This update reviews material presented at the 2009 annual meetings of the American Society for Surgery of the Hand (ASSH), American Association for Hand Surgery (AAHS), and American Academy of Orthopaedic Surgeons (AAOS), as well as articles published in the field of hand surgery (other than those published in this journal) between August 2008 and July 2009. Over the years, as with other maturing organizations, the trend at annual meetings has been for fewer free papers and more symposia and hands-on workshops, including many non-continuing medical education (non-CME)-credit industry-sponsored workshops in facilities adjacent to the accredited scientific meeting. In addition, both hand surgery organizations featured presentations on shoulder and elbow surgery and general microsurgery beyond the scope of this review.

Meeting abstracts for the ASSH and AAOS annual meetings are maintained online at www.assh.org and www.aaos.org, respectively.

**Trauma**

**Hand Amputations and Hand Transplantation**

Hand amputations are devastating injuries. They are receiving more attention as a result of their prevalence as war injuries, and some innovative changes in upper limb prosthetics have been the result.

A surgical technique called targeted muscle reinnervation (TMR) has been developed, in which nerves that had formerly served the amputated part are rerouted to new muscle sites. After reinnervation, these target muscles produce electromyogram (EMG) signals that can be used to control upper limb prostheses. The result is more rapid and natural prosthetic movements. While certainly not normal, these new myoelectric prostheses do appear to offer improved function to upper limb amputees.

Despite the progress in amputation prosthetics, however, hand transplantation remains a focus of interest for hand surgeons. Longer-term follow-up results are now available, there are new immunosuppression regimens on the horizon, and the socioeconomic impact of the procedure is also coming into view.

Breidenbach et al. recently provided an update on the outcomes for the first two hand transplantation patients in the United States. At nine and seven years after transplantation, hand function was reported as fair in both. Both patients have had episodes of rejection, one has required bilateral hip replacement for the treatment of osteonecrosis, and the other has had transient diabetes related to the immunosuppressive medication. At the time of the latest follow-up, both patients were working and remained satisfied with the results of the surgery.

Immunotherapy for hand transplantation continues to improve. However, the issues are more complex than they are in cases of single-tissue organ transplantation. The skin is the prime target of rejection in most cases, and in some patients it appears that repetitive hand trauma can incite a rejection episode, but new strategies offer the possibility of reducing and even intermittently halting immunosuppressive therapy, which would greatly reduce morbidity.

The burden of post-transplant morbidity was the subject of a study presented to the ASSH. That study evaluated the value of hand transplantation in terms of cost and preference. A decision tree was then constructed. The results suggested that hand transplantation would produce, over a hypothetical remaining lifespan of forty years, twenty-five quality-adjusted life-years (QALYs) for a unilateral transplantation and twenty-two QALYs for a bilateral transplantation. Unilateral and bilateral amputations were estimated to provide thirty-four and twenty-nine QALYs, respectively. (A normal life spanning forty years would, of course, produce forty QALYs.) The cost per QALY was between $14,000 and $27,000 for the amputations (based on the estimated costs of prosthetic replacement) and more than $700,000 for the transplantations (based on the costs of surgery, medications, and estimated complications). For a bit of perspective, these values compare with a cost per QALY of

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Dorsal plates are frequently associated with joint stiffness and extensor tendon problems. Volar plates, in contrast, most often require removal because of screw penetration into the radiocarpal joint, which may be difficult to identify on intraoperative fluoroscopy but later becomes apparent on postoperative tomography.

Another area of controversy related to the treatment of fractures of the distal part of the radius is what to do with the commonly associated fracture of the ulnar styloid, which may be a marker of distal radioulnar joint injury. Should such fractures be fixed? If so, what are the indications? One common belief is that fractures at the base of the styloid are particularly unstable. To test this hypothesis, a study that was presented to the AAHS evaluated seventy-four patients who had a distal radial fracture, half of whom had a fracture at the base of the ulnar styloid and half of whom did not have a styloid fracture. All patients were managed with a plate for the treatment of the radial fracture. Pairs of patients were matched for age, sex, and fracture type. After two years, the only difference between the two groups was a slight but significant (p < 0.05) diminution in forearm rotation arc of motion (164° compared with 171°) in the patients with a styloid fracture. Strength, pain, function, and motion in other planes were similar between the two groups. The authors concluded that internal fixation of fractures of the ulnar styloid base are usually not necessary. Similar studies that were presented to the AAOS and the ASSH evaluated cohorts of patients with plated distal radial fractures in which more than half of the patients in each group had ulnar styloid fractures, including distal, base, displaced, and undisplaced variants. None of the styloid fractures were fixed. Again, the results were similar for the groups with and without styloid fractures. Finally, a study that was presented to the ASSH evaluated patients who had nonunions of the ulnar styloid in the context of a healed, plated distal radial fracture. In that study, there was no difference in outcome between patients with union and those with nonunion of an ulnar styloid base fracture six months after volar plate fixation of a fracture of the distal part of the radius. The message is clear: while of course there will be exceptions, in general, the surgeon need not automatically consider the presence of an ulnar styloid fracture, even when displaced, to be an indication for internal fixation of the styloid. However, it is important to note that none of those studies included what might be considered Galeazzi fracture variants, in which the styloid fracture is associated with instability of the distal radioulnar joint. In such cases, the conventional wisdom remains that styloid fracture fixation contributes to stability of the reduction of the distal radioulnar joint.

Carpal tunnel syndrome is, of course, common in its own right, but it is also a common complication of distal radial fractures. Is it possible to predict which fractures, and which patients, might be at risk for post-fracture carpal tunnel syndrome? A recent study addressed this issue⁴, and the answer...
appears to be yes. Fractures in which the distal fragment is translated >35% of the width of the bone appear to explain more than half of the relative risk; women under the age of forty-eight years also appeared to be predisposed to these complications.

Finally, distal radial fractures are also often “fragility fractures” (i.e., a sign of osteoporosis). Do osteoporosis treatments affect fracture-healing? A retrospective comparison of patients with distal radial fractures suggests a possible connection. In a group of 196 patients with distal radial fractures, forty-three patients were receiving bisphosphonate therapy. While the fractures in the overall group healed at an average of forty-nine days, those in the bisphosphonate group healed at an average of fifty-five days. However, because the bisphosphonate treatment was not randomly allocated, it is not possible to conclude more; it is possible that some factor associated with the indication for bisphosphonate treatment, and not the drug itself, may have been the reason for the difference in time to radiographic union.

Proximal Interphalangeal Joint Injuries in Children
Displaced fractures of the phalangeal neck are difficult problems in patients of any age because of the small size of the fragments and the difficulty of maintaining a stable reduction without surgery. Open treatment runs the risk of devascularizing the tiny fracture fragments. Those problems are compounded in the pediatric population. A report that was presented to the ASSH presented a useful treatment algorithm for such cases. Sixty-one children with closed, displaced phalangeal neck fractures were managed first with closed reduction. If that treatment was unsuccessful, then percutaneous reduction was attempted with use of an intrafocal Kirschner wire as a “joystick.” Open reduction was reserved for cases in which the percutaneous reduction failed. Percutaneous interfragmentary Kirschner wires were used for fixation in all cases. With use of this algorithm, forty-nine fractures were satisfactorily reduced with the closed method and the remainder were satisfactorily reduced with the intrafocal pin method. None required open reduction. Fifty-three patients were followed for at least one year. The final result was excellent for forty-five patients, good for four, fair for one, and poor for three. There was one nonunion and one case of osteonecrosis. The authors concluded that their algorithm was useful in their hands, and it avoided the need for open reduction in their series.

A second paper that was presented to the ASSH addressed the issue of malunions of phalangeal condylar fractures in pediatric patients (age range, two to fourteen years at the time of the injury). While these fractures are usually treated surgically, the authors followed eight patients who did not have surgery in order to see if remodeling would occur. Normally, of course, remodeling is expected when a fracture is close to the growth plate; these fractures, however, are at the opposite end of the bone from the phalangeal growth plate. Neverthe-
associated with worse driving performance in cars in which the driver sits on the right side. However, in countries in which the driver sits on the left side, patients wearing left-arm casts should probably be advised that their driving ability may be impaired as a result of the cast.

**Postoperative Pain**

All surgeons are aware that similar operations can result in very different degrees of perceived pain postoperatively and that similar abnormalities can result in very different degrees of perceived disability. Can these differences in outcome be predicted? Much recent evidence suggests that they can. A study that was presented to the AAOS reviewed >1000 patients who had various upper extremity conditions. A significant correlation was found between function and depression, pain catastrophizing, pain anxiety, and pain rating, all of which were found to be as important as or more important than the diagnosis itself for determining disability. A second study that was presented to the AAOS reviewed ninety-five patients who had had various minor surgical procedures on the hand, such as carpal tunnel and trigger finger releases, and another study that was presented to the ASSH reviewed 150 patients who had had carpal tunnel surgery. Both studies showed that the strongest predictors of postoperative pain and disability were the levels of preoperative depression and anxiety. The authors concluded that psychological distress and ineffective coping skills explained a large proportion of the observed variation in illness behavior during recovery from hand surgery. Finally, a recent report suggested that many patients managed with hand surgery meet the criteria for the diagnosis of post-traumatic stress disorder. Together, these studies provide strong evidence to support an assessment of a patient’s anxiety and depression levels preoperatively in order to better predict and treat postoperative pain and disability.

**Arthritis and Other Degenerative Disorders**

Hand surgeons and rheumatologists sometimes disagree about the benefit of finger joint replacement in patients with rheumatoid arthritis. Although newer medications have reduced the need for hand surgery in many practices, there is still a role for surgery in many cases. To address the potential benefit of implant arthroplasty, a recent study investigated the outcomes in two cohorts of patients with rheumatoid arthritis. One cohort was managed with silicone metacarpophalangeal joint arthroplasties, whereas the other cohort was managed medically. The patients in the surgical treatment group began with more severe impairment of hand function, but after one year the two groups had similar hand function. The patients in the surgical treatment group had improved significantly (p < 0.05), whereas the outcomes for the patients in the medical treatment group were unchanged. The authors concluded that implant arthroplasty does improve hand function, at least in the short term, and that it is a good option for patients with poor hand function for whom medical therapy alone has been ineffective.

Proximal interphalangeal joint arthritis remains to some extent an unsolved problem. While joint replacement implants are available, the results in terms of motion restoration and durability have been somewhat disappointing. A report that was presented to both the AAHS and the AAOS shed some further light on the subject. In that report, thirty-six patients who had had fifty-one proximal interphalangeal joint arthroplasties with use of a cobalt-chromium and ultra-high molecular weight polyethylene surface replacement (SR PIP; Small Bone Innovations, Morrisville, Pennsylvania) were followed for a mean of ten years. The indications included osteoarthritis, traumatic arthritis, and rheumatoid arthritis. At the time of the latest follow-up, 90% of the implants remained in place; four joints had been fused, and two fingers had been amputated as a result of various complications. Postoperative pain relief was quite good, with the visual analog scale pain score averaging 8 of 100 at the time of the latest follow-up. However, motion was not improved; preoperative motion averaged 44°, whereas postoperative motion was slightly less, averaging 42°, not counting the fused and amputated joints. The Disabilities of the Arm, Shoulder and Hand (DASH) score was also modest postoperatively, averaging 46 points. This moderate degree of final disability was attributed not only to the finger results but also to other upper limb problems, which were often present in the same patients.

When trapezium excision arthroplasty is performed, many hand surgeons use a part of the flexor carpi radialis tendon to perform a ligament reconstruction. Some surgeons use a longitudinal strip of tendon and attempt to keep the flexor carpi radialis muscle-tendon unit intact. Other surgeons have expressed the opinion that they, too, prefer to use half of the flexor carpi radialis tendon (specifically, the distal half). Thus far, there has been little information to suggest whether there is any detriment to simply dividing the flexor carpi radialis and using the full thickness of the tendon for distal reconstruction. Two studies that were presented in 2009 addressed this issue. In a report that was presented to the AAHS, involving a series of seventeen patients who were managed with “distal half” ligament reconstruction, there was no difference between the preoperative and six-month postoperative wrist flexion motion or wrist flexion strength, suggesting that removal of this part of the tendon is not detrimental to hand function. A report that was presented to the ASSH, involving fifty-three patients who were followed for eighteen months, led to similar conclusions, although that group of patients did have a slight decrease in postoperative radial deviation motion. On the basis of these studies, it appears that the flexor carpi radialis can be harvested as the surgeon prefers.
However, it may be that all that bother is not necessary. In a recent prospective randomized trial, trapeziectomy with flexor carpi radialis ligament reconstruction, Kirschner wire fixation, and six weeks of postoperative casting was compared with simple trapeziectomy and three weeks of protection in a soft bandage. Patients were followed at three and twelve months after surgery. There was no difference between the two groups in terms of pain, motion, or strength at either time point. Once again, it appears that, at least sometimes in hand surgery, less is more—or, at least, the same.

Patients with thumb carpometacarpal arthritis often have an associated carpal tunnel syndrome. Most often, if both conditions need surgery, each is treated through a separate incision. That may not be necessary. A recent report involving ten patients described a release of the carpal tunnel through the base of the trapeziectomy incision. The carpal tunnel syndrome resolved in all patients. This approach seems worthwhile to consider when patients have both carpal tunnel syndrome and thumb carpometacarpal arthritis and require surgery for both conditions.

Arthroplasties of the distal radioulnar joint continue to gain acceptance among hand surgeons. A paper that was presented to the ASSH discussed the use of an ulnar head prosthesis (Martin, Tuttlingen, Germany) to salvage failed resection arthroplasties (i.e., the time-honored Darrach procedure). A total of sixteen patients (from an initial cohort of twenty-two patients) were followed for a minimum of eight years after implant arthroplasty; one other patient was excluded from the study because of an infection that required implant removal three months postoperatively. Pain, stability, motion, and satisfaction remained excellent in these patients, and radiographs demonstrated no signs of stem loosening. These encouraging results suggest that distal radioulnar joint arthroplasty can be a valuable salvage option following a failed resection of the distal part of the ulna.

Nerve
The treatment of nerve gaps is a frequent reconstructive challenge for the hand surgeon. While the gaps often can be closed by means of nerve mobilization, in many cases they must be bridged somehow. Nerve grafts are commonly used, but more recently nerve conduits have become available as alternatives to grafts. A recent prospective randomized study that was presented to the ASSH compared two types of conduits in a group of forty-two patients with traumatic nerve gaps in a total of seventy-six nerves. The first type was a commercially available woven polyglycolic acid mesh tube, and the second type was an autologous vein, harvested from the dorsal part of the hand or forearm. Follow-up assessment was provided by a blinded observer at three, six, and twelve months postoperatively. The nerve gaps ranged from 4 to 25 mm. The surgical time was fifteen minutes longer in the vein group than in the synthetic conduit group (p < 0.05), representing the time needed for vein harvest and preparation. The cost of the increased surgical time in the authors’ hospital was slightly less than the purchase cost of the implant. Postoperative sensibility was similar in the two groups, but two synthetic conduits had to be removed as a result of implant extrusion. The investigators concluded that vein and synthetic conduits were roughly comparable in terms of outcome and cost but that there were fewer postoperative complications in the vein group.

Conduits also can be used to treat neuromas. A study that was presented to the AAHS evaluated the results associated with the use of conduits for the treatment of symptomatic neuromas of the radial sensory nerve in twenty-one patients. The results were evaluated at a minimum of one year postoperatively on the basis of a clinical examination and the responses on a questionnaire. All but two patients had improvement in terms of both the clinical and questionnaire measures, and only one patient was dissatisfied with the result, although four patients were involved in litigation regarding the initial nerve injury at the time of surgery. The authors concluded that neurolysis and wrapping with a resorbable collagen tube is effective for the treatment of symptomatic neuromas of the radial sensory nerve.

Hand Tumors
Over the past decade, collagenase injections have been used experimentally as an alternative to surgery for the treatment of Dupuytren disease. Although the treatment is still not generally available, longer-term results are now being presented, which support the hypothesis that this treatment is safe and moderately effective, at least in some cases. A paper that was presented to the ASSH described the minimum eight-year follow-up results for eight of twenty-three patients who had been managed with injection in 1999 to 2000. The mean pre-injection contracture was 57° at the metacarpophalangeal joint and 45° at the proximal interphalangeal joint. These contractures initially improved to approximately 8° each. At the time of the latest follow-up, the average metacarpophalangeal joint contracture was 22.5°, a 50% net improvement, whereas the average proximal interphalangeal joint contracture was 60°, essentially the same as the initial contracture. The authors concluded that there appeared to be a role for collagenase injection in the treatment of Dupuytren contracture, particularly in patients with isolated metacarpophalangeal joint contractures. However, other therapies, such as percutaneous needle fasciotomy, are also effective at that level, as noted in this review in 2008. In the future, it would be helpful to compare the short and long-term costs, morbidity, and outcome of the needle and enzyme treatments, both of which appear to offer alternatives to the more traditional open fasciectomy.
**Annual Meetings**

The Sixty-fifth Annual Meeting of the American Society for Surgery of the Hand (ASSH) will be held from October 7 through 9, 2010, in Boston, Massachusetts. The ASSH will also offer a Master Skills course in Hand and Wrist Trauma on May 21 and 22, 2010, and a Wrist and Elbow Arthroscopy course on August 6 and 7, 2010, both in Rosemont, Illinois, and a Comprehensive Review in Hand and Upper Extremity Surgery from July 16 through 18, 2010, in Chicago, Illinois.

The Forty-first Annual Meeting of the American Association for Hand Surgery (AAHS) will be held from January 12 through 15, 2011, in Cancun, Mexico. The annual meetings of the AAHS are always held in combination with the annual meetings of the American Society for Reconstructive Microsurgery and the American Society for Peripheral Nerve. Of note, after many years in Chicago, the AAHS has moved its headquarters to Arlington Heights, Illinois, where it is colocated with the offices of the American Society of Plastic Surgeons, somewhat similar to the colocation of the ASSH and AAOS offices in nearby Rosemont.

The triennial congress of the International Federation of Societies for Surgery of the Hand will take place from October 31 through November 4, 2010, in Seoul, South Korea.

All of the above meetings are open to all interested parties. Further details will be forthcoming on the society web sites, listed below. The annual meetings of both the ASSH and the AAHS accept free papers and also feature a wide variety of instructional courses and symposia, many with hands-on sessions.

Membership in the two hand surgery societies is restricted to those who have had specific hand surgery training and, in the case of the ASSH, those who have received the Certificate of Added Qualifications in Surgery of the Hand offered by the American Boards of Orthopaedic Surgery, Plastic Surgery, and Surgery. Further information on membership as well as any of the above meetings can be obtained by contacting the organizations directly.

Finally, both organizations maintain active web sites, with educational and informational content directed to the public and interested medical professionals, as well as members.

American Society for Surgery of the Hand:
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**Evidence-Based Orthopaedics**

The editorial staff of *The Journal* reviewed a large number of recently published research studies related to the musculoskeletal system that received a Level of Evidence grade of I. Over 100 medical journals were reviewed to identify these articles, all of which have high-quality study design. In addition to articles published previously in this journal or already cited in this update, nine additional level-I articles were identified that were relevant to hand surgery. A list of those articles is appended to this review following the standard bibliography. We have provided a brief commentary about each of the articles to help guide your further reading, in an evidence-based fashion, in this subspecialty area.

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**References**


Evidence-Based Articles Related to Hand Surgery


Two hundred patients were randomized to open release or release with the Indiana Tome and were evaluated at three months and seven years postoperatively. There were no differences in terms of average pain or function at either time point, but the Indiana Tome group had more recurrences and more complications, including one median nerve laceration. The Indiana Tome did not appear to offer any advantages in comparison with open surgery in this study.


Fifty supple hands with distal ulnar neuropathy were randomly assigned to either immediate mobilization or three weeks of immobilization after tendon transfer. Motion, function, pain, and time to discharge were assessed. The mean duration of follow-up was eighteen months. Functional outcomes and complications were similar between the two groups, but the patients in the early mobilization group had significantly less pain postoperatively and were discharged from therapy an average of three weeks sooner. Early mobilization may accelerate return to function after tendon transfer surgery.


Seventy-five patients with unstable distal radial fractures were randomized to treatment with either a nonbridging external fixator or a dynamic bridging fixator. Radiographic, clinical, and functional (DASH) assessments were then treated with percutaneous pinning and external fixation. Clinical outcomes (including the DASH score, motion, and strength) and radiographic outcomes were assessed at three, nine, twelve, and twenty-four months after fracture. In the arthroscopically and fluoroscopically controlled cases, a total of twenty-three injuries to the triangular fibrocartilage and intercarpal ligaments were identified; when present, these were treated either arthroscopically or with open operation. While the final DASH scores were similar, the patients with arthroscopic control had significantly better motion at all time points.

What’s New in Hand Surgery

Evidence-Based Articles Related to Hand Surgery


Fifty-six patients with fractures that were treated either with pins or casts were randomized to either a therapist for advice and to participate in a home exercise program, or not. Six weeks later, range of motion and strength were similar for the two groups, but pain was less severe and self-reported activity was greater in the group that had received the advice. The advice group was also more satisfied with the care that had been received. In this study, a single therapist visit appeared to provide some benefits in the short term after fracture treatment.


Forty patients with intra-articular fractures were randomized either to arthroscopically and fluoroscopically controlled reduction or to fluoroscopically controlled reduction without supplemental arthroscopy. All fractures were then treated with percutaneous pinning and external fixation. Clinical outcomes (including the DASH score, motion, and strength) and radiographic outcomes were assessed at three, nine, twelve, and twenty-four months after fracture. In the arthroscopically and fluoroscopically controlled cases, a total of twenty-three injuries to the triangular fibrocartilage and intercarpal ligaments were identified; when present, these were treated either arthroscopically or with open operation. While the final DASH scores were similar, the patients with arthroscopic control had significantly better motion at all time points. The addition of arthroscopy to fluoroscopy appears therefore to have some benefit for the closed treatment of intra-articular distal radial fractures.


Seventy-five patients with unstable distal radial fractures were randomized to treatment with either a nonbridging external fixator or a dynamic bridging fixator. Radiographic, clinical, and functional (DASH) assessments were carried out at six, twelve, twenty-four, and fifty-two weeks. Outcomes were not significantly different between the two groups.


One hundred and twelve patients with thumb-base osteoarthritis were randomized to treatment with either a custom Neoprene night splint or “usual care.” Patients were assessed with regard to self-reported pain and disability at one and twelve months after treatment. While there was no difference between the groups in terms of the outcome at one month, the patients in the splint group reported significantly less pain and better function at twelve months. At twelve months, 86% of the patients in the splint group were still using the splint at least five nights per week. Nighttime splinting appears to provide some benefit when used for the treatment of thumb-base osteoarthritis if it is continued beyond one month.


Twenty-six patients with open injuries were assessed with ultrasound prior to exploration. Ultrasound identified all tendon injuries and foreign bodies but missed some arterial injuries and had poor sensitivity and specificity for detecting nerve injuries.


Seventy-nine patients with ninety affected fingers, each of which had a proximal interphalangeal joint contracture, were randomly assigned to have either a “firebreak” skin graft or direct closure after fasciectomy. At three years postoperatively, there was no difference between the two groups in terms of motion or recurrence. While routine use of “firebreak” grafts during surgery for the treatment of Dupuytren contracture does not appear to improve outcomes, selected use in cases of recurrence or severe contracture remains to be studied.

Evidence-Based Articles Related to Hand Surgery


Fifty supple hands with distal ulnar neuropathy were randomly assigned to either immediate mobilization or three weeks of immobilization after tendon transfer. Motion, function, pain, and time to discharge were assessed. The mean duration of follow-up was eighteen months. Functional outcomes and complications were similar between the two groups, but the patients in the early mobilization group had significantly less pain postoperatively and were discharged from therapy an average of three weeks sooner. Early mobilization may accelerate return to function after tendon transfer surgery.


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