SPECIALTY UPDATE

What’s New in Hand Surgery

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Introduction

This update reviews material presented at the 2012 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 2011 and July 2012. In addition to the broad focus of the AAOS, both hand surgery organizations feature presentations on shoulder and elbow surgery and general microsurgery, all of which are beyond the scope of this review. If a work was presented at more than one meeting, only the first presentation is described.

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

Skeletal Trauma

The treatment of wrist fractures is increasingly surgical. However, several recent studies called into question the benefits of operative treatment as compared with nonoperative treatment. A report that was presented to ASSH reviewed 258 patients over the age of sixty-five years with distal radial fractures that were treated either operatively or nonoperatively. The patients were matched according to AO type, age, and sex. One year after the fracture, Patient Rated Wrist Evaluation (PRWE) scores, wrist motion, and grip strength were similar in the two treatment groups. The operative treatment group had a higher risk of complications (29% compared with 17%; p = 0.03) and a greater need for subsequent surgery (11% compared with 5%; p = 0.1) but had a lower malunion rate (4% compared with 26%) in comparison with the nonoperative treatment group. The authors concluded that surgery improves radiographic appearance but not function in patients over the age of sixty-five years and that these results come at the cost of higher rates of complications and additional surgery. A recent report expanded on this theme by evaluating the cost effectiveness of various treatments for distal radial fractures. The authors concluded that internal fixation resulted in an additional cost of approximately $15,000 per quality-adjusted life year (QALY) gained in comparison with casting. In that study, patients expressed a small preference for surgery over casting, but this preference was not sufficient to outweigh the substantial difference in cost ($564 for casting versus $3516 for surgery).

The treatment of scaphoid fractures continues to garner attention. A systematic review evaluated the benefits of casting versus surgery for the treatment of scaphoid fractures. The authors identified eight trials in which surgical treatment was compared with casting. The surgical treatment group had a faster return to function and a lower nonunion rate (relative risk of nonunion with surgery, 0.29; 95% confidence interval [CI], 0.09 to 0.92). However, the surgical treatment group also had a higher complication rate. There were no differences between casting and surgery in terms of final outcome, pain, or patient satisfaction. There was also no difference in outcome between casts that extended above or below the elbow or between casts that did or did not include the thumb.

As noted above, the surgical treatment of scaphoid fractures is associated with risks as well as benefits; thus, what is the proper role of nonsurgical treatment? A systematic review that specifically evaluated nonunion rates following scaphoid fractures demonstrated that cast treatment of displaced fractures resulted in an 18% rate of nonunion (with a relative risk of nonunion of 4.4 [95% CI, 2.3 to 8.7; p = 0.00] for displaced fractures compared with undisplaced fractures), compared with a roughly 1% nonunion rate for surgically fixed fractures. Nonunion rates of as high as 34% have been reported in association with nonoperative treatment of fractures involving the proximal pole. Given the marked difference in outcomes...
What’s New in Hand Surgery

with displacement, it seems that displaced scaphoid fractures might benefit most from surgical fixation.

However, when scaphoid fractures remain undisplaced, the data above suggest a role for casting. In such cases, the morbidity of casting depends considerably on whether the elbow and thumb are immobilized. Including the elbow and thumb in the cast may make little difference. Additional detail on this issue was provided by a study that was presented to the ASSH, which reviewed the results of fifty-five waist and seven distal scaphoid fractures. All of these fractures were undisplaced on initial computed tomography (CT) or magnetic resonance imaging (MRI), and all were randomized to treatment with a below-the-elbow cast that included or excluded the thumb. Union was assessed at ten weeks with use of CT. Previous studies had not used CT to assess displacement. The union rate was significantly higher in the group managed with casts that excluded the thumb (p = 0.048), which is good news for patients with undisplaced scaphoid fractures who choose nonoperative treatment as it allows for the preservation of mobile thumb and elbow without jeopardizing union rates.

Dupuytren Contracture

Collagenase is increasingly used to treat Dupuytren disease. A report that was presented to the ASSH described 643 patients (1080 treated joints). Three-year follow-up data were available for 417 of 648 metacarpophalangeal joints and 155 of 172 proximal interphalangeal joints, all of which had had complete correction of the deformity after initial treatment with collagenase. Of the 417 metacarpophalangeal joints, 321 showed no sign of recurrent joint contracture (with a mean value of 38° before treatment and 3° at the time of the three-year follow-up). The other ninety-six metacarpophalangeal joints (23%) had recurrent contracture (with a mean value of 37° before treatment and 33° at the time of the three-year follow-up). Recurrence was gradual in these cases. Eighty-nine (57%) of the 155 proximal interphalangeal joints had recurrent contracture (with a mean value of 40° before treatment and 37° at the time of the three-year follow-up), whereas sixty-six did not (with a mean value of 35° before treatment and 8° at the time of the three-year follow-up). No long-term adverse effects were noted in association with the collagenase treatment. The authors concluded that collagenase could be an effective treatment for Dupuytren disease, especially at the metacarpophalangeal joint. While these recurrence rates are somewhat higher than the 21% rate recently reported five years after open fasciectomy, a systematic review of 277 articles demonstrated that the aggregate recurrence rate was significantly less (p = 0.01) for collagenase than it was for open surgery or needle fasciotomy. In that review, major complications such as infection, tendon injury, and nerve injury were observed primarily in the open surgery group.

Collagenase is effective, but is it cost effective? A recent study attempted to address this question with a cost utility analysis in which open partial fasciectomy was compared with needle aponeurotomy and collagenase injection. On the basis of that analysis, the answer appears to be, “it depends.” Specifically, the open procedure was always the most costly in the modeling scenarios that were used, at $800,000 per QALY gained in comparison with no treatment. The cost of the needle procedure per QALY ranged from $36,000 to nearly $100,000 on the basis of assumptions about the treatment setting (office or operating room) and success rate. The cost of collagenase per QALY was highly dependent on its price. At the current U.S. retail price of $5400 per treatment, the cost of collagenase per QALY was estimated to be $166,000. The authors estimated that for collagenase to be more cost effective than the most optimistic needle aponeurotomy scenario, a cost of $250 per treatment would be required. For a more realistic needle aponeurotomy scenario, a cost of $945 per collagenase injection would result in similar cost effectiveness between the two treatments. The cost of collagenase in several other countries approaches this latter figure. On the basis of data such as these, will payers in the U.S. attempt to negotiate a more “effective” price?

The cost-effectiveness study described above suggests that open surgery is the least cost effective. However, such results are based on assumptions derived from clinical data rather than on actual case comparisons. In a recent study, 111 patients were randomized to either open fasciectomy or needle aponeurotomy and were followed for five years. At the end of that time, nearly 85% of the patients in the needle aponeurotomy group had had a recurrence of the contracture, compared with only 21% of those in the fasciectomy group (p < 0.001). Satisfaction overall was high in both groups. Nevertheless, more than half of the patients preferred the needle procedure and were willing to accept a possible recurrence because of the perceived benefits of fast recovery, fewer complications, and minimal invasiveness.

Nerve

Carpal tunnel release remains by far the most common surgical procedure involving the hand, with nearly 600,000 such procedures being done per year. Despite the ubiquity of carpal tunnel syndrome, though, many questions remain about its treatment, several of which were discussed at national meetings in 2012.

When patients with carpal tunnel syndrome have severe thenar muscle atrophy and absent motor conduction on electrodiagnostic tests, the question often arises as to whether a tendon transfer to restore thumb opposition should be performed immediately or whether it is wise to await possible motor recovery after carpal tunnel release. A report that was presented to the ASSH suggests that the correct answer may be, “it depends.” In a series of 214 patients with preoperative absent motor unit potentials on electromyography, 109 patients had more than one year of follow-up and did not have any confounding conditions such as diabetes or hemodialysis. Fifty-seven of these 109 patients had recovery of motor unit potentials and active opposition at the time of the latest follow-up. This group included eleven of twelve patients under the age
What’s New in Hand Surgery

Arthritis

Anatomy does not change, but when it comes to hand anatomy at least, it seems that there are always new interpretations and connections to report. It is well known that thumb carpometacarpal arthritis is more common in women than in men, but the reason is not clear. In the past, different patterns of hand use and genetically based differences in the shape of the trapezium have been implicated. A study that was presented to the ASSH suggests an important role for hormonal influences. Relaxin is a hormone produced in the corpus luteum that relaxes pelvic ligaments in preparation for childbirth. It is also secreted by the prostate to enhance sperm motility in men. The study demonstrated that relaxin receptors are present in the thumb carpometacarpal ligaments in both men and women, but are more abundantly present in women. The presence of so many relaxin receptors in the thumb carpometacarpal ligaments suggests a role for relaxin in thumb carpometacarpal ligament function and may explain why women are more likely to have instability and arthritis in this joint.

Does silicone metacarpophalangeal joint arthroplasty improve the results in patients with rheumatoid arthritis in the intermediate term? The results of a National Institutes of Health-funded prospective study that was presented to the ASSH, in which patients who were managed with silicone metacarpophalangeal joint arthroplasty were compared with those who were managed nonoperatively, suggest that it does. A total of sixty-seven patients undergoing surgical treatment and ninety-five patients undergoing nonsurgical treatment were followed; all patients had metacarpophalangeal joint subluxation and/or ulnar drift at the time of enrollment. Although the patients in the surgical treatment group had significantly worse motion, alignment, and function preoperatively, the two groups were quite similar in these aspects at three years postoperatively. The nonsurgical treatment group did not have a change in any measurement over the three years of the study. In a separate publication, the authors noted that satisfaction in the surgical treatment group correlated with reduction in extensor lag at the metacarpophalangeal joint to <30°, correction of ulnar drift to <10°, and metacarpophalangeal joint flexion of >30°. Changes in strength did not correlate with patient satisfaction.

Hand surgeons now have a variety of options when faced with a patient who is a candidate for proximal interphalangeal joint arthroplasty, ranging from silicone devices that were first introduced in the 1960s to more recently devised metal and plastic or pyrocarbon implants. Does the choice of implant make a difference in the outcome? A recently published prospective randomized trial suggests that it does, but perhaps not in the manner expected. A total of forty-three patients (sixty-two joints) with osteoarthritis were randomized to receive either a silicone, titanium/polyethylene, or pyrocarbon device. After a mean duration of follow-up of three years (minimum, thirty months), there was no significant improvement in motion in association with any device in comparison with preoperative levels, although the titanium/polyethylene and pyrocarbon devices were associated with some early improvement in motion, which was lost with further follow-up. All devices provided pain relief. There was a major difference, though, in terms of the rate of surgical failures: at the time of the latest follow-up, two of eighteen silicone implants, seven of twenty-six titanium/polyethylene implants, and seven of eighteen pyrocarbon implants had been removed. A second study specifically reviewed the reasons for reoperation after treatment with either pyrocarbon or titanium/polyethylene implants. In that study, seventy-six patients from a single institution had a total of 121 reoperations (range, one to four reoperations per digit). The most common reasons for reoperation included extensor mechanism failure, collateral ligament instability, and joint contracture. Ultimately, six of these digits required amputation. These results suggest that, unfortunately, the newer devices provide results that are somewhat different from, but not necessarily better than, those associated with silicone implants, despite the fact that the silicone devices have been in clinical use for over forty years.

Distal radioulnar joint instability following a Darrach procedure (distal ulnar resection arthroplasty) can be a difficult problem to treat. One study investigated the long-term results associated with the use of a distal ulnar prosthesis (UHP; KLS Martin, Tuttlingen, Germany) for the treatment of this problem in twenty-two patients who were followed for a mean of eleven years postoperatively. The clinical and radiographic results had remained stable since the time of the initial report, after two years of follow-up, in 1999. Another solution that has been proposed is a linked distal radioulnar joint replacement arthroplasty (Aptis; Aptis Medical, Louisville, Kentucky). Two reports that were presented to the ASSH discussed the use of this device in a total of twenty patients who were followed for an average of...
approximately three years. All but two of these twenty patients had improvement, and there was only one reoperation (for a loose ulnar device); the revision remained stable two years later.

Kienböck Disease
The treatment of Kienböck disease continues to represent a challenge to hand surgeons. For patients with early-stage involvement, revascularization or osteotomies to redistribute load across the wrist can be attempted. For patients with severe osseous collapse, wrist arthrodesis may be needed. For patients with intermediate-stage involvement, in which the lunate has collapsed and there is carpal malalignment but there is not yet any arthritis (Lichtman Stage 3B), one option is a midcarpal arthrodesis, which can correct the malalignment and unload the lunate at the same time. One such procedure, scaphocapitate arthrodesis, was the subject of a report that was presented to the AAHS. A total of thirty-six procedures were done, and the mean duration of follow-up was three years. There were three major complications, including one delayed union, one case of chronic pain, and one scaphoid fracture. The arc of wrist motion decreased from 90° to 60°. Grip strength increased from 16 to 22 kg (compared with 34 kg on the contralateral side). Pain was relieved in thirty of the thirty-six patients.

Cost Effectiveness of Hand Surgery
As a requirement of certification, hospitals in the U.S. have adopted the Surgical Care Improvement Project measures, one of which requires the timely administration of preoperative antibiotics. While the list of procedures specifically included in these measures does not include hand surgery procedures, the question often arises whether prophylactic antibiotics are as useful for patients undergoing carpal tunnel release as they are for patients undergoing hip or knee replacement. A recent study of >8000 consecutive clean elective hand surgery procedures suggests that they are probably not. The overall infection rate was 0.35%, and the infection rate for patients receiving antibiotics (n = 2755) was not significantly different from that for patients not receiving antibiotics (n = 6095). The risk of infection was associated with smoking, diabetes, and the duration of the procedure, but subgroup analysis did not show a protective effect of antibiotics in these subgroups either. On the basis of these results, and being cognizant of the low but real rate of complications resulting from the administration of even a single dose of antibiotics, the authors concluded that antibiotics should not be routinely given to patients undergoing clean elective hand surgery.

Is routine postoperative follow-up by the hand surgeon always needed? As the U.S. considers the potential impact of the 2010 Patient Protection and Affordable Care Act, a look at how care is managed in other countries may be instructive. In the U.K., as a cost-savings measure, patients are followed for three months by the hand therapist under a protocol instead of by the surgeon; patients can be referred back to the surgeon if there are problems. A group of British surgeons presented the results of a patient satisfaction survey of this practice to the AAOS. A total of 121 patients who had surgery for the treatment of Dupuytren contracture and thumb carpometacarpal arthritis were included; five patients who had had surgery for the treatment of Dupuytren contracture were lost to follow-up. Of the 116 patients who were contacted three months after surgery, 106 (91%) were satisfied and ninety-nine (85%) did not want to be reviewed by the surgeon. The authors concluded that their policy reduced waste for the British National Health Service by allowing the surgeons to see more new patients, and reduced inconvenience to the patients.

Should antiplatelet medications be stopped before elective hand surgery? A report that was presented to ASSH suggests that this may not be necessary. The study included seventy-six patients undergoing a variety of procedures in whom antiplatelet medications were not stopped and seventy-six controls undergoing similar procedures who were not receiving antiplatelet therapy. One patient who underwent a wrist arthrodesis was brought back to the operating room because of bleeding, but otherwise there were no differences between the two groups in terms of pain, swelling, ecchymosis, or any other postoperative measure. The authors concluded that the advantages of continuing antiplatelet therapy exceed the disadvantages.

Education in Hand Surgery
Is the current model of hand surgery training in the U.S., with a one-year fellowship after training in orthopaedic surgery, plastic surgery, or general surgery, appropriate? Should hand training include the proximal part of the upper extremity and microsurgery? A recent report provided some answers to these questions on the basis of a survey of current hand program directors. A total of sixty-two of the seventy-four hand directors responded to the survey, for an 84% response rate. Of these, 65% thought that one year was sufficient. Only 24% thought that it would be worthwhile to create a five or six-year residency program in hand surgery. As for content, nearly all thought that hand surgeons should also be trained in the care of wrist problems, including distal radial fractures, and in peripheral nerve surgery. Fewer than half thought that proficiency in microsurgery was a necessary element of a hand fellowship, and fewer than one-third thought that burn, shoulder, elbow, or brachial plexus proficiency should be the goal of a hand fellowship. On the basis of this survey of fellowship directors, the need for more hand training seems unpopular. However, as reported to the AAOS, a different perspective was obtained in a similar survey of 166 hand fellows who had been trained from 2008 to 2010. The fellows noted that they felt less comfortable with the care of proximal arm problems, microsurgery, and brachial plexus care, but, unlike the directors, 60% said that they would have applied for a two-year fellowship if one had been offered. In addition to improvement of clinical skills, the fellows also mentioned time for research as an advantage of additional training. It seems that further conversation between educators and students is in order.

As noted above, hand fellowship directors generally do not consider proficiency in microsurgery to be a critical
element in hand surgery training, and hand fellows often feel uncomfortable with microsurgery. How does that translate into practice? Another report that was presented to the ASSH evaluated the replantation success rate at two academic medical centers with level-1 trauma centers. The success rate for attempted digital replantation usually is in the range of 80% to 90%; in most cases, such rates are reported by centers with dedicated microsurgery teams. The two centers in this case reported a total of 134 replantation attempts between 1996 and 2011—fewer than ten per year, on average, at the two centers combined. Replantation was successful in seventy-six digits (57%). The authors attributed the lower success rate to low volumes and the consequent absence of a dedicated replantation team and unit. This study calls into question the proper setting for replantation surgery; specifically, should there be regional replantation centers, or should every level-1 trauma center have a dedicated team, regardless of volume?

To put this experience into perspective, Friedrich et al. recently studied the epidemiology of replantation in the United States with use of a large administrative database that covers 90% of all hospital discharges nationally. All upper extremity amputations and replantations were tracked for the years 2001, 2004, and 2007. During those three years, a total of 9407 patients were treated for upper extremity amputations, and a total of 1361 patients underwent replantation. That comes to roughly 450 replantations per year nationwide. The minimum number of replantation cases that would be needed in order to support a team is not clear from these data, but even one case per week would suggest a need for very few such centers nationwide.

Also, as noted above, proficiency in surgical techniques is a concern of hand fellows. Can surgical skills be successfully taught outside the operating room, or is “see one, do one, teach one” still appropriate? One study evaluated the results of a teaching program for tendon repairs in which both a tutorial and tabletop exercise, simulating a clinical repair, were used in a group of fourteen plastic surgery residents. Participants were retested six months later to assess retention. At the time of re-assessment, repair strength was significantly increased compared with pretest levels (p < 0.001). In contrast, a report that was presented to the ASSH described the findings from one program in which residents were assessed annually on their ability to fix distal radial fractures in a simulated fracture cadaver model with use of one of three randomly assigned fixation methods that did not differ in terms of biomechanical properties.

Staff observers rated technical ability, and the specimens were evaluated with radiographs to assess the quality of reduction and with mechanical testing to evaluate the stiffness of the final construct. While ability generally improved with the level of training (as one might expect), some residents who had good performance in Years 1 and 2 failed in Year 3, and the staff ratings correlated poorly with the radiographic and mechanical results. The authors concluded that while the program was a step in the right direction, more should be done to develop methods that result in more consistent retention of previously learned materials.

Appendix
Details regarding upcoming meetings and contact information for the two hand surgery societies are available with the online version of this article as a data supplement at jbjs.org.

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References