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George J. Mundanthanam MD, Tamara D. Rozental MD

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Long-term outcomes of closed reduction and percutaneous pinning for the treatment of distal radius fractures. Glickel SZ, Catalano LW, Raia FJ, Barron OA, Grabow R, Chia B. *J Hand Surg Am.* 2008;33:1700–1705.

Context: There are several ways to treat distal radius fractures including casting, closed reduction with percutaneous pinning, and open reduction internal fixation. Pinning can be a relatively simple and minimally invasive treatment option for two- and three-part distal radius fractures.

Study Design and Results: A retrospective review was performed involving 54 patients with 55 distal radius fractures (AO types A2, A3, C1, or C2) treated with closed reduction percutaneous pinning. The average followup for this group of patients was 59 months. Range of motion was compared with that of the contralateral hand. Forearm supination (4°) and wrist flexion (5°) were decreased compared with those of the normal wrist. The DASH (Disability Arm Shoulder and Hand) scores averaged 9.7, which approximates the mean values of healthy volunteers as reported by Hunsaker et al. A change in ulnar variance was seen in six of 55 wrists between immediate postoperative and final followup radiographs. Three patients had increased articular step-off on final followup. Four patients had lost 5° or greater volar tilt and had dorsal angulation.

Conclusions: Closed reduction and percutaneous pinning of two- and three-part distal radius fractures seem to provide acceptable long-term clinical results.

Comments: Percutaneous pinning has been criticized because it is said to not sustain the immediate postoperative

reduction, and the fracture tends to settle during initial healing. A benefit of this procedure is relative decreased cost, as K-wires can cost approximately \$23 (US).

Pearls: Retrospective studies such as this one can at best prove that the treatment under consideration is acceptable, not necessarily preferable to another (as it was not studied head-to-head).

Effect of patient age on the radiographic outcomes of distal radius fractures subject to nonoperative treatment. Makhni EC, Ewald TJ, Kelly S, Day CS. *J Hand Surg Am.* 2008;33:1301–1308.

Context: The incidence of distal radius fractures increases with age. This suggests cumulative bone loss is a risk factor, which in turn implies that fractures in older patients may have unique biologic properties. Nonetheless, there have been few studies stratifying results by age.

Study Design and Results: A retrospective review was performed of 124 patients diagnosed with a distal radius fracture to determine rates of secondary displacement. Displacement was defined as dorsal tilt greater than 10°, volar tilt greater than 25°, radial shortening greater than 5.0 mm, and articular gap/step-off greater than 2.0 mm. Fifty patients were treated with a cast and 74 had a closed reduction performed with application of a splint. The patients were categorized into three groups based on age: Group 1 (18–44 years), Group 2 (45–64 years), and Group 3 (65 years and older). Among the fractures treated with casting only, there was no age-matched increase in the rates of secondary displacement. Patients treated with closed reduction had age-matched increases in displacement (58% in Group 1, 81% in Group 2, and 89% in Group 3).

Conclusions: Secondary displacement of distal radius fractures increased with increasing patient age especially among fractures that underwent closed reduction.

G. J. Mundanthanam (✉), T. D. Rozental
Department of Orthopaedic Surgery, Beth Israel Deaconess
Hospital, 330 Brookline Ave, Boston, MA 02215, USA
e-mail: gmundant@hotmail.com

Comments: This study shows that increasing age is a risk factor for secondary loss of reduction. This implies, perhaps, that the overall bone density is an independent risk factor for collapse. A highly accurate statistical model for predicting which fracture will collapse, and by how much, remains elusive.

Pearls: Patients who require reduction in the emergency room should undergo close monitoring for evaluation of fracture collapse—independent of age. It also is important to consider recommending operative treatment for these fractures, given the high secondary displacement rates after nonoperative treatment.

Comparison of intramedullary nailing versus plate-screw fixation of extra-articular metacarpal fractures.

Ozer K, Gillani S, Williams A, Peterson SL, Morgan S. *J Hand Surg Am.* 2008;33:1724–1731.

Context: Patients with displaced, malrotated extraarticular metacarpal fractures are commonly thought to be candidates for surgical intervention. Open reduction internal fixation with plates and screws provide excellent stability but requires extensive soft tissue dissection and can cause extensor tendon scarring and adhesions. Intramedullary nailing of these fractures has been proposed as a method to eliminate such potential complications.

Study Design and Results: A retrospective review was performed of 52 displaced extraarticular metacarpal fractures treated with either percutaneous intramedullary nail (IMN) fixation (38) or plate and screw fixation (14). There were no differences between the groups in terms of post-operative radiographs (shortening, lateral angulation, anteroposterior angulation, and time to radiographic healing), total active motion, and DASH (Disabilities of Arm, Shoulder, and Hand). Loss of reduction with the intramedullary nail group occurred in five patients with no hardware failures in the plate group. Fifteen of the 38 patients with IMN required hardware removal owing to extensor tendon irritation. Two of the 14 patients in the plate fixation group required hardware removal.

Conclusion: Open reduction and internal fixation of extraarticular metacarpal fractures appears to have fewer complications than IMN of these same fractures.

Comments: In this study, IMN fixation of extraarticular metacarpal fractures did not provide a better functional outcome compared with plate fixation for total active motion, DASH score, and radiographic parameters. The weaknesses of this study include lack of true randomization, and a 3:1 ratio of IMN fixation versus plate fixation. It does call into question the theoretical advantages of IMN of metacarpal fractures which include minimal soft tissue dissection, smaller scar formation, and less tendon irritation.

Pearls: Metacarpal fractures with shortening of at least 4 to 5 mm can lead to an imbalance of the flexor and

extensor tendons, and are an indication for operative treatment. Other indications for operative intervention include rotational deformity, lateral or anteroposterior angulation, open fractures, and multiple metacarpal fractures.

Comparison of 2 methods of immobilization of fifth metacarpal neck fractures: a prospective randomized study. Hofmeister EP, Kim J, Shin AY. *J Hand Surg Am.* 2008;33:1362–1368.

Context: Fractures of the fifth metacarpal neck, otherwise known as Boxer's fractures, are common injuries caused by a longitudinal compression force while the hand is in a clenched fist position. The mainstay of treatment has been closed reduction and casting. Closed treatment is successful even with imperfect reduction because of the relatively high degree of motion of the 5th carpometacarpal joint. This allows patients to tolerate a marked amount of angulation in the sagittal plane.

Study Design and Results: A prospectively randomized trial was performed of 81 predominantly young, active-duty patients who sustained a 5th metacarpal neck fracture. After closed reduction, they were randomized to either a short arm cast with volar outriggers (stabilizers to keep the MCP joint in flexion) or a short arm cast with the MCP in extension. Radiographs were obtained at 1 and 4 weeks with final range of motion and grip strengths obtained at 3 months followup. There were no statistical differences regarding final range or final grip strength between the two casting techniques. There also was no difference between callus formation and maintenance of reduction between the two casting techniques.

Conclusion: There is no clinical or radiographic difference regarding the method of immobilization of 5th metacarpal neck fractures.

Comments: The article dispels the axiom that flexion of the MCP joint is required to neutralize deforming forces of the intrinsic musculature and primarily prevent collateral ligament contracture. However, the average age of patients in this study was 25 years. Therefore, caution should be used when applying these results to an older population as stiffness at the MCP joint may result if that joint is splinted in extension.

Pearls: Because of a cam effect at the MCP joint, the ligaments are in tension when the joint is flexed. Thus, positioning the MCP joint in flexion for immobilization is apt to prevent contractures.

Variations in digital rotation and alignment in normal subjects. Tan V, Kinchelow T, Beredjiklian PK. *J Hand Surg Am.* 2008;33:873–878.

Context: While treating metacarpal and phalangeal fractures it is essential to assess fracture pattern and

stability. Rotational deformity is an important but difficult to assess factor when considering these fractures. Clinically, rotational deformity has been assessed by examination of the opposite hand. Another means of assessment is to ensure that with the fingers flexed at the metacarpophalangeal (MCP) and proximal interphalangeal (PIP) joints, the fingers should point to the scaphoid tubercle.

Study Design and Results: Two hundred forty normal fingers in 30 volunteers were examined for rotation by having the palm flat and fingers extended. Digit overlap, parallelism (angular relationship between the fingers), and scaphoid convergence were determined with the MCP and PIP joints passively flexed by using a special hand positioning device. Measurements were performed with imaging software. Rotation, parallelism, and scaphoid convergence were similar when comparing left with right hands. All the digits were found to be in supination in the horizontal plane. For scaphoid convergence, no hand studied had all four fingers converge onto the scaphoid tuberosity.

Conclusion: When treating metacarpal or phalangeal fractures, it is imperative to use all clinical examinations (comparison to the other hand, scaphoid convergence, and tenodesis effect: with wrist flexion the fingers extend, and with wrist extension the fingers flex, there should not be much finger overlap during this maneuver) when determining the appropriate position the fracture should be placed, as none is perfect for assessing normalcy.

Comments: In this study the authors confirm that using the contralateral uninjured hand can be used for comparison for rotation, parallelism, and scaphoid convergence. For digit overlap, they believe that the opposite hand should not be used for comparison because of side-to-side asymmetry and variability. They propose that if 50% or less overlap of the nail plate in any digit is within normal limits, no functional difficulties will result. The weakness of this study was that landmarks were determined visually and by palpation and can be subject to examiner bias. Also, there was no clinical evidence that 50% or less overlap of the nail plate is clinically acceptable.

Pearls: It is important to assess finger rotation in flexion and extension. Approximately 1° rotation at the fracture site may translate to 5° at the finger tip. Five degrees of fracture malrotation can cause 1.5 cm of digital overlap when the fingers are flexed.

Scratch collapse test for evaluation of carpal and cubital tunnel syndrome. Cheng CJ, Mackinnon-Patterson B, Beck JL, Mackinnon SE. *J Hand Surg Am.* 2008;33:1518–1524.

Context: Carpal tunnel syndrome, cubital tunnel syndrome, and nerve compression disorders are predominantly

clinical diagnoses. Currently the most frequently used tests for diagnosing carpal tunnel syndrome are Tinel's test (tapping the median nerve just distal to the wrist crease should produce numbness and tingling), Phalen's test (passive flexion of the wrist for 30–60 seconds should reproduce numbness and tingling), and Durkin's compression test (manual compression of the median nerve at the carpal tunnel just distal to the wrist crease should reproduce numbness and tingling). Cubital tunnel syndrome also can be diagnosed via elbow flexion and compression of the ulnar nerve at the elbow. All of these tests rely on the patient reporting whether symptoms are elicited.

Study Design and Results: The scratch collapse test involves the examiner initially testing shoulder external rotation bilaterally then scratching the patient's skin lightly over the area of nerve compression while the patient performs sustained resisted shoulder external rotation bilaterally. If the patient has allodynia owing to compression neuropathy, a brief loss of muscle resistance will be elicited on the affected side. The scratch collapse test was prospectively compared with Tinel's sign and flexion/nerve compression in 169 patients and 109 control subjects. One hundred nineteen patients were diagnosed with carpal tunnel syndrome and 70 patients were diagnosed with cubital tunnel syndrome based on history, physical examination, and electrodiagnostic testing. The scratch collapse test had a sensitivity of 64% for carpal tunnel syndrome and 69% sensitivity for cubital tunnel syndrome. This is compared with 32% sensitivity for Tinel's test for carpal tunnel syndrome, 54% sensitivity for cubital tunnel syndrome, 44% for the wrist flexion/compression test for carpal tunnel syndrome, and 46% for cubital tunnel syndrome.

Conclusion: The scratch collapse test is a valuable clinical examination for diagnosing carpal tunnel syndrome and cubital tunnel syndrome in addition to the current bevy of physical examinations.

Comments: This test does not rely on the patient reporting whether symptoms are elicited, thereby removing one potential bias, namely, inaccuracies in the patients' reports.

Pearls: Carpal tunnel syndrome, or any diagnosis denoted as "syndrome", often is detected imprecisely. Treating physicians must be mindful of their goal, which is not so much to label the disorder but to identify which set of patients is apt to respond best to treatment. This scratch test may provide helpful data in future studies to determine which patients may benefit from specific treatments.

The ECU synergy test: an aid to diagnose ECU tendonitis. Ruland RT, Hogan CJ. *J Hand Surg Am.* 2008;33:1777–1782.

Context: Chronic dorsoulnar-sided wrist pain has been likened to low back pain owing to its broad differential

diagnosis and refractory nature of pain. The classic provocative maneuver for extensor carpi ulnaris (ECU) tendinitis is active resisted extension and ulnar deviation. This maneuver is thought to inadequately differentiate between intraarticular and extraarticular disease.

Study Design and Results: A retrospective chart review identified 55 patients who reported having dorsoulnar-sided wrist pain for greater than 4 months, and who had adequate physical examination, MRI, and/or wrist arthroscopy performed. The ECU synergy test also was performed. In this test, the patient is instructed to perform resisted radial abduction of the thumb with an isometric contraction of the ECU tendon. If pain is reproduced along the dorsoulnar aspect of the wrist, the test is considered positive. The patients were divided in three groups. Patients in Group 1 had no pain with the synergy test but other examination features were consistent with intraarticular disease. Every patient in this group had ulnar-sided intraarticular disease observed on MRI and/or arthroscopy. Patients in Group 2 had positive synergy tests and no pain with other provocative maneuvers. Ninety percent of patients had pain relief with an ECU tendon sheath injection. Group 3 patients had positive synergy tests and positive provocative maneuvers indicating intraarticular disease as well. Five of 22 patients had ulnar-sided intraarticular disease confirmed by MRI and/or arthroscopy. Seventeen of 22 patients had pain relief after ECU injection.

Conclusions: The ECU synergy test helps identify patients with extraarticular disease, who may in turn be helped by an ECU tendon sheath injection. By using the ECU synergy test, the need for wrist MRI and diagnostic arthroscopy can be reduced in certain situations.

Comments: The ECU synergy test exploits an isometric contraction of the ECU during resisted radial abduction of the thumb with the wrist in neutral position and the forearm supinated. Electromyography confirmed that the ECU and FCU muscles are statically stabilizing the wrist with resisted radial abduction of the thumb. The benefits of this test are the ulnocarpal structures are minimally loaded and the DRUJ is held in its position of maximal stability. The ECU synergy test provides another helpful examination in narrowing the diagnosis of dorsoulnar-sided wrist pain.

Pearls: “A dog can have lice and fleas”; that is, it is possible to have extraarticular and intraarticular disease in the same patient.

Simple decompression versus anterior subcutaneous and submuscular transposition of the ulnar nerve for cubital tunnel syndrome: a meta-analysis. Macadam SA, Gandhi R, Bezuhly M, Lefavre KA. *J Hand Surg Am.* 2008;33:1314–1324.

Context: Ulnar nerve entrapment at the elbow (cubital tunnel syndrome) has been treated surgically with various

procedures. Advocates of transposition (subcutaneous or submuscular) believe dynamic compression of the nerve that occurs with the elbow in flexion is addressed with their procedure. Advocates of simple decompression believe their procedure produces fewer complications and does not compromise vascularity of the nerve.

Study Design and Results: Computerized database searches of MEDLINE, EMBASE, Cochrane central, and all relevant surgical archives were performed. Studies included patients with a diagnosis of cubital tunnel syndrome in whom simple decompression or anterior transposition (subcutaneous or submuscular) was performed. Ten studies which included 449 simple decompressions, 342 subcutaneous transpositions, and 115 submuscular transpositions were used. There was no statistically significant differences between the methods of decompression; however, there was a trend toward improved clinical outcome with transposition of the ulnar nerve as opposed to simple decompression.

Conclusion: Despite an extensive review of the literature, there were no statistically significant differences between simple decompression versus transposition (subcutaneous or submuscular).

Comments: The optimal surgical treatment for cubital tunnel syndrome remains elusive. Factors that influence which surgical technique is used include etiology of the neuropathy, severity of patient symptoms, presence or absence of subluxation of the ulnar nerve, and surgeon preference.

Pearls: The ulnar nerve can be entrapped at the following locations: arcade of Struthers, medial intermuscular septum, distal transverse fibers of the arcade of Struthers, Osborne’s ligament, and the fascia of the FCU and fascial bands in the FCU. Poor prognosis correlates most closely with intrinsic atrophy.

Core decompression of the distal radius for the treatment of Kienbock’s disease: a biomechanical study.

Sherman GM, Spath C, Harley BJ, Weiner MM, Werner FW, Palmer AK. *J Hand Surg Am.* 2008;33:1478–1481.

Context. Numerous procedures have been used for treatment of Kienbock’s disease (avascular necrosis of the lunate). Resolution of Kienbock’s disease has been observed after a nondisplaced distal radius fracture, perhaps owing to a decompressive effect of the radial metaphysis.

Study Design and Results: Seven fresh upper extremity cadavers with an average age of 66 years, and without preexisting disease were axially loaded after core decompression of the distal radius. A pressure-sensitive film was used to measure changes in the radioscapoid fossa, radiolunate fossa, and ulnar carpal fossa. The stiffness of the distal forearm was statistically decreased after core decompression. Minimal changes were seen in the distribution of the force in each radiocarpal fossa and ulnocarpal

fossa. There was a statistically significant dorsally directed change in the dorsal/volar location of the radioscaphoid centroid after core decompression.

Conclusion: Core decompression of the distal radius does not produce biomechanical unloading of the lunate. Another explanation must underly the resolution of Kienbock's disease which has been observed after a non-displaced distal radius fracture.

Comments: There have been numerous procedures for treatment of Kienbock's disease (limited carpal fusions, joint-leveling procedures, lunate excision, and proximal row carpectomy). Successful clinical use of decompression in Kienbock's disease can be attributed to the response of the local vascular environment. This procedure may be a viable treatment option that does not significantly alter the anatomy of the radiocarpal, ulnocarpal, or radioulnar joints.

Pearls: The principle anatomic factor associated with Kienbock's disease is negative ulnar variance (ie, the ulnar articular surface lying proximal to the radial articular surface on an AP view). This suggests that some alteration in loading contributes to the pathogenesis of the disease.

Proximal row carpectomy for advanced Kienbock's disease: average 10-year follow-up. Croog AS, Stern PJ. *J Hand Surg Am.* 2008;33:1122–1130.

Context: Kienbock's disease has been classically divided into four stages. Stage I: normal radiograph with MRI showing high or low signal intensity on T2 images; Stage II: lunate sclerosis with one or more fracture lines with possibly early collapse of the lunate on the radial border; Stage IIIA: lunate collapse with normal carpal alignment and height; Stage IIIB: lunate collapse with fixed scaphoid rotation, decreased carpal height, and migration of the capitate proximally; and Stage IV: severe lunate collapse with intraarticular degenerative changes at the midcarpal joint, radiocarpal joint, or both. Salvage procedures are reserved for Stages III and IV.

Study Design and Results: Twenty-one patients with either Stage IIIA, IIIB, or IV Kienbock's disease treated with proximal row carpectomy were followed at an average of 10 years (range, 4–17 years). The average wrist flexion/extension arc was 105° which averaged 78% of the contralateral wrist. The average maximal grip strength was 35 kg which averaged 87% of the contralateral wrist. The average quick DASH (Disabilities of the Arm, Shoulder, and Hand) was 12 (0–50) and Patient Related Wrist Evaluation (PRWE) was 17 (0–81). Degeneration of the radiocapitate articulation was seen in 16 of 18 patients. Three patients required radiocapitate arthrodesis at a mean of 23 months owing to persistent pain. Two of these three patients had Stage IV Kienbock's disease.

Conclusion: At an average followup of 10 years, proximal row carpectomy is a reliable procedure in patients with Stage IIIA or IIIB Kienbock's disease.

Comments: The authors provide long-term followup of patients who had a salvage procedure for Kienbock's disease. There is no association between radiographic findings and subjective and objective outcomes. Caution should be used when performing a proximal row carpectomy in patients with Stage IV Kienbock's disease as it can lead to early symptomatic radiocapitate degeneration.

Pearls: A proximal row carpectomy converts a complex link joint into a simple hinge joint. Thus, this operation may have effects on other distal joints. It must be recalled, of course, that carpectomy would not be performed in patients with a normal wrist; as such, it is possible that the distal joints would be abnormally loaded even without this operation.

Early free active versus dynamic extension splinting after extensor indicis proprius tendon transfer to restore thumb extension: a prospective randomized study. Giessler GA, Przybelski M, Germann G, Sauerbier M, Megerle K. *J Hand Surg Am.* 2008;33:864–868.

Context: The extensor pollicis longus (EPL) tendon can rupture secondary to closed posttraumatic ruptures or subcutaneous ruptures without previous trauma. The standard of care for these injuries is transfer of the extensor indicis pollicis (EIP) tendon to the extensor pollicis longus using a Pulvertaft weave technique.

Study Design and Results: Twenty one patients sustaining closed EPL tendon ruptures treated with an EIP transfer were randomized into the following postoperative rehabilitation protocols: dynamic protocol using a rubber-band system (DY) or early active thumb extension with limited flexion (AC). Three weeks postoperatively, the DY group showed greater total IP joint motion when compared with the AC group. However, at 8 weeks there was no difference between the two groups regarding total range of motion, grip strength, or tip-pinch strength.

Conclusion: At this time, there is no significant difference in outcome between dynamic protocols using a rubber band system and early active thumb extension with limited flexion for an EIP to EPL transfer.

Comments: Perhaps because of the small numbers of this randomized study, the authors were unable to show statistical differences between the two rehabilitation protocols used. They do hypothesize that using active thumb extension with limited flexion is better for selected motivated and understanding patients. Based on their results, the authors are continuing to use their dynamic protocol using a rubber-band system for EIP to EPL transfers; a reasonable approach given the lack of cost and risk.

Pearls: When examining the EPL for rupture, ask the patient to place his or her hand flat on the table and lift only the thumb off the table. If there is a rupture, the patient will be unable to raise the thumb in line with the 2nd metacarpal.

Matrix metalloproteinase inhibition reduces contraction by Dupuytren fibroblasts. Townley WA, Cambrey AD, Khaw PT, Grobbelaar AO. *J Hand Surg Am.* 2008;33:1608–1616.

Context: Dupuytren's disease is a common fibroproliferative condition of the palmar fascia of the hand that causes disability through progressive digital contracture. Clinically it presents as nodules or cords. The actual pathogenesis of Dupuytren's disease is not completely understood; however, it is thought to occur through simultaneous fibroblast contraction and remodeling of the surrounding matrix.

Study Design and Results: Fibroblast-populated collagen lattices (FPCLs) are a three-dimensional in vitro model system that simulates interaction between cells and their surrounding matrix. FPCLs were used as a model of contraction. Five sets of paired Dupuytren cords and nodule fibroblasts were obtained during elective primary surgical fasciectomy. Carpal ligament-derived fibroblasts obtained from patients without Dupuytren's disease during carpal tunnel release acted as control subjects. Ilomostat (a

hydroxamate class of MMP-metalloproteinase inhibitor) was used to treat FPCLs with cords, nodules, and carpal ligament. Contraction was estimated by measuring lattice areas of FPCLs treated with cords and nodules compared to untreated cells. Nodule-derived fibroblasts contracted lattices to a greater extent than fibroblasts from cords or carpal ligament. When treated with Ilomostat, inhibition of lattice contraction by all fibroblasts was noted.

Conclusion: Inhibition of MMP activity results in reduction in extracellular matrix contraction by Dupuytren fibroblasts and suggests that MMP activity may be a critical target in preventing recurrent contracture caused by this disease.

Comments: The authors of this study begin to shed light on the true etiology of Dupuytren's disease. By showing that inhibition of lattice contraction by Ilomostat was more pronounced in nodule-derived than cord-derived fibroblasts, one potentially can hypothesize a treatment for Dupuytren's which does not involve surgery. Additional study is needed to translate this into clinical work.

Pearls: Loss of control of MMP activity is implicated in numerous pathologic conditions including arthritis, chronic obstructive pulmonary disease, atherosclerosis, and facilitating metastatic spread. The net balance of MMP activity in the extracellular space is crucial for guiding normal biologic processes such as embryogenesis and wound repair.