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TECHNIQUE

Arthroscopically Assisted Sauvé-Kapandji Procedure: An Advanced Technique for Distal Radioulnar Joint Arthritis

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ABSTRACT

Osteoarthritis of distal radioulnar joint (DRUJ) leads to chronic wrist pain, weakness of grip strength, and limitation of motion, all of which affect the quality of life of the patient. Over the years, several procedures have been used for the treatment of this condition; however, this condition still remains a therapeutic challenge for the hand surgeons. Many procedures such as Darrach procedure, Bower procedure, Sauvé-Kapandji procedure, and ulnar head replacement have been used. Despite many advances in wrist arthroscopy, arthroscopy has not been used for the treatment of arthritis of the DRUJ. We describe a novel technique of arthroscopically assisted Sauvé-Kapandji procedure for the arthritis of the DRUJ. The advantages of this technique are its less invasive nature, preservation of the extensor retinaculum, more anatomical position of the DRUJ, faster rehabilitation, and a better cosmesis.

Keywords: wrist, arthroscopy, distal radioulnar joint, arthritis

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HISTORICAL PERSPECTIVES

An intact distal radioulnar joint (DRUJ) is essential for the normal functioning of the wrist.[1] Osteoarthritis of the DRUJ results in a painful wrist with limitation of pronosupination and weakness of grip strength, thereby severely limiting the activity of daily living.[2] For the last 25 years, the interest in this pathologic condition has increased, and various surgical procedures have been described to treat this disabling condition.[3–6] Darrach[3] described a procedure with an intention of increasing range of motion (ROM) and decreasing pain in the posttraumatic effect on the DRUJ. Since then, this procedure has gained wide acceptance with satisfactory results in most patients. Bowers[4] described his hemiresection interposition arthroplasty of the DRUJ for arthritis of the

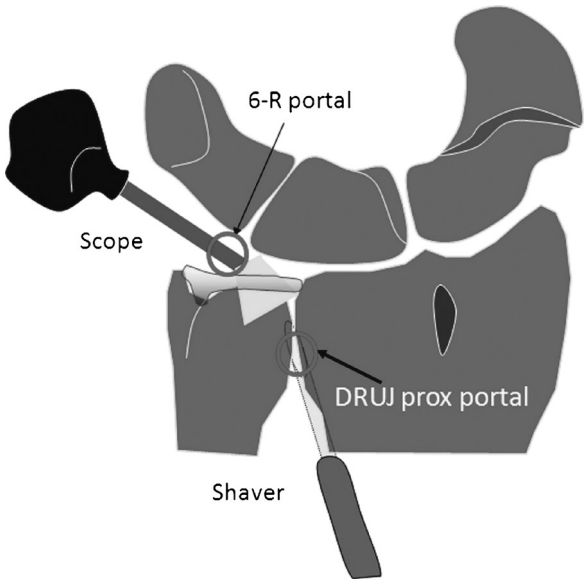

FIGURE 1. Illustration showing the positioning of the arthroscope in the 6R portal with instrumentation in the DRUJ portal.

DRUJ with a neutral or minus ulnar variance. Sauvé and Kapandji[5] described a DRUJ arthrodesis technique with an ulnar osteotomy while preserving the normal ulnocarpal relationship. This procedure had the advantage of physiological pattern of load transmission of forces from hand to forearm. Keeping the ulnar head in normal alignment with the radius and carpus is important for an effective load transmission, especially in high-demand younger patients. Hence, in high-demand young patients and elderly active patients, Sauvé-Kapandji procedure has been considered the procedure of choice in DRUJ arthritis.[6] Moreover, it also results in a better wrist contour and hence a better result as compared with the Darrach procedure. Lluch and Garcia-Elias[7] recommended a fluoroscope-guided resection osteotomy of 1 cm proximal to the ulnar neck and the site for the placement of the screw volar to the extensor carpi ulnaris using the Sauvé-Kapandji procedure. Ulnar head arthroplasty was advocated for pain-free movements of the wrist while maintaining a normal ulnocarpal relationship.[8] However, the results with ulnar head prosthesis were not satisfactory, and hence, they are preferred usually for salvage procedures.[9]

With advances in arthroscopy, many arthroscopic techniques have been used for radiocarpal (RC) conditions but less techniques have been used for conditions of the DRUJ because the former are much easier to treat.[10]

The purpose of this study was to describe a novel technique of arthroscopically assisted Sauvé-Kapandji procedure. Arthroscopy is used to assist the arthrodesis of the DRUJ followed by the resection pseudoarthrosis of the ulna.

INDICATIONS AND CONTRAINDICATIONS

This technique is indicated in patients with primary or posttraumatic osteoarthritis of the DRUJ with chronic pain, stiffness, and disability. However, this is a demanding technique and should only be used by surgeons having a good experience in wrist arthroscopy. Furthermore, DRUJ arthritis secondary to instability is a contraindication to this arthroscopically assisted procedure because it may lead to instability of the distal ulnar stump and a secondary surgery may become necessary for its stabilization. For DRUJ arthritis secondary to instability, the Darrach[3] procedure, Bowers[4] procedure, or an ulnar head prosthesis[6] should be considered. We suggest a thorough assessment of the DRUJ under anesthesia to rule out any evidence of instability so that in the presence of instability of the DRUJ, an alternative suitable procedure can be chosen with an informed consent of the patient.

SURGICAL TECHNIQUE

The wrist is maintained in a vertical position during the wrist arthroscopy using the Borelli wrist tower. Arthroscopies of the RC joint, ulnar carpal (UC) joint, and the DRUJ are performed. The RC and UC joints are arthroscopically explored first, followed by the DRUJ. The central part of the triangular fibrocartilage complex (TFCC), if found intact, is excised to reach the ulnar head. The surface of ulnar head is examined over the TFCC. The ulnar articulation with the sigmoid fossa is thoroughly examined for loss of cartilage and exposure of the subchondral bone.

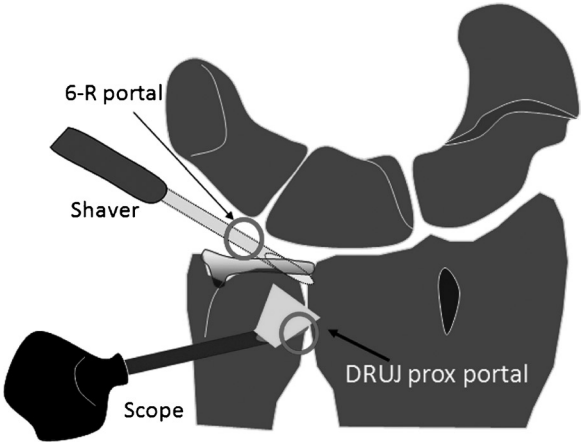

FIGURE 2. Illustration showing the frequent interchanges of portals for a better visualization and access.

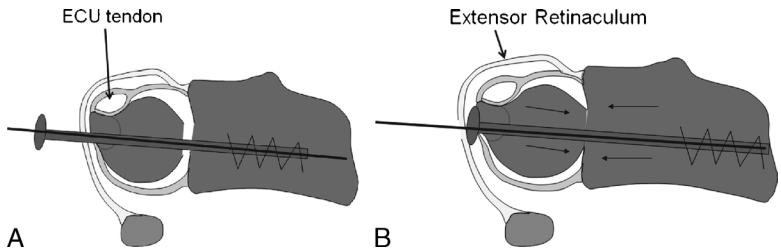

FIGURE 3. A, Illustration showing the insertion of the cannulated screw over the guidewire, volar to extensor carpi ulnaris tendon. The screw is only stabilizing the DRUJ and is not tightened. B, Illustration showing the tightening of the screw after the ulnar resection osteotomy to achieve compression at the DRUJ.

Double approach (UC and DRUJ arthroscopy) is used to remove the remnant cartilage both on the ulnar head and the sigmoid fossa. This is performed using a motorized burr (3.5 mm) and radiofrequency device (Vulcan Endoscopy Smith & Nephew, Inc, Andover, MA). An arthroscope is positioned at the 6R portal and instrumentation at the DRUJ portal (Fig. 1). Frequent changes in the work portals are done for a better visualization and better access (Fig. 2). After a thorough debridement of the DRUJ and removal of the remnant cartilage, the DRUJ is fixed temporarily using a Kirschner wire (K wire) under fluoroscopy and, using this wire as a guide; the joint is fixed and stabilized by a cannulated screw inserted volar to the extensor carpi ulnaris tendon (Fig. 3A). The extensor retinaculum (fifth and sixth extensor compartments) is well preserved. The screw is initially used only to hold the bones and is not tightened. A resection osteotomy of 1 cm is then done proximal to the ulnar neck. After resection of the ulna, the screw is firmly tightened to achieve the compression at the DRUJ (Fig. 3B). Arthrodesis of the DRUJ is performed while maintaining the wrist in a vertical position at 0-degree pronosupination. A 2.0-mm K wire can also be used in addition to the cannulated screw to provide an additional reinforcement of the fixation. The DRUJ is not surgically exposed and the pronator quadratus muscle is not inserted at the site of osteotomy of the ulna.

Postoperatively, an above-elbow cast is given for 4 weeks with the wrist in 0-degree pronosupination and the elbow flexed at 90 degrees. Rehabilitation and physical therapy continued for 4 weeks after the removal of the cast, gradually gaining the ROM and strength while the fusion of the DRUJ is checked by follow-up radiographs.

■ COMPLICATIONS

We did not experience any complications after this procedure; however, there are still some potential complications that can be encountered, such as incomplete resection of the articular surface of the DRUJ leading to failed arthrodesis, incorrect placement of the K wire and/or the screw, too proximal or too distal resection of the ulna, radioulnar impingement, and infection.

■ CASE EXAMPLE

A patient aged 53 years, right hand–dominant, heavy worker by profession, and affected by bilateral DRUJ arthritis for 3 years reported with chief complaint as pain in bilateral wrist (left > right). Being a gardener, he could not perform his heavy work comfortably owing to reduction in his grip strength and severe pain while using scissors during pronosupination movements. The pain in the left wrist was graded as 9 on a visual analog scale (VAS) of 0 to 10, with 10 being the most severe. The ROM of the left wrist was measured as (45–50 degrees) of pronosupination, whereas the flexion extension (80–80 degrees) was normal. Radiographs showed primary osteoarthritis of the DRUJ of the bilateral wrist without involvement of any other

FIGURE 4. Preoperative radiographs of both left and right wrists demonstrating severe arthritis of bilateral DRUJ.

FIGURE 5. Radiographs of bilateral wrists at 3 years showing fusion of bilateral DRUJ.

part of the wrist (Fig. 4). Magnetic resonance imaging excluded any ischemic phenomena of the ulnar head. An arthroscopically assisted Sauvé-Kapandji procedure was planned.

At follow-up (2 months postoperatively), the VAS for pain was 0 at rest and 2 after heavy work. The patient was comfortable and pain-free during his activities of daily living, and with gradual improvement in the grip strength, he eventually returned to his heavy manual work. The pronosupination recovered completely. Radiographs demonstrated complete fusion of the DRUJ.

The patient's satisfaction could be judged by the fact that he underwent the same surgery for his right wrist 2 years later. The patient's recovery time was the same for the right wrist (Fig. 5). At the final follow-up (3 years), the patient had a VAS of 2 in bilateral wrists after heavy work and 0 at rest. Furthermore, the grip strengths of bilateral wrists were 33 kg on average while maintaining an excellent ROM of the bilateral wrist (Figs. 6A–D).

■ DISCUSSION

Arthritis of the DRUJ remains a difficult problem to treat especially in young patients, despite the various advancements in the surgical techniques.[11] The Darrach[3] procedure, although considered an easy procedure and has gained wide acceptance, results in an impairment of the TFCC function, thus leading to ulnar instability.[4] It can also lead to dynamic radioulnar convergence and ulnar translocation eventually leading to weak grip, wrist instability, radioulnar impingement, and subcutaneous rupture of finger extensors.[11–15] The Bower[4] procedure, although advantageous over the Darrach[3] procedure, can lead to stylocarpal impingement.[9] Moreover, an intact TFCC is a prerequisite for this procedure.[4] Ulnar head prostheses have been associated with resorption of distal ulna and migration or breakage of the prostheses.[9,16–18] Hence, these prostheses are usually used only for salvage procedures and in elderly patients with rheumatoid arthritis.[16] In recent years, the Sauvé-Kapandji procedure has become the treatment of choice for arthritis of the DRUJ.[19] The Sauvé-Kapandji procedure can be performed even in the presence of TFCC tears and is suitable for young and elderly high-demand patients.[20] It restores the wrist ROM and stability while improving the grip strength.[21,22]

This technique presents a unique role of arthroscopy in the treatment of arthritis of the DRUJ by the Sauvé-Kapandji procedure. Assisted arthroscopic arthrodesis of the DRUJ is a safe and promising technique and can be successfully used for arthrodesis of the DRUJ. The noteworthy advantages are the preservation of the fifth

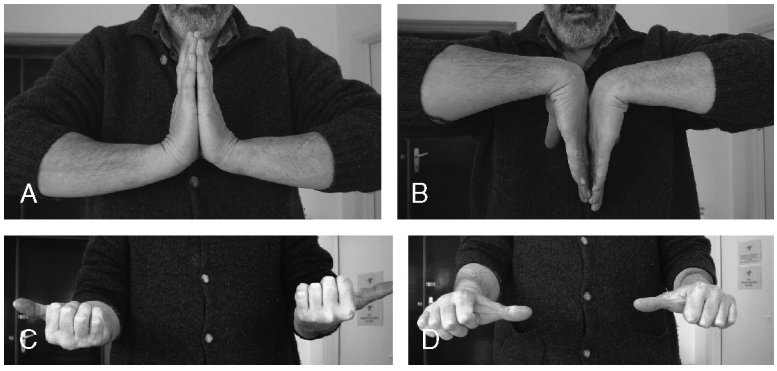

FIGURE 6. A–D, Clinical photographs of the patients showing ROM of bilateral wrists at 3 years.

and sixth extensor compartments, more anatomical position of the DRUJ, faster rehabilitation, and a better cosmesis.

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