9 Arthritis of the Carpometacarpal Joint

Seok-Whan Song and Joo-Yup Lee

Introduction

Osteoarthritis of the carpometacarpal (CMC) joint of the thumb is one of the most common symptomatic conditions of the hand. The prevalence of thumb CMC arthritis has been reported up to 15% of women and 7% of men in the middle years of life [1]. The wide range of motion contributes to the high prevalence of thumb CMC arthritis [2]. The condition may be acquired due to various underlying medical conditions, chronic trauma, advancing age, hormonal factors, and genetic influences [3]. Occupational factors are also believed to have a role in the development of thumb CMC arthritis [4].

This review will briefly introduce the pathophysiology and clinical features of the CMC arthritis and will discuss the possible surgical options including ligament reconstruction, extension osteotomy, simple trapeziectomy, interposition arthroplasty, trapezium excision and ligament reconstruction procedures, arthrodesis, and prosthetic arthroplasty. Clinical outcomes after different surgical procedures are also presented.

S.-W. Song
Department of Orthopedic Surgery,
Yeouido St. Mary's Hospital, The Catholic University of Korea, Seoul, South Korea
e-mail: sw.song@catholic.ac.kr

J.-Y. Lee (✉)
Department of Orthopedic Surgery,
St. Paul's Hospital, The Catholic University of Korea,
Seoul, South Korea

Pathophysiology

The CMC joint of the thumb is a biconcave-convex or reciprocal saddle joint with inherent instability. Because of the lack of bony stability, the stability of the joint is dependent on ligamentous structures. Although there is an association between CMC joint instability and the subsequent development of arthritic changes, there is no consensus on which ligament is primarily responsible for the joint stability. There are four primary ligamentous stabilizers in the CMC joint of the thumb: the anterior oblique ligament, the dorsoradial ligament, the intermetacarpal ligament, and the posterior oblique ligament. The primary stabilizer of the thumb CMC joint is the deep anterior oblique ligament. Eaton reported that the anterior oblique or volar beak ligament, which originated from the palmar tubercle of the trapezium and inserting to the volar aspect of the first metacarpal, is the primary restraint to dorsoradial subluxation [5]. This theory is supported by anatomic studies showing a direct correlation between the degeneration of the carpometacarpal articular surface and the integrity of the beak ligament.

Dorsoradial ligament is another important structure to contribute the thumb CMC joint stability. Strauch and colleagues performed serial sectioning of the ligaments of the CMC joint and showed that the primary restraint to dorsal dislocation was the dorsoradial ligament that connects the dorsal and radial aspect of the trapezium to

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the dorsum of the metacarpal base [6]. The intermetacarpal ligament, which originated from the dorsoradial aspect of the index metacarpal and inserting to the ulnar aspect of the first metacarpal, was determined to be the primary stabilizer to dorsal and radial subluxation according to Pagalidis and colleagues [7]. The posterior oblique ligament, which originated from the dorso-ulnar aspect of the trapezium and inserting on the palmar-ulnar aspect of the first metacarpal base, was the primary stabilizer according to Harvey and Bye [8].

Osteoarthritis of the thumb CMC joint occurs in a predictable pattern. High compressive and shear forces occur across the thumb CMC joint during pinch motion. Eaton and Littler observed that the dorsoradial facet of the CMC joint was the first site of articular wear. Subsequent study by Pellegrini et al. showed that arthritic changes usually occurred in the palmar compartment, and the area of cartilage eburnation corresponds to the primary loading area during lateral pinch [9]. Pellegrini concluded that the degeneration of the anterior oblique ligament results in dorsal translation of the metacarpal during lateral pinch motion. The beak ligament is the focus of many procedures designed to stabilize the thumb especially in the pronated position.

Clinical and Radiologic Findings

Clinical symptoms and signs of the arthritis of thumb CMC joint are variable according to the stages of the disease. From the vague pain and discomfort to the frank swelling and instability, the level of derangements of the anatomical structures and biomechanics of thumb CMC joint determines the clinical and radiologic findings. Usually the symptoms start with vague discomfort at the CMC joint and often aggravated with powerful pinch and grasp. It is possible to identify the maximum tender point on the radial side of thumb basal joint. However, sometimes the patient cannot locate the tender point at the joint and describes as the pain of whole or part of the thumb. With the advancement of the arthritis, physical examination reveals swelling around the joint, tenderness at the joint, sometimes pain radiating to the radial aspect of the forearm, and decreased pinch power. Crepitus over the joint can be felt, and the grind test is positive when it causes pain and/or crepitus at the joint [10].

Finally, if the stabilizing ligaments, especially anterior oblique and/or dorsoradial ligaments, were attenuated, instability of the joint is established with dorsoradial protrusion of the base of the first metacarpal bone. The subluxation can be described as dynamic or fixed. In dynamic subluxation stage, i.e., an active instability stage, the CMC joint subluxes and reduces during active pinch and release. However, when the arthritis progresses, narrowing of the joint space and development of osteophytes decrease and prevent the subluxation of joint and result to fixed deformity as adducted position of the CMC joint and/or hyperextended metacarpophalangeal joint of the thumb [11].

Radiographic examination includes anterior-posterior (AP), lateral, semi (45°)-pronated, and semi-supinated oblique views. Hyperpronated Robert view and oblique stress view (Fig. 9.1) are also helpful to view the joint space clearly [12]. In general MRI or CT examinations are not needed in preparation of an operation. However if there is a severe deformity of the joint, CT

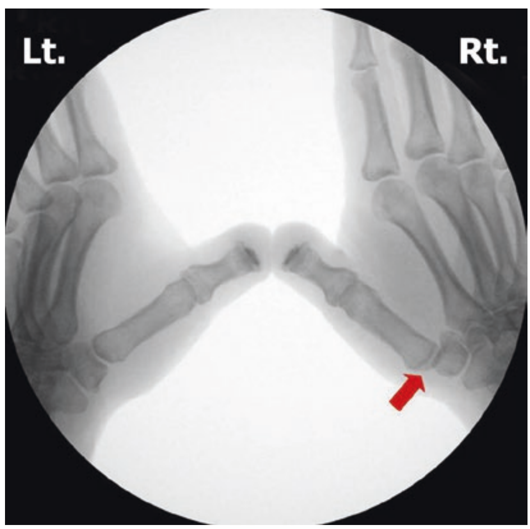

Fig. 9.1 Posteroanterior oblique stress view of the thumb showing subluxation of the right thumb carpometacarpal joint (arrow)

examination can be used to plan a more detailed operative preparation [13] and MRI examination for the detection of soft tissue pathology [14].

Burton classified the carpometacarpal joint arthritis into a four-stage system, based on clinical signs, symptoms, and radiographic findings (Table 9.1). Stage I involves early degeneration of the joint characterized by pain, ligamentous laxity, and a dorsoradial subluxation. Stage II demonstrates increased instability, chronic subluxation, and degenerative changes in radiographs. Stage III is a further progression of the degeneration to involve the scaphotrapezial joint or trapeziotrapezoid or carpometacarpal joint of the index finger. Stage IV is either stage II or III with metacarpophalangeal joint changes [15].

Eaton and Littler introduced a classification system for staging the severity of CMC joint arthritis in 1973, and Eaton and Glickel adapted this to include degenerative changes to the scaphotrapezial joint in 1987 (Table 9.2) [16, 17]. The Eaton classification remains the most common system employed to determine the stage of the disease. Although this is the most useful staging system clinically, it relies on radiographic changes only without the patient's subjective and objective findings.

Table 9.1 Burton classification for thumb carpometacarpal arthritis

Staging	Description
I	Pain, ligamentous laxity, slight subluxation
II	Instability, chronic subluxation, radiographic degenerative changes
III	Involvement of the scaphotrapezial joint
IV	Stage II or III with the metacarpophalangeal joint arthritis

Table 9.2 Eaton classification system for thumb carpometacarpal arthritis

Staging	Description
I	Normal joint or slight widening as a result of coexisting synovitis
II	Joint narrowing due to cartilage wear and osteophytes < 2 mm
III	Joint narrowing and osteophytes > 2 mm, sclerosis, and cystic changes
IV	Scaphotrapezial involvement with advanced carpometacarpal arthritis

Table 9.3 Arthroscopic classification system suggested by Badia

Staging	Description
I	Intact articular cartilage, disruption of the dorsoradial ligament and diffuse synovial hypertrophy, inconsistent attenuation of the anterior oblique ligament
II	Frank eburnation of the articular cartilage on the ulnar third of the base of first metacarpal and central third of the distal surface of the trapezium
III	Widespread, full-thickness cartilage loss with or without a peripheral rim on both articular surfaces

Badia recently introduced a classification with carpometacarpal arthroscopy (Table 9.3) and recommended this arthroscopic staging to ensure better judgment of this condition in order to provide the most adequate treatment option to patients who have this disabling condition [18].

Treatment for Early Arthritis

In early CMC arthritis, nonoperative treatment is always recommended before surgical intervention. Nonsteroidal anti-inflammatory drugs and thumb spica splint/brace may be helpful to relieve pain and to return to an adequate level of function [19]. Intra-articular steroid injections can offer short-term pain relief in patients with early arthritis [20]. Hypertonic dextrose injection may be effective in reducing pain [21].

Because volar ligamentous laxity contributes to carpometacarpal instability and arthritis progression, it has been suggested to reconstruct the weak volar ligaments to treat early carpometacarpal joint arthritis. Eaton and Littler described a procedure to reconstruct the volar ligaments by using the half-slip of flexor carpi radialis tendon through the base of the first metacarpal [16]. It has been reported to slow the radiologic progression of arthritis in more than 90% of patients. Although the patients have mild pain, they are generally satisfied with the procedure. Another procedure that can be done in early disease is dorsal wedge extension osteotomy. This osteotomy can extend and abduct the metacarpal and unload the joint. It has the added benefit of correcting adduction contracture that may be present. Tomaino reported good to excellent long-term pain relief in more than 90% of patients [22]. This procedure is contraindicated in patients with global joint laxity and irreducible subluxation.

Treatment for Advanced Arthritis

Simple Trapeziectomy

Simple trapezial excision without soft tissue interposition was first described by Gervis [23]. Based on the simplicity and low morbidity of the procedure, trapeziectomy with hematoma arthroplasty has been increasingly used in clinical practice. Many authors agree that significant pain relief can be achieved with trapeziectomy alone. Although grip and pinch strength are often decreased after surgery, the absence of pain results in improved overall function. Multiple studies have demonstrated the clinical success of simple trapezial excision. Dhar and colleagues reported that excellent pain relief and reasonable strength and motion were obtained at the last follow-up [24]. Hollevoet and colleagues found no significant difference in motion, strength, and trapezial height between simple trapeziectomy and tendon interposition arthroplasty [25].

A prospective study comparing trapeziectomy alone, trapeziectomy with palmaris longus tendon interposition, or trapeziectomy with ligament reconstruction and tendon interposition was performed by Dowing et al. [26]. They showed that no statistically significant decrease was seen in the trapezial space ratio in the three treatment groups. In contrast, De Smet et al. reported trapezial height was much better preserved in the ligament reconstruction group, and the remaining trapezial space did significantly correlate with key pinch force [27].

Trapeziectomy with K-wire fixation has continued to gain support as a reliable technique for treating painful CMC arthritis. The results have improved with modification to develop of a fibrous pseudarthrosis from maturation of the postoperative hematoma in the arthroplasty space. Slightly overdistracting the first metacarpal also enhances the ability of the thumb to heal with adequate stability [28]. This procedure is especially useful in patients with low demand and high morbidity.

Ligament Reconstruction

In Eaton stage I or II of the thumb CMC joint arthritis, a ligament reconstruction may be enough to prevent the further progression of the disease [16]. If there is a chronic long-standing instability with the weakness of ligaments, it may lead to a potential osteoarthritis of the joint [29]. Ligament reconstruction has been proved to improve the stability of the joint in a biomechanical study [30]. It stabilizes the joint and reduces those shear forces on the CMC joint [31]. It has generally been felt that ligament reconstruction be reserved for patients with very mild articular changes and that it is contraindicated in patients with stage III and IV disease.

Gervis described one of the oldest surgical procedures, the concept of trapeziectomy without suspension arthroplasty or tendon interposition [23]. Based on the work by Gervis [23] on trapeziectomy and by Eaton and Littler [16] on volar ligament reconstruction using the flexor carpi radialis tendon, Burton et al. [32] described the ligament reconstruction and tendon interposition (LRTI) arthroplasty and used the flexor carpi radialis tendon and a bone tunnel at the base of the thumb metacarpal to maintain the trapezial height after resection of the trapezium and thus, theoretically, preserve thumb strength [33]. Although there is a debate between anterior oblique ligament and dorsoradial ligament as a principal stabilizer of the thumb CMC joint, the technique of ligament reconstruction with flexor carpi radialis (FCR) tendon slip is routed functionally and reconstructs both the anterior oblique and dorsoradial ligaments [31].

Operative Technique of Ligament Reconstruction (Fig. 9.2)

The basal joint is opened through Wagner's approach. After the skin incision, along the radial border of the first metacarpal bone and trapezium, thenar muscles are sharply dissected subperiosteally, and the dissection is extended to the CMC and scaphotrapeziotrapezoidal (STT) joints. The deeper dissections include "T"-shaped incision over the ligament-capsule of the CMC joint, the transverse fascial fibers overlying the FCR tendon, and the dorsal and volar soft tissues of first to second metacarpal bases.

The inflammatory synovium is cleaned. After the debridement of any osteophytes, manually reduce the CMC joint. To avoid injury, the terminal branch of the superficial radial nerve and extensor pollicis brevis (EPB) tendon is retracted in either direction. Between the insertions of the EPB and abductor pollicis longus (APL) tendons, the periosteum is sharply incised longitudinally, about 1 cm distal to the CMC joint, and dissected subperiosteally.

About 1 cm distal to the CMC joint, a 0.062 in. K-wire is inserted at the base of the metacarpal, parallel to the joint and perpendicular to the metacarpal long axis. On the fluoroscopic examination, the correct position of the

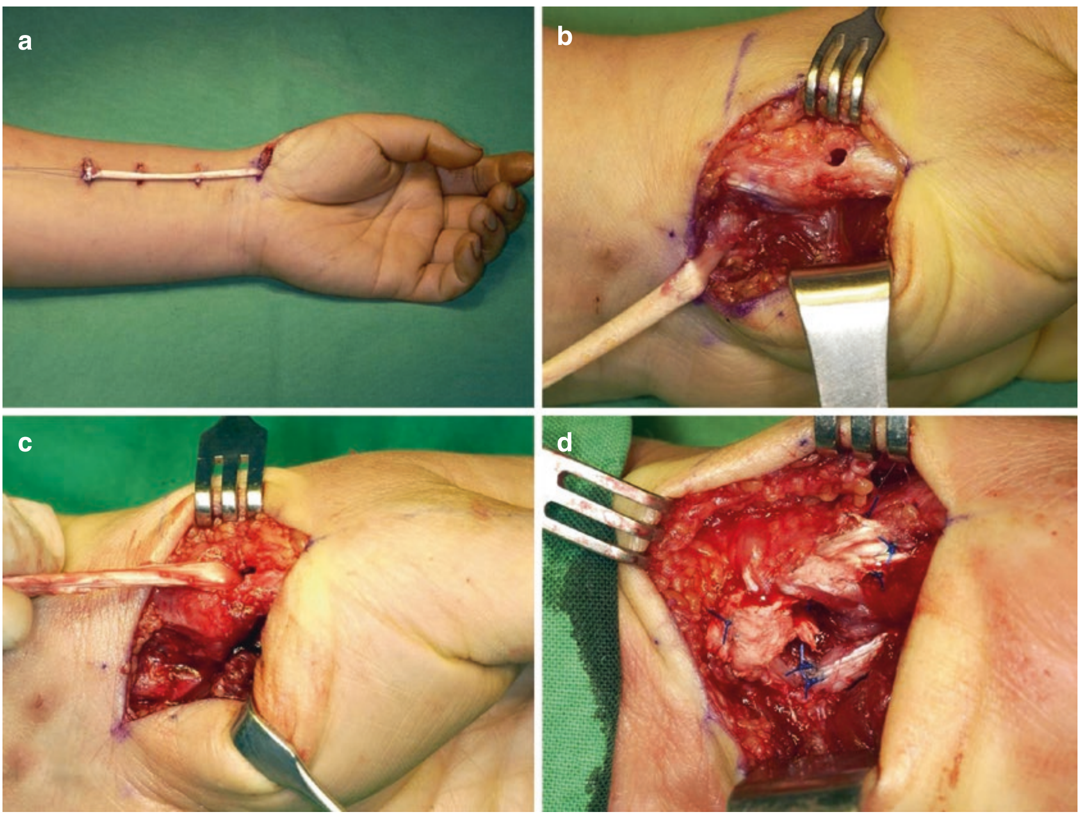

Fig. 9.2 (**a**) The FCR tendon slip is harvested in half, while the distal portion is attached to the insertion. (**b**) The drill hole is placed through the thumb metacarpal base and above the abductor pollicis longus tendon. (**c**) The FCR tendon slip is passed through the hole and is directed volarly along the radial side of the carpometacarpal joint. (**d**) The reconstruction is completed by passing the FCR tendon slip beneath the intact part of the FCR volarly and then back dorsally beneath the APL tendon to which it is sutured (*FCR* flexor carpi radialis, *APL* abductor pollicis longus)

K-wire is confirmed, and then 2.5 or 3.2 mm drill bit is used to create a hole at the base of the metacarpal. The size of the hole depends on the size of the metacarpal and thickness of the half of FCR tendon.

Half of distal FCR tendon is harvested as follows. The distal insertion of FCR is identified, passing medial to the scaphoid tubercle. About 10–12 cm proximal to the wrist crease, usually at the musculotendinous area, proximal FCR tendon is identified, and 2 cm longitudinal skin incision is made over the tendon. Using #2-0 nylon suture material, without needle, pass through the distal half of FCR tendon, and pass the both ends of nylon subcutaneously and preferably intra-FCR fascial proximally. The nylon material is pulled proximally in seesaw motion until the desired length of FCR is separated in half. Cut the radial half of FCR tendon proximally and retrieve through the distal incision. The proximal incision is closed.

A folded end of #28 wire is passed dorsal to volar through the drill hole. The 2–4 mm free end of FCR tendon is inserted between the folded ends of wire and drawn volar to dorsal through the hole. The free graft end is passed under the APL tendon insertion and across the volar capsule and sutured the tendon to the dorsal and volar capsules and the metacarpal periosteum using #3-0 nonabsorbable suture. If FCR tendon length is enough, the tendon graft is looped around the sutured FCR tendon and sutured to itself.

The tendon is kept in a moist sponge, and it is important not to overtighten the graft. If possible the "T" incised capsule and soft tissues are repaired, and the thenar muscles also are repaired with absorbable suture. A short arm thumb spica splint is applied and is removed at 3 weeks. Gentle and progressive use and range-of-motion exercises are begun. Unlimited activities, including sports, are permitted at 6 weeks postoperatively.

The author used to use the radial half of extensor carpi radialis longus (ECRL) tendon instead of FCR, to make a simple first to second intermetacarpal ligament reconstruction, as in the following technique (Fig. 9.3).

Through the modified Wagner incision, the CMC joint of the thumb is opened dorsoradially. A second incision on the mid-forearm, about the musculotendinous area of the ECRL muscle, is made about 2 cm in length. ECRL tendon insertion on the dorsal second metacarpal base is identified and longitudinally separated in half. #2-0 nylon suture is passed through the mid-ECRL tendon, and both ends of nylon are passed to the proximal incision through intra-tendon sheath space. Using seesawing movement, the nylon, without needle, is pulled proximally until the desired length of ECRL is separated in half. Cut the radial half of ECRL tendon proximally and retrieve through the distal incision. The proximal incision is closed.

T-incision on the dorsoradial capsule and first to second intermetacarpal base area is made and exposes the two metacarpal bases. From dorso-ulnar base of the first metacarpal base, 2.5 mm drilling is made to the palmar radially, and then another drilling, from dorso-ulnar base of second metacarpal base, is made to the palmar radial base of the second metacarpal bone. All drill holes are made about 5 mm distal from the proximal articular surface of the metacarpals.

Using #28 wire loop, the prepared ECRL half tendon passed the first metacarpal base from dorso-ulnar hole to palmar radial and then from palmar radial hole to dorso-ulnar. Pulling and tightening the tendon should make the proper reduction of the first CMC joint under the vision, and the ECRL tendon from the dorso-ulnar hole of the second metacarpal base sutured to the ECRL tendon insertion with #2-0 nonabsorbable suture material. Additional suture of the ECRL end can be done to the capsule. Avoid too much tightening, because it may make a limitation of motion or pain on motion. We do not use K-wire to fix the joint and apply short arm thumb spica splint for 3 weeks. After

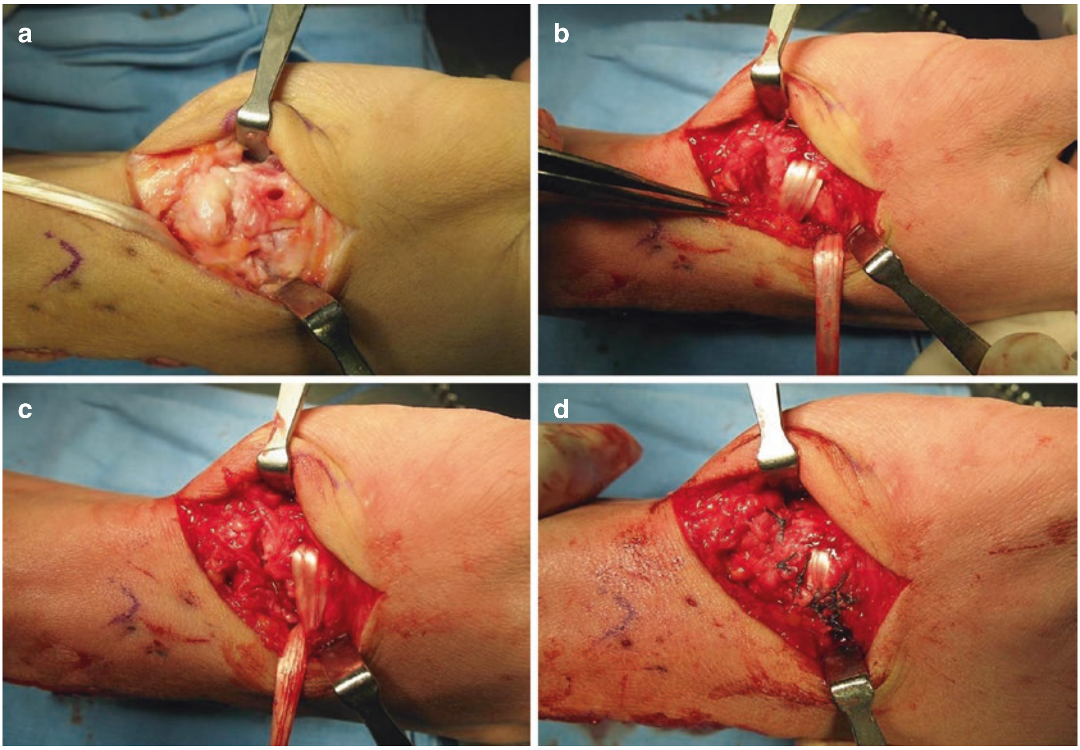

Fig. 9.3 (**a**) The ECRL tendon slip is harvested in half, while the distal portion is attached to the insertion. (**b**) The drill hole is placed through the thumb and second metacarpal base. (**c**) The ECRL tendon slip is passed through the holes and is tightened to reduce the first carpometacarpal joint under the vision. (**d**) The reconstruction is completed by passing the ECRL tendon slip beneath the intact part of the ECRL tendon and sutured itself (*ECRL* extensor carpi radialis longus)

6 weeks the thumb is allowed to use activities of daily living and 3 months later for normal activities.

Prosthetic Arthroplasty

Once an arthritic change is established, the joint cannot be made asymptomatic only with ligament reconstruction. Prosthetic arthroplasty can provide some benefits compared to trapeziectomy only and trapeziectomy with ligament reconstruction. The potential advantages include preservation of joint biomechanics, avoidance of metacarpal subsidence, and prevention of possible later adjacent joint problems [34]. Vitale et al. provided a summary of the trapezium prosthetic options that have emerged over the past five decades [34]. First-generation implants were primarily Swanson silicone prostheses, which have been reported as preserving good range of motion and grip strength and minimizing pain [35]. Several other studies have reported the outcomes of silicone implants with varying results. Frequently identified problems include the development of silicone synovitis, breakage, subluxation/dislocation, bony erosion, loosening, and long-term implant failure. Therefore, these implants are no longer available [36]. Interestingly, Umarji and colleagues have recently reported their experience with ten patients who had revision surgery with a silastic finger joint implant spacer following failure of simple trapeziectomy [37]. At an average follow-up of 53 months, 9 of the 10 patients reported improvement in pain and were generally satisfied with their function. Silicone arthroplasty has fallen out of favor because of the availability of numerous other treatment options.

Implant arthroplasty of the thumb CMC joint has met with varied, if not unpredictable, results. Several other devices have been developed and used. These include the de la Caffinière prosthesis which is a semiconstrained ball-and-socket design with both components cemented. The metacarpal component is made of cobalt chromium, and the trapezium component is a polyethylene cup. The Guepar prosthesis is also a cemented prosthesis with cobalt-chrome metacarpal component that snap-fits into a polyethylene trapezium component and functions in a constrained fashion. The Elektra prosthesis is a modular design made of cobalt-chrome and threads into the trapezium. The Braun prosthesis is a cemented design that consists of a metallic metacarpal and a polyethylene socket. The Avanta CMC prosthesis is a cemented total joint surface replacement with matching sloped, saddle-shaped components approximating the natural contours of the base of the first metacarpal and the articular surface of the trapezium, with the trapezium component made of cobalt-chrome and the first metacarpal component made of polyethylene [38]. More recent implant designs have focused on resurfacing devices with the hope of producing a stable hemiarthroplasty.

Pyrolytic carbon prosthesis has been used to develop replacement arthroplasties and hemiarthroplasties of the thumb CMC joint (Figs. 9.4 and 9.5), including the pyrolytic carbon anatomic interposition arthroplasty,

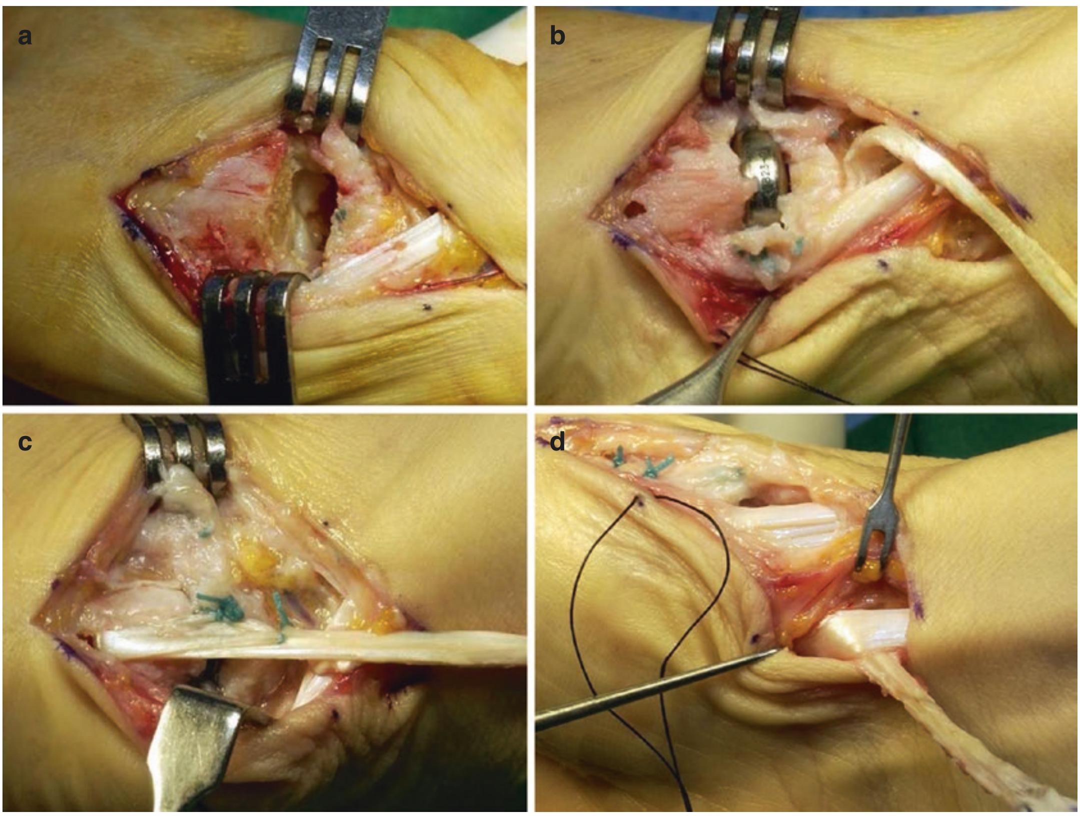

Fig. 9.4 (**a**) Part of the trapezium and the first metacarpal is resected to make a space for pyrocarbon implant. (**b**) The drill hole is placed through the trapezium and the first metacarpal with trial implant. (**c**) Once the implant is placed, APL tendon slip is passed through the holes and is tightened. (**d**) Remaining tendon is passed under the FCR tendon to stabilize the carpometacarpal joint

Fig. 9.5 Postoperative radiograph showing pyrocarbon implant placed in the carpometacarpal joint

the pyrocarbon implant (BioProfile/Tornier, Montbonnot-Saint-Martin, France), and the pyrocarbon interposition implant (Pyrodisk, Integra Life Sciences, Plainsboro, NJ). This prosthesis has been used in patients with stage II or III disease. A recent prospective study of trapeziectomy alone versus trapeziectomy and pyrocarbon hemiarthroplasty assessed outcomes in 38 patients [39]. There was no significant difference in functional scores and pain and grip strength between two groups, although there was a higher complication rate in the pyrocarbon group.

Confidence in many of these devices is hampered by its relatively recent use and high loosening rates. Metallic implant arthroplasty has improved to address shortcomings and failures of previous implant design. Subsidence, instability, and implant loosening have all been reported with metallic implant and have decreased their popularity. Newer synthetic materials are also available on the market. However, care should be taken to use these implants as no long-term studies are available at the moment.

Carpometacarpal Arthrodesis

Arthrodesis of the carpometacarpal joint of the thumb has proven to be a reliable option for advanced arthritis. It has been reported to provide satisfactory pain relief and obtain a strong, stable, and functional hand at the expense of mobility. Patient selection for this procedure is important for a successful outcome. This procedure is usually reserved for young high-demand patients under 50 as older patients were thought to be prone to progression of pantrapezial arthritis [40]. However, recent report proved that this procedure can be used successfully for the older patients [41]. To be indicated for carpometacarpal joint arthrodesis, the patient should not have degenerative changes in scaphotrapezial and metacarpophalangeal joints. Arthrodesis is also indicated for patients with soft tissue laxity as there will be a high probability of dislocation or mechanical failure of the implant arthroplasty. Arthrodesis is contraindicated in patients with scaphotrapezial and metacarpophalangeal joint arthritis or in patients requiring a mobile carpometacarpal joint.

Although there are several techniques for thumb carpometacarpal arthrodesis, the position of fusion is constant. The thumb is placed in the "position of a clenched fist" in which the distal phalanx of the thumb comfortably rests on the middle phalanx of the index finger with a fully clenched fist [42]. The optimal position for carpometacarpal arthrodesis is 35° of palmar abduction and 10° of radial deviation with 15° of pronation. Excellent results have been reported from arthrodesis of thumb CMC joint (Fig. 9.6). Leach and Bolton found that 89% of patients had excellent results with no pain after fusion. Although there was reduced motion, it did not hinder their function [43]. Stark and colleagues reported all patients had pain relief and felt that the gain in stability and strength compensated for the slight loss in motion [44].

Fig. 9.6 Postoperative radiograph showing carpometacarpal joint arthrodesis using two staples

Bamberger and colleagues reported that functional outcome after arthrodesis revealed a 72% decrease in the adduction/abduction arc of motion and a 61% decrease in flexion/extension arc of motion. Despite this loss of motion, there were minimal subjective functional complaints (Fig. 9.7). Complications of carpometacarpal arthrodesis include progression to pantrapezial arthritis and nonunion [45].

Arthrodesis of the carpometacarpal joint of the thumb may be useful for advanced arthritis in the high-demand patient. This procedure creates a pain-free, strong, stable thumb at the expense of full range of motion. Arthrodesis remains an excellent option for patients who need a strong pain-free thumb.

Comparison of Clinical Results

There have been many prospective, randomized, clinical trials comparing different surgical procedures. De Smet et al. compared trapeziectomy alone and trapeziectomy with ligament reconstruction and tendon interposition procedure [27]. They found the results showed no differences in pain relief and functional outcome although trapezial height was better maintained after ligament reconstruction. Davis et al. conducted prospective randomized trials comparing trapeziectomy alone and trapeziectomy with ligament reconstruction tendon interposition [46]. They found that there was no difference in pain relief, hand function, and thumb strength between groups. This group

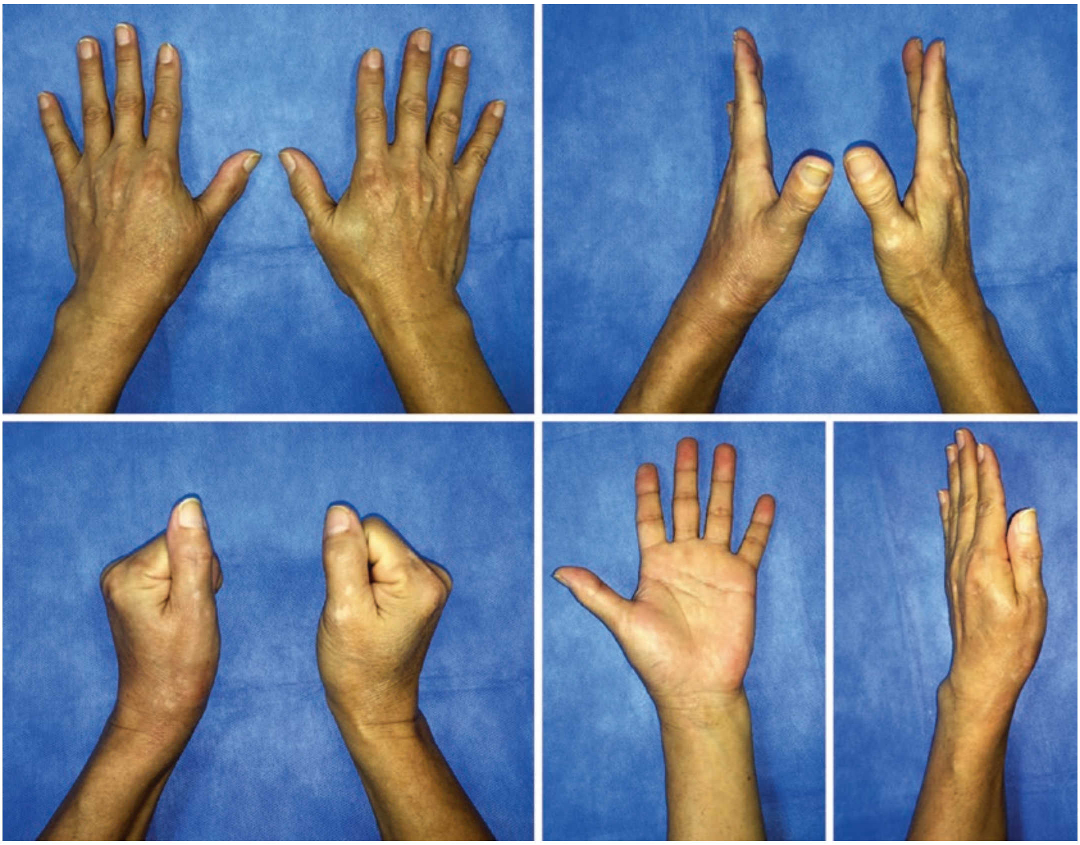

Fig. 9.7 Range of motion after thumb carpometacarpal arthrodesis. Compensatory motions occur in scaphotrapezial and metacarpophalangeal joint

subsequently compared simple trapeziectomy and trapeziectomy with ligament reconstruction and tendon interposition and additional Kirschner wire stabilization [47]. There were no significant differences between the two treatment groups in any subjective or objective outcome measures.

At present, there is no evidence to suggest that any one surgical procedure is superior to another. Based on the Cochrane Database Systematic Review, they recommended trapeziectomy alone for the treatment of carpometacarpal arthritis [48]. However, a recent survey showed that trapeziectomy with ligament reconstruction and tendon interposition is the most popular procedure among members of the American Society for Surgery of the Hand [49].

Conclusions

Thumb carpometacarpal arthritis is one of the most common causes of pain in the hand. There are several surgical options for this condition; however, to date, no single method has emerged superior, although each method has specific advantages and disadvantages for the surgeon to consider. Until the ideal prosthetic implant is developed by innovations, trapeziectomy with ligament reconstruction and/or tendon interposition remains the most commonly performed procedure for patients who want mobile thumb. Arthrodesis can still be a valid option for patients who want strong stable thumb at the expense of mobility.

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