

# Review of thumb carpometacarpal arthritis classification, treatment and outcomes

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Thumb carpometacarpal osteoarthritis (CMC OA) is a common disease, affecting up to 11% and 33% of men and women in their 50s and 60s, respectively, which leads to pain, laxity and weakness of the CMC joint. Based on the staging of the CMC OA, different forms of treatment can be used, including both conservative and surgical measures. Surgical options include osteotomy, trapezium excision, ligament reconstruction with or without tendon interposition, and various prosthetic interpositional implants with or without trapezium excision. The present article reviews the staging of CMC OA, the evaluation of hand function using patient-reported questionnaires, and outcomes of both conservative and surgical treatments. The present review also introduces a commercially available interpositional spacer surgical technique for CMC OA and the early evidence that the literature has shown for improving hand function, strength and stability of the thumb CMC joint postoperatively.

**Key Words:** *Artelon; Carpometacarpal joint; Interpositional spacer; Ligament reconstruction; Osteoarthritis*

The thumb carpometacarpal (CMC) joint, a biconcave-convex saddle joint, consists of the articulation between the first metacarpal of the thumb and the trapezium carpal bone. Other significant articulations of the trapezium bone are the scaphoid and trapezoid carpal bones and the second metacarpal bone. Because the CMC joint lacks bony confinement, there are various ligaments that play a role in stabilizing it; however, the most important is the anterior oblique (also known as 'beak'), ligament. One of the main contributors to osteoarthritis (OA) of the CMC joint is laxity of this ligament, which leads to increased stress loads on the CMC joint, causing cartilage loss, bony impingement and pain. The treatment of CMC OA is aimed at relieving this pain and restoring joint stability (1,2). The arthritic CMC joint cartilage loses glycosaminoglycan from the extracellular matrix, which causes progression of the disease (1). The structure of the CMC joint enables three different planes of motion: adduction-abduction, flexion-extension and axial rotation. This property of the joint has contributed to the fact that CMC OA is the second most common degenerative joint disease of the hand. It typically affects postmenopausal women in their fifth to sixth decade of life, where it has been estimated that between 17% and 33% of these women have evidence of CMC OA, compared with 5% to 11% of men of similar age (1,3). This is possibly due to a hormonal predisposition for OA in women (4).

## CLASSIFICATION OF CMC OA

Classification of OA of the CMC joint can be achieved using radiographs or arthroscopy. Eaton et al (5) have described radiographic stages I to IV of OA of the CMC joint. Eaton stage I has normal articular cartilage with possible joint widening due to effusion and laxity of the beak ligament. Eaton stage II has narrowing of the joint space, with debris and osteophytes smaller than 2 mm in size, and more than one-third subluxation of the metacarpal. Eaton stage III exhibits more severe joint narrowing, with osteophytes and debris greater than

## L'analyse bibliographique de la classification, du traitement et des issues de l'arthrite carpométacarpienne

L'arthrose carpométacarpienne (A-CMC) du pouce est une maladie courante, qui touche de 11 % à 33 % des hommes et des femmes dans la cinquantaine et la soixantaine, respectivement, et qui entraîne de la douleur, une laxité et une faiblesse de l'articulation CMC. Selon l'évolution de l'A-CMC, on peut utiliser diverses formes de traitement, y compris des mesures classiques et chirurgicales. Les possibilités chirurgicales incluent l'ostéotomie, l'excision du trapèze, la reconstruction ligamentaire avec ou sans interposition du tendon et divers implants interpositionnels prothétiques. Le présent article expose l'évolution de l'A-CMC, l'évaluation de la fonction de la main au moyen de questionnaires déclarés par les patients et les issues des traitements classiques et chirurgicaux. La présente analyse expose également une technique chirurgicale d'espacement interpositionnel de l'A-CMC offerte sur le marché, et les données probantes prometteuses publiées ont révélé une amélioration de la fonction de la main, de la force et de la stabilité de l'articulation CMC du pouce après l'opération.

2 mm in size. Eaton stage IV begins when there is involvement of the scaphotrapezium joint (1,4). Badia (4) described arthroscopic stages I to III of the arthritic CMC joint. He believes that arthroscopic evaluation of the joint enables earlier detection of arthritic changes than can be achieved with radiographic analysis. The earlier detection of joint pathology of the articular surfaces enables treatment of earlier stages of CMC OA (4).

## DETERMINATION OF HAND FUNCTION

Hand function is determined both through patient-reported questionnaires and physical measurements. Physical measurements important for CMC joint function are range of motion (ROM), and grip and pinch (tripod and key) strength and dexterity, which can be assessed using the NK Hand Assessment System and instruments such as the dynamometer and pinch gauges (6). These are objective measures of hand function that can be compared with population values; therefore, the data are reliable and valid (6,7). These measures enable objective comparison of hand function when comparing two different surgical techniques for a disease such as OA. There are many patient-reported questionnaires, some of which deal with general health and general limb function, and some that can be as specific as a disease of a region. These questionnaires can be used to determine patient satisfaction with a procedure outcome and their choice of the procedure, and their return to activities of daily life. Questionnaires help determine health-related quality of life of a patient, which objective measures fail to address (7). They acknowledge that a patient's view and perception about their procedure outcome can be helpful for future patients in deciding which treatment to choose. The hand-related outcomes addressed are a patient's time to return to work, activities of daily living and pain control (8). The Disabilities of the Arm and Shoulder (DASH), and Michigan Hand Questionnaire are the most common patient-reported questionnaires in the United States for determination of hand surgery outcomes, and have been found to be equally responsive to clinical conditions (8).

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Macdermid et al (6) reviewed the validity of patient-reported questionnaires specifically for OA of the CMC joint. A cross-sectional study of 121 patients who had undergone CMC joint surgery for OA was performed, in which physical assessments were performed, along with the Australian/Canadian Osteoarthritis Hand Index (AUSCAN), DASH, Short-Form 36 and Patient-Rated Wrist Hand Evaluation (PRWHE). They concluded that the AUSCAN, PRWHE and DASH have similar evaluation criteria for OA of the CMC joint. They found that the pain and functional subscales demonstrated a high correlation within the questionnaires, and the AUSCAN and DASH showed a better ability to measure impairment. Unlike the DASH, the AUSCAN questionnaire has a subscale specific for pain and could, therefore, be better in assessing OA. The AUSCAN has also been used more widely in OA, enabling more data comparison (6). The AUSCAN and the DASH were able to discriminate between individuals with CMC OA and those with involvements of other joints of the hand, whereas the PRWHE could not.

Bellamy et al (9) examined the reliability, validity and responsiveness of the AUSCAN questionnaire. Because the AUSCAN consists of 15 items concerning pain, stiffness and physical function, they assessed each of these three properties. They assessed 50 patients with OA of the hand at one-week intervals to determine test-retest reliability and internal consistency, in which validity was tested by comparing to the quantitative measurements of grip and pinch strength and other questionnaires. The AUSCAN showed high internal consistency, establishing reliability (or the absence of random errors of the test), with Cronbach values greater than 0.80. Using a washout treatment model, they showed the AUSCAN to also have validity and responsiveness. This means that the AUSCAN is appropriate for evaluating treatments of CMC OA because it is disease-specific and would be more responsive than a generic questionnaire (9,10).

## TREATMENT OF CMC OA

### Conservative measures

Many conservative measures are available to treat OA of the CMC joint, and are usually most effective for a patient with Eaton stage I disease. Compensation from other joints to avoid use of the CMC joint (activity modification), or using splints, slings, nonsteroidal anti-inflammatory drugs and cortisol injections are all examples of conservative treatment. Day et al (11) investigated intra-articular steroid injections of the CMC joint in 30 thumbs in a prospective analysis, and found that at 18 months, 80% of Eaton stage I patients experienced pain relief. However, this was not true for patients with worse stage CMC arthritis, in which only 25% of stage IV patients experienced pain relief. Cortisol injections may be helpful for earlier stage thumb CMC arthritis; however, additional injections can lead to weakening of the joint, so caution should be used when prescribing this treatment (1).

### Surgical treatments

There are many surgical techniques available to treat OA of the CMC joint when conservative measures have failed or have produced unsatisfactory results. These therapies are used primarily in patients with Eaton stage II to IV OA of the thumb CMC joint. Options include osteotomy, trapezial excision, ligament reconstruction with or without tendon interposition, and various prosthetic interpositional implants with or without trapezial excision. An osteotomy is a procedure in which the bone is shaved to change the structure of the joint. It places the thumb in a more extended and abducted position, to reduce the chance of subluxation, and it changes the contact points between the metacarpal and trapezium where cartilage is worn out (4). Badia (4) performed a retrospective assessment of 43 Badia stage II CMC OA patients who received extension-abduction closing wedge osteotomies at a mean follow-up of 43 months. He found the average pinch strength to be 73% of their nonaffected hand, and 37 of his patients to be pain free. This procedure is only useful in patients who have not experienced complete articular cartilage loss, with cartilage wear restricted to the volar surface, and is more useful in younger active patients (1).

**Implants:** Implants that have been used previously in the treatment of CMC OA include silicone trapezial implants, Gore-Tex (WL Gore and Associates, USA) (polytetrafluoroethylene) and GraftJacket (LifeCell, USA) interpositional material. Silicone implants were promising initially, relieving pain and improving function while maintaining thumb length. However, long-term results revealed subluxation, implant wear, bony cysts, silicone synovitis and adjacent bony erosion (12-16). It has been shown that 25% of silicone implant cases result in instability and subluxation, with a subsequent high rate of revision. Creighton et al (17) observed 151 silicone trapezial arthroplasties and reported a 56% incidence of scaphoid cysts. In addition, 74% of patients showed intramedullary radiolucency of the first metacarpal, suggesting silicone synovitis (12,13). A review of 32 silicone implant arthroplasties at four years postoperatively by Pellegrini and Burton (18) revealed 50% loss of implant height and 35% subluxation, leading to revision surgery in 16% of patients. However, 75% of the patients still reported satisfaction with their outcome (16).

Gore-Tex interpositional material has also met with poor results. Greenberg et al (19) observed 31 patients with 34 Gore-Tex implants after approximately 41 months. Their study showed an 80% incidence of osteolytic changes around the implants, suggesting reactant particulate synovitis. Thus, Gore-Tex has fallen out of favour for use as an interpositional material (14,16). GraftJacket – an acellular dermal allograft – is another interpositional material that has had some success. It is composed of donated cadaver tissue from which the cellular components have been removed while retaining the collagen scaffold. This is performed to reduce the immunoreactions to the interpositional material, while retaining its structural integrity. Kokkalis et al (20) performed a retrospective evaluation of the acellular dermal allograft interpositional material in 82 thumbs with CMC OA for a mean follow-up period of 30 months, with a minimal follow-up of 12 months. They found 80 of the thumbs to have pain relief and 66 thumbs could touch the base of the small finger with the tip of the thumb. Grip and key pinch strength improved 16% and 19%, respectively – a 3.6 kg and 0.9 kg increase, respectively. There were no signs of osteolysis or cyst formation, suggesting no foreign body reaction to the allograft tissue. There was a 31% loss of thumb height; however, there was no impingement of the thumb metacarpal against the scaphoid (20).

The Artelon spacer (Artimplant AB, Sweden) is composed of a biodegradable synthetic material, polycaprolactone-based polyurethane urea, that has been shown in vitro and in vivo to promote dermal tissue growth and regeneration. It is a T-shaped woven textile device made from Artelon fibres, with a dry weight of 0.3 g (21). It is used to resurface the trapezial side adjacent to the first metacarpal and to stabilize the CMC joint by augmenting the joint capsule (14). This biodegradable material is used because degradation of the Artelon, which takes six years, promotes ingrowth of collagen-producing fibroblasts (22). Huss et al (22) performed in vitro studies showing that the Artelon material was able to provide a scaffolding for human fibroblasts to proliferate on and within. They showed in vivo that after eight weeks, all of the Artelon scaffolds implanted into their patients were filled with fibroblasts and endothelial cells. Thus, the spacer acts to prevent bony impingement through interposition of the CMC joint and also provides a scaffold for autologous tissue regeneration (22).

The Artelon spacer has been shown to be biocompatible, with no chronic inflammation, cellular granulomas or osteolysis produced, as there was with silicone and Gore-Tex implants. The material has excellent mechanical properties and blood compatibility (23). As the Artelon spacer degrades, it is still able to provide mechanical strength to prevent failure of the implant because it retains 50% of its strength for more than nine months at body temperature. Its biocompatibility can also be attributed to the structure of the Artelon material because it is woven in a wet-spinning procedure that does not allow additives. In animal models, bone formation was seen around the Artelon implant, with connective tissue ingrowth that formed collagen fibres at six-months follow-up. These findings were consistent in human models in which neocollagenesis and angiogenesis occurred within the Artelon implant (22,23).

There has only been one report of any reaction associated with the Artelon spacer procedure (24). The patient received the Artelon implant and, six weeks postoperatively, was pain free with no tenderness. At 10 weeks, physical examination revealed minimal erythema and warmth at the thumb base, which improved at 12 weeks postoperatively. Computed tomography scans failed to show osteolysis or deep collections. Due to the patient's pain, the Artelon and screws were removed and a complete trapeziectomy was performed. Biopsies revealed acute and chronic inflammatory synovitis, with no infection. Four months later, the patient presented again with pain and swelling in the same area. An aspiration, debridement and synovectomy were performed at that point and again at six months due to incomplete resolution of the symptoms. Biopsies at this time, again, showed chronic inflammatory synovitis, with no evidence of infection. However, there was no evidence of any foreign body particles or fragments of the Artelon material in the biopsies, and her condition persisted even after two separate synovectomies. Diao (25) commented on this particular case, saying that the complications could have arisen due to penetration of the articular surface by an over-tightened thumb metacarpal screw. He described the screw heads to be recessed into the subchondral bone and the Artelon implant, which could have led to instability. He also provided anecdotal evidence supporting the Artelon prosthesis, reporting that he has achieved good results with 50 of his patients and has now replaced the abductor pollicis longus (APL) suspensionplasty with the Artelon spacer for treating CMC OA.

The Artelon spacer prevents impingement between the trapezium and metacarpal bones. This technique enables preservation of most of the trapezium and stabilizes the joint by adding an interpositional material of synthetic fibres that promotes tissue growth and regeneration (13,21).

Because this is a new technique we will describe the surgical approach in detail. The hand is prepared as it would be for any surgery, while the Artelon CMC spacer is soaked in sterile 0.9% saline at room temperature for at least 5 min. An open surgery is used more frequently in patients with significant trapezium subluxation because the wings of the Artelon implant are used to stabilize the CMC joint (13). The procedure is performed under a regional block anaesthesia. The CMC joint is opened with a curved dorsal incision, and a periosteal flap is dissected from the trapezium bone, including the joint capsule. Care is used to identify and protect the radial artery and surrounding nerves. The flap is extended distally until it is 1 cm to 2 cm in length. The distal joint surface of the trapezium and 1 mm to 2 mm of subchondral bone is removed with an oscillating saw or osteotome from the surface that articulates with the first metacarpal. The surface of the metacarpal is left intact at this time. Osteophytes are removed from the joint and the positions of the Artelon wings are marked on the dorsal cortex of the trapezium and metacarpal bones. The cortical bone in the area marked for the wings (the dorsal surface of the trapezium and proximal metacarpal) is flattened with a burr to create a bleeding surface that will come into contact with the Artelon spacer. The subchondral bone is resected, and the cortical bone flattened because it is important to create a bleeding surface on the trapezium bone to allow influx of tissue growth factors that will mediate the regeneration of tissue (14,21).

The presoaked spacer is positioned into the joint with the vertical portion between the resected trapezium and metacarpal. The horizontal portion, or wings, are used to fixate the spacer and are positioned over the previously outlined areas. A sharp drill is used to bore a pilot hole through the wing over the trapezium, ensuring penetration of the volar cortical bone. The depth of the pilot hole is quantified to ensure proper screw length, and a self-tapping titanium screw is tightened into the hole. Alternatively, a suture anchor may be used. The thumb is fixed dorsally, aligning the dorsal surface of the trapezium and metacarpal bones, and the wing over the metacarpal bone is attached in the same fashion as the trapezium wing. The periosteal flap and skin is then closed and sutured. After fixation, the joint is immobilized in 10° flexion and 30° palmar and radial abduction with a thumb spica cast.

After two to three weeks, the sutures are removed and the cast is exchanged for one that immobilizes the thumb CMC joint, but not the interphalangeal joint, for the following two to three weeks (21).

Arthroscopic surgery is used in the absence of extreme subluxation of the CMC joint. This method allows the CMC joint capsule to remain intact, maintaining joint stability, and is minimally invasive, leading to shorter postoperative recovery times (13). Badia (13) has reported favourable results with the arthroscopic Artelon procedure. Of his 12 patients and 13 thumbs with Eaton stage III arthritis that received the Artelon implant, all showed marked pain relief. All of his patients also showed increased pinch strength over time, and follow-up x-rays revealed a narrow space in CMC joint that was not present preoperatively, showing an increase in joint space and, thus, less bone contact. However, this was a surgical technique article that only stated these outcomes without objective data. The author did not include any design or protocol for this study.

Nilsson et al (14) compared the Artelon surgery with tendon arthroplasty for the CMC joint after a follow-up period of three years. Due to proximal migration of the first metacarpal and associated weak lateral pinch that can occur with tendon arthroplasty, they investigated Artelon interposition for the CMC joint as a more optimal technique. An open, controlled, prospective pilot study was performed, in which the control group patients received trapezium excision with APL tendon interposition. Fifteen patients with Eaton stage III OA, who experienced disabling pain for at least two years and conservative treatment failure, were included. The Artelon procedure was performed as an open surgery, with five patients receiving osteosutures and five receiving titanium screws to secure the CMC implant. All patients reported major pain relief, with no difference between the two groups. Within the Artelon group, their key pinch, tripod pinch and transverse volar grip strength all increased compared with preoperative values, while the APL group did not improve postoperatively. The Artelon group was significantly stronger in key and tripod pinch compared with the APL group, as recorded by an independent observer (14). There were no other significant differences reported. Histology of biopsies taken from the Artelon procedure showed bone in close contact to the fibres, with tissue ingrowth into the woven structure and no chronic inflammatory cells or any foreign body response. The Artelon group had a faster recovery, allowing them to return to normal activities. The authors also noted that the Artelon procedure is not as invasive, because the trapezium is not excised, allowing for more invasive surgery, later, if needed. This article reported favourable results for Artelon; however, there was a conflict of interest because this study was funded by Artimplant AB, Sweden. This is the company that makes the Artelon interpositional spacers and the results reported by Nilsson et al may have been affected by the benefits received by this commercial party.

**Ligament reconstruction tendon interposition:** The ligament reconstruction tendon interposition (LRTI) procedure varies based on which ligament is used and whether the trapezium is completely excised. It is usually performed on patients with mild to moderate CMC arthritis, and is generally considered the gold standard against which newer procedures are judged (2,26). Regardless, it has three principles as described by Tomaino et al (27): removal of the abnormal bony surface through either partial or complete trapezium excision; reconstruction of the ligament to stabilize the joint; and interposition of a substance to reduce axial shortening of the metacarpal and to prevent bony impingement (1,28,29). The flexor carpi radialis (FCR) ligament is more commonly used to reinforce the lax deep anterior oblique ligament. The radial half of the FCR is used, leaving the tendinous insertion on the base of the second metacarpal (1,2). There have been favourable results using the LRTI procedure, shown both short and long term. Lins et al (30) assessed 30 thumbs with CMC arthritis that received the LRTI at a mean follow-up of 3.5 years. They reported pain relief in 89% of the patients, with a 50% and 43% improvement in grip and key pinch strength, respectively. They also revealed a 33% decrease of the trapezium height ratio compared with

preoperative values (1,30). Yang and Weiland (31) assessed 15 thumbs after LRTI with a mean follow-up period of 32 months and revealed a 17% increase in grip, key pinch and tip-to-tip strength. They also showed a 21% decrease in height of the first metacarpal, rising to a 32% decrease under the stress of a forceful pinch. This suggested instability at the metacarpal base. They also reported reduced ROM, in which 33% of patients could not touch the base of the small finger with the tip of his or her thumb (31,32). A retrospective review of eight patients with early CMC OA, 55 years of age or younger, who received tendon arthroplasty and trapeziectomy, was performed by Wollstein et al (33). There were no significant differences between the operated and nonoperated hands at a mean follow-up of 86 months, except for significantly reduced flexion in the metacarpophalangeal joint. This study's weakness was its small sample size, but they were able to show a significant increase in strength from the short-term follow-up (six weeks) to the long-term follow-up (33). Kriegs-Au et al (2) performed a randomized trial of 43 patients comparing ligament reconstruction with or without tendon interposition after a mean follow-up period of 48.2 months. They found there to be significantly better palmar and radial abduction in the group without the added interposition, with no other significant differences. However, it is unclear whether these values increased compared with preoperative scores because these data were not reported; the authors included only a between-group comparison. Both groups demonstrated height loss: 32% and 42% with and without tendon interposition, respectively. The risks associated with the LRTI method include injury to the FCR tendon because it lies underneath the ulnar aspect of the trapezium. Inadequate tension on the FCR tendon during reconstruction can cause the tendon to slip and cause pain, while excessive tension can lead to impingement of the first metacarpal with surrounding bones (2).

Saehle et al (34) investigated APL tendon interposition instead of the FCR because it negates the need for K-wire fixation and allows shorter immobilization. They performed a retrospective study of 47 patients at a mean follow-up of 41 months and found excellent pain relief in 81%, but with less mobility in the operated hand compared with the unoperated. They also found key pinch and grip strengths to be 22% and 11% less than the unoperated side, respectively. Compared with the FCR procedure they have also reported on, Saehle et al found that fewer of the APL tendon arthroplasty patients reported resumption of their activities of daily living at follow-up, but they demonstrated somewhat better mobility and strength (34).

Although interposition is performed in an attempt to prevent subluxation, it has been suggested that the LRTI procedure may not maintain trapezial height and, thus, not fully restore thumb strength. The maintenance of thumb height has been correlated to key or lateral pinch strength, showing the importance of reducing axial shortening (29). The loss of thumb height can also lead to scaphoid impingement, causing degenerative problems on its distal border (1). Studies have shown 27% to 33% loss of the trapezial space ratio compared with presurgical values when using the LRTI technique (28). Thus, Mo and Gelberman (28) assessed the technique of ligament reconstruction while retaining the trapezium to maintain metacarpal height. They performed the surgery on 16 patients with stage III or IV CMC OA and followed up at an average of 20 months. They revealed no significant change of the trapezial height ratio and a significant (26%) improvement in grip strength. However, pinch strength and ROM did not increase significantly (28). De Smet et al (35) performed a prospective study of 56 patients comparing trapeziectomy and the LRTI technique. They found no significant difference in outcomes other than the LRTI technique had less thumb migration, showing 32% loss of height compared with preoperative values (35).

One of the first surgical therapies used to treat CMC OA was complete excision of the trapezium, ie, trapeziectomy. The problem with this was a loss of thumb length and subsequent loss of pinch strength. There were problems with grip strength at follow-up evaluation, and postoperative weakness was also reported in a study of 26 patients

(32). There is also reported reduction in pinch strength compared with preoperative values, but with pain relief after two years (3). However, the instability of the procedure has also led to concerns regarding long-term pain relief (1). Thus, the procedure was modified by fixing the first metacarpal, in a distracted position, to the index metacarpal with a K-wire for four to five weeks. This is referred to as a hematoma-distraction arthroplasty, which is beginning to gain popularity due to its simplicity and favourable outcomes (3,29). The distraction allows scar and fibrosis formation within the joint space, which acts as interpositional material, and prevents thumb shortening by securing the metacarpal base. The hematoma is formed through the inflammatory response to the surgery, which is aided by capsular tears and injury. Mahoney and Meals (36) suggest removal of the trapezium in a piecemeal fashion to promote additional capsular injury, furthering the inflammatory response and aiding in scar formation to stabilize the first metacarpal.

Gray and Meals (37) performed a prospective study of 26 patients with Eaton stage I to IV CMC OA at a mean follow-up of 25 months, and a further follow-up at a mean of 88 months with 22 of the patients. At the 88 month follow-up, 18 of the patients reported pain relief, and grip and tip pinch strength had increased significantly. The article cites Tomaino et al (27), in which a mean follow-up period of nine years after LRTI was performed on 24 thumbs. Gray and Meals claimed that the hematoma procedure had a greater absolute increase in strength after a follow-up period of six-years (37). However, the patients demonstrated a 22%, 13% and 22% increase in grip strength, key pinch and tip pinch, respectively, compared with preoperative values. Tomaino et al reported 93%, 34% and 65% increase in grip strength, key pinch and tip pinch, respectively, when compared with preoperative values at nine years, with the increase of key pinch not being significant (27). Tomaino et al also reported an average subluxation of 11% and an average decrease in arthroplasty height of 13% after nine years (27).

Kuhns et al (32) performed a prospective study of hematoma and distraction arthroplasty on 26 patients with peritrapezial arthritis. The follow-up period (24 months) was shorter than that of Gray and Meals, but revealed 92% of patients to be pain free, with two patients complaining of weakness. There was also a 47%, 33% and 23% increase in grip, key pinch and tip pinch strength, respectively, compared with preoperative values. There was a 47% decrease in scaphoid-first metacarpal distance at six months, and a 51% decrease at 24 months, compared with preoperative values, thus showing a greater migration with longer follow-up (32).

In an attempt to maintain a better foundation of the first metacarpal, a hemitrapeziectomy can be performed to keep the proximal portions of the trapezium as an osseous base, hopefully reducing thumb subsidence. Hofmeister et al (38) performed a retrospective study of 18 patients with CMC OA who received an arthroscopic distal hemitrapeziectomy along with a pancapsular thermal shrinkage at a mean of 7.6 years follow-up. They found that ROM decreased 20% and grip strength did not change. However, key pinch and tip pinch improved significantly – 3 lb and 1 lb, respectively (38).

## OUTCOMES

The fact that there are so many options is a testament to the variation in opinion on which surgery should be used to treat thumb CMC OA. This is due to varying success of the surgeries and the outcomes reported in the literature. The Artelon procedure has shown favourable results in the literature; however, there are only a total of six articles on this topic. Only two of these papers are groups that have investigated the outcomes of the surgery, with only one group performing a comparative study. The other four articles deal with biomechanics, composition and surgical techniques of the Artelon spacer. The Artelon spacer has been shown to be biocompatible, unlike the silicone and Gore-Tex interpositional materials. This means it does not have the side effects of synovitis and osteolysis that other interpositional materials may encounter, and could be a very useful

interpositional material. The outcomes reported in the literature for the Artelon procedure seem to be better than tendon arthroplasty using the APL tendon. The Artelon patient's key pinch, tripod pinch and transverse volar grip strength all increased compared with preoperative values. The procedure has only been compared with the LRTI procedure with the APL tendon by Nilsson et al (14). However, the Nilsson study, the only one to report comparative data and objective measures for the Artelon, was funded by the company that produces the Artelon implant. Thus, it is important to collect more information on the Artelon procedure to provide an unbiased assessment of the Artelon treatment for thumb CMC OA. Given the results of Saehle et al (34) compared with the LRTI with FCR tendon as performed by Tomaino et al (27), one could conclude it would be useful to compare Artelon versus the latter

because it seems to yield better outcomes. Other surgeries, such as the hematoma-distraction arthroplasty, have been favourable, but are still plagued with the first metacarpal shortening, as was reported by Kuhns et al (32).

## CONCLUSIONS

OA of the CMC joint is a debilitating disease that affects up to 33% of postmenopausal women. It has significant effects on the stability of the CMC joint and causes pain while reducing capacity to perform activities of daily living. There are many surgical options available and any approach must be tailored to the individual patient's needs and their stage of disease. Newer techniques such as the Artelon implant, although promising, must be subjected to rigorous scientific study before being widely accepted.

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