

# Joint Replacements for the Arthritic Hand



by Stephen J. O'Connell, MD and Andrew Allen, PA

Sir Isaac Newton asserted, "In the absence of any other proof, the thumb alone would convince me of God's existence." Whether divine engineering or evolutionary biology, the thumb is a magnificent combination of motion and power, allowing for pinching and grasping. The thumb moves in no less than six different directions, maximizing mobility. It makes opposition possible and produces unequalled grip, torque and dexterity, making the human hand unique. An average person can generate 20 pounds per square inch of force when pinching, which translates to 240 pounds per square inch of force at the base of the thumb (12 times pinch strength). Unfortunately, there is a significant drawback to all of this strength and mobility — the increased risk of arthritis at the base of the thumb, or carpometacarpal (CMC) joint.

To allow for motion, the CMC joint is shallow and relies on ligaments, the structures that hold bone to bone, to stabilize the joint. Over time, in response to inflammation and repetitive stress, these ligaments stretch and loosen (laxity), altering the normal functional position of the thumb and allowing the CMC joint to slip and partially dislocate. This leads to joint incongruity, which can cause cartilage, the protective covering on the joint surface, to wear away. Without cartilage, the bones no longer glide over each other, thus producing painful rubbing between the surfaces. This dyad of laxity and cartilaginous loss can produce a painful, dysfunctional thumb, known as basal thumb or thumb CMC osteoarthritis (OA).

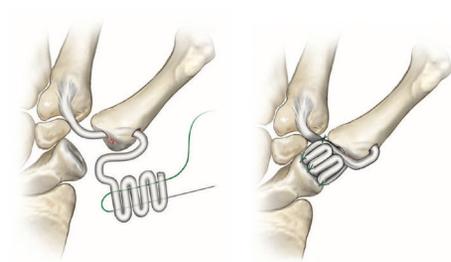
Thumb CMC OA is the most common form of OA involving the hand. It usually occurs

after the age of 40 and affects women 10 to 20 times more often than men, or one in four women compared to one in 12 men. Between the ages of 50 and 60, women and men experience symptomatic basal thumb OA at the rates of 15 percent and 7 percent, respectively. By the age of 75, 25 percent of men and 40 percent of women have X-ray findings of CMC OA involving the thumb. While thumb CMC OA is quite prevalent, it is not always symptomatic. However, when it becomes problematic, the symptoms may range from the occasional nuisance to completely intolerable and functionally limiting pain.

Symptoms of basal thumb OA include pain with activities requiring grip or pinch, often perceived as decreased strength in the thumb or hand. Swelling or a bony prominence over the base of the thumb may occur. Loss of motion and stiffness are also common. These symptoms may wax and wane, or become constant and unyielding. Evaluation by a hand surgeon is warranted at any point along the spectrum of symptoms.

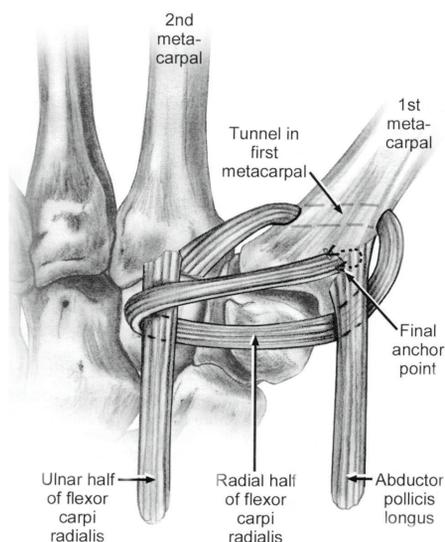
Conservative measures, such as rest, ice and modification of activities, are initial treatment modalities. Splinting and anti-inflammatories (oral, topical and injectable) are indicated for more aggressive symptomatology. When these measures fail and the individual is suffering with intolerable pain and/or loss of function, surgery may be indicated.

When surgery is necessary, a thumb CMC joint replacement or arthroplasty may be



an option. There are several variations on the theme, but the basis is the same — eliminating the painful joint and, in some cases, re-creating the stability of the joint through ligament reconstruction. One of these procedures, ligament reconstruction with tendon interposition (LRTI) arthroplasty, is a well-studied, well-tested and commonly performed surgery.

LRTI is performed in an outpatient setting in which the patient will return home after the procedure. The procedure can typically be performed under regional or general anesthesia in about 60 minutes. The surgery involves removing the trapezium, one of the bones that make up the painful CMC joint. This is done through a small incision over the base of the thumb, thus eliminating the painful contact between the bones. To address the second part of the painful dyad, ligament instability, the remaining bone of the joint (metacarpal) is stabilized. This is done via a tendon graft obtained through two small incisions in the wrist/forearm or with a man-made implant. This portion of the procedure not only restores stability to the joint but also re-creates the normal position of function for the thumb.



After surgery, a period of immobilization is necessary using a cast and/or splint. Hand therapy is also part of the rehabilitation process and is customized to the individual and his or her particular procedure. Therapy is focused on regaining motion, improving strength and restoring function. Regular postoperative visits with the surgeon are scheduled to assess progress and ensure an optimal outcome. The vast majority of patients resume their normal activities approximately three to four months after the surgery.

While not as commonly symptomatic, the CMC and the proximal and distal interphalangeal (PIP, DIP) joints of the remaining four digits are also susceptible to arthritis. The "knuckles," as they are often referred to, are under similar forces, which precipitate arthritic changes. Furthermore, recent or remote trauma to the joint may also contribute to arthritic pain. Swelling, stiffness, pain and loss of motion are typical symptoms.

Nonsurgical treatment options for these joints are similar to those for thumb arthritis, with modification of activities and anti-inflammatories as mainstays.

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When these modalities fail, surgery may be indicated, and a joint replacement may be an option. These joints, made out of PyroCarbon, a material similar in strength and elasticity to bone, resemble the natural joint shape and contour, preserving motion and reducing pain. These implants are inserted through a small incision over the affected joint. The damaged joint is removed, and the implants are inserted in its place. This surgery, routinely done in under an hour, is also done as an outpatient

procedure under regional or general anesthesia. Splinting and hand therapy follow the procedure, with close supervision by a certified hand therapist. Comprehensive follow-ups with the surgeon throughout the rehabilitation process maximize the outcome.

The human hand is a remarkable structure, capable of producing the finest, most delicate movements or generating the greatest of force, allowing for infinite activities. Regardless of the endeavor, the joints of the human hand are exponentially susceptible to wear and tear, and thus arthritis. It is important to note that not all patients with arthritis are symptomatic, and not all those individuals who are symptomatic will require surgery. However, early diagnosis and treatment in those experiencing symptoms may preserve function and relieve pain. The majority of patients can be treated with nonsurgical modalities. In cases where these treatment options fail and intolerable pain and loss of function persist, joint replacement procedures are available to relieve pain and restore function. ■



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