

Case Report of Modified Sauvé-Kapandji Technique Using Endobutton Suture in Secondary Treatment of Madelung Deformity

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Abstract

The Sauvé-Kapandji technique is considered a useful treatment option for distal radioulnar joint instability encountered in many conditions, such as Madelung deformity or in post-traumatic entities. However, post-operative instability of the proximal ulnar stump and radioulnar convergence may be symptomatic and is still a major concern. Despite proximal ulnar stump stabilization with various techniques, many patients still complain of pain and limitation of wrist movement. We report a case of a patient with Madelung disease treated initially by corrective radial and ulnar osteotomy, and then encountered a post-traumatic distal radioulnar joint instability. This condition was treated with a modified Sauvé-Kapandji procedure using a single endobutton suture, leading to good clinical and radiological results.

Keywords: Distal Radioulnar Joint Instability; Endobutton Suture; Madelung Disease; Proximal Ulnar Shaft; Sauvé-Kapandji Technique

Introduction

The Sauvé-Kapandji procedure is used and is indicated for treatment of many conditions that result in distal radioulnar joint pain or instability or both, such as in Madelung deformity and post-traumatic dislocations. Despite proximal ulnar stump stabilization with various techniques, many patients continue to experience pain and limitation of wrist movement. Various modalities for the surgical management of distal radioulnar joint instability have been described. However, the current literature lacks robust evidence to support the use of a specific approach especially in urgent conditions. We report the use of a new concept of distal radioulnar joint stabilization in a patient with Madelung deformity treated initially and successfully with corrective radial and ulnar osteotomies and then later suffering from a post-traumatic distal radioulnar joint instability. This condition was treated with a modified Sauvé-Kapandji procedure using a single endobutton suture to stabilize the proximal ulnar shaft.

Case Report

We present the case of a 23-year-old young woman who presented with Madelung deformity in both wrists. Pain and wrist deformity were her major concerns. DASH score was 30. She successfully underwent an operation by the author in February 2013, including distal radial corrective osteotomy and distal ulnar shortening osteotomy in her left wrist (Figure 1). The postoperative course was uneventful. The patient was satisfied concerning pain, mobility, and esthetic shape of the wrist. DASH score was 5. In August 2016, she visited the outpatient clinic because of painful posttraumatic distal radioulnar joint

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Citation: Ghassan Zakhia-Douaihy, Yehia Tfayli, Ahmad Salaheddine Naja, Mohamad Issa, Jean Paul Rizk. Case Report of Modified Sauvé-Kapandji Technique Using Endobutton Suture in Secondary Treatment of Madelung Deformity. Archives of Clinical and Medical Case Reports . 7 (2023): 132-135.

Received: March 01, 2023

Accepted: March 14, 2023

Published: March 28, 2023

instability in the past 3 months before (Video 1). The physical examination result was positive for distal radioulnar joint instability, which was confirmed based on the radiographs of the left wrist and forearm (Figure 1). DASH score was 43. After obtaining formal oral and written informed consent for the surgical procedure and approval from the patient to share this case report, a modified Sauvé-Kapandji technique was performed with ulnar stump stabilization using endobutton, a single bundle suture (Figure 3). The device was tensioned according to the surgical findings, that is, the necessary tension to stabilize the ulnar proximal stump in a different arc of motion without causing any movement limitation or conflict and impingement with the surrounding soft tissues and the radius. The interval between the radius and the ulna did not require reconstruction. The endobutton did not affect the range of motion of the forearm owing to its accentuated transverse orientation (Video 2). A short-arm cast was applied for 6 weeks, and then physical therapy was started. A yearly follow-up was conducted for 3 years. The patient attained almost complete resolution of pain. Her grip strength was satisfactory, without subluxation of the proximal ulnar stump. She recovered her pre-traumatic range of motion within 2 weeks of continuous physical therapy 3–5 times a week. The patient was satisfied with the result. She could use her left wrist conveniently in her daily life activities as compared with her right wrist. The Dash score was 3.6. Figure 4 shows the 3-year follow-up radiograph depicting adequate healing, and no signs of malunion or distal radioulnar joint instability. Video 3 shows the wrist and forearm ranges of motion at 3 years after operation. DASH score was 4.3 at the latest review. Stress X-rays showed no conflict between the radius and the proximal ulnar shaft (Figure 5). The patient did not complain of any pain during the maneuver.

Discussion

Madelung deformity is a rare congenital dyschondrosteosis of the wrist caused by crooked growth at the distal radial physis secondary to a partial ulnar-sided arrest [1-3]. The



Figure 1: Preoperative radiograph.

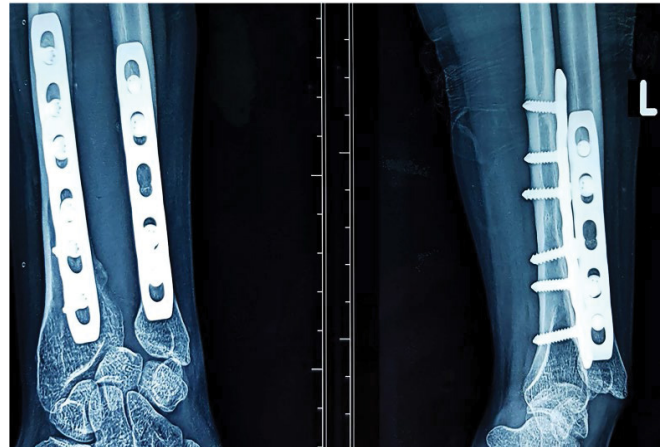


Figure 2: Postoperative radiograph showing the outcomes of corrective radial and ulnar shortening osteotomies. No instability of the distal radioulnar joint articulation can be observed.

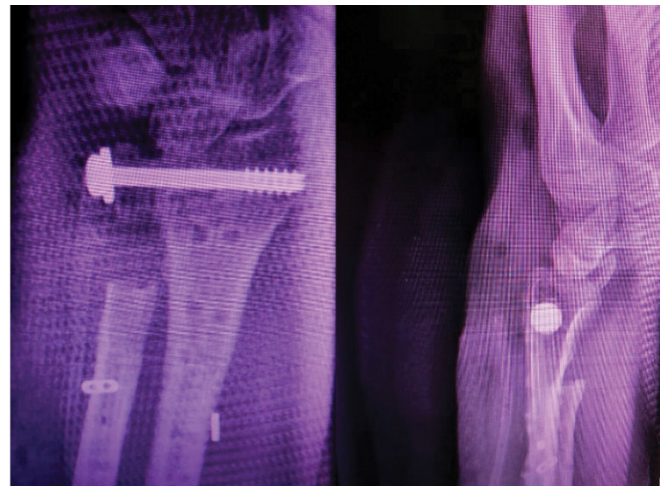


Figure 3: Intraoperative lateral and anteroposterior radiograph obtained during the modified Sauvé-Kapandji procedure using Mini TightRope.



Figure 4: Three-year follow-up radiograph showing appropriate healing, and good alignment, with no signs of distal radioulnar joint instability.



Figure 5: Stress X-ray shows no conflict between the radius and the proximal ulnar stump.

deformity is characterized by ulnar and palmar curvature of the distal radius, positive ulnar variance, and proximal gradual sinking of the lunate, which leads to ulnar carpal impaction. With female predominance, Madelung disease typically affects both wrists. The deformity can occur in isolation or as part of a genetic syndrome (i.e., Leri-Weil dyschondrosteosis or Turner syndrome). The pathophysiology of this deformity ranges from disruption of the ulnar volar physis of the distal radius to tethering by the Vickers ligament. The most common clinical scenario is a female patient aged 6–13 years with impaired grip strength, limited range of motion, and pain. Surgery remains to be the mainstay treatment for Madelung deformity, in defiance of the lack of consensus for an optimal unified approach due to substantial wrist pain, wrist stiffness, and cosmetic reasons. The surgical options include radial lengthening, ulnar shortening, the Sauvé-Kapandji procedure, the Darrach intervention, and the Langenskiöld technique [4]. Nevertheless, most reports in the literature describe postoperative complications that require a revision procedure with varying indications inclusive of but not limited to complex regional pain syndrome, deformity recurrence, and need for additional reconstructive procedures [4]. Angelini et al. reported the results of the Sauvé-Kapandji technique for Madelung deformity. Postoperative pain reduction and improved range of motion were observed in 87% of the patients. Complex regional pain syndrome was reported in 1 (6.6%) of 15 patients. Being the gold standard technique, corrective radial osteotomy with ulnar shortening osteotomy was successfully performed in our patient suffering from a Madelung deformity in her left wrist with satisfactory results. Unfortunately, our patient encountered a post-traumatic painful distal radioulnar joint instability

three years later. One of the options was to treat our patient with a total distal radioulnar joint arthroplasty, which was used by some authors in adult patients with symptomatic Madelung deformity or when there are osteoarthritic changes. Nevertheless, due to the young age of our patient and the absence of osteoarthritic changes, we opted to treat her distal radioulnar joint instability by using the modified Sauvé-Kapandji procedure that we have described using the endobutton device to overcome and prevent its pain and debilitating complications, namely the instability of the proximal ulnar shaft and radioulnar impingement. Despite the fact that the Sauvé-Kapandji technique is considered as a salvage procedure of chronic disorders of the distal radioulnar joint, this technique is still suffering from many complications. In addition, the Sauvé-Kapandji technique encompasses four major complications, namely non-union, delayed union of the arthrodesis, fibrous or osseous union at the pseudoarthrosis, and most importantly, painful instability of the proximal ulnar stump and radioulnar convergence, which can be a serious debilitating ailment that can be challenging to correct in most cases [5,6]. The appropriate choice of treatment of distal radioulnar joint instability in this proper case depended on the individual patient, the specific derangement of the distal radioulnar joint and the author's experience. This technique has the advantage of correcting the dorsal dislocation of the ulnar head leaving also the ulnocarpal ligaments undisturbed, which is mandatory for ulnar support of the wrist in this complex situation. In the Sauvé-Kapandji procedure, the proximal ulnar stump is a potential source of complications, especially if instability existed preoperatively. Knowing that, several techniques have been adopted to reduce the likelihood of ulnar stump painful instability. Some authors recommended the use of the resected ulna as a bone graft. However, insertion of bone graft between the radius and the ulna might generate a barrier of devascularized tissue [7]. Other authors advocate executing a tenodesis with preservation of a piece of the extensor carpi ulnaris and flexor carpi ulnaris to their distal attachment into the pisiform bone. However, a too proximal osteotomy requires placement of two screws where this might jeopardize the integrity of the pronator quadratus attributed to its interposition at the pseudoarthrosis [8-10]. The potential problems of instability of the proximal ulnar shaft can be avoided by performing a short distal segment and a narrow pseudoarthrosis gap. In our case, to avoid the risk of proximal ulnar stump instability, we elected to use the endobutton suture, placed and suspended between the radius and the proximal ulnar stump. This allowed stabilization of the ulnar stump without the need for any tendon strips, tenodesis, or bone grafts (Figure 4). This simple technique allowed early healing, short postoperative immobilization, and satisfactory range of motion, acceptable patient satisfaction, and a minimal rehabilitation program limited to 2 weeks of physical

therapy. The endobutton suture -device was successfully used in interosseous membrane reconstruction for the treatment of acute and chronic longitudinal forearm instability, that is, the Essex-Lopresti lesion [8]. Many complications have been described with the use of endobutton, including loss of supination and fracture. Recently, a new study has emphasized the use of suspension fixation with button plates for patients with distal radioulnar joint dislocations with good results. However, no complication has been reported yet concerning the use of this device for this particular indication. This simple surgical technique was used to treat a fairly common and debilitating complication in a well-known surgical operation. To the best of our knowledge, the use of the modified Sauvé-Kapandji technique with endobutton suture for proximal ulnar stump stabilization has not been reported yet in a patient with a Madelung deformity. Despite the short follow-up period, this surgical technique might be a promising procedure warranting further investigations to evaluate long-term patient outcomes in a large sample size for comparison with the outcomes obtained with other surgical modalities.

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