

Journal Scan

Journal of Hand Surgery

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Published online: 7 May 2008
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CMC Joint

Hematoma and distraction arthroplasty for thumb basal joint osteoarthritis: minimum 6.5-year follow-up evaluation. Gray KV, Meals RA. *J Hand Surg Am.* 2007;32:23–29.

Context: Various surgical procedures have been developed for treatment of severe carpometacarpal (CMC) joint osteoarthritis, however controversy exists over which procedure provides the best outcome. Choices include simple trapeziectomy (removal of the trapezium), arthrodesis (joint fusion), interpositional arthroplasty (resection of the joint surface and placement of a soft tissue spacer to avoid bone-on-bone contact), and tendon/ligament reconstruction. Each of these has advantages and disadvantages and no clear standard procedure has been established. A previous study with 2-year followup after a trapeziectomy and 5 weeks of K-wire fixation to prevent subsidence (also referred to as hematoma arthroplasty or distraction arthroplasty, HDA) showed good early results, yet long-term data regarding the efficacy of this procedure have not been reported.

Study Design and Results: This prospective single-arm study included 22 patients evaluated after a minimum of 79 months. At an average of 7.3 years after surgery, 82% of patients reported complete pain relief and all 22 patients were “very satisfied.” Objective evaluation showed 22%, 13%, and 22% increases in grip strength, key pinch, and tip pinch, respectively, relative to preoperative values.

Ninety-five percent had full adduction and 91% had full opposition to the thumb. All results for subjective and objective outcomes compared favorably or equally with previously published outcomes for more complicated surgical reconstructions.

Conclusions: Hematoma distraction arthroplasty of the CMC provides an effective, simple, and long-term treatment for severe CMC arthritis with comparable outcomes to other surgical procedures.

Comments: This paper provides good evidence for the long-term efficacy of hematoma distraction arthroplasty for treatment of CMC arthritis. The information may be useful when considering surgical treatment options in patients with severe CMC degeneration, however, the study does not prove the superiority of hematoma distraction arthroplasty over any other procedure or treatment approach. Only a comparative study could begin to address that.

Pearls: The unique anatomy of the human CMC joint has been suggested to predispose the first metacarpal and trapezium to arthritis secondary to its saddle-joint configuration. Because the structure has little inherent stability, the joint relies on soft tissue for support and ligamentous stability has been implicated in the development of CMC arthritis. The fact that patients can do well with the bone removed underscores the importance of the soft tissue structures.

Osteoarthritis of the thumb carpometacarpal joint in women and occupational risk factors: a case-control study. Fontana L, Neel S, Claise JM, Ughetto S, Catilina P. *J Hand Surg Am.* 2007;32:459–465.

Context: Many risk factors have been implicated in the development of carpometacarpal (CMC) joint arthritis of the thumb, however the etiology and pathology of CMC arthritis are still unknown. Suggested risk factors include

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age, female gender, genetic predisposition, acquired medial conditions, and long-term low-level psychological stress. Identifying additional and more specific risk factors for development of CMC arthritis has the potential to target future preventative or operative therapies.

Study Design and Results: This case-control study surveyed 61 Caucasian women surgically treated for CMC arthritis and 120 age, gender, and ethnically matched control subjects to examine the impact of age, smoking, lifestyle history, and occupation on the development of CMC thumb arthritis. Results showed that the patients with CMC arthritis had significantly higher rates of family history of the disease ($p = .01$) and higher rates of cumulative occupation years ($p = .02$). In addition, higher rates of CMC arthritis correlated with occupations perceived as having "few rest breaks during a day" and repetitive use (administrative support, tailors, sewers, domestic helpers, and cleaners). No associations were observed with other factors including force of pinching actions, manual occupation, gripping/grasping, pressure on the pad of the thumb, or body/hand vibration.

Conclusions: The authors conclude that this study supports findings linking long-term and repetitive thumb use with development of CMC arthritis, however there was no evidence for an association with a particular thumb function, or position.

Comments: The case control method is probably the best for elucidating mechanisms and causes for development of CMC arthritis; it would be highly impractical to begin a prospective trial and follow patients for decades. Nonetheless, this method has inherent weaknesses, such as recall bias: patients with painful CMC arthritis are more apt to recall exposures such as occupational tasks that produced pain.

Pearls: Lack of motion at the CMC joint secondary to osteoarthritis predisposes patients to develop compensatory hyperextension of the metacarpophalangeal (MP) joint. Treatment may require MP joint arthrodesis (fusion), capsulodesis, a more complex surgery which involves anchoring a lax volar plate to the bone. The results of these procedures are equivocal, and compensatory MP joint hyperextension continues to be difficult to treat.

Predictors of functional outcomes after surgical treatment of distal radius fractures. Chung KC, Kotsis SV, Kim HM. *J Hand Surg Am.* 2007;32:76–83. Context: Distal radius fractures are a common orthopaedic injury and frequently require surgical fixation, however the specific factors that influence outcome success are not well characterized. Previous studies have suggested that precise fracture reduction correlates with improved outcomes, but little is known regarding the effects of postsurgical variables or patient characteristics such as age, education level, income, or hand dominance.

Study Design and Results: Sixty-six patients were evaluated in a prospective study to identify predictors of outcomes after distal radius fractures. All patients were treated with the volar locking plate system (VLPS), and outcome measurements included radiographic data and Michigan Hand Outcomes Questionnaire (MHOQ) scores at 3-months and 12-months postoperatively. Three months after surgery, poorer functional outcomes were associated with radiographic evidence of step-off and gap greater than

Wrist

Carpal kinematics after proximal row carpectomy. Blankenhorn BD, Pfaefle HJ, Tang P, Robertson D, Imbriglia J, Goitz RJJ *Hand Surg Am.* 2007;32:37–46. Context: Proximal row carpectomy, namely, the removal of the proximal carpal bones (the scaphoid, lunate, and triquetrum), allows the proximal capitate to articulate directly with the radius, recreating the radiocarpal joint.

1 mm, increased volar (palmar) tilt, increased age, and decreased income. However, at 12 months, only age and income were associated with poorer outcomes.

Conclusions: Two patient-related factors: increased age and decreased income were important clinical predictors for poorer functional outcomes assessed by the MHOQ following volar plating for treatment of distal radius fractures.

Comments: This study shows that older patients and lower income patients may require greater attention such as hand therapy or assistance following distal radius fractures to attain maximal postoperative function. However, these patients may find it more difficult to get assistance in the first place.

Pearls: The radiographic criteria for anatomic reduction of distal radius fractures includes radial angle $< 15^\circ$, radial height > 5 mm, palmar tilt between 10° and 15° volar angulation and 10° dorsal angulation, and intraarticular step < 2 mm.

Perilunate fracture-dislocations of the wrist: comparison of temporary screw versus K-wire fixation. Souer JS, Rutgers M, Andermahr J, Jupiter JB, Ring D. *Hand Surg Am.* 2007;32:318–325.

Context: Perilunate dislocations or fracture-dislocations are severe wrist injuries typically treated with open reduction and internal fixation with temporary K-wires. Recently, the use of screws has been suggested as an alternative stabilization technique to reduce skin problems and infection associated with K-wires.

Study Design and Results: This retrospective study examined 18 patients who underwent open reduction and internal fixation followed by temporary stabilization (nine had K-wires, nine had screws) for a perilunate dislocation or fracture-dislocation. The average followups were 43 months and 48 months for K-wire and screw cohorts, respectively.

The study found no significant difference in average flexion-extension arcs, radial-ulnar deviation arcs, grip strength, and Mayo wrist scores or DASH scores between the two groups. Complications in the screw cohort included one patient with a deep wrist infection and two patients had scaphoid nonunions. Complications in the K-wire cohort included two patients with infection, two patients with loss of alignment, and two patients required wrist arthrodesis within 2 years of injury.

Conclusions: The study concluded that no judgment could be made regarding the superiority of one technique and that the two procedures appeared to be comparable complications and outcomes. The authors suggest that a larger cohort of patients may reveal differences between these procedures.

Comments: This study of only 18 patients is far too small to meaningfully assess the differences between the

two approaches, but is more than large enough to show that complications are common with this severe injury, regardless of treatment. The appeal of temporary screw

fixation over K-wires is the ability to begin wrist motion within a few weeks and avoid pin-related infections. There were similar outcomes with screws and K-wires. The rate of complications was slightly less in the screw cohort, but objective comparisons are difficult to quantify owing to the

small sample size. The reason for selecting one procedure over another for each patient was not described.

Pearls: Perilunate dislocations are classified according to the Mayfield classification where Stage I represents disruption of the scapholunate and radioscapocapitate ligaments. In Stage 2, the capitate and scaphoid separate from the lunate, and in Stage 3, the lunotriquetral ligament also is disrupted. Stage 4 represents a complete lunar dislocation.

Biomechanical comparison of fixed-angle volar plate versus fixed-angle volar plate plus fragment-specific fixation in a cadaveric distal radius fracture model. Grindel SI, Wang M, Gerlach M, McGrady LM, Brown S. *J Hand Surg Am.* 2007;32:194–199.

Context: Distal radius fractures associated with metaphyseal comminution pose a challenge to achieving anatomic reduction, stable fixation, and early rehabilitation. Traditional treatments such as cast immobilization, external fixation, and dorsal plating have been inadequate owing to complications including radial shortening and dorsal tilt, hardware complications, and high rates of extensor tendon

complications, respectively. Two recently introduced concepts for unstable distal radius fractures include fragment-specific fixation which can stabilize smaller fragments and volar fixed-angle plate fixation. Both have shown reliability for treating displaced distal radius fractures.

Study Design and Results: This cadaveric study used specimens to compare interfragment stability of combined fragment-specific fixation with volar fixed-angle fixation versus volar fixed-angle fixation alone. The combined volar fixed-angle plate with fragment-specific fixation had a 40% reduction in angular displacement between radial and ulnar plates group alone.

Conclusions: The use of a combined volar plating and dorsal fragment-specific fixation showed significant reductions in fragment motion and increased construct stability and strength relative to volar plating alone.

Comments: This cadaveric fracture model suggests that the use of combined surgical treatment for unstable distal radius fractures may provide improved fixation stability

because this is a cadaveric study, clinical trials are required

before conclusions can be drawn regarding the clinical efficacy of this procedure.

Pearls: Even when reduced anatomically and reliably, distal radius fractures are associated with complications independent of the ultimate union of the fracture.

These include carpal tunnel syndrome (22%), reflex sympathetic dystrophy (20%), tendinitis/tenosynovitis (14%), radial nerve compression/neuropathy (11%), tendon adhesions/scarring (7%), ulnar nerve compression (6%), and distal radioulnar joint problems (5%).

Internal fixation of acute, nondisplaced scaphoid waist fractures via a limited dorsal approach: an assessment of radiographic and functional outcomes. Bedi A, Jebson PJ, Hayden RJ, Jacobson JA, Martus JJ. *J Hand Surg Am.* 2007;32:326–333.

Context: Nondisplaced scaphoid waist fractures historically have been treated with cast immobilization. Surgical fixation for nondisplaced fractures has been advocated for reasons including reduced time to union, early access to physiotherapy, improved range of motion, and faster functional recovery.

Study Design and Results: This retrospective review examined 18 patients (15 males, 3 females) with a nondisplaced scaphoid waist fracture via a limited dorsal approach. Followups at an average of 97 weeks recorded motion, grip strength, pain scores, and subjective functional outcome questionnaire scores. Results showed an average time to union of 8 weeks with one case of non-union. The only significant difference in range of motion between the injured and contralateral wrists was a reduction of 6° extension ($p = .035$). There were no differences in grip strength or pain, and functional outcome scores showed minimal long-term disability.

Conclusions: The authors conclude that the limited dorsal approach results in good outcomes relative to historical results obtained with cast immobilization and other methods of surgical fixation.

Comments: This study lacks a comparison group; conclusions can be drawn. The utility of studies such as this, perhaps akin to Phase I drug trials, is to offer a justification for a head to head trial. Fixation of nondisplaced scaphoid fractures minimizes the period of immobilization and potentially allows patients to return to work sooner with better functional outcomes.

Pearls: The goal of treatment of nondisplaced fractures includes not only ultimate union but prevention of displacement during the healing process. Blood supply to the scaphoid is unique in that the majority of blood vessels enter at the distal end and perfuse the proximal scaphoid in a retrograde fashion. Because the proximal of the

scaphoid is supplied by vessels entering at the dorsal surface, fractures of the scaphoid neck may destroy blood supply to the proximal fragment resulting in high rates of malunion and avascular necrosis. Ultimately this leads to severe degenerative joint disease.

These include carpal tunnel syndrome (22%), reflex sympathetic dystrophy (20%), tendinitis/tenosynovitis (14%), radial nerve compression/neuropathy (11%), tendon adhesions/scarring (7%), ulnar nerve compression (6%), and distal radioulnar joint problems (5%).

Community-associated methicillin-resistant Staphylococcus aureus hand infections in an urban setting. Bach HG, Stefan B, Chhadia AM, Kovachevich R, Gonzalez MH. *J Hand Surg Am.* 2007;32:380–383.

Context: Staphylococcus aureus is the organism most commonly cultured from community-acquired hand infections, and the development of drug resistance is rapidly increasing. Complications of hand infections may include stiffness, contracture, and even amputation if not treated appropriately. Identifying the most common infectious organisms and their resistance profile can improve empiric antibiotic treatment and reduce morbidity.

Study Design and Results: This prospective review collected cultures from 52 patients who met criteria for a community-acquired hand infection. Forty-five patients were found to have Staphylococcus aureus infections, of which 38 were methicillin-resistant (MRSA). A majority (73%) of hand infections in patients treated at an inner city hospital were caused by MRSA.

Comments: The prevalence of MRSA in this study is higher than previously suspected and increasing should alert physicians to closely monitor cultures and choose appropriate antibiotic coverage.

Pearls: Empiric treatment of hand infections may be required: treatment must begin before the pathogen is identified. In addition to MRSA, common pathogens to consider include *Eikenella corrodens* in patients who have been bitten by humans (which typically happens after punching something, perhaps akin to Phase I drug trials, is to offer a solid body in the mouth) and hemolytic Streptococci and *Pasteurella multocida* in patients who have sustained cat and dog bites.

Distal Radioulnar Joint Arthroplasty of the distal radioulnar joint using a new ulnar head endoprosthesis: preliminary report. Willis AA, Berger RA, Cooney WP 3rd. *J Hand Surg Am.* 2007; 32:177–189.

Context: Resections of the ulnar head (Darrach) for radiocapitellar joint, ie, using a prosthesis that is too thick. distal radioulnar joint (DRUJ) arthritis or instability have been associated with impingement of the distal ulna against the wrist and instability of the proximal stump. Ulnar head resection produces elbow stiffness, pain, and capitellar joint space narrowing. Typically radiographic widening of the lateral ulnohumeral joint space has been used as a marker of joint space narrowing, but the normal variability and reliability of this radiographic measure has not been studied.

Study Design and Results: This prospective study followed 17 patients (19 wrists) with a new distal radioulnar joint prosthesis for an average of 32 months. Fifty anteroposterior elbow radiographs were obtained from 26 individuals with normal joint arthroplasty prosthesis and 24 patients with contralateral radial head replacement. Radiographs were compared with the contralateral elbow in each subject for variations in joint space between the medial and lateral facets of the ulnohumeral joint, and reviewed three times by one observer and an additional time by a second observer. Results showed the mean lateral ulnohumeral joint space to be greater than the medial ulnohumeral joint space by an average of 0.8 mm and grip strength improved from 67% to 83% of the contralateral limb relative to preoperative values. In addition, intratester and intertester reliability were 0.85 and 0.83, respectively.

Conclusions: The authors conclude that measuring the lateral ulnohumeral joint space was not a reliable procedure for detecting radiocapitellar joint overstuffing, and that a more reliable conclusion may be drawn by comparing radiographs from the contralateral, unaffected elbow.

Comments: The results of this study highlight the importance for contralateral elbow radiographs when assessing morphologic features of a normal ulnohumeral joint and spacing before radial head arthroplasty. The measurements discussed here are after-the-fact assessments and say nothing about how to get it right at the time of surgery. The authors recommend using smaller radial head implant sizes and intraoperative fluoroscopic imaging when the choice is not clear.

Conclusions: The authors conclude that preliminary results showed that distal ulna prosthetic systems combined with soft tissue repair can restore stability to the DRUJ. Assessing longer-term comparative trial is needed to show if the distal radioulnar joint arthroplasty prosthesis is superior to resections of the ulnar head.

Comments: The results of this study are encouraging for physicians and patients who are not satisfied with the current standard of distal ulna resections for DRUJ arthritis. The reported complication rate, however, included one intraoperative nondisplaced ulna fracture and three late complications.

Pearls: The anatomy of the DRUJ is composed of the triangular fibrocartilage complex and ligamentous attachments. The triangular fibrocartilage complex is the main stabilizer of distal radioulnar joint.

Elbow

Lateral ulnohumeral joint space widening is not diagnostic of radial head arthroplasty overstuffing. Rowland AS, Athwal GS, MacDermid JC, King GJ. *Hand Surg Am.* 2007;32:637–641.

Context: Treatment of a radial head fracture with concomitant injury to the interosseous membrane (the Essex-Lopresti lesion) should include radial head resection or arthroplasty, to prevent proximal migration of the radius and a painful, ulnar-positive wrist. Replacement arthroplasty can be marred by so-called overstuffing of the range of motion at either early or late followups, with the

Open reduction and internal fixation compared with excision for unstable displaced fractures of the radial head. Lindenhovius AL, Felsch Q, Doornberg JN, Ring D, Kloen P. *J Hand Surg Am.* 2007;32:630–636.

Context: Radial head excision may be associated with proximal migration of the radius and a painful, ulnar-positive wrist when there is a concomitant injury to the interosseous membrane (the Essex-Lopresti lesion; see above) Excision also disrupts radiocapitellar contact and may be associated with development of ulnohumeral arthrosis but this has not been studied extensively.

Study Design and Results: Thirteen patients treated with ORIF and 15 patients with radial head excision were evaluated through a combination of medical record review

and followups. Results were analyzed at 1-year followup and an average of 17 years after injury using range of motion, radiographic analysis, pain, subjective questionnaires, and physician-based scoring scales. No significant differences were found between groups with respect to the range of motion at either early or late followups, with the

exception of a trend favoring ORIF for ulnohumeral arc motion at early followup. Pain scores, physician-rated scales, and subjective questionnaires were not significantly different between groups. Arthrosis was observed in two elbows with ORIF, and eight elbows with excision.

Conclusions: The authors suggest that restoration of radiocapitellar contact with ORIF reduces the potential for long-term arthrosis and joint degeneration relative to radioulnar head excision.

Comments: This study is potentially flawed in that patients probably were selected for excision because they sustained more complex fractures. Therefore it is difficult to know whether arthrosis is a result of severity of the initial injury or a result of the treatment method. This study is important, however, because it calls attention to the presence of late elbow arthrosis, a complication not often considered in the risk/benefit calculation of excision.

Pearls: Consider radial head replacement arthroplasty when the fractures are not amenable to excision.

Conclusions: These results suggest that primary care physicians and physiatrists play a critical role in influencing the opinions of patients regarding reconstructive surgery, resulting in negative first impressions and making patients less likely to receive potentially beneficial procedures.

Reconstructive Surgery

Perceptions of people with tetraplegia regarding surgery to improve upper-extremity function. Wagner JP, Curtin CM, Gater DR, Chung KCJ *Hand Surg Am.* 2007;32:483–490.

Context: Reconstructive procedures can significantly improve upper-extremity function in as much as 65% of patients with tetraplegia, however a recent analysis showed that fewer than 10% of people with tetraplegia will have these procedures. The impact of health insurance, physician doubts, and patient interest regarding use of these procedures has not been studied.

Study Design and Results: Fifty individuals with cervical spinal cord injuries ranging from C4 to C8 with an average of 12.8 years from injury and no history of upper-extremity reconstructive surgery were recruited to respond to a survey. Results showed that upper extremity function was the top restoration desire (42% of all surveyed) but 26% of those surveyed were unaware of available reconstructive surgery. People who first heard about reconstruction from their physician as opposed to friends or support groups, or the internet were significantly more likely to have a negative impression ($p = .004$) of the procedures and less likely to believe procedures would improve their independence ($p = .01$) or quality of life ($p = .02$). There were no significant differences between the opinions of individuals classified as high-functioning or low-functioning. Procedure cost and insurance status did not seem to be a determining factor significantly influencing interest in or perception of procedures.

Conclusions: Providers of reconstructive upper-extremity surgery are generally in favor of these procedures whereas primary care physicians and physiatrists are known to have stronger relationships between these groups with the potential benefit of positively influencing patients' opinions and subsequent choices with respect to reconstructive surgery.

Pearls: The goal of reconstructive upper-extremity surgery in patients with a cervical spine injury is to transfer of muscles supplied by nerve above the level of the lesion to perform functions typically provided by muscles innervated below (and lost in the particular patient.) Thus forearm extension can be improved with a transfer of the posterior deltoid or biceps to the triceps and wrist extension can be restored with a brachioradialis transfer to extensor carpi radialis brevis transfer.

A comparison of tenocytes and mesenchymal stem cells for use in flexor tendon tissue engineering. Kryger GS, Chong AK, Costa M, Pham H, Bates SJ, Chang H *Hand Surg Am.* 2007;32:597–605.

Context: Intrasyneovial exor tendons of the upper extremity are surrounded by an epitendon layer of cells which are not present in tendons typically used for grafting (ie, palmaris, plantaris, and foot extensor tendons). Theoretically, using an intrasyneovial tendon graft would be superior to extrasynovial tendons but intrasyneovial tendon graft donors are not adequately available. Thus the ability to repopulate allogeneic tendon graft with autologous cells—broblasts obtained from tenocytes or stem cells of mesenchymal origin—to recreate the milieu of an intrasyneovial tendon for grafting would be appealing.

Study Design and Results: White rabbits were used as a source for tendons and in vivo grafts to study the ideal cell type to seed allogeneic grafts. A control group included the same procedure with tendons devoid of cells (so-called acellularized tendon grafts). The four candidate cell types tested included epitendon tenocytes, tendon sheath broblasts, bone marrow-derived mesenchymal stem cells, and adipoderived mesenchymal stem cells representing the cell types most commonly used as scaffolds in tissue engineering. Each cell type was tested to assess growth characteristics (proliferation and senescence) in vitro by counting cells daily and β -galactosidase activity staining assay. In addition, the ability of each cell type to successfully reseed acellularized tendon grafts for implantation was examined

in vivo by observing representative samples from implanted tendons under light microscopy at 1-, 4-, and 8-week intervals after implantation. Results of in vitro and in vivo experiments showed similar growth characteristics among all four cell types and viability for implanted grafts at 6 weeks relative to no growth in the controls.

Comments: By mimicking intrasynovial tendons and tendons under light microscopy at 1-, 4-, and 8-week intervals after implantation. Results of in vitro and in vivo experiments showed similar growth characteristics among all four cell types and viability for implanted grafts at 6 weeks relative to no growth in the controls. Potentially improving healing time, the results of this study would be of interest to researchers working to advance methods of tissue engineering for tendon reconstruction and grafting.

Pearls: The strength of a tendon repair is a function of the suture technique (and is related directly to the number of suture strands crossing the repair). A circumferential suture can add 10%–50% strength to the core repair. In the next decade, cellular augmentation techniques may offer additional advantages.

Conclusions: The authors conclude that any of these four cell types, epitenon tenocytes, tendon sheath blasts, bone marrow-derived mesenchymal stem cells, and adipoderived mesenchymal stem cells, are adequate for use in tendon tissue engineering.