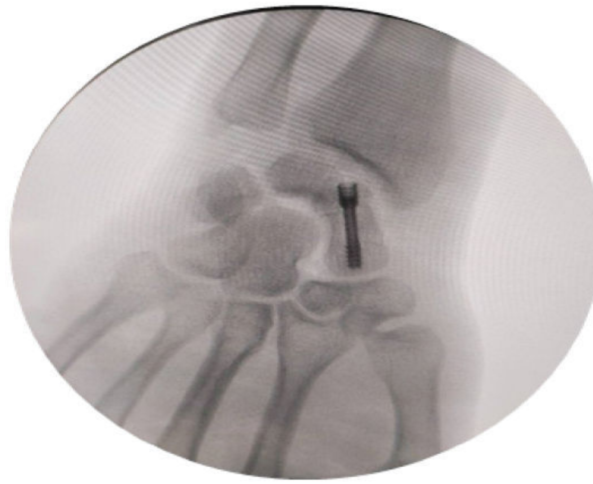

Fig. 5: Scaphoid waist non union fixed with one headless Herbert screw

Discussion

Non-union has been reported to occur in 5% to 10% of scaphoid fractures.[14,15] Fracture type, methods of immobilization, and associated carpal instability have been studied to predict which fractures will fail to unite. The investigation of internal fixation of scaphoid fractures to prevent non-union was much stimulated by the introduction of the Herbert screw in 1984. Hebert screw gave advantage as a reliable device for treatment of acute fractures as well as in fixation of malunions and non-unions of the scaphoid. For many years it was believed that an asymptomatic non-union of the scaphoid should be left alone. However, recent studies indicate that greater than 90% of patients with unstable non-unions will go on to develop adjacent arthritis.[18,19] Most hand surgeons now agree that some type of treatment is warranted in all types of scaphoid non-union. Methods of treatment include casting with electrical stimulation, bone grafting without fixation, bone grafting with internal fixation, vascularized bone grafting, silastic replacement, limited arthrodeses, and proximal row carpectomy. Proper preoperative evaluation of scaphoid non-union is critical to ensure good results. The size of the fragments and amount of displacement must be defined with comparison x-rays of the opposite wrist and CT scan if needed. Bone scans have been used to assess viability but have been surpassed by magnetic resonance imaging (MRI).

Once the non-union is staged, a treatment plan should be developed. Is the bone solid enough to hold a screw? Will adjacent arthritis interfere with pain relief? Is a cancellous graft adequate or will a corticocancellous wedge be required? Which type of fixation (if any) will allow this bone its best chance of healing? A scaphoid fracture with a very small proximal pole will require an alternative method of treatment. The Herbert screw has been successfully used in the management of scaphoid non-union. The technique of insertion is technically demanding, but the benefits of stability and early mobilization are critical to a functioning pain free wrist. pre-operative symptoms are best resolved by restoring the original scaphoid anatomy as much as possible.

CASE 3

A case of Volar fracture dislocation of proximal interphalangeal joint (PIPJ) of left ring finger

A 45 year old female presented to OPD with history of injury to left ring finger while working at home result as a result of domestic accident. She complained a giveaway sensation in her left ring finger associated with severe pain, swelling and difficulty in moving the finger. Icepack application and analgesics were tried at home and she came to the clinic two days later. On clinical examination, the ring finger was swollen, rotated, shortened, and had fixed flexion deformity at PIP joint with ulnar deviation of middle phalanx. The clinical presentations mimics buttonhole presentation with the proximal interphalangeal joint in flexion deformity called as extension lag. Radiographs revealed volar dislocation of the PIP joint and proximal and radial displacement of the middle phalanx base (Fig. 6) associated with bony avulsion fracture of the dorsal aspect of the head of the proximal phalanx. There is suspicion of volar plate avulsion injury. A complete neurovascular examination is done showing no neurovascular compromise. Since there is articular impaction, patient was planned for reduction under anesthesia and reassement under fluoroscopy.

Fig. 6: Showing volar dislocation of the PIP joint and proximal and radial displacement of the middle phalanx base associated with bony avulsion fracture of the dorsal aspect of the head of the proximal phalanx

Under brachial block, with patient on supine table with hand on arm board, a trail of closed reduction was done which seemed to be unstable. A Bruner incision was made over the PIP joint flexion crease. The neurovascular bundles were identified and were protected. The flexor sheath was identified and opened between A2 and A4 pulleys. To expose the volar PIP joint the flexor tendons were retracted and the volar plate was found damaged was retracted proximally, leaving it attached to the volar fracture fragment. The articular surface was exposded, and the fragments were reduced with towel clip and stabilized using kwires which were replaced with two 1.5 mm mini-screws. The ROM at the PIP joint and stability were confirmed during surgery. Fluoroscopy images confirmed joint reduction (Fig. 7,8). The volar plate was repaired and was reattached with non absorbable sutures to the pulley and periosteum at the base of proximal phalanx. The fixation was supplemented with splintageon palmar aspect for 1 week, and physiotherapy was started after that. Passive AND active ROM of the distal IP and PIP joints were encouraged to prevent joint stiffness. During follow-up (16–18 months) patient didn't develop a boutonniere deformity.

Fig. 7,8: Intraoperative images showing volar dislocation of PIPJ reduced and avulsion fracture of head of proximal phalanx fixed with miniscrews

Discussion

Injuries to the proximal interphalangeal (PIP) joint can severely restrict the function of the hand. Dorsal PIP joint dislocations are common injuries; palmar PIP joint fractures and dislocations are far less frequent and more difficult to treat.

The aim of treatment of unstable volar PIP joint fracture dislocations includes immediate re-establishment of articular congruity and providing a stable and concentric joint with rigid fixation, thereby permitting early mobilization to minimize the risks of stiffness or contractures.[20] A variety of treatment options for fracture dislocations of the proximal interphalangeal jointjoint have been presented in the literature, including traction, external fixation, volar plate arthroplasty, hemihamateautograft, and ORIF.[21,22] Many surgical approaches are there to facilitate ORIF of PIP joint fracture dislocations. Wilson and Rowland[23] reduced and the fracture fragment and stabilized using a volar-to-dorsal pin via a midlateral incision. A retrospective study conducted by Lee and Teoh[25] showed the outcomes of 12 unstable PIP joint fracture dislocations with a single volar fragment in 10 patients managed using mini-screws via a dorsal approach. In our case, a volar incision was used which facilitatates easy access to both radial and ulnar sides of the pip joint and it also allows adequate exposure fordis impaction, and reduction of impacted fracture fragments at the head of the proximal phalanx. K-wires or mini-screws can been used to fix fragments in unstable PIP joint fracture dislocations. Green et al[22] and Freeland and Benoist[21] demonstrated the use of mini-screws in PIP fracture dislocations. The Freeland and Benoist study[21] was a review article which explains the technique of ORIF using mini-screws, and the Green et al study[22] followed the outcomes of patients who had open reduction and internal fixation using mini screws. Hence screws offer several advantages over the traditional K-wires as screws have better holding power, do not protrude like k wires, and usually donot require removal.

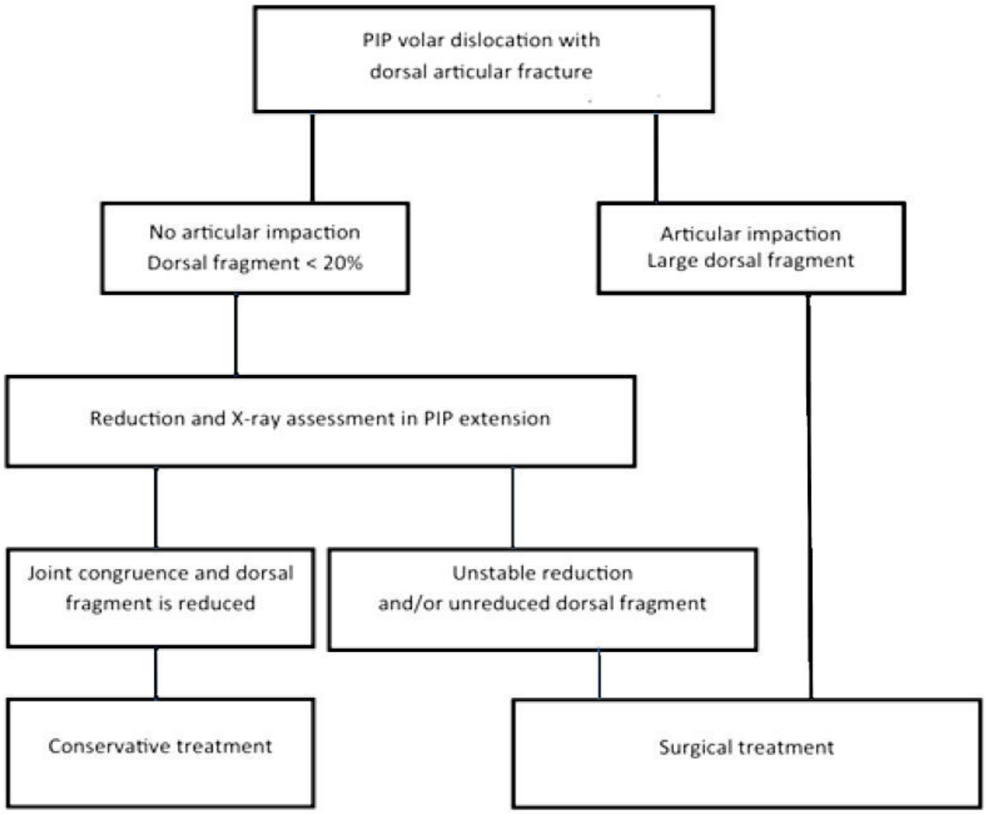

Fig. 9: Decision tree for the management of volar dislocation of the proximal interphalangeal joint associated with fracture of proximal phalanx

CASE 4

Corrective Osteotomy for Malunited Intra-Articular distal end of radius fracture

A 52-year-old male allegedly had a history of a road traffic accident due to slip and fall from a bike, on his fully extended hand, approximately 6months prior, resulting in injury to the left wrist. After the fall, the patient experienced sudden onset, non-progressive, sharp shooting pain in the left wrist, which persisted continuously throughout the day and was localized to the left wrist. The patient was unable to perform any movements with the left wrist. The patient went to outside hospital where an X-ray was performed he sustained a volar Barton fracture of the left distal radius and surgery was advised, but the patient declined and sought management from a local practitioner, who applied indigenous ointment with a compression bandage. Subsequently, malunion of the left wrist and deformity developed gradually. Now patient presented to us with complaint of mild pain in left wrist along with deformity and limited movements at left wrist. On physical examination, wrist extension and flexion were restricted to 45° and 5°, respectively, with marked pain. Grip strength was 20 kg compared to 50 kg in the opposite hand. Radiographs of the left wrist with hand anteroposterior (A) and lateral (B) views revealed malunited intra articular distal end radius fracture with irregular articular surface. It showed positive ulnar variance with loss of radial height and radial inclination.

Fig. 10: Showing malunited intra articular distal end radius fracture left wrist with irregular articular surface

The patient was planned for open corrective osteotomy and internal fixation with plate osteosynthesis and bone grafting for the malunited distal end radius fracture. A volar approach to the distal radius was performed. A 6cm long longitudinal incision was made centred over the flexor carpi radialis tendon just proximal to the wrist flexion crease. The subcutaneous tissue was divided. The FCR tendon was retracted medially and the superficial branch of radial artery was identified and preserved. The pronator quadratus was identified and is released along its distal and radial borders. The malunited site was identified and and the muscles are elevated with periosteum. After exposure, the plate was positioned provisionally on the volar aspect of distal radius and the the five hole plate was fixed to the distal radius with help of K-wires distally. C arm images were taken to ensure correct position of the plate over the radius and for site of the osteotomy. The position of the plate and osteotomy site were marked and the osteotomy was performed. Osteotomy was performed at the site of deformity in perpendicular plane to the radius shaft.

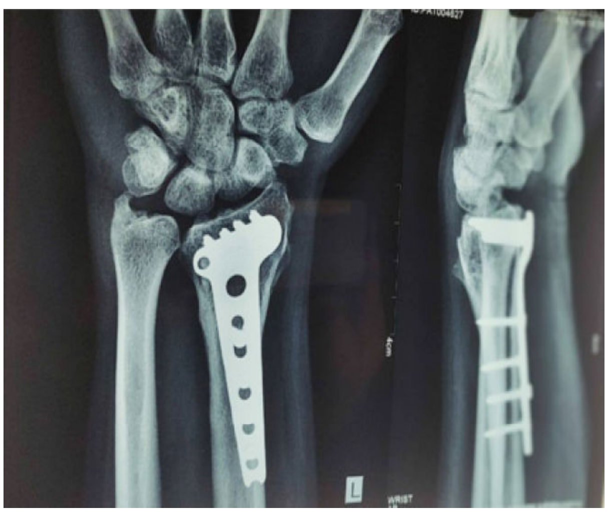

Fig. 11: Followup xray of 1 year after surgery showing good union

Once the osteotomy was completed, the fragments were initiallydistracted by levering with a small osteotome. The plate was fixed to the distal fragment with locking screws in all holes maintaining the acceptable volar tilt and radial inclination under fluoroscopy guidance. If the plate position, volar tilt and radial inclination are satisfactory then the lamina spreader was used for distraction at the osteotomy site, and after proper distraction maintain the radial height and ulnar variance, the proximal portion of the plate was fixed provisionally with k wires. Plate position was confirmed on C arm and necessary adjustments were done to maintain radial height and inclination. The non-locking hole in the plate was fixed with a 3.5mm cortical screw which fixes the plate to the bone. Incison is taken over the iliac crest of same side and corticocancellous bone graft was harvested between inner and outer table of iliac crest and placed in this osteotomy gap. The rest of the proximal locking holes were fixed with 3.5mm locking screws. A good wash was given and the pronator quadratus muscle was sutured back. Final fluoroscopy images were taken to confirm that screws are not in the joint. The skin was closed with a continuous absorbable sub-cuticularprolene suture.

A good padded above elbow slab was applied to the patient and discharged on 4^{th} post-operative day. Immediate physiotherapy was started with passive ROM and then active ROM because intraoperatively stable fixation was achieved. Three months after surgery, bone union had been achieved, the range of motion had improved, and the pain had disappeared. At the follow-up 1 year after surgery, the congruity of the radio carpal joint was preserved on radiographs. Wrist extension and flexion improved to 80° and 80°, respectively (Fig. 12,13), and the grip strength increased post-operatively. Furthermore, the patient no longer complained of any functional limitation in activities of daily living and pain.

Fig. 12,13: Showing Wrist extension and flexion improved to 80° and 80° at 1 year follow-up, respectively.

Discussion

Most fractures of the distal radius, if treated properly, heal without relevant deformity. However, malunions can occur,[26-29] most notably if fractures have been left untreated or if well-meant but inappropriate conservative treatment has been applied. Every malunion is not symptomatic or need not to be treated. But, the kinematics can be changed in the wrist joint,[26,30,31,32] there was a chance of instability in midcarpals,[33] reduced ROM and grip strength, which eventually resulting in unsatisfactory outcome. The most important factor in occurrence of malunion is radian inclination.[34]

Surgical correction of malunion is always a challenging problem with unpredictable clinical outcomes. The best course of action is to prevent of malunion of a distal radius fracture. Bone grafting need not to be done in certain cases of malunion correction with the use of volar fixed-angle devices if volar cortical contact is maintained. New technologies like computer generated osteotomy and three dimensional modelling can guide us to have a positive impact on the surgical management outcomes. Radial malalignment correction in the sagittal plane, combined with articular segment lengthening at the osteotomy site, will restore ulnar variance and provided symptomatic relief. Ulnar shortening osteotomy can be performed if realignment of the radius alone is insufficient. Malunion being the most disabling complication of distal end of radius fracture, corrective osteotomy showed significant outcomes in management.

Fig. 15: Showing isolated 5th Metacarpophalangeal dislocation

Operative management of malunion is indicated mainly for symptomatic patients,[35] and always early intervention is better.[36] The corrective osteotomy can be either closing or opening wedge osteotomy, with or without bone grafting, and can be fixed with either fixed-angled plate or a standard T-plate.

CASE 5

A case of unstable 5th Metacarpophalangeal joint dislocation in 12 year old kid.

A 12-year-old male kid presented to the Emergency Department with severe pain in right hand following a fall. There was a mild swelling at fifth MCP joint region and a bony prominence was felt dorsally, little finger presented an abduction deformity, and there was apparent shortening of the fifth ray. Range of motion was restricted and extension deformity at MCP joint.

Standard radiographs were obtained which revealed isolated pure dorsoulnardislocation of the fifth MCP joint without any other associated injury or fracture of other metacarpals or wrist (Fig. 14). A diagnosis of isolated dislocation of fifth MCP dislocation was made based on radiographs. Immediate closed reduction was done in emergency room by applying longitudinal traction and direct pressure on metacarpal base dorsally, reduction was unstable and confirmed by postreduction radiographs. Patient was immediately posted for emergency surgery after proper pre-anesthetic check-up.

Patient was shifted to operation theatre, placed in supine position with arm on arm board. Tourniquet was applied after general anaesthesia. After draping, markings were done using C arm. A 3 cm curved dorsal incision was taken centering the MCP joint of 5th finger. Skin and sub cutaneous tissue dissected and extensor ligaments were identified and retracted. Capsule was identified and incised in longitudinal fashion to expose MCP joint. Volar plate if coming into surgical field was pushed anteriorly, joint was reduced and fixed with two 1.2mm cross k wires. Reduction is confirmed under C arm and then stability is checked under vision and in fluoroscopy. Thorough wash was given with normal saline. Both K wires were bent and then cut. The incised capsule was closed first following the subcutaneous tissue and skin. Sterile dressing was done and below elbow ulnar gutter slab was given with MCP joint and PIP joint in 30^0 of flexion for 2 weeks. Then we advised to use removable dorsal extension blocking splint for another 2 weeks and then check x-rays were done which were satisfactory. K wires were removed after another 2 weeks and physiotherapy was started as passive ROM followed by active ROM at mcp joint and pip joints for 1 month. On follow-up after 10 weeks post-operatively we observed had full range of movements at 5th MCP and PIP joints without any pain, deformity and contractures.

Fig. 15: Showing 5th MCPJ dislocation reduced and fixed with two cross k-wires

DISCUSSION

The primary stabilizer of MCP joint in abduction and adduction is radial and ulnar proper collateral ligaments which originate from condyles of metacarpal head to the base of the proximal phalanx and distend obliquely from dorsal proximal to ventral distal direction. This act as restraints in MCP flexion. Thevolar plate is stabilized by accessory collateral ligament which originates anterior to this ligament and takes its insertion over the volar plate. The volar plate is a static restraint in MCP extension.[37,38] The volar aspect of the MCP joint is facilitated by A1 pulley, flexor tendons and joint capsule positioned anteriorly to volar plate stabilizing the MCP joint anteriorly. The dorsal aspect of the MCP joint is most weak because joint capsule is usually loose, weak and thin on dorsal aspect. Hence this a predisposition to dislocate dorsally at the MCP joint due to forcible hyper extension after a fall on outstretched hand because of axial load. Most commonly, metacarpophalangeal joint of the index finger is involved.[37-39] The volar plate which is fibrocartilagenous structure present ventral to MCP joint is a rectangular reinforcement thickening in the joint capsule. The membranous attachment of the volar plate is usually torn at the head of proximal metacarpal in hyperextension injuries[41] which makes the fracture unstable. To reduce simple dislocations, we hyperextend the MCP joint by 90^0, but to reduce complex dislocations we hyperextend by 20^0 and we apply pressure in volar direction over the dorsal aspect of the proximal phalanx base, which reduces it over metacarpal head.[43]

Closed reduction is contraindicated in dorsal dislocations if there is puckering of skin on palmar aspect which occurs due to stretching of transverse and pretendinous group of fibers of palmar fascia and skin due to displacement of the metacarpal head.[42] Surgical treatment of complex dislocations of MCP joint consist volar or dorsal or a combination of both these approaches.[42]

CONCLUSION

Management of wrist and hand fractures can be simple in some instances and very complicated sometimes, but almost all cases require proper evaluation and early intervention. The decision on how to manage these fractures of wrist and hand is based on several factors like age, occupation mechanism of injury, degree of severity of fracture, the associated soft tissue involvement and neurovascular status. If surgical intervention is needed for the patient, the surgeon should do a careful preoperative planning and precise decision on a suitable method to be used for the patient. Immediate Stabilisation of the joint allows fractures to unite, definitive treatment, early mobilisation of hand and wrist will maximise the functional restoration of the hand. In this case series we have discussed about some of rare cases of hand and wrist, possible complication of delayed treatment and the management of those complications. It is always better for early intervention and avoiding the delayed complications and also early management of those delayed complications is better for good functional outcome of the patient.

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