Prospective Outcomes of Arthroscopic Treatment of Dorsal Wrist Ganglia

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Abstract

The purpose of this study was to assess the results of arthroscopic resection of dorsal wrist ganglia. Between November 2002 and September 2007, all patients with dorsal wrist ganglia underwent arthroscopic resection in our institution. Average follow-up was 39.2 months (range, 24-71 months). Fifty-two patients (40 women and 12 men; mean age, 29.8 years) were treated with our operative technique. Symptoms at presentation were unpleasant appearance in 15 patients (28.8%), pain in 30 (57.6%), and unpleasant appearance and pain in 7 (13.5%). The ganglion cyst site was in front of the midcarpal joint in 41 patients (78.8%), in front of the radiocarpal joint in 6 patients (11.5%), and in front of the radiocarpal and midcarpal joints in 5 patients (9.6%). Our surgical technique resulted in a significant improvement in flexion, extension, and grip strength (P < .005). In patients with painful ganglia, treatment also had a significant effect. Nine (17.3%) recurrences were observed. Mean time off work was 14 days, but 19 patients returned to work immediately. According to the results of this study, we recommend the use of arthroscopy as the primary treatment method for dorsal wrist ganglion excision.
Dorsal wrist ganglia originating from the scapholunate joint are the most frequent type of wrist and hand ganglia. The classic surgical approach is open ganglionectomy. Concern has existed about arthroscopic ganglionectomy as a suitable alternative technique since its description by Osterman and Raphael in 1995. Diagnostic wrist arthroscopy has improved in recent years. It has been accepted among hand surgeons to treat several wrist pathologies. Wrist arthroscopy requires a dedicated surgical training program; once the surgeon becomes experienced with performing the technique correctly, it offers several advantages in comparison with classic open methods. A complete understanding of wrist anatomy is a fundamental requirement for wrist arthroscopy. Accurate portal placement, condition identification, and successful treatment depend on a perfect recognition of the structures at risk, in addition to an understanding of pathologic conditions.

Dorsal wrist ganglion is a fairly common condition and is thought to be the most frequent soft tissue mass in the hand. Controversy exists regarding the optimal treatment method. Many treatment methods have been introduced, including observation, sclerotherapy, percutaneous aspiration, and open surgery. Fifty percent of ganglia spontaneously disappear with time, and some may recur. Surgical resection is the most successful treatment. It is usually used after various nonsurgical treatments with recurrence rates ranging from 1% to 40%. These results may result in joint stiffness and unpleasant or aching scars, which lead to unsatisfied patients.

Recent studies have reported the use of arthroscopic resection of wrist ganglia with hopeful outcomes regarding recurrence rates (0% to 20%), aesthetic and functional outcome, and morbidity. Arthroscopy provides a minimally invasive method to safely remove the mass without creating large scars as a result of open surgery. Arthroscopic dorsal wrist ganglion excision allows a more detailed assessment of abnormal anatomy, etiology, and concomitant wrist conditions. Arthroscopic resection prevents some of the conventional complications related to open resection and results in a lower recurrence rate.

The purpose of this study was to assess the results of a clinical series of patients with dorsal wrist ganglia with 1-year follow-up operated on by 1 surgeon (H.A.). Our results showed a significant decline in the occurrence of the conventional complications of the open surgical approach (eg, unpleasant scars and joint stiffness). However, the recurrence rate seemed to be similar to that of the open surgical approach. Our hypothesis was that arthroscopic ganglionectomy can be a reliable and safe method resulting in a lower complication rate, high patient satisfaction levels, and lower recurrence rate.

**Materials and Methods**

Fifty-two patients who underwent arthroscopic surgical resection of dorsal wrist ganglia through a unique standardized technique between November 2002 and September 2007 at 1 institution by the same surgeon were enrolled in this prospective observational clinical series. The study was approved by the Ethical Review Committee of Shahid Beheshti University of Medical Sciences. All patients had a confirmed clinical diagnosis of dorsal wrist ganglion arising from the midcarpal or radiocarpal joint. Patients with scapholunate ligament pathologies (according to clinical aspects and radiographic criteria) were excluded, as were children and patients with ganglia in locations other than the midcarpal or radiocarpal joint.

The study group comprised 40 (76.9%) women and 12 (23.1%) men with a mean age of 29.8 years (range, 18-58 years) and a confirmed diagnosis of dorsal wrist ganglion. A questionnaire was used to record baseline patient characteristics, main cyst site, onset, recurrences, previously performed treatments, pre- and postoperative clinical characteristics, and return to work. Pre- and postoperative data were collected from the questionnaires and from physical examination results at initial and discharge clinical evaluations. Objective functional features consisted of range of motion (ROM) in degrees measured with a goniometer, grip strength evaluated via the Jamar dynamometer (Lafayette Instruments, Lafayette, Indiana), and pain assessed with a visual analog scale (VAS) from 0 (no pain) to 10 (worst pain). During follow-up, all patients were asked if they were satisfied with the outcomes of the surgical technique and if they would use it again if needed. Three answers were possible: no, I may prefer another technique; yes, with doubts; and yes, with no doubts. All patients underwent a full physical examination of both wrists. Anterior and lateral plain wrist radiographs were obtained to rule out bony pathologic conditions or carpal instability (eg, scapholunate ligament gap and measurement of scapholunate ligament angle), and magnetic resonance imaging (MRI) was performed to confirm the anatomic location and diagnosis of the cyst. Painful wrists and unclear anatomic location of the cyst are the major indications for preoperative wrist MRI (24 [46.1%] patients in our series).

**Surgical Technique**

All patients underwent ultrasound-guided regional nerve block. A pneumatic tourniquet was applied in all cases (240 mm Hg of pressure). Wrist arthroscopy was performed with the patient in the supine position. The arm was fixed to the table, and the elbow was flexed to 90° with the wrist in a vertical grip tower using 4 to 5 kg. We used a 2.7-mm arthroscope with a visual angle of 25° and a wet method with normal saline solution supplied via the arthroscope cannula. The ganglion was excised with a 2.9-mm shaver through an aggressive cutter. In most of our patients,
we used the 3-4 portal (Figure 1) for stalk resection and the 6R portal for scope insertion (Figures 2, 3). In some cases we also used the 6U or ulnar and radial midcarpal portals.

Organized thorough assessment of the wrist joint was performed following a sequence from radial to ulnar, then distal to proximal, and finally volar to dorsal, assessing the capsule ligamentous structures first and, as a final point, the cartilage itself to prevent missing any concomitant pathologic conditions. This evaluation was performed before any manipulation of the ganglion structure. With a #15 blade, transverse 2-mm incisions were created throughout the skin, followed by blunt perforation to the capsule to prevent intraarticular injuries. The #11 blades applied in arthroscopy of the knee are too sharp, so they can lead to damage when inserted directly to the wrist joint; therefore, we do not use them. The 6R portal and ulnar midcarpal portal were established to introduce the arthroscope because the ganglion usually lies directly over the radial side and its stalk is best visualized from the ulnar side of the wrist. The accurate sites of the proximal and distal limits of the cyst were detected with intramuscular needles placed at these borders to precisely demarcate the area of pathologic involvement of the joint capsule. Through gentle external pressure over the cyst, the stalk was localized. It appeared gray and opalescent, usually at the connection of the dorsal capsule and the scapholunate ligament. Then the shaver was inserted directly into the ganglion inside the marked limits of the ganglion stalk, which was frequently found in the midcarpal joint (Figure 4). In some patients, a radiocarpal approach combined with the midcarpal portal was performed to enable a complete resection. After excision of the ganglion cyst’s implantation in the scapholunate ligament, a 1- to 2-cm hole was left in the dorsal capsule. The cyst was decompressed by removing the cyst gelatinous material. If dorsal synovitis was seen, it was resected completely. Care was taken to protect the dorsal part of the scapholunate ligament in addition to the extensor tendons. In multilobulated cysts, instant disappearance of the cyst should be proved to prevent early recurrence due to incomplete removal.

To drain excess fluid from the joint, the 2-mm portal insertion sites were left open. A bulky dressing was performed. In the immediate postoperative period, patients were recommended to avoid strenuous labor and weight lifting for at least 6 weeks. Scheduled physical therapy was recommended.

RESULTS

All 114 patients included in the study with a diagnosis of dorsal wrist ganglion between November 2002 and September 2007 underwent arthroscopic resection with the described technique. Mean follow-up was 39.2 months (range, 24-71 months). Nineteen (36.5%) patients were students, 17 (32.6%) were secretaries, 10 (19.2%) had other jobs, and 6 (11.9%) had no occupation. Forty-three (82.7%) patients were right-handed and 9 (17.3%) were left-handed. Dorsal ganglion cysts appeared in 30 (57.7%) right hands and 22 (42.3%) left hands.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n (%)</th>
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<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12 (23.1)</td>
</tr>
<tr>
<td>Female</td>
<td>40 (76.9)</td>
</tr>
<tr>
<td>Mean age (range), y</td>
<td>29.8 (18-58)</td>
</tr>
<tr>
<td>Cyst location</td>
<td></td>
</tr>
<tr>
<td>Midcarpal</td>
<td>41 (78.8)</td>
</tr>
<tr>
<td>Radiocarpal</td>
<td>6 (11.5)</td>
</tr>
<tr>
<td>Combined midcarpal and radiocarpal</td>
<td>5 (9.6)</td>
</tr>
<tr>
<td>Affected side</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>30 (57.7)</td>
</tr>
<tr>
<td>Left</td>
<td>22 (42.3)</td>
</tr>
<tr>
<td>Bilateral</td>
<td>0</td>
</tr>
<tr>
<td>Previous treatment</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>30 (57.7)</td>
</tr>
<tr>
<td>Nonsurgical</td>
<td>22 (42.3)</td>
</tr>
<tr>
<td>Open surgery</td>
<td>0</td>
</tr>
<tr>
<td>Mean symptom duration (range), mo</td>
<td>17.81 (4-48)</td>
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</table>
No patient had bilateral dorsal wrist ganglia. The ganglion cyst site was in front of the midcarpal joint in 41 (78.8%) patients, in front of the radiocarpal joint in 6 (11.5%) patients, and in front of the radiocarpal and midcarpal joints in 5 (9.6%) patients. Twenty-two (42.3%) patients had previously undergone nonsurgical treatment (Table). Baseline patient characteristics, including age, sex, dominance, occupation, time since symptoms appeared, and earlier therapies, were not used in the statistical analysis. Of 37 (71.1%) patients with painful ganglion cyst preoperatively, 35 reported that their pain totally disappeared postoperatively (Figure 5). Hence, a statistically significant difference existed between pre- and postoperative pain (P < .0005).

Wrist ROM of the affected side was measured preoperatively; mean flexion was 60.7° (range, 37°-93°) and mean extension was 69.1° (range, 43°-92°). A significant difference was found compared with the opposite side (mean flexion, 73.4°; mean extension, 79.6°) (P < .005, 95% confidence interval [CI]). Postoperative ROM of both wrists showed no significant difference (P > .05). Comparison of pre- and postoperative ROM showed a significant difference of 12.7° in flexion (60.7° vs 73.4°, respectively) and 10.5° in extension (69.8° vs 77.9°, respectively) (P < .0005 and P < .05, respectively; 95% CI). An objective improvement in grip strength was observed, measured by use of the Jamar dynamometer, from a mean of 23.8 mm Hg preoperatively to 30.2 mm Hg postoperatively (P < .0005; 95% CI) equivalent to the mean contralateral assessments (28.9 vs 31.7 mm Hg, respectively).

Complications occurred in 16 (30.8%) patients: 1 hematoma that required surgical drainage, 2 synovitis of the extensor pollicis longus tendon, 2 cases of tendinitis of the extensor digitorum communis tendon, 2 cases of transitory anesthesia of the dorsal nerves, and 9 (17.3%) recurrences. Measuring the size of the ganglia on MRI, we found no association between ganglion size and recurrence probability. Mean time off work was 14 days for the 52 patients, but 19 of them returned to work immediately. Seven patients had >40 days off work. Regarding patient satisfaction, 5 (9.6%) patients stated that they would prefer another treatment method, but 47 (90.4%) stated that they were satisfied with the outcomes of this technique and would prefer it again if required.

**DISCUSSION**

Ganglia are mucin-filled cysts attached to the tendon, joint capsule, or tendon sheath in the wrist and hand. The origins, formation, and pathologic structure are in doubt. Kuhlmann et al23 surveyed 59 cases of wrist ganglia to understand the anatomic and histologic characteristics of these masses. They found that the osseous sites of wrist ligament attachment are the origin of degenerative changes. Although 40% to 50% of dorsal wrist ganglia may spontaneously resolve with time, approximately 58% of them may recur in the long term.24

The classic surgical approach is open ganglionectomy. It is a safe and reliable treatment option. It has been established that an open surgical approach has a lower recurrence rate compared with observation or a nonsurgical approach.25 Angelides and Wallace25 reported 3 recurrences in 500 open surgical excisions. Not all studies have found open surgical ganglionectomy to be the perfect method. McEvedy26 reported a recurrence rate of 40% as a result of open surgical resection. In another study, Zachariae and Vibe-Hansen27 reported a recurrence rate of 34% in 347 patients with dorsal wrist ganglia. Another important complication after open surgery is scapholunate instability.28,29 Crawford and Taleisnik27 reported that, even if uncertain, open surgical ganglionectomy may lead to joint instability. Clay and Clement25 reported that surgical resection of the ganglion by means of weakening the scapholunate ligament might increase the risk of joint instability. Several studies report that the ganglion cyst itself is a consequence of underlying scapholunate instability or pathology.28,29 A strong association exists between scapholunate instability and open surgical resection.

In 1995, Osterman and Raphael21 introduced arthroscopic ganglionectomy as a minimally invasive approach with a lower rate of complications (2.9%). In contrast to open surgery, no scapholunate ligament instability occurred11,30 and a low recurrence rate existed (range, 0%-15%), as reported by earlier studies.10,13,14,16,18-21 In our series, no cases of postoperative scapholunate instability occurred. As compared with open ganglionectomy, an arthroscopic approach allocates resection of the ganglion stalk located at the scapholunate ligament through a dorsal capsular window.13,15,16,19-21,31 None of our patients had articular structure–related injuries. The main cause of recurrence after arthroscopy or open surgery is often incomplete excision of the stalk or the existence of multiple concealed cysts not removed during regular treatment.10,13,15,18,20

**Figure 5:** Graph showing pre- versus postoperative pain evaluation via visual analog scale.
Chassat et al\textsuperscript{12} evaluated the efficiency of dorsal wrist ganglion resection by arthroscopic resection of the pedicle and found a 29.7% recurrence rate among their operated patients. In a study by Shih et al,\textsuperscript{33} no recurrence was reported in patients who underwent arthroscopic ganglion cyst resection with 15- to 37-month follow-up (mean, 26.8 months). In a retrospective review of the surgical results of dorsal and volar wrist ganglia excision by Lidder et al,\textsuperscript{34} with a mean follow-up of 4.2 years (range, 1.5-8.7 years) in 117 patients, the overall recurrence rate following excision of all wrist ganglia was 41.8%. Kang et al\textsuperscript{16} prospectively compared the outcomes of arthroscopic vs open ganglion cyst resection in 72 patients and reported no statistically significant difference in recurrence rate, with a minimum 1-year follow-up between these groups (7% in open surgery group vs 11% in arthroscopic resection group). In the current study, 9 (17.3%) recurrences were found in our patients who underwent arthroscopic ganglion cyst resection, with a mean 17.8-month follow-up.

As reported by Westbrook et al,\textsuperscript{35} patients ask for medical treatment to relieve pain (26%), improve appearance (38%), or because of the risk of malignant growth (28%). Clay and Clement\textsuperscript{3} evaluated 61 ganglia that underwent open surgical resection and reported that 90% of patients had no or mild pain and 5 (10%) patients reported moderate to severe pain. In the current study, the reason for referral was unpleasant appearance in 15 (28.8%) patients, pain in 30 (57.6%), and both unpleasant appearance and pain in 7 (13.4%).

Osterman and Raphael\textsuperscript{7} reported limited movement in 45% of patients preoperatively and a considerable improvement after excision in 94% of patients. In the current study, preoperative wrist extension in the affected hand represented a mean of 80% of that in the unaffected hand. Preoperative wrist flexion was at a mean of 90% of that in the contralateral side. After treatment, we detected an improvement of 14% and 20% in extension and flexion, respectively. Osterman and Raphael\textsuperscript{7} reported 20% of the contralateral grip strength in 27% of their patients in the preoperative assessment and an improvement reaching 90% of the normal contralateral hand postoperatively. Luchetti et al\textsuperscript{8} reported no progress in grip strength or ROM after arthroscopic ganglionectomy in 30 patients. In the current study, we found a statistically significant recovery between pre- and postoperative grip strengths.

The presentation of pain is different among the reported trials, probably as a result of the absence or presence of related injuries. However, pain improvement is reported in the arthroscopic review series.\textsuperscript{7,17,20,35} Pain was the major symptom in 30 (57.6%) of our patients. All patients who reported a preoperative pain rating of 2 to 6 on the visual analog scale were symptom free after treatment. Although several studies on arthroscopic resection of dorsal wrist ganglia reported recurrence rates comparable with the open approach rates,\textsuperscript{10,13,14,19,21} one unpublished study reported a 36% rate of recurrence after arthroscopic excision of dorsal wrist ganglia. A probable cause of this result is that only radiocarpal portals were applied, rendering the resection laborious. After 6-year follow-up, Dias et al\textsuperscript{17} reported a recurrence rate of 58% in a group without invasive manipulation, 58% in a group with aspiration, and 39% in a group with an open surgical approach. In our patient population, a significant rate (7/52) of postoperative joint stiffness was noted after an arthroscopic approach. All patients ultimately showed improved ROM; in 2 patients, formal occupational therapy was essential, and perfect ROM was not achieved until approximately 10 weeks after resection. Because they were immobilized for a longer period of time in contrast with recent protocols, excessive immobilization was not essential.

Dias et al\textsuperscript{17} reported patient satisfaction rates of 53% without invasive manipulation, 81% after aspiration, and 83% after surgery without considering recurrence rates. Our patient population had an excellent rate of patient satisfaction (96.5%). The technique we describe is easy, allowing instant use of the hand, compared with findings in studies by Dumontier et al\textsuperscript{20} and Kang et al.\textsuperscript{16} In our patient population, 19 (36.5%) patients returned to work 1 day postoperatively. Other noted complications exclusive to an open surgical approach include neuroma, infection, keloid formation, and unpleasant scar.\textsuperscript{1,24,26} Our technique results in an aesthetic improvement as a result of the tiny size of the portals. Diversities in the series’ population (occupation, age, sex) and the fact that the patients had no associated lesions may have affected the final outcomes, and this may be a bias in our series.

**Conclusion**

Arthroscopic dorsal wrist ganglion resection results in an improvement in functional parameters and pain relief in a significant proportion of the patient population. Complications associated with the operative technique resulted in no important long-term functional deficits. The recurrence rate was 17.3%, and patient satisfaction was high. The arthroscopic surgical approach allows patients to use their hands instantly. According to the results of this study, we recommend the use of arthroscopy as a primary treatment method for dorsal wrist ganglion excision.

**References**


