Surgical Management of Osteoarthritis of the Hand and Wrist

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Osteoarthritis is a highly prevalent and disabling condition of the hand in the geriatric population. It is commonly and effectively managed by surgical means. The interphalangeal joints and base of the thumb are most frequently involved, particularly in women, whereas post-traumatic osteoarthritis of the wrist is more common in men. Surgical procedures include simple debridement, soft tissue stabilization or osteotomies for milder cases. Joint arthroplasty, including excision procedures, and joint arthrodesis (fusion) are indicated for more severe arthritis. The type of procedure used depends on the location of the affected joint, patient age and physical demands placed on the hand. Surgery can effectively alleviate pain and improve hand function to improve an individual’s quality of life.

Key words: osteoarthritis, hand, arthrodesis, arthroplasty, surgery.

Introduction

Osteoarthritis in the hand is ubiquitous, being present in more than 95% of individuals over the age of 70 years. The progressive nature of osteoarthritis causes pain, deformity and loss of function. Medical management is effective in reducing symptoms and is frequently required to maintain the quality of an individual’s life. When such measures are no longer sufficient to control the progression or to keep symptoms at an acceptable level, surgical strategies should be considered. Surgical procedures range from simple debridement of osteophytes to precision joint arthroplasty or arthrodesis (joint fusion). Correctly chosen procedures are associated with a high degree of patient satisfaction.

The distal and proximal interphalangeal (DIP and PIP) joints of the fingers and the carpometacarpal (CMC) joint at the base of the thumb are the most common sites of primary osteoarthritis in the hand, especially in women. Chronic joint hypermobility may be an etiological factor in developing osteoarthritis. In the wrist, post-traumatic osteoarthritis is most common, particularly in men, and is due to old scaphoid fracture non-unions, carpal instability, or chronic ligament tears that result in abnormal wrist kinematics. Each problem carries with it a unique set of surgical solutions based on the joint(s) involved, the degree of osteoarthritis, patient age and functional demands. Although surgical limitations must be considered, consistent benefits have resulted from the continued evolution of surgical techniques and implants. This review will highlight practical surgical solutions and advances to treat the over 30 joints of the hand and wrist.

Finger Distal Interphalangeal and Thumb Interphalangeal Joints

The DIP joints of the fingers are the most common sites of osteoarthritis in the hands (Figure 1), with a slightly higher incidence in women than in men. Heberden’s nodes (osteophytes) form over time and contribute to the pain and deformity. Surgical excision of osteophytes significantly improves symptoms. Arthrodesis of the DIP joints, or the interphalangeal (IP) joint of the thumb, eliminates pain and improves the alignment and appearance of the digits (Figure 2). Since the DIP joints do not have a large range of motion, the small remaining motion present in osteoarthritic DIPs can readily be sacrificed without imposing any significant functional limitations on the hand or on the individual.

The author’s preferred method involves excision of the osteophytes and of the articular surfaces of the DIP or IP joint through a small incision, followed by fixation and compression across the joint using a Herbert screw inserted percutaneously through the tip of the finger. No bone graft is required. The final position of flexion is fixed between 0° and 10°.

Arthroplasty of these joints is not commonly recommended since it does not result in significant gains in motion, and can result in flexion deformities and instability.

Proximal Interphalangeal Joints of the Fingers

The PIP joints of the fingers are the second most common sites of osteoarthritis in the hands. These joints are vital to finger and hand function, so motion-preserving procedures are therefore favoured. Debridement of osteophytes (Bouchard’s nodes) should be considered with caution since such procedures may not improve or may even worsen stiffness or instability. For severely involved PIP joints, arthroplasty is a consideration. Traditional silicone replacements have not had sufficient strength and durability to provide long-term improvement,
particularly at the border digits (index and small fingers) that are subject to increased lateral mechanical loads. Newer designs and materials, including metal/polyethylene, ceramic and pyrocarbon prostheses, hold greater promise (Figure 3). Different sizes of prostheses and precision preparation of the bone, analogous to knee arthroplasty surgery, improves prosthetic fit and stability and are proving to have been useful advancements. Patients are pleased with the much-improved appearance of their fingers following arthroplasty and are typically impressed with their early motion (Figure 3). Immediate motion, careful splinting programs and supervision by a hand therapist are absolute requirements for a successful outcome following arthroplasty of the PIP joint.

Biological arthroplasty is an alternative consideration for the PIP joint. In these cases the dense volar plate is brought into the joint to provide a new surface for the phalanges to glide. Adequate soft tissues are required which may not be sufficient around a severely arthritic joint. Intense postoperative therapy and patient commitment are necessary, and, in my experience, final outcome in terms of motion are not as good as with prosthetic arthroplasties. Failed arthroplasties of any kind can often be replaced with new prostheses and do not necessarily require arthrodesis.

PIP joint arthrodesis is a final option to deal with a painful or unstable finger. The procedure is performed by resecting the joint and placing straight Kirschner (K) wires across the joint and a cerclage wire around it. Other forms of fixation also may be used and bone graft is not required. Fusion in positions with increasing degrees of flexion are required from the index finger (35°) to the small finger (55°). However, the limitation of motion following this procedure makes this choice a last resort. Although patients are pleased with the stability and lack of pain following the procedure, the ensuing stiff finger can interfere with common activities. A secondary extension deformity of the adjacent DIP also may occur.
Hand and Wrist Osteoarthritis

Metacarpophalangeal Joints of the Fingers

Osteoarthritis of the metacarpophalangeal (MCP) joints is uncommon. Arthroplasties as per the PIP joints are useful for maintaining good motion and reducing pain.

Metacarpophalangeal Joint of the Thumb

Chronic instability of the MCP joint of the thumb, usually due to weakness of the collateral ligament on the ulnar side of the thumb, has a high association with osteoarthritis of the joint. The changes are initially characterized by pain and a weak grip. Given the role of the thumb as a post for the fingers to work against, stability in all directions is of basic importance. Arthrodesis of the joint is a highly effective procedure that meets all treatment goals. The MCP joint is not highly mobile, particularly when arthritis is present, thus the loss of motion resulting from a fusion is not a problem. Following resection of the joint, arthrodesis is achieved with K and cerclage wires, or a screw or plate. Bone graft is not required. The final position of the joint is in $0^\circ$ or very slight degrees ($< 10^\circ$) of flexion. Hardware sometimes must be removed due to an irritative effect below the skin, but the procedure is otherwise well tolerated with predictable outcomes.

Carpometacarpal Joint at the Base of the Thumb

Osteoarthritis of the carpometacarpal (trapeziometacarpal) joint of the thumb is exceptionally common in the older population, and many variations of surgical procedures have been developed to address this problem. Ligament laxity has been proposed as an initiating factor of the osteoarthritis. Soft tissue reconstruction for stabilization can improve symptoms and slow progression of the condition. A simple closing wedge osteotomy at the base of the metacarpal is equally effective in early cases by altering the force distribution across the joint. Given the high degree of mobility of the joint, arthrodesis can be limiting and has a high non-union rate, and should therefore be reserved for individuals who place a very high functional demand on their hands.

Biological arthroplasty procedures at the carpometacarpal (CMC) joint maintain motion and reduce pain. These commonly performed procedures involve resection of all or part of the trapezium. Complete resection is technically easier than hemiresection, and is required if the adjacent scapho-trapezio-trapezoid (STT) joint is arthritic. A tendon graft (usually the flexor carpi radialis tendon) is used to stabilize the thumb metacarpal and to occupy the space resulting from the trapezection. Outcome is reliable with excellent pain relief, improved function and strength, and maintenance of the first web space, which is important for grip.

Since osteoarthritis of the CMC joint is so common, many types of prosthetic arthroplasties have been designed for this location. Silicone implants carry a risk of silicone synovitis and largely have been abandoned. Fixed implants carry a risk of loosening. Newer designs, including ceramic balls, carry promise but require adequate excision of marginal osteophytes and a sound repair of the joint capsule to maintain stability.

Figure 4. Severe osteoarthritis of the CMC joint at the base of the thumb (A) compared to a relatively uninvolved joint on the other side (B). Typical radiographic features of CMC osteoarthritis include joint space narrowing, subchondral sclerosis, subluxation of the joint and osteophyte formation. Excision of the trapezium together with a tendon graft to stabilize the metacarpal is an ideal treatment that reduces pain and maintains motion.
Carpal (Wrist) Osteoarthritis

Wrist osteoarthritis in the geriatric population is typically due to remote ligament tears or fracture non-unions that result in instability and years of abnormal wear within the carpus. Such injuries are often initially misdiagnosed as “sprains” decades prior to presentation of significant osteoarthritis. Reconstructive options can be considered if osteoarthritis is not yet established in the joints. However, once arthritis is present, salvage procedures involving partial excision of carpus (e.g., proximal row carpectomy; Figure 5) or partial intercarpal fusions utilizing bone graft and fixation (Figure 6) are required. Both types of procedures maintain approximately 50% of wrist motion. A total wrist arthrodesis from the radius to the third metacarpal is a final alternative that is useful for very high demand hand function. Wrist arthroplasty prostheses have traditionally not had a good track record. Although newer designs have many advantages, they are still not commonly used.

Summary

A spectrum of surgical procedures for osteoarthritis of the hand is available and is effective in achieving pain-free function. Treatment early on in the disease process requires relatively simple procedures that slow progression of the arthritis. Complication rates are low and all procedures are generally well tolerated by patients in the older population. As such, there are few contraindications for surgery, and most patients are successful candidates. Joint arthroplasty or arthrodesis procedures are considered to be definitive procedures in older patients. All procedures are performed by hand surgeons, and many are also performed by orthopedic or plastic surgeons who have an interest in upper extremity surgery. Most surgeries are performed on an outpatient basis utilizing regional anesthesia. Accepting osteoarthritis as a normal part of aging is no longer necessary, as surgery for osteoarthritis of the hand is highly successful in contributing to an individual’s independence and quality of life.

No competing financial interests declared.

References