CURRENT CONCEPTS

Failed Thumb Carpometacarpal Arthroplasty: Common Etiologies and Surgical Options for Revision

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Carpometacarpal (CMC) arthroplasty surgery, although modifications have occurred over time, continues to be commonly performed and has provided patients with their desired pain relief and return of function. The complications of primary surgery, although relatively rare, can present in various clinical ways. An understanding of the underlying anatomy, pathology of coexisting conditions, and specific techniques used in the primary surgery is required to make the best recommendation for a patient with residual pain following primary CMC arthroplasty. The purpose of this review is to provide insights into the history of CMC arthroplasty and reasons for failure and to offer an algorithmic treatment approach for the clinical problem of persistent postoperative symptoms. *(J Hand Surg Am. 2018;■(■):■−■.*

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Considering the importance in routine daily activities of the basal thumb joint, it is not surprising that degenerative conditions have long engaged the attention of hand surgeons. The most appropriate and effective surgical intervention remains somewhat controversial. Simple trapeziectomy was first described by Gervis in 1949 for monoarticular osteoarthritis but not for rheumatoid arthritis or polyarthritis. The 1973 Gervis and Wells paper[1] reported on 25 years of data for simple trapeziectomy and the results were "satisfactory without exception" and reported "pain-free" responses from all patients. However, concerns about shortening of the thumb metacarpal into the trapezial space following excision led to the introduction of ligament stabilization and interposition procedures. To combat subsidence, some suggested leaving the trapezium in place and simply stabilizing the joint with reportedly good results.[2] In the early 1970s, prosthetic implants began to be used with mixed results,[3] and this has subsequently been followed by use of biological implants.

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REASONS FOR FAILURE OF PRIMARY CARPOMETACARPAL ARTHROPLASTY

The rate of carpometacarpal (CMC) arthroplasties that require revision is largely unknown. Complications and unsatisfactory results are only briefly mentioned in the broader context of mostly good to excellent outcomes, regardless of surgical procedure. Cooney et al[4] retrospectively evaluated over 600 cases of CMC arthroplasties over a 12-year period, reporting that 2.5% went on to require revision procedures. Another large institutional review cited a similar revision rate of 2.9%.[5] The overall literature

on failures and revision procedures, however, is deficient.

Certain surgical risks may occur with any of the CMC arthroplasty procedures. These include neuroma, complex regional pain syndrome (CRPS), infection, untreated metacarpophalangeal (MCP) joint hyperlaxity and/or arthritis, and untreated peritrapezial or other midcarpal arthritis.[6] During a standard surgical approach to the first CMC joint, the superficial sensory radial nerve (SSRN) is typically found superficial to the extensor pollicis brevis tendon, providing sensation to the dorsum of the thumb, and is the most common nerve to be injured.[5] Failure to identify or recognize an injury to the nerve can lead to a painful neuroma. CRPS may result with or without a nerve injury and is characterized by autonomic sensory dysfunction and chronic pain. Infection is a rare complication, but a hypothetical concern when using synthetic implants.[7] Failure to address MCP joint hyperlaxity may lead to weakness and instability of the thumb. Lastly, recalcitrant mechanical pain can continue if the treating surgeon fails to address concomitant scaphotrapeziotrapezoidal or other coexisting midcarpal arthritis.[6]

Each of the common arthroplasty procedures performed has risks for specific complications. Ligament reconstruction tendon interposition (LRTI) with trapeziectomy procedures can result in graft extrusion or mechanical failure of the suspension.[7] This can lead to subsidence of the metacarpal vertically or dorsoradial migration, on the scaphoid, or impingement with the adjacent trapezoid leading to mechanical pain.[6] Incomplete trapeziectomy is relatively common complication when planning a full excision of the trapezium. Conversely, a shell of deep trapezium that is nonarticular, but nonetheless seen radiographically, may not be the cause of postoperative pain. Utilizing the flexor carpi radialis tendon (FCR), as many procedures do, may play a role in development of scapholunate instability. The FCR has been described as a dynamic stabilizer of the scaphoid, and redirection of that tendon at the carpal level could lead to dorsal intercalated segment instability deformity.[8] Only using half of the FCR may reduce this potential risk. Complications of CMC arthrodesis include nonunion and prominent hardware.[7] Nonunion rates have been reported as high as 16%,[9] varying with the type of fixation and the use of bone graft. Implant arthroplasty can be complicated by aseptic loosening, dislocation or subluxation, hardware complication, or foreign body reactions.[6] Loosening is the most commonly encountered problem with synthetic implants, with some studies approaching 50% loosening rates, but not all of those cases were symptomatic or required revision.[10]

CLINICAL EVALUATION/PATIENT SELECTION

Diagnostic accuracy and patient selection are imperative for successful revision surgery. Not all of the previously mentioned complications warrant surgical intervention, and distinguishing those not appropriate for revision surgery is important. Mechanical (vs neurological) etiologies are typically the best indications for revision procedures. It is important to relay to the patient what is a typical postoperative course for a primary surgery. Surgical intervention is generally not recommended (short of catastrophic failure) within the first 6 months following the initial procedure. Radiographs tend to exaggerate the amount of subsidence and impingement and should be interpreted with caution in the early postoperative period. Refractory pain for 3 to 6 months after surgery should be treated with reassurance and activity modification. Pain or symptoms that last beyond 6 months, however, are an indication for further investigation. In addition to radiographs, diagnostic injections in various carpal articulations can help identify the true source of the pain. If multiple injections are being considered, it is important to separate them by time to allow for a more specific diagnosis.

Mechanical etiologies often present in the postoperative patient as a deep pain, grinding, or feeling of instability with pinch or grip.[6] Mechanical etiologies include nonunion after arthrodesis, impingement, implant loosening, or failure to adequately treat instability or arthritis. Treatment of subsidence of the metacarpal base after a trapeziectomy with or without any sort of interposition or suspension is controversial. Thumb metacarpal subsidence does not appear to directly correlate with pinch strength or patient satisfaction.[11] Subsidence alone is often asymptomatic and not an indication for revision. Subsidence can, however, be a harbinger of failure of the suspension or interposition, and close monitoring for symptoms of impingement is needed. Impingement can also result from overconstraint, which presents as an abduction contracture and an inability of the palm and thumb to lie flat.

Residual symptomatic pinch or pinch/grasp weakness (especially with larger objects) can be a result of failure to correct a hyperextension/adduction deformity of the MCP joint that classically coexists with CMC arthritis. Hyperextension of the MCP joint should be evaluated before surgery and addressed at the same time as the CMC arthroplasty, but failure to address or