Coexisting Intraarticular Disorders Are Unrelated To Outcomes After Arthroscopic Resection of Dorsal Wrist Ganglions

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Abstract

Background Dorsal wrist ganglions are one of the most frequently encountered problems of the wrist and often are associated with intraarticular disorders. However, it is unclear whether coexisting intraarticular disorders influence persistent pain or recurrence after arthroscopic resection of dorsal wrist ganglions.

Questions/purposes We investigated (1) which intraarticular disorders coexist with dorsal wrist ganglions and (2) whether they influenced pain, function, and recurrence after arthroscopic ganglion resection.

Methods We retrospectively reviewed 41 patients with primary dorsal wrist ganglions who underwent arthroscopic resection. We also obtained VAS pain scores and the Mayo Wrist Scores (MWS) preoperatively and at 2 weeks, 6 weeks, 3 months, 6 months, 1 year, and annually thereafter postoperatively. Minimum followup was 24 months (mean, 38.9 months; range, 24–60 months).

Results Twenty-one patients had other coexisting intraarticular disorders: 18 triangular fibrocartilage complex tears and nine intrinsic ligament tears. All coexisting disorders were treated simultaneously. Two years after surgery, the mean VAS pain score decreased from 2.4 to 0.6, and mean grip strength increased from 28 to 36 kg of force. The mean active flexion-extension showed no change. The mean MWS improved from 74 to 91. Three ganglions recurred. There was no difference in mean VAS pain score and MWS preoperatively and at 2 years after surgery or recurrence of ganglions between patients with or without coexisting lesions.

Conclusions Intraarticular disorders commonly coexist with ganglions but we found they were unrelated to pain, function, and recurrence after arthroscopic resection of the ganglion when the intraarticular disorders were treated simultaneously.

Level of Evidence Level IV, therapeutic study. See Guidelines for Authors for a complete description of levels of evidence.

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Each author certifies that his or her institution approved the human protocol for this investigation, that all investigations were conducted in conformity with ethical principles of research, and that informed consent for participation in the study was obtained.

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Introduction

Dorsal wrist ganglions are one of the most frequently encountered problems of the wrist [1]. Trauma, synovial herniation, and myxoid or mucoid degeneration of periarthicular connective tissue have been suggested as possible causes of wrist ganglions [3, 21]; however, the direct causes remain unclear. Dorsal wrist ganglions are the most common form of wrist ganglions and are frequently associated with the scapholunate interosseous ligament [1]. Nonsurgical treatments such as needle aspiration, ganglion puncture, and closed rupture reportedly are associated with rates of recurrence ranging from 15% to 78% [18, 20, 23]. Recurrence rates range from 0.6% to 40% after open

resection [1, 13, 22], but joint stiffness occurs in 1.2% to 14% of patients [1, 4] and unsightly or painful scars in 3.4% to 8.2% [13, 22]. Accordingly, arthroscopic resection has been proposed as a potentially more favorable alternative to open resection, with recurrence rates of 0% to 11% [11, 12, 15, 16] and improved pain, grip strength, and wrist motion [1, 2, 7–10]. Further, arthroscopic resection reportedly is associated with no scaphoid subluxation or chronic scapholunate instability attributable to ligament injury during surgery that has been reported after open resection [2, 3, 8, 11, 12, 16], and an improved cosmetic appearance [11]. Moreover, diagnostic arthroscopy together with ganglion resection simultaneously allows for thorough examination of the joint and treatment of coexisting intraarticular disorders commonly associated with symptomatic wrist ganglions, such as the triangular fibrocartilage complex (TFCC) or tears of intrinsic or extrinsic ligaments [3]. Nonetheless, persistent pain occurs in 0% to 17% of patients [8, 11, 12, 15, 16] and it is unclear whether coexisting intraarticular disorders influence persistent pain or recurrence after arthroscopic resection of dorsal wrist ganglions.

We therefore investigated (1) which intraarticular disorders coexist with dorsal wrist ganglions and (2) whether they influenced pain (VAS), function (Mayo Wrist Score [MWS]), and recurrence after arthroscopic ganglion resection.

Patients and Methods

We retrospectively reviewed the records of all 53 patients who underwent arthroscopic resection of wrist ganglions between January 2007 and January 2010. The indications for arthroscopic resection were symptomatic dorsal or volar wrist ganglions: with (1) persistent pain and interference of activity, (2) at least one attempt at aspiration or rupture, and (3) at a typical location such as between the third and fourth extensor compartments (dorsal ganglions) and between the flexor carpi radialis tendon and the abductor pollicis longus tendon and proximal to the wrist crease (volar ganglions). The contraindications were: (1) ganglions located on other joints, (2) ganglions in hands, and (3) ganglions adjacent to major peripheral nerves or vessels. During the study period, we treated a total of 112 patients with ganglions. Among them, 53 underwent arthroscopic resection of wrist ganglions. For the purposes of this study we excluded patients with (1) volar wrist ganglions; (2) a history of previous surgery on the wrist, including ganglion resection; (3) a history of fracture around the wrist; (4) preexisting arthritis; (5) static carpal instability on preoperative plain radiographs; (6) impairment of cognitive function to complete a

questionnaire; (7) workers compensation issues; and (8) inadequate followup (< 24 months). Based on these criteria, four patients with volar wrist ganglions, one patient with distal radius fracture history and traumatic wrist arthritis, one patient with static carpal instability, and two patients with workers compensation issues were excluded. Four of the 53 patients were lost to followup. In total, 12 patients were excluded leaving 41 patients (13 men, 28 women). The mean age of the patients at the time of surgery was 33.7 (range, 19–59 years). The average duration of ganglion symptoms before surgery was 17.8 months (range, 6–72 months). Plain radiographs were taken routinely to evaluate preexisting bony lesions or gross carpal instability. The minimum followup was 24 months (mean, 38.9 months; range, 24–60 months). No patients were recalled specifically for this study; all data were obtained from medical records.

Arthroscopic resection of wrist ganglions was performed by one hand surgeon (YRC) while patients were under general anesthesia. A pneumatic tourniquet and Esmarch bandage were used to exsanguinate the arm. The patient's arm was suspended in an Arc Wrist Tower (Acumed, Hillsboro, Oregon, USA) with 5 to 8 kg of traction. A 6-R portal was created first as a viewing portal. While introducing a 2.0-mm arthroscope into the 6-R portal, a 3-4 portal was made under direct vision for a working portal. The working portal was made just proximal, distal, or slightly radial to the traditional placement of the 3-4 portal to prevent unintentional puncturing of the ganglions. All patients underwent a thorough arthroscopic radiocarpal joint examination to search for the ganglion stalk and any coexisting intraarticular disorders, such as extrinsic or intrinsic ligament integrity or a TFCC tear. A 2.0 full-radius shaver then was introduced through the adjusted working portal, making an effort not to decompress the ganglions with the introduction of the shaver. Shaving then was started at the site of the ganglion stalk or redundant capsular material if present. If not present, shaving began adjacent to the dorsal scapholunate interosseous ligament (SLIL) and dorsal capsular reflection while confirming the site of the ganglion by gentle external pressure over the mass. Decompression of the ganglion usually is seen by the extrusion of gelatinous material inside. After completion of the ganglionectomy, a dorsal capsular window of approximately 1 cm² was made, and the extensor carpi radialis brevis or longus tendons were seen through the window. The extensor digitorum communis tendons also sometimes were visible. In all cases, radial and ulnar midcarpal portals were created to examine the midcarpal joint for any remnants of the ganglion and to evaluate and grade intrinsic ligament instability [9]. TFCC tears were classified using the Palmer system [17]. Patients with intrinsic ligament tears or TFCC tears underwent

simultaneous surgical treatment according to the grade of intrinsic ligament tears or the classification of TFCC tears. The ganglions appeared to arise from the radiocarpal joint in 32 patients and midcarpal joint in nine patients. All coexisting intraarticular disorders were treated at the same time with arthroscopic ganglion resection.

The portals were closed with sterile strips and a compressive dressing was placed. The wrist was splinted for 1 week. All patients were encouraged to move the wrist and hand as tolerated while taking care to avoid strenuous work and weight lifting for 4 to 6 weeks.

Postoperatively, patients had regular followups in the outpatient clinic at 2 weeks, 6 weeks, 3 months, 6 months, 1 year, and annually thereafter. One observer not involved in the treatment (BRK) performed preoperative and postoperative assessments of pain scores using a VAS of 0 to 10 and the MWS. The MWS is a commonly used wrist rating system [5]. The total score ranges from 0 to 100 points, with higher scores indicating a better result. The scoring system comprises four categories of pain (25 points), active flexion-extension arc as a percentage of the opposite side (25 points), grip strength as a percentage of the opposite side (25 points), and the ability to return to regular employment or activities (25 points). Grip strength and wrist ROM also were measured using a dynamometer (Asimov Engineering Co, Los Angeles, CA, USA) and a standard orthopaedic goniometer. Each patient also was assessed for any recurrent ganglions or other complications throughout the followup period. There were no missing data.

The preoperative and postoperative clinical ranked continuous variables (VAS pain score, grip strength, MWS) were compared using paired t-tests. The Mann-Whitney U tests were used to evaluate the associations of the presence of coexisting intraarticular disorders with VAS pain score and MWS preoperatively, and at 2 years after surgery. Fisher's exact or chi-square tests were used to compare the presence of coexisting intraarticular disorders and ganglion stalks with recurrence of the ganglion. We used SPSS® Version 18.0 (SPSS, Inc, Chicago, IL, USA) for statistical analyses.

Results

Twenty-one patients had coexisting intraarticular disorders (Table 1): TFCC tears in 18 and intrinsic ligament tears in nine (Fig. 1). Patients with TFCC tears underwent débridement and ablation of the torn central disc, and those with intrinsic ligament tears underwent simultaneous débridement and ablation of loose tissues. We discovered ganglion stalks in nine patients (Fig. 2).

Table 1. Coexisting intraarticular disorders of dorsal wrist ganglions

Intraarticular disorder	Number of patients
TFCC tear (Palmer type)	
IA	15
IIC	2
IID	1
SLIL tear (Geissler stage)	
I	6
II	1
LTIL tear (Geissler stage)	
I	2

TFCC = triangular fibrocartilage complex; SLIL = scapholunate interosseous ligament; LTIL = lunotriquetral interosseous ligament.

We found no difference in mean VAS pain score or MWS preoperatively, and at 2 years after surgery between patients with or without coexisting intraarticular disorders ($p = 0.989$ and $p = 0.772$; $p = 0.116$ and $p = 0.391$, respectively). We further observed no difference between recurrence of ganglions and the presence of coexisting intraarticular disorders ($p = 0.675$) or ganglion stalks ($p = 0.340$) despite that no patients with a ganglion stalk reported recurrence. Two years after arthroscopic ganglion resection, the mean VAS pain score decreased from 2.4 (95% CI, 1.9–2.9) to 0.6 (95% CI, 0.4–0.9) ($p < 0.001$) and grip strength increased from 28 kg of force (95% CI, 25–32 kg of force) to 36 kg of force (95% CI, 33–39 kg of force) ($p < 0.001$). There was no change of the mean active flexion-extension arc preoperatively (123° [95% CI, 116° – 131°]) and at 2 years after surgery (127° [95% CI, 122° – 132°]). The mean MWS improved ($p < 0.001$) from 74 (95% CI, 68–79) to 91 (95% CI, 88–94) (Table 2).

No intraoperative or postoperative complications were observed. Three patients reported recurrent ganglions at 10 months, 12 months, and 16 months postoperatively. Two of these patients received another arthroscopic ganglion resection to remove the recurrent ganglions. The third patient refused surgical treatment, and aspiration of the ganglion was performed.

Discussion

Dorsal wrist ganglions are one of the most frequently encountered problems of the wrist and are commonly associated with intraarticular disorders. However, in the literature, there is lack of information regarding the correlation of such intraarticular disorders with clinical outcomes after arthroscopic resection of these ganglions. We therefore investigated (1) which intraarticular disorders coexist with dorsal wrist ganglions and (2) whether they

Fig. 1A–B The arthroscopic views show (A) a radiocarpal joint with a TFCC tear (Palmer Type IA) and (B) midcarpal joint with scapholunate interosseous ligament instability (Geissler Stage II).

Fig. 2 An arthroscopic view from the 3–4 portal shows the intraarticular stalk of the dorsal wrist ganglion.

influenced pain, function, and recurrence after arthroscopic ganglion resection.

There are some limitations to our study. First, although this is a retrospective case study, all arthroscopic resections were performed by one hand surgeon (YRC) and the VAS

pain score, MWS, ROM of the wrist, and rates of recurrence were assessed, for each patient at the followups, by the same nurse specialized in orthopaedics. Second, we analyzed only the measures at 2 years after surgery. Several studies have described data at various points of followup after 1 to 94 months after arthroscopic resection [7, 11, 12, 16]. For comparison, we intended to analyze the measures at a single time: 2 years after surgery. For the three patients who experienced recurrence after arthroscopic resection, we reviewed their medical records and described when they had recurrences and what they underwent to eradicate the recurred ganglions. Third, we treated all coexisting intraarticular disorders simultaneously with arthroscopic resection of the ganglions and therefore cannot say whether coexisting intraarticular disorders would influence recurrence of dorsal wrist ganglions or their symptoms if not treated.

Surgical resection of ganglions and their stalk is the standard procedure for eradicating ganglions and involves relatively low recurrence [1]. Based on the relevant literature, recurrence rates between open and arthroscopic resections of dorsal wrist ganglions are similar and seem not to be the advantage of arthroscopic technique (Table 3). However, open resection can result in unsightly scars, dorsal sensory nerve injury, or wrist stiffness. Arthroscopic ganglion resection, initially reported by Osterman and Raphael [16], has become a common

Table 2. Outcome measures after arthroscopic resection of dorsal wrist ganglions

Outcome measure	Preoperative	2 years postoperative	p value
VAS pain score (points)	2.4 (1.9–2.9)	0.6 (0.4–0.9)	< 0.001
Grip strength (kg of force)	28 (25–32)	36 (33–39)	< 0.001
Flexion-extension arc (°)	123 (116–131)	127 (122–132)	0.194
MMWS (points)	74 (68–79)	91 (88–94)	< 0.001

Values are expressed as mean, with 95% CI in parentheses; MMWS = Mayo Wrist Score.

treatment and offers several theoretical advantages over open resection, including faster recovery, lower complication and recurrence rates, and more cosmetically superior incision scar [2, 3, 7, 11, 12, 16]. We found similar improvement of outcome measures compared with previous studies on arthroscopic resection of dorsal wrist ganglions, including VAS pain score, grip strength, active flexion-extension arc, and MWS at 2 years after arthroscopic ganglion resection to their respective preoperative values (Table 3).

We determined differences in mean VAS pain score and MWS between patients with or without coexisting intra-articular disorders and clinical outcomes at 2 years after surgery and the recurrence of the ganglions. Osterman and Raphael [16] reported associated intraarticular disorders with the incidence of ganglions. In their study, nearly 1/2 of the patients had some type of intraarticular disorder, the most common being a Stage II or III SLIL tear. Subsequently, Edwards and Johansen [7] reported all of their patients with primary dorsal wrist ganglions also had intrinsic ligament instabilities. In our study, 21 of 41 patients had coexisting intraarticular disorders, including TFCC tears in 18 and intrinsic ligament tears in nine. According to the Palmer system [17], 15 of 18 patients with TFCC tears had traumatic tears at the central discs and three had degenerative tears at the central discs. Patients with TFCC tears underwent débridement and ablation of the torn central disc at the time of arthroscopic resection of the ganglions. Patients with degenerative central disc tears did not undergo ulnar shortening osteotomy or the wafer procedure because they had no ulnar wrist symptoms after the index surgery. Nine patients with intrinsic ligament tears underwent simultaneous débridement and ablation of loose tissues because all of them had Geissler Stage I or II tears [9]. There was no clinical evidence of scapholunate or lunotriquetral instability noted after surgery. In contrast to previous reports [3, 7, 16], TFCC tears were the most common concomitant condition. A relatively high

incidence of ulnar-positive variance among Asians [6, 14] may explain the high incidence we found, as our study included only patients of Asian descent. To estimate the role of coexisting intraarticular disorders like TFCC tears and intrinsic ligament tears in preoperative pain and the benefits from débridement and ablation that were performed at the time of arthroscopic ganglion resection, we compared VAS pain score preoperatively and at 2 years after surgery in patients with or without coexisting intraarticular disorders. There was no difference in VAS pain score or MWS preoperatively and at 2 years after surgery between patients with or without coexisting intraarticular disorders. In addition, the incidence of recurrence of the ganglions did not differ between patients with or without coexisting intraarticular disorders. It seems that coexisting intraarticular disorders are unrelated to preoperative pain, outcomes measured by VAS pain score and MWS at 2 years after arthroscopic ganglion resection, and recurrence if those disorders are treated simultaneously.

Concern for the presence of an intraarticular ganglion stalk and the role of arthroscopic resection of such stalks during ganglion resection have been reported in the literature. In the study by Osterman and Raphael [16], ganglion stalks were identified in 2/3 of patients undergoing arthroscopic ganglion resection, but the remaining 1/3 in whom the stalk was not identified reported no recurrence [16]. Other studies have reported the incidence of stalks to range from 9% to 30% [7, 10, 19]. In our study, discrete stalks were identified in only nine of 41 (22%) patients. None of these patients reported recurrence.

Arthroscopic resection of dorsal wrist ganglions improved patients' pain, grip strength, and MWS measured at 2 years after surgery without impairment of range of joint movement. Coexisting intraarticular disorders like TFCC injury and intrinsic ligament injury were common; however, they were unrelated to VAS pain score and wrist function measured by the MWS at 2 years after surgery or to recurrence of the ganglions after being treated simultaneously.

Table 3. Comparison of the clinical outcomes of various studies after arthroscopic or open resection of dorsal wrist ganglions

Study	Operation	Number of patients	Patients with pain (%)			Change from preoperative value (n or %)			Recurrence (%)	Complications	Mean followup (months)
			Preoperative	Last followup	Pain improvement	Grip strength	Flexion-extension arc				
McEvedy [13]	OR	15	NR	NR	NR	In 4	NR	40	Unsilghtly scar in 4	132	
Zachariae & Vibe-Hansen [22]	OR	347	47.1	NR	NR	NR	NR	34	Transient infection or sensory nerve injury in 9	NR (range, 12–72)	
Angelides & Wallace [1]	OR	346	NR	NR	Improved	NR	No functional loss	0.9	None	NR (range, 9–300)	
Clay & Clement [4]	OR	52	45	48	Improved	In 9	Normalized	3.8	SL instability in 1	28 (range, 12–74)	
Osterman & Raphael [16]	AR	18	12	2	Improved	+ in 5, – in 2	+ in 5, – in 2	0	None	16 (range, 9–23)	
Luchetti et al. [12]	AR	34	32	3	Improved	No change	8.3%+	5.9	None	16 (range, 1–35)	
Rizzo et al. [19]	AR	41	41	7	Improved	45.8%+	23.9%+	4.9	None	47.8 (range, 28–97)	
Gallego & Mathoulin [8]	AR	114	51	0	Improved	43.7%+	20.1%+	12.3	None	42.3 (range, 24–74)	
Current study	AR	41	33	18	Improved	28.6%+	3.3%+	7.3	None	38.9 (range, 24–60)	

OR = open resection; AR = arthroscopic resection; NR = not reported; + = increased; – = decreased; SL = scapholunate.

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