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An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis

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Clinical Scenario

A 58-year-old postal worker is referred to you as a workers' compensation patient because she cannot work with her bilateral thumb pain. Her x-rays reveal classic advanced bilateral thumb basal joint arthritis. She has failed the full spectrum of non-operative treatment. What is the best evidence to guide you in the surgical management of her condition?

Keywords

Evidence-based medicine; MOC; Thumb Carpometacarpal Joint; Arthritis

Introduction

Surgical training today still retains considerable similarities to the apprenticeship model of past decades. Operations that work reasonably well are often passed down from professor to trainee and adopted into practice. Although traditional and comfortable for many surgeons, this model does not meet our modern expectations for patient safety, cost-effectiveness, and evidence-based practice.

Evidence-based medicine has been defined as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.”¹ The purpose of this article is to provide a summary of the best available evidence on the surgical treatment of thumb carpometacarpal joint arthritis.

Methods for Identifying Evidence

A literature search of PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and the Cochrane Library was performed to obtain the best available evidence

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ontreating thumb carpometacarpal joint arthritis, with emphasis on preoperative assessment, treatment, and outcomes. The following search terms were combined as appropriate, and PubMed MeSH terms were used when available: carpometacarpal joints, thumb, basal joint arthritis, thumb basal joint arthritis, arthroplasty, osteotomy, trapeziectomy, ligament reconstruction tendon interposition, diagnosis, preoperative assessment, risk factors, smoking, DVT prophylaxis, antibiotic prophylaxis, anesthetics, premedication, surgical treatment plan, treatment, surgery, outcome, complications, postoperative complications, tendon damage, artery damage, pain, hypesthesia, time off work, venous thrombosis, pulmonary embolism, infection, pain management, and analgesia. The initial search was limited to human studies that were published from 1999–2009 and indexed as meta-analyses, randomized controlled trials, clinical trials, comparative studies, or case series with at least 20 patients; however, additional references were included if deemed necessary for discussion. Studies were excluded if the full text was inaccessible or of non-English language, as the study quality could not be evaluated. Relevant studies were appraised for quality and validity according to criteria published by the Critical Appraisal Skills Programme (CASP)² and assigned a level of evidence with the ASPS Evidence Rating Scale for Therapy (Table 1). Levels of evidence are indicated throughout the text. Evidence ratings were not assigned to studies with inadequately described methods and/or worrisome biases or to references included for discussion purposes only (e.g., narrative reviews).

Evidence on Preoperative Assessment

Reflecting the population at risk, most studies had a majority (80–85%) of female patients.^{3–5} The dominant hand was more often (60–65%) affected with the disease than the non-dominant hand.^{3, 4} None of the studies identified by the search criteria showed any differences in postoperative outcome related to age, gender, hand dominance, smoking history, heaviness of work at occupation, stage of disease, or use of preoperative splinting or steroid injections.

Although none of the surgical studies examined the effect of preoperative splinting and injections on outcomes, these are commonly practiced non-operative interventions for this clinical problem. Day et al followed a prospective cohort of 30 patients for a minimum of 18 months, and found that splinting and steroid injections gave reliable, long-term pain relief (average of 23 months) in early-stage disease (**Level IV Evidence**).⁶

Evidence on Surgical Treatment Plan

There appears to be consensus that removal of the arthritic surface of the trapezium leads to successful outcomes (pain relief, improved strength and range of motion). Simple trapeziectomy can be performed by itself, or combined with tendon interposition arthroplasty, ligament reconstruction, or both. Table 2 lists these options, as well as the abbreviations that will be used in this article. Temporary fixation with Kirschner wires (K-wires) may or may not be performed. Arthroplasty can also be performed with a variety of implants, including use of an interpositional spacer, hemiarthroplasty, and total joint arthroplasty options (Table 3).

Case series represent low-level evidence, but they provide the foundation upon which better studies can be constructed. The high-quality case series identified in this particular literature search are summarized in Table 4. A couple of these studies report excellent results after traditional T+LRTI. This operation, first popularized by Burton and Pelligrini,⁷ became the standard by which other procedures would be measured. Varitimidis followed 62 T+LRTI cases for 3.5 years and reported 95% pain relief, and very good strength and range of motion (Table 4) (**Level IV Evidence**).⁸ DeSmet reported similar results in a smaller series (**Level IV Evidence**).⁹ Both of these studies used the entire flexor carpi radialis (FCR) tendon,

rather than just a portion of the tendon as originally described.⁷ Use of the entire FCR did not appear to result in any specific postoperative deficits.

“Sling” procedures substitute a tendon suspension for a formal ligament reconstruction. Typically, a distally-based slip of APL is woven around FCR, or vice versa, to create a “sling” beneath the first metacarpal base, suspending it to the index metacarpal. Many of these techniques do not require drilling of bone tunnels, making them more appealing to surgeons and patients alike. Sirotakova reported a series 104 arthroplasties using an APL-based suspension **(Level IV Evidence)**.¹⁰ After 12 months, 91% of patients still had excellent pain relief; the remaining 9 patients had undergone revision surgery. In the successful cases, tip pinch, key pinch, and grip strength increased by 46%, 19%, and 41%, respectively, from the preoperative values. In a case series with long-term follow-up, Sai reported on 22 patients who underwent trapeziectomy and FCR-based suspension sling, with advancement of APL and imbrication of extensor pollicis brevis (EPB) **(Level IV Evidence)**.¹¹ At an average of 8.4 years, 82% had complete pain relief and very reasonable range of motion and strength.

In further efforts to simplify the T+LRTI operation, surgeons have sought to eliminate parts of the procedure. Budoff reported a series of T+IA procedures with APL tendon shortening, but without formal ligament reconstruction **(Level IV Evidence)**.¹² At 5-year follow-up, 83% of patients reported minimal or no pain, with reasonable motion and strength (Table 4). However, subluxation correlated with poor results in this study, leading the authors to conclude that ligament reconstruction was worthwhile. Maqsood also reported excellent results after T+IA (Table 4) **(Level IV Evidence)**.¹³

Simple trapeziectomy has also been the subject of several well-conducted case series. Nusem reported a series 34 operations in which Gelfoam was used to fill the trapeziectomy space, which was stabilized with K-wires postoperatively **(Level IV Evidence)**.¹⁴ At 5 years, 68% of patients were pain-free, with reasonable strength (Table 4). Gray reported similar findings with the so-called “hematoma and distraction arthroplasty,” which is essentially simple trapeziectomy with temporary K-wire fixation **(Level IV Evidence)**.¹⁵ At long-term follow-up (6.5 years), 18 of 22 patients were pain-free, with near-normal dexterity. Improvements in grip and pinch were maintained over time. These long-term results were very consistent with the earlier results published on this cohort of patients.¹⁶

With all of these results being very similar, higher-level evidence is required to answer key questions that have arisen:

Is complete trapeziectomy required? Catalano retrospectively compared T+LRTI with a similar procedure in which only part of the trapezium was removed **(Level III Evidence)**.¹⁷ Although this study showed an increase in key pinch strength in the partial trapeziectomy group, the patient groups had significant differences in their preoperative demographics, including age, stage of disease, and range of motion measures. Importantly, 22% of the partial trapeziectomy patients were revised to a complete trapeziectomy plus LRTI during the follow-up period. Although preservation of a portion of the trapezium offers the potential for increased pinch strength, it is associated with a significantly increased revision rate due to progression of disease.

Is tendon interposition required? A randomized controlled trial (RCT) by Kriegs-Au compared T+LRTI to the same procedure without tendon interposition (T+LR) **(Level II Evidence)**.⁴ At 4 years follow-up, the T+LR group was found to have better Buck-Gramcko scores, better range of motion, and increased willingness to undergo the procedure again. No changes were detectable in grip or pinch strength between the groups. The addition of tendon interposition appears to offer no advantages over ligament reconstruction alone.

Is maintenance of the scaphometacarpal space important? It has been postulated that maintenance of an appropriate scaphometacarpal space is important for these procedures to succeed. Several studies have sought a correlation between height of the scaphometacarpal space and postoperative pain, function, or both. DeSmet was able to demonstrate a weak association between scaphometacarpal space and key pinch, but this finding is difficult to interpret, as it came from a study in which a statistically significant difference in key pinch could not be detected between the T and T+LRTI groups (**Level II Evidence**).¹⁸ Many other studies have failed to find any association between scaphometacarpal space and strength,^{4, 9, 14-16} pain relief,^{4, 12} or function^{15, 16} (**Level II, IV Evidence**).

It is clear that both implant arthroplasties¹⁹ and procedures including ligament reconstruction and/or suspension maintain a greater scaphometacarpal space over time.^{3, 18} However, the clinical importance of maintaining this space has yet to be proven.

Is simple trapeziectomy alone sufficient? A retrospective cohort study by Gibbons reported on 40 consecutive simple trapeziectomies (without placing temporary K-wires), with an average 11-year follow-up (**Level III Evidence**).²⁰ 65% of thumbs were completely pain-free; 25% had only mild pain that did not restrict activity. Additionally, a RCT by DeSmet compared simple trapeziectomy vs. T+LRTI, finding no difference in pain scores, grip or pinch strength at 2.4 years follow-up (**Level II Evidence**).¹⁸ Finally, Field compared simple trapeziectomy (no K-wires) with T+LRTI in a randomized controlled trial (**Level I Evidence**).³ Although an increase in radial abduction was eventually seen at 12 months in the simple trapeziectomy group, there were no differences in palmar abduction, first webspace span, grip strength, pinch strength, pain, or patient satisfaction between these groups. The T+LRTI group had a higher incidence of CRPS and volar forearm scar adherence, but other complications were similar between groups. In summary, there is strong evidence that T+LRTI offers no definite advantages over simple trapeziectomy, and may have a higher complication rate.

A systematic review by the Cochrane Collaboration has been performed to examine differences between all surgical treatments for thumb carpometacarpal arthritis (**Level II Evidence**).¹⁹ Their search yielded 9 studies for review (some of which have already been mentioned above), and compared seven different surgical interventions (T, T+LRTI, T+IA, T+LR, Artelon joint resurfacing, arthrodesis, and joint replacement). None of these procedures was found to be significantly better than the others with regard to pain, physical function, patient global assessment, or range of motion. In one of the studies included in the review, the Artelon spacer was found to provide improved key pinch compared to T+LRTI.²¹ Simple trapeziectomy was found to have significantly fewer complications than T+LRTI.

Does implant arthroplasty offer any advantages? Silicone elastomer implants, such as the Swanson endoprosthesis, have the longest track record of any implant arthroplasties for the thumb basal joint. In a study of 62 implants with over 16-year follow-up, Bezwada reported 84% of patients would undergo the surgery again, although 26% experienced subluxation and/or implant failure (**Level IV Evidence**).²² Similarly, MacDermid reported that 88% of patients had improvement in their pain after silicone arthroplasty, but the high incidence of revision surgery (20% at 6.5 years) tempered the enthusiasm for this prosthesis (**Level IV Evidence**).²³

A retrospective comparison of 58 Swanson implant arthroplasties with 56 patients undergoing T+LRTI showed some advantages in pain relief in the Swanson implant group (**Level III Evidence**).²⁴ However, this study excluded 8 implant failures and 8 T+LRTI failures from the final analysis. Because the worst results in both groups (14% of the total cases) were excluded from the study, these results must be interpreted with caution.

A RCT comparing Swanson endoprosthesis with T+LRTI/APL suspension showed no difference in tip pinch strength at follow-up of 3.6 years (**Level II Evidence**).²⁵ Reports of pain and patient satisfaction were also similar in these groups, which consisted of 13 patients each. No cases of clinical silicone synovitis were reported in this small study, although significant bone cysts developed in the metacarpal and the scaphoid. Two patients with implant dislocations remained symptom-free and declined additional surgery.

Pyrolytic carbon hemiarthroplasty of this joint has also been examined in a case series (**Level IV Evidence**).²⁶ In this study, 54 arthroplasties were followed for just under 2 years. Overall satisfaction was 81%, and only 71% of patients were pain-free. Operative revision was required in 15 of 54 joints, due to problems with dislocations and/or persistent pain. The author's explanation for the high revision rate includes disclosure of a steep learning curve, as the early cases in this series often required revision to a deeper trapezial "socket". Since loosening and subsidence were not seen in this series, this implant may hold promise for the future.

Several implants have performed rather poorly, and probably should not be used in routine practice. The Helal silicone rubber ball interposition implant is implanted after trapeziectomy, with stems inserted into tunnels in both the scaphoid and first metacarpal. A retrospective cohort study found that 26% of patients still had significant pain 1 year postoperatively (**Level III Evidence**).²⁷ Titanium hemiarthroplasty was essentially abandoned after a case series reported a 20% early failure rate (**Level IV Evidence**).²⁸ The ceramic sphere implant received a similarly poor report in a recent study, which showed severe subsidence and fractures occurred frequently during the 3-year follow-up period (**Level IV Evidence**).²⁹

Total joint arthroplasty (TJA) for the thumb basal joint has had mixed reviews. Lemoine reported on 72 arthroplasties with the GUEPAR II prosthesis (**Level IV Evidence**).³⁰ At a follow-up of 4.2 years, 60% of patients were pain-free, and another 18% had pain only with significant activity. Only one revision was required in this series. Badia followed 26 arthroplasties with the Braun-Cutter prosthesis for an average of 3.8 years (**Level IV Evidence**).³¹ Pain relief was complete in 96%, and only one revision was required.

A retrospective comparative study on the de la Caffinière prosthesis was reported by DeSmet (**Level III Evidence**).³² Key pinch was found to be no different between TJA (27 patients) and T+LRTI (26 patients) at an average of 2.1 years after surgery. There was loosening in 51% of the implant cases. An unacceptably high rate of loosening (44%) for this prosthesis was confirmed in two additional case series (**Level IV Evidence**).³³ 34

Does arthrodesis offer any advantages? A retrospective study by Taylor compared arthrodesis, silicone arthroplasty, and trapeziectomy (including T and T+LR cases) (**Level III Evidence**).³⁵ No differences were found in pain relief or function between the three groups. The arthrodesis group had a significantly higher complication rate, with 17% of patients requiring re-operation. A similar study by Mureau compared arthrodesis with T+IA (**Level III Evidence**).⁵ Both groups contained a significant proportion of male patients (24% in the T+IA group, 12% in the arthrodesis group), and both groups included some heavy laborers. This study showed better pain relief, less cold intolerance, and fewer complications in the T+IA group. Measures of tip pinch, key pinch, and grip strength between groups showed no significant difference.

Schröder compared partial trapeziectomy plus tendon interposition with arthrodesis (**Level II Evidence**).³⁶ This non-randomized prospective comparison study showed no difference in patient satisfaction, pain, grip strength, or range of motion outcomes at an average of 3.5 years follow-up.

Although it is clear that arthrodesis, in certain surgeon's hands, can be performed with good results, the evidence suggests that equal or better outcomes are possible with arthroplasty procedures.

Evidence on Postoperative Outcomes

The vast majority of studies on basal joint arthroplasty involve postoperative immobilization in a cast or splint for 4–6 weeks. Results are very predictable with this method. Maqsood reported on a series of T+LRTI patients mobilized early (2 weeks) (**Level IV Evidence**).¹³ He felt this was important to reduce the incidence of stiffness and complex regional pain syndrome (CRPS). His series of 60 patients followed for 5.5 years had no cases of CRPS, and mobility was near-normal. DeSmet reported on a series of patients (trapeziectomy with or without LRTI) mobilized “as soon as possible usually within a week” (**Level II Evidence**).¹⁸ Out of 56 patients evaluated, he reported 1 failure that went on to arthrodesis. He did not report on the incidence of CRPS. No studies were reviewed that compared one postoperative protocol directly with another.

Most of the studies reviewed discussed adverse events, but did not include them as a primary outcome measure. Generally speaking, more complex or extensive procedures were found to have a higher complication rate. For instance, T+LRTI was found to have a higher incidence of complications (including CRPS) than simple trapeziectomy.¹⁹ Arthrodesis typically has a higher complication rate than arthroplasty.^{5, 35} Complication rates associated with titanium hemiarthroplasty and ceramic sphere implants were felt to be prohibitive to their routine use,^{28, 29} and the loosening rates for TJA are concerning.^{33, 34}

Satisfaction rates appear to be high in most of these studies, with 85–100% satisfaction reported in most studies of arthroplasty (Table 4) (**Level IV Evidence**). Mureau found satisfaction was higher with arthroplasty than for arthrodesis (**Level III Evidence**).⁵

Overall health and quality of life are rarely assessed in this literature. However, Angst followed 103 arthroplasty patients for over six years (**Level IV Evidence**).³⁷ Quality of life was assessed with the SF-36, and was found to be significantly better than control data from in the general population.

Suggested Treatment for Clinical Scenario

When practicing evidence-based medicine, the surgeon should consider the strength of the available evidence and integrate the evidence with his/her clinical expertise and the patient's values and preferences to develop an appropriate treatment plan. The treatment plan below is an example of how the surgeon might use the evidence to care for this particular patient.

Based on the best evidence available, our patient in the scenario above should undergo simple trapeziectomy (**Level I Evidence 3**). This operation offers a very high satisfaction rate with the least chance of serious complications. The addition of a suspension procedure or ligament reconstruction will not likely change the outcome, but will help preserve scaphometacarpal space. It is unclear if maintaining this space offers any clinical advantages, and the use of ligament reconstruction or suspension to preserve this space may be associated with an increased rate of complications. Although a couple of studies have suggested earlier mobilization, reliably good results are achieved with 4–6 weeks of postoperative immobilization in a thumb spica splint.

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Appendix

Multiple choice questions, discussions and references for: An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis

1. A 55 year-old postal worker presents with Eaton Stage I carpometacarpal joint arthritis of bilateral thumbs. She is not interested in surgical intervention due to her work schedule this year. What is her most likely expected result after steroid injection and splinting?

- A. Pain relief for 12 months or longer.
- B. Pain relief for 2–3 months.
- C. Pain relief for 1–2 weeks.
- D. No significant relief of pain.

Correct answer: A

Discussion: Day showed in a study of 30 consecutive patients that steroid injection and splinting led to long-term (average 23 months) relief of pain in the group with early-stage (Eaton I) arthritis (**Level IV Evidence**).¹

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1. Day C, Gelberman R, Patel A, Vogt M, Ditsios K, Boyer M. Basal joint osteoarthritis of the thumb: a prospective trial of steroid injection and splinting. *J Hand Surg Am.* 2004;29:247–251.

For more information on the evidence discussed above, please refer to the MOC paper:

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2. A 60 year-old homemaker desires surgical intervention for painful basal joint arthritis of her dominant thumb. You have recommended trapeziectomy with ligament reconstruction and tendon interposition (LRTI). Which of the following is the most accurate description of her prognosis regarding long-term pain relief?

- A. This operation improves mobility, but does not significantly improve pain.
- B. After 2 or 3 years, approximately 10% of patients report excellent pain relief.
- C. After 2 or 3 years, approximately 50% of patients report excellent pain relief.
- D. After 2 or 3 years, approximately 90% of patients report excellent pain relief.

Correct answer: D

Discussion: Varitimidis followed 62 T+LRTI cases for 3.5 years and reported 95% pain relief, and very good strength and range of motion (**Level IV Evidence**).¹ This finding is similar to reports from other authors, showing that most patients maintain excellent pain relief for years after this operation.

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For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

3. Which of the following is the principal advantage of a “sling” type suspensionplasty over traditional ligament reconstruction and tendon interposition (LRTI) following trapeziectomy?

- A. Avoids need for bone tunnels
- B. Less functional deficit due to loss of FCR
- C. Less subsidence over time
- D. More physiologic range of motion

Correct answer: A

Discussion: Sirotakova reported a series of 104 APL-based suspensionplasties with excellent results (**Level IV Evidence**).¹ After 12 months, 91% of patients still had excellent pain relief; the remaining 9 patients had undergone revision surgery. In the successful cases, tip pinch, key pinch, and grip strength increased by 46%, 19%, and 41%, respectively, from the preoperative values. Sai reported similarly good results with sling arthroplasty (**Level IV Evidence**)² but none of these reports shows any significant advantages over LRTI, with the exception of the avoidance of drilling bone tunnels.

References:

1. Sirotakova M, Figus A, Elliot D. A new abductor pollicis longus suspension arthroplasty. *J Hand Surg Am.* 2007;32(1):12–22.
2. Sai S, Fujii K, Chino H, Inoue J. Tendon suspension sling arthroplasty for degenerative arthritis of the thumb trapeziometacarpal joint: long-term follow-up. *J Orthop Sci.* 2004;9(6):576–580.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

4. Based on the many different studies comparing different procedures for thumb carpometacarpal arthroplasty, which of the following components of the operation appears to be the most important for the surgery to be a success?

- A. Ligament reconstruction to stabilize the first metacarpal base
- B. Tendon interposition to prevent scaphometacarpal impingement
- C. Temporary postoperative fixation with Kirschner wires
- D. Removal of the trapezium

Correct answer: D

Discussion: In his randomized, controlled trial, Field showed us that neither ligament reconstruction nor tendon interposition were required for successful results (**Level I**

Evidence).1 Furthermore, after simple trapeziectomy, he did not use K-wires for fixation, as had been done by Gray in a similar study.²

References:

1. Field J, Buchanan D. To suspend or not to suspend: a randomised single blind trial of simple trapeziectomy versus trapeziectomy and flexor carpi radialis suspension. *J Hand Surg Eur.* 2007;32(4):462–466.
2. Gray K, Meals R. Hematoma and distraction arthroplasty for thumb basal joint osteoarthritis: minimum 6.5-year follow-up evaluation. *J Hand Surg Am.* 2007;32(1):23–29.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

5. One of your colleagues believes that maintenance of the scaphometacarpal space is important. Which of the following operations provides the best maintenance of this space over time?

- A. simple trapeziectomy without K-wires
- B. simple trapeziectomy with K-wire immobilization for 6 weeks postoperatively
- C. Gelfoam arthroplasty
- D. Swanson silastic implant arthroplasty

Correct answer: D

Discussion: Implant arthroplasties, as well as operations involving suspension or ligament reconstruction, do the best at maintaining the scaphometacarpal space. Of course, the importance of maintaining this space is debated in the literature, since many studies have not shown a significant clinical advantage in motion or strength with better scaphometacarpal space preservation (**Level I, II Evidence**).^{1–3}

References:

1. Field J, Buchanan D. To suspend or not to suspend: a randomised single blind trial of simple trapeziectomy versus trapeziectomy and flexor carpi radialis suspension. *J Hand Surg Eur.* 2007;32(4):462–466.
2. Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometacarpal joint) osteoarthritis. *Cochrane Database Syst Rev.* 2009;7(4):CD004631.
3. De Smet L, Sioen W, Spaepen D, van Ransbeeck H. Treatment of basal joint arthritis of the thumb: trapeziectomy with or without tendon interposition/ligament reconstruction. *Hand Surg.* 2004;9(1):5–9.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

6. Many surgeons believe that that preservation of scaphometacarpal space is important for postoperative success of basal joint arthroplasty. Which of the following best represents the current state of evidence to describe the effect of maintaining anatomical scaphometacarpal space on post operative function after basal joint surgery?

- A. Better pain relief
- B. Better tip pinch strength
- C. Better grip strength
- D. No proven effect

Correct answer: D

Discussion: Although DeSmet found a weak association between scaphometacarpal space and key pinch, this finding is difficult to interpret, as it came from a study in which a statistically significant difference in key pinch could not be detected between the T and T +LRTI groups (**Level II Evidence**).¹ Other authors have failed to document any strong association between scaphometacarpal space and strength, pain relief, or function.²⁻⁷

References:

1. De Smet L, Sioen W, Spaepen D, van Ransbeeck H. Treatment of basal joint arthritis of the thumb: trapeziectomy with or without tendon interposition/ligament reconstruction. *Hand Surg.* 2004;9(1):5-9.
2. Kriegs-Au G, Petje G, Fojtl E, Ganger R, Zachs I. Ligament reconstruction with or without tendon interposition to treat primary thumb carpometacarpal osteoarthritis. Surgical technique. *J Bone Joint Surg Am.* 2005;87(Suppl 1):78-85.
3. De Smet L, Vanfleteren L, Sioen W, Spaepen D, Van Ransbeeck H. Ligament reconstruction/tendon interposition arthroplasty for thumb basal joint osteoarthritis preliminary results of a prospective outcome study. *Acta Orthop Belg.* 2002;68(1):20-23.
4. Budoff J, Gordon L. Long-term results of tendon shortening trapeziometacarpal arthroplasty. *Clin Orthop Relat Res.* 2002;405:199-206.
5. Nusem I, Goodwin D. Excision of the trapezium and interposition arthroplasty with gelfoam for the treatment of trapeziometacarpal osteoarthritis. *J Hand Surg Br.* 2003;28(3):242-245.
6. Gray K, Meals R. Hematoma and distraction arthroplasty for thumb basal joint osteoarthritis: minimum 6.5-year follow-up evaluation. *J Hand Surg Am.* 2007;32(1):23-29.
7. Kuhns C, Emerson E, Meals R. Hematoma and distraction arthroplasty for thumb basal joint osteoarthritis: a prospective, single-surgeon study including outcome measures. *J Hand Surg Am.* 2003;28(3):381-389.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

7. A 2009 systematic review conducted by the Cochrane Collaboration on this basal joint arthroplasty analysed different procedures for arthritis dysfunction relief. Which of the following statements on procedure comparisons most accurately reflects the findings of this study?

- A. Simple trapeziectomy had significantly fewer complications than trapeziectomy with LRTI.

- B. Artelon spacer arthroplasty provided better range of motion than trapeziectomy with LRTI.
- C. Procedures that include ligament reconstruction provided better strength than other procedures.
- D. Prosthetic joint replacement provided less pain relief than autogenous reconstruction.

Correct answer: A

Discussion: In a systematic review conducted by the Cochrane Collaboration, Wajon showed there was a significant increase in complications when ligament reconstruction and tendon interposition was added to simple trapeziectomy (**Level II Evidence**).¹ No differences were found in strength, range of motion, or pain relief between these two procedures.

Reference:

1. Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometacarpal joint) osteoarthritis. *Cochrane Database Syst Rev.* 2009;7(4):CD004631.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

8. Which of the following options for implant arthroplasty has been compared to autogenous reconstruction in a randomized controlled trial which showed no difference in tip pinch, pain, or patient satisfaction between groups?

- A. Pyrolytic carbon implant
- B. Helal silicone ball implant
- C. Orthosphere ceramic implant
- D. Swanson endoprosthesis

Correct answer: D

Discussion: Tägil's 2002 study compared these two operations (Swanson implant vs. LRTI) in a RCT; however, the groups were small (13 patients each), and no significant differences were found between groups (**Level II Evidence**).¹

Reference:

1. Tagil M, Kopylov P. Swanson versus APL arthroplasty in the treatment of osteoarthritis of the trapeziometacarpal joint: a prospective and randomized study in 26 patients. *J Hand Surg Br.* 2002; 27: 452–456.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

9. Which of the following implant arthroplasties is no longer recommended for routine use, due to severe subsidence and associated fractures?

- A. Pyrolytic carbon implant

- B. Orthosphere ceramic implant
- C. Swanson endoprosthesis silicone implant
- D. GUEPAR II prosthesis

Correct answer: B

Discussion: This implant received a poor report in a study by Adams in 2009, which showed severe subsidence and fractures occurred frequently during the 3-year follow-up period (**Level IV Evidence**).¹

Reference:

1. Adams B, Pomerance J, Nguyen A, Kuhl T. Early outcome of spherical ceramic trapezial-metacarpal arthroplasty. *J Hand Surg Am.* 2009;34(2):213–218.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

10. Which of the following potential advantages is most cited by proponents of early mobilization (within 2 weeks) after thumb carpometacarpal joint arthroplasty?

- A. Decreased incidence of CRPS
- B. Increased range of motion
- C. Increased grip strength
- D. Decreased time until return to work

Correct answer: A

Discussion: The advocates of early mobilization believe this helps decrease the incidence of CPRS. Early mobilization does not appear to increase range of motion, grip strength, or provide a faster return to work. 1, 2

References:

1. Maqsood M, Chentil Kumar N. Interposition arthroplasty for osteoarthritis of trapezio metacarpal joint: results of a modified incision and technique of interposing with early mobilisation. *Hand Surg.* 2002;7(2):201–206.
2. De Smet L, Sioen W, Spaepen D, van Ransbeeck H. Treatment of basal joint arthritis of the thumb: trapeziectomy with or without tendon interposition/ligament reconstruction. *Hand Surg.* 2004;9(1):5–9.

For more information on the evidence discussed above, please refer to the MOC paper:

Haase S, Chung K, An Evidence-Based Approach to Treating Thumb Carpometacarpal Joint Arthritis. *Plast. Reconst. Surg.*

Table 1

ASPS Evidence Rating Scale for Therapy

Level of Evidence	Qualifying Studies
I	High-quality, multicenter or single-center, randomized controlled trial with adequate power; or systematic review of these studies
II	Lesser quality, randomized controlled trial; prospective cohort study; or systematic review of these studies
III	Retrospective comparative study; case-control study; or systematic review of these studies
IV	Case series
V	Expert opinion; case report or clinical example; or evidence based on physiology, bench research, or "first principles"

Table 2

Autogenous Arthroplasty Options for Thumb Carpometacarpal Arthritis

Surgical Treatment	Abbreviation	Description of Procedure
Trapeziectomy	T	Removal of trapezium ("simple trapeziectomy")
Trapeziectomy plus Tendon Interposition Arthroplasty	T+IA	Removal of trapezium and interposition of tendon into arthroplasty space. Choices of tendon include palmaris longus, split or whole flexor carpi radialis (FCR), or slip of abductor pollicis longus (APL)
Trapeziectomy plus Ligament Reconstruction	T+LR	Removal of trapezium and volar beak ligament reconstruction and/or suspension using slip of flexor carpi radialis or abductor pollicis longus tendon
Trapeziectomy plus Ligament Reconstruction and Tendon Interposition Arthroplasty	T+LRTI	Removal of trapezium, reconstruction of volar beak ligament, and interposition of leftover tendon graft into the arthroplasty space

Table 3

Implant Arthroplasty Options for Thumb Carpometacarpal Arthritis

Implant Type	Implant Name(s)	Description
Degradable spacer	<ul style="list-style-type: none"> • Artelon 	Removal of distal surface of trapezium and interposition of degradable spacer into joint, secured to first metacarpal and remaining trapezium by means of extraarticular tabs
Silicone prostheses	<ul style="list-style-type: none"> • Swanson endoprosthesis • Helal silicone rubber ball 	Removal of trapezium and placement of silicone elastomer interposition prosthesis, secured with "stem" into metacarpal base and/or scaphoid
Hemiarthroplasty	<ul style="list-style-type: none"> • Pyrolytic carbon • Titanium 	Surface replacement arthroplasty of the metacarpal base using non-cemented implant and creation of a "socket" in trapezium
Total joint replacement (TJA)	<ul style="list-style-type: none"> • de la Caffinière • GUEPAR II • Braun-Cutter 	Joint replacement with ball-and-socket configuration; often cemented in place
Ceramic sphere implant	<ul style="list-style-type: none"> • Orthosphere 	Interposition of ceramic sphere between metacarpal and trapezium, requiring creation of a concave "socket" in each bone

Table 4
Case Series Reports of Autogenous Arthroplasty for Thumb Carpometacarpal Arthritis (Level IV Evidence)

Study	Procedure	Follow-up	Radial Abduction	Palmar Abduction	Grip	Tip Pinch	Key Pinch	Pain Relief
Vartimidis, 2000	T+LRTI (62 hands)	3.5 years	44 degrees	41 degrees	22 kg	4.6 kg	5.0 kg	95% excellent
De Smet, 2002	T+LRTI (31 hands)	2.1 years			26 kg		5.0 kg	2.5 / 10 (on visual analog scale)
Strotakova, 2007	T+APL sling (104 hands)	1 year	53 degrees	47 degrees	18 kg	4.0 kg	5.1 kg	91% pain-free
Sai, 2004	T+FCR sling (22 hands)	8.4 years	44 degrees	50 degrees	18 kg	2.6 kg	3.4 kg	82% pain-free
Budoff, 2002	T+IA w/APL shortening (29 hands)	5.1 years	31 degrees	45 degrees	26 kg	3.5 kg	4.5 kg	83% good or excellent
Maqsood, 2002	T+IA (60 hands)	5.5 years			21 kg	4.2 kg	6.5 kg	100% pain-free at rest
Nusem, 2003	T+Gelfoam interposition (34 hands)	5 years			17 kg	3.7 kg	4.1 kg	68% pain-free
Gray, 2007	T (22 hands)	7.3 years			23 kg	5.0 kg	5.0 kg	82% pain-free
Kuhns, 2003	T (26 hands)	2.1 years			26 kg	4.9 kg	6.0 kg	92% pain-free