Arthroscopic Resection of Dorsal Wrist Ganglion: Results and Rate of Recurrence Over a Minimum Follow-up of 4 Years

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Abstract

Background: Dorsal wrist ganglia are the most common soft tissue tumor type of the upper limb. Surgical resection, open or arthroscopic, is one of the most frequent procedures performed by hand surgeons. This study sought to perform an objective evaluation of the outcomes of arthroscopic resection of dorsal wrist ganglia and their recurrence rates over 4 years. Patients treated with arthroscopic resection were expected to have favorable outcomes and low complication rates after 4 years of follow-up. **Methods:** We evaluated 34 cases of dorsal wrist ganglia in patients who underwent arthroscopic resection. The patients were evaluated using the Quick-Disabilities of the Arm, Shoulder and Hand (QuickDASH) outcome measure, visual analog scale (VAS) for pain, range of motion of the wrist, palmar grip strength, rates of recurrence, and complications. **Results:** During the postoperative period, the QuickDASH score averaged 2.3 points, the mean residual pain by VAS was 0.54, full range of wrist movement was recovered by all patients, and the mean palmar grip strength was 29.4 kgf; there was 1 case with recurrence. There were no severe postoperative complications throughout the follow-up period. **Conclusions:** The outcomes, recurrence, and complications rates after 4 years of follow-up presented in this study support the use of arthroscopy as a treatment for dorsal wrist ganglion.

Keywords: arthroscopy, dorsal wrist ganglion, recurrence, complication, results

Introduction

Most tumors of the hand and wrist are benign and, therefore, need not be excised. Ganglion cysts, the most common soft tissue tumor in the upper limb, may resolve spontaneously or remain unchanged.^{11,24,29} They are more common in females in the ratio of 3:1 and appear more frequently between the third and fourth decades of life, being very uncommon in children. The etiology is unknown, and there are no known occupational risk factors.

The ganglion may be simple or multilobulated. The wall consists of collagen and cells with no epithelial pattern and no synovial lining. The capsule of the ganglion communicates through tortuous ducts with the adjacent joint capsule. Furthermore, a 1-way valvular mechanism has been postulated to connect the wrist joint and the cyst.¹⁹ A small volume of dye solution injected into the cyst permits its identification, allowing for a more effective and efficient ganglion excision in both open and arthroscopic procedures.^{23,35} The ganglion is further characterized by clear, viscous mucin and is composed of glucosamine, albumin, and globulin, with high

concentrations of hyaluronic acid; in some cases, the liquid may contain blood.

The most common location of ganglion cysts is the dorsal wrist. In the vast majority of cases, they present as painless, firm, and immovable masses that vary in size. In most patients, they do not cause symptoms, although some patients complain of pain and limitation of movement. Symptomatic dorsal wrist ganglia are associated with both generalized ligamentous hyperlaxity and a positive scaphoid shift test.²⁷

Different treatment options are available for dorsal wrist ganglia, such as observation for the possibility of spontaneous regression,³⁰ simple aspiration,^{3,7} aspiration associated

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Figure 1. Preoperative aspect of patient's wrist who had a dorsal wrist ganglion recurrence after 3 open procedures.

with infiltration with corticoid,^{18,36} open resection,⁸ and arthroscopic resection.^{21,26,33,34} The rate of recurrence is variable after arthroscopic resection and is as high as 29.7%.^{5,13} This study was designed to determine the postoperative results and the complications of arthroscopic resection of dorsal wrist ganglia after a 4-year postoperative follow-up.

Materials and Methods

Between December 2000 and July 2011, 79 wrists in 79 patients underwent arthroscopic resection of the dorsal synovial cyst. All surgeries were performed by the same surgeon (C.H.F.). During the follow-up period, 45 patients could not be tracked. In the end, 34 dorsal wrist ganglia (34 patients) were evaluated. The mean age of patients at the time of surgery was 29.7 years (range: 11-53 years). There were 25 women and 9 men. The left wrist was affected in 18 and the right wrist in 16 patients. Follow-up ranged from 48 to 135 months, with an average of 81 months. Clinical diagnosis was made using clinical history and physical examination. All patients underwent sonography for diagnostic confirmation. Four patients had previously been treated with aspiration of the cyst, and 1 patient had been aspirated twice. Two patients had undergone open surgery, and 1 patient underwent open surgery on 3 occasions (Figure 1).

The surgical technique performed in all patients is primarily described by Osterman and Raphael.³² To perform the surgical procedure, the patients underwent brachial plexus block or general anesthesia. With the patient in the supine position on the operating table, the pneumatic tourniquet was placed on the arm, inflated and maintained at 250 mm Hg pressure. The arm was then secured to the table, the elbow flexed 90° and, with the handle in the upright position, a double finger trap was placed on the index and ring fingers. The patient's wrist was suspended with 5 kg (approximately 10-12 lbs) of traction in a traction tower to achieve distension of the wrist joint. The 3-4 portal was

located between the third and fourth extensor tunnels. The radiocarpal joint capsule was previously distended with injection of fluid with a 22-gauge needle in 3-4 portal. The 3-4 portal was performed with a longitudinal incision on the skin. Through blunt dissection with the tip of a mosquito, the subcutaneous and joint capsules were opened until the output of the fluid infused. The cannula with the trocar was placed intra-articularly, and a 2.4-mm arthroscope with 30° angulation was introduced into the 3-4 portal.

Fluid infusion was maintained with the aid of an infusion pump or by gravity through the cannula. Fluid effusion was maintained with the introduction of a needle into the 6-U portal, localized in the ulnar side to the extensor carpi ulnaris tendon and distal to the ulnar styloid. The 6-R portal was localized to the radial side of the extensor carpi ulnaris tendon. By blunt dissection with the tip of a mosquito, the subcutaneous and joint capsules were opened and a probe for joint inventory was introduced. After joint inventory, optics were redirected to the 6-R portal and, through 3-4 portal, a full-radius shaver blade of 2.9 mm was introduced. Debridement of dorsal synovitis was performed and, in the direction of the scapholunate ligament, a "hole" in the dorsal capsule of 1 × 1 cm was opened until visualization of extensor tendons was achieved (Figure 2).

The ulnar and radial mediocarpal portals were not routinely used. After removal of the equipment, wrist extension and flexion movements were performed to observe the integrity of the extensor tendons by the tenodesis effect. The portals were closed with nylon stitches and a short plaster splint was applied for 1 week. The stitches were removed after 1 week, and patients were advised to wear a removable brace for 2 weeks.

We evaluated outcomes, including recurrence and complications, with a minimum 4 years of postoperative follow-up. Patients were contacted through telephone calls to return to evaluation in the office. The visual analog scale (VAS) was scored from 0 to 10, with 0 being no pain and 10 as the most intense pain ever experienced.

Figure 2. A wrist internal view from the portal 6-R. A defect performed by the shaver blade in the wrist dorsal capsule (WDC) and visualization of extensor tendon (ET).

Figure 3. Recurrent dorsal wrist ganglion (arrows) after 3 months of arthroscopic resection. Skin scars (circles).

Patients were also asked to respond to the Quick-Disabilities of the Arm, Shoulder and Hand (QuickDASH) questionnaire consisting of 11 questions about their symptoms and abilities, where a high score indicates significant dysfunction. The 2 optional modules intended to measure symptoms and function in athletes, performing artists, and other workers whose jobs require a high degree of physical performance were not used.³¹

Using a universal goniometer, the range of motion (ROM) of the operated wrist and the contralateral, active,

Figure 4. Hypertrophic scarring in the dorsal wrist skin after arthroscopic resection.

and passive wrists were measured in degrees. The palmar grip strength of the operated side was evaluated using a hydraulic hand dynamometer, adjusted to the second position. To perform the evaluation, patients were seated with the adducted arm parallel to the trunk with the elbow flexed at 90° and the forearm and wrist in a neutral position. Three measurements were taken using as much force as possible. The mean of the measurements were recorded in kgf.

The presence of recurrence and the presence of any other complications were noted.

Results

Residual pain assessed by the VAS ranged from 0 to 10, with an average of 0.54 points. During the postoperative period, the Quick DASH score ranged from 0 to 20.5, with an average of 2.3 points.

All patients preserved normal range of operated wrist movement compared with the contralateral side. The mean palmar grip strength was 29.4 kgf, ranging from 10 kgf to 48 kgf. One case of recurrence was noted (2.9%), and the patient was diagnosed 3 months postsurgery (Figure 3).

One patient developed hypertrophic scarring (2.9%). There were no severe or moderate postoperative complications (Figure 4).

Discussion

The classical surgical approach for the treatment of dorsal wrist ganglia is the open technique; however, its rates of

recurrence are very controversial and may be as high as 40%.² Carpal instability caused by the lesion of the scapholunate ligament is a complication associated with open resection.^{10,12}

Few studies have reported large case series with long-term follow-up and patient satisfaction after open procedure. In 2 retrospective reviews, the recurrence rates, 4.2 and 6 years after open surgical excision, were 32.5% (13 of 40) and 39% (40 of 103), respectively.^{11,24}

The numbers of studies on wrist arthroscopy have progressively increased, indicating its importance for the treatment of internal wrist problems.¹⁴ In 1995, Osterman and Raphael³² reported that the main advantage of arthroscopic treatment is to provide a direct view of the wrist joint with small and more aesthetic surgical incisions. Like the open technique, recurrence rates are quite controversial and may be as high as 29.7%.^{5,13,17} Dominant side, female gender, and age younger than 24 years are the most influential risk factors for recurrence.²² The Ganglion is usually located over the scapholunate ligament. It can be connected to the ligament through a long pedicle. Failure to identify this pedicle and excise its attachment to the scapholunate ligament increases the likelihood of recurrence.³ In the study by Kang et al,²⁰ discrete stalks were identified in only 9 of 41 patients (22%), and none of these patients reported recurrence. In the study by Kim et al,²² the presence or absence of the cyst stalk was not a significant factor for recurrence.

Long-term follow-up is an important factor needed for the full analysis of new treatments. There are no long-term postoperative follow-up studies of the evaluation of arthroscopic resection of the wrist dorsal ganglia to determine if the advantages of arthroscopic surgery decrease with time or to evaluate recurrence rates.⁷

Both the QuickDASH and the full DASH outcome measures are valid, reliable, and responsive measures and can be used for clinical and/or research purposes. Edwards and Johansen reported improvements in self-reported functional evaluation using a DASH questionnaire from 14 points in the preoperative period to 1.6 points over a 2-year postoperative period.¹³ In our study, the QuickDASH questionnaire revealed an average of 2.3 points after 48 months of minimal postoperative follow-up.

The VAS is widely applied in research. It is easy to use, requires no verbal or reading skills, and is sufficiently versatile to be employed across a variety of settings. The mean VAS score in our patients during the follow-up period was 0.54. Chung and Thay also reported significant improvement in VAS scores pre- and postoperatively from 0.8 to 0.3.⁷ In addition, Aslani reported no postoperative pain in 35 of 37 patients who reported preoperative pain.²

Postoperative stiffness, grip weakness, and decreased ROM may occur after open resection.²⁸ Aslani et al² and Gallego and Mathoulin¹⁵ found no differences in ROM between the operated wrist and the contralateral wrist following sur-

gery. In the patients included in this study, ROM on the operated side was the same as on the contralateral side.

An unfortunate limitation of our study is its retrospective nature. We did not collect preoperative scores, and the contralateral strength was not measured at reevaluation. The mean grip strength on the operated side was 29.4 kg in our study. This mean value is lower than the values described by Kang et al¹⁹ and Edwards and Johansen.¹³ Considering a Brazilian populational study, our measured grip strength is in line with the age and gender of our evaluated patients.⁴ Gallego and Mathoulin reported improvement in palmar grip strength from 22.2 preoperatively to 31.9 postoperatively.¹⁵

Complications of open surgery include infection, neuroma, unsightly scarring, and keloid.²⁸ Complications such as neuroma formation and keloids are not specific to open techniques and though they may be more cosmetically disturbing in an open incision, they are not exclusive to them. Neuroma formation can occur with the dorsal sensory nerves, both radial and ulnar, during arthroscopic procedure with portal placement that is aberrant or when proper dissection is not performed. Gallego and Mathoulin reported 6 cases (52%) of postoperative complications and that required additional surgical procedures.¹⁵ However, Rizzo et al treated and followed 41 patients for 24 months and reported no major complications.³³ In addition, Chung and Thay reported no major intra- or postoperative complications.⁷ One patient in our study developed hypertrophic scarring.

The rate of recurrence varies following arthroscopic resection and may be as high as 29.7%.^{5,13} Chung and Thay reported a 10% recurrence rate.⁷ Revision of literature shows different recurrence rates of 0% to 11%.^{1,13,21,25,30,32,33} In our study, we found recurrence in 1 patient (29%), 3 months following arthroscopic treatment; the patient refused further surgical treatment because he was asymptomatic. We believe that two factors are possibly responsible for the recent excellent success rates of arthroscopic resection of dorsal wrist ganglion: further dissemination of technical knowledge about wrist arthroscopy, and a skill progression of most surgeons in the natural learning curve of the wrist arthroscopy technique.

Chen et al described the use of an intrafocal portal to facilitate resection of the cyst.⁶ However, we did not consider this procedure necessary due to the risk of tendon injury.

To improve visualization of the ganglion stalk intra-articularly to produce a more effective and efficient arthroscopic ganglion excision, some researchers recommend injecting a small volume of an inert dye.^{23,37} We believe that the injection of inert dye can be useful to identify the ganglion; however, we did not use it in our patients.

In our study, we had a case of hypertrophic wound healing, which we did consider a minor complication of the surgical

technique because it is not inherent to the arthroscopic technique and did not require surgical reintervention. We did not have any cases of extensor tendon injury as described by Cooper and Elfar.⁹ There was no clinical evidence of scapholunate or lunotriquetral instability noted after arthroscopic resection.

Randomized controlled trials studies are considered the most powerful clinical design to evaluate whether a cause-effect relation exists between treatment and outcome. We found only 2 retrospective studies comparing the results between open and arthroscopic techniques for the treatment of wrist ganglion.^{19,35} Kang et al related that the results of arthroscopic treatment were not superior to those of open excision at 12-month follow-up.²¹ Rocchi et al suggested that arthroscopic resection was a reasonable alternative to treat volar wrist ganglion because it has less postoperative morbidity and better cosmetic result.³⁴ The literature shows there is a necessity for additional randomized or controlled clinical trials for assessing the superiority of arthroscopic resection of dorsal wrist ganglion.

There are some limitations to our study. First, although this is a retrospective case study, all arthroscopic resections were performed by one hand surgeon (C.H.F.). Unfortunately, our study is retrospective, and 45 patients could not be tracked during the period of follow-up. If the unfollowed patients had experienced recurrence, our final results could have been different. Other limitation to this study is our relatively small sample. A justification for this limitation is the time of postoperative follow-up required.

Arthroscopic excision has yielded promising outcomes, but data from comparative trials are limited and have not demonstrated its superiority.¹⁶

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Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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