REVIEW ARTICLE

Radial Portal Tendon Harvest and Interposition in Arthroscopic Treatment of Thumb Basilar Joint Osteoarthritis

Jerone T. Landström, MD

This study describes an arthroscopic technique that uses the same radial arthroscopic access portal to harvest and to interpose tendon material into the trapeziometacarpal joint in the treatment of Eaton-Littler stage 2 and 3 osteoarthritis of the trapeziometacarpal joint. Clinical application of this technique has resolved pain and preserved motion at the trapeziometacarpal joint in this study experience. *(J Hand Surg 2008;33A:442–445. Copyright © 2008 by the American Society for Surgery of the Hand.)*

Key words Arthritis, arthroscopy, same-portal tendon harvest–interposition, trapeziometacarpal joint.

Since Menon reported an initial series using arthroscopy in treating isolated trapeziometacarpal joint osteoarthritis (OA), there have been continued advances in arthroscopic technique for the treatment of thumb basilar joint OA, with favorable outcomes.[1–4] However, arthroscopic technique to date has not treated patients with symptomatic trapeziometacarpal joint OA by using the same arthroscopic access site to harvest and to insert tendon interposition material in order to minimize surgical intervention. Therefore, the purpose of this study was to synthesize open and arthroscopic surgical concepts to treat Eaton-Littler[5] stage 2 and 3 symptomatic trapeziometacarpal joint OA not responsive to medical treatment alone. This was accomplished by incorporating the open technique as described by Zancolli[6] with established arthroscopic technique that only uses the same trapeziometacarpal joint radial portal site (1-R) for the harvest and interposition of tendon material into the trapeziometacarpal joint.

SURGICAL TECHNIQUE

This technique includes standard thumb trapezial-metacarpal arthroscopic access using the ulnar (1-U) and the radial (1-R) access portals with the extremity extended on an arm board.[1–4,7] The 1-R access site is modified by a larger 1.0-cm chevron incision with the apex radial and volar at the interface of glabrous and nonglabrous skin to expose the distal insertion of the accessory abductor pollicis longus (AAPL) tendon group and the abductor pollicis longus (APL) tendon group (Fig. 1). For the purpose of this study, all APL tendon slips were considered accessory if they did not insert into the radial dorsal portion of the first metacarpal base. Prior to placing traction on the affected thumb, all the distal AAPL and APL tendon slips were dissected out completely and the extensor pollicis brevis tendon identified ulnarly at the modified 1-R access site, facilitated by using small retractors. The distal radial branch of the superficial branch of the radial nerve was a constant finding in this series, and it was retracted to protect and exclude it from the surgical field. The AAPL and APL tendons were always dissected from distal to proximal until almost reaching the distal margin of the first dorsal compartment through the radial 1-R access site.

All 14 thumbs of 13 patients in this study were noted to have the AAPL tendon group inserting into the thenar eminence fascia and musculature. Also, in all cases the APL tendon inserted into the radial dorsal base of the first metacarpal, and no patient had AAPL or APL tendon insertions into the trapezium. The AAPL tendon group was released from its insertion into the thenar eminence. Then the most radial aspect of the APL tendon group was released from its metacarpal insertion leaving about a distal 5-mm cuff of tendon material, with preservation of the remaining APL tendon group inserting into the metacarpal base. This was done to approximate 50% of the combined width of all distal AAPL and APL tendons (Fig. 2). This allowed for adequate tendon interposition material and potential trapeziometacarpal joint unloading as hypothesized by Zancolli.[6] The released portions of the AAPL and the APL tendons were allowed to retract, but these tendons were easily grasped later if needed for tendon interposition

From the Pacific Hand Surgery Center, Tamuning, Guam.

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Corresponding author: Jerone T. Landström, MD, Suite 212, Guam Medical Plaza, 633 Gov. Camacho Rd., Tamuning 96913, Guam; e-mail: handsurgery@guam.net.

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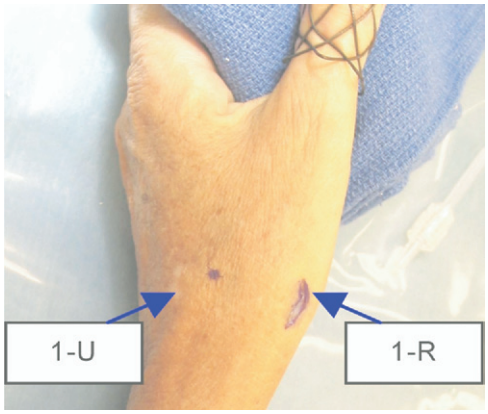

FIGURE 1: Enlarged 1-R portal and 1-U portal site.

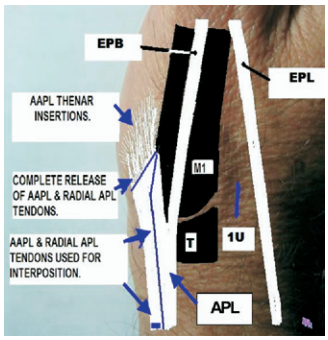

FIGURE 2: Schematic of excised accessory AAPL tendons inserting into thenar eminence and the APL tendon at the trapeziometacarpal joint. M1, first metacarpal; T, trapezium; EPB, extensor pollicis brevis; EPL, extensor pollicis longus; 1U, ulnar arthroscopic access site to trapeziometacarpal joint.

material. In addition, a very large piece of AAPL and APL tendon material can be obtained by a separate incision over the first dorsal compartment, followed by tenovaginotomy of the first dorsal compartment, to achieve the maximum amount of tendon interposition material up to the myotendinous junction of the AAPL and the APL tendons. However, this was not necessary in this study.

Next, distal axial traction was placed on the thumb to distract the trapeziometacarpal joint and was followed by arthroscopic technique using a 30°, short, 2.7-mm arthroscope, and joint fluid irrigation was infused by gravity effect. After arthroscopic trapeziometacarpal joint evaluation and debridement, it was noted that in all cases the ulnar and palmar aspects of the trapeziometacarpal joint cartilage were preserved, as published in other studies.[8] Arthroscopic hemitrapeziectomy of arthritic surfaces was accomplished with a 2.9-mm burr extending down into cancellous bone through the 1-R portal from radial to ulnar until intact trapezial cartilage was reached. All but 1 patient required tendon interposition. The previously released AAPL and APL tendons were identified in the proximal aspect of the 1-R portal site. Then these distal free tendon ends were

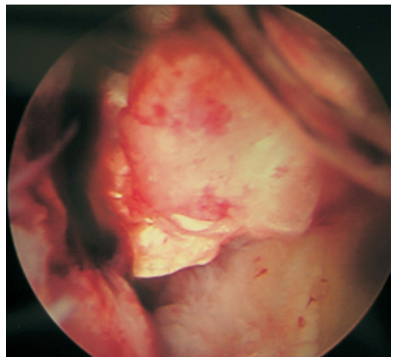

FIGURE 3: AAPL-APL tendon interposition in radial trapeziometacarpal joint.

grasped and placed on distal traction and dissected away from the remaining APL tendons from distal to proximal. Placing a small retractor under the proximal margin of the 1-R wound and retracting the skin away from the tendons and radially deviating the wrist assisted in the dissection proximally to near the distal margin of the first dorsal compartment. At all times, the superficial branch of the radial nerve must be protected, but typically it is usually ulnar to the dissection plane.

Upon separating out the radial-oriented AAPL and APL tendons to be used for interposition from the ulnar-preserved APL tendons, the release AAPL and APL tendons were divided proximally near the first dorsal compartment under direct vision facilitated by radially deviating the wrist with skin retraction. The harvested tendons were then placed in an antibiotic saline solution. Next, and after debridement and hemitrapeziectomy, the traction was removed from the thumb and the tourniquet was deflated while the harvested AAPL and APL tendons were folded into an approximate 1 x 1 x 1 cm ellipse-like configuration that was secured with a 4-0 Supramid suture (S. Jackson, Inc., Alexandria, VA) to maintain its shape. After this, distal axial traction was replaced on the thumb, and the harvested tendon group was inserted through the 1-R portal into the trapeziometacarpal joint for the tendon interposition material facilitated by using a mosquito hemostat or a freer. Then the cannula and arthroscope were reinserted at the 1-U portal, and the placement of the tendon interposition was assessed and confirmed to be in the radial position in the trapeziometacarpal joint without reinflation of the tourniquet. If bleeding from the trapezium impairs the arthroscopic visualization of the trapeziometacarpal joint, irrigation usually clears the field adequately. However, the tourniquet can be reinflated with gravity-assisted fluid irrigation for adequate visualization if necessary (Fig. 3).

Next, the ulnar arthroscope and cannula were removed, and the axial thumb traction was released. Then the radial joint capsule in between the metacarpal and trapezium and the distal APL tendon cuff remnant on the first metacarpal base were approximated with a 4-0 Supramid in a simple suture technique. The 1-R access port site skin wound was

closed with 6-0 Monocryl suture (Johnson & Johnson Medical, Division of Ethicon, Inc., Arlington, TX) in a buried interrupted subcuticular manner, and the 1-U access port site skin wound was closed with Dermabond (Johnson & Johnson Medical, Division of Ethicon, Inc., Arlington, TX) followed by application of Steri-Strips (3M Health Care, St. Paul, MN) and Bioclusive dressing (Johnson & Johnson Medical, Division of Ethicon, Inc., Arlington, TX) to both portal sites. Full passive range of motion was tested with and without loading on the thumbs without any instability or grind noted. C-arm x-ray evaluation revealed separation of the metacarpal from the trapezium. All patients were seen the following day. Restricted activities and thumb spica splinting continued for a total of 6 weeks postoperatively. After this period, the patients were initiated on a home exercise program and allowed to perform activities of daily living as tolerated. Only 4 patients out of a total of 13 patients received postoperative hand therapy due to noncoverage of hand therapy by the patients' health insurance plans.

DISCUSSION

The author reports on using this technique for 14 thumbs with trapeziometacarpal joint OA that causes pain symptoms interfering with activities of daily living and is unresponsive to nonsurgical management. The patients represented Pacific Islanders with Asian (1) and Eurasian (2) ancestry and Americans with European ancestry (10). The average age at surgery was 57 years with a range from 35 to 65 years. Using the Eaton-Littler[5] classification for trapeziometacarpal joint OA, preoperatively 8 thumbs were classified as stage 2 and 6 thumbs were classified as stage 3. Regarding the Eaton-Littler[5] stage 3 classification, there were no thumbs with trapezial collapse. There was no preoperative impairment of any wrist, digit, or thumb active range of motion based on the *Guides to the Evaluation of Permanent Impairment*.[9] At the metacarpophalangeal joint, 1 thumb had 50° extension and the remaining thumbs had less than 30° extension. Arthroscopic and open surgical treatments were thoroughly explained and offered to each patient; however, all patients desired arthroscopic treatment because of its perceived lesser invasiveness. Intraoperative arthroscopic findings were greater than anticipated in 3 of the stage 2 thumb basilar joints. No patient was classified as Eaton-Littler[5] stage 1 or 4, and no patient had a history of previous hand or wrist surgery. All patients had preoperative, intraoperative, and serial postoperative radiographs completed. All patients had Disability of the Arm, Shoulder, and Hand (DASH) questionnaires completed for all thumbs preoperatively (DASH-1) and postoperatively (DASH-2) with scores calculated.[10,11] In addition, Jamar dynamometer measurements (Fabrication Enterprises Inc., Irvington, NY) of grip strength were accomplished using the protocol of Mathiowetz et al.[12]

Evaluating patients using this described technique revealed that the mean DASH score improved by 79% from preoperative scoring to postoperative scoring. The Jamar dynamometer measurement of grip strength improved postoperatively compared with preoperative measurements for most of the patients. All were pleased with the outcome of the procedure, and the near nonvisualization of the wound sites was a common subjective positive comment regarding this procedure. Despite the overall positive patient responses, 2 women complained of some subjective persistent loss of strength when opening jars, but no pain. The 1 thumb with passive hyperextension of the metacarpophalangeal joint preoperatively had no problems postoperatively and did not develop any thumb deformity. There was 1 complication of transient neurapraxia of the thumb dorsal radial sensory nerve, which resolved over time.

This study noted that the AAPL and the radial portion of the APL tendons that were released distally and then harvested through the modified radial arthroscopic access port proximally up to the first dorsal compartment were adequate in volume for tendon interposition material. This described procedure incorporates the noted benefits of inserting allograft tendon material into the trapeziometacarpal joint along with the potential benefit of trapezial flattening by arthroscopic hemitrapeziectomy to treat symptomatic trapeziometacarpal joint OA.[13–20] With arthroscopic hemitrapeziectomy, there is an additional hypothetical benefit of creating an environment for potential diapedesis of mesenchymal marrow stem cells into the trapeziometacarpal joint. The mesenchymal marrow stem cells may then differentiate and create fibrocartilage or possibly hyaline type II cartilage that may similarly resurface this small joint as reported in larger joints.[21]

By building on the established effectiveness of an arthroscopic and a select open surgical technique and synthesizing them into this described modified arthroscopic technique, the author has achieved for the patients in this study the resolution of pain due to Eaton-Littler[5] stage 2 and 3 symptomatic trapeziometacarpal joint OA while maintaining motion at the trapeziometacarpal joint. These favorable results have continued for more than 3 years without any revision surgeries to date.

The described modified arthroscopic technique allows for future surgical treatment options for symptomatic degenerative progression of trapeziometacarpal joint OA.[22–27] This technique is also less invasive by virtue of using the same radial arthroscopic access site to harvest and to insert tendon interposition material into the trapeziometacarpal joint rather than harvesting tendon interposition material from remote surgical donor sites.

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