Ultrasound-Guided Aspiration Does Not Reduce the Recurrence Rate of Ganglion Cysts of the Wrist

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Abstract

Background Ganglion cysts are the most frequent soft tissue tumor encountered in the upper extremity and are commonly treated by aspiration or by surgical excision. Ultrasound is a promising addition to traditional aspiration, as it allows for visualization of the needle within the ganglion before aspiration.

Questions Are ganglion cysts of the wrist less likely to reoccur if they are aspirated under ultrasound guidance versus “blind” aspiration without the use of ultrasound guidance? Does patient functionality change based on whether or not the cyst recurred?

Patients and Methods In total, 52 patients were successfully contacted and recurrence rates were compared between those whose cyst was treated with ultrasound-guided (13 patients) with those whose cyst was treated with blind aspiration (39 patients). Mean follow-up time was 2.9 years.

Results Recurrence rates were 69% (9 patients) and 74% (29 patients) for the ultrasound-guided and blind aspiration groups, respectively (*p*-value: 0.73), showing no significant difference in recurrences of wrist ganglion between the two groups. A metric of functionality (Quick-DASH [Disabilities of the Arm, Shoulder, and Hand]) revealed worse outcomes in patients who experienced return of ganglion cyst after aspiration versus those who did not.

Conclusion Additional studies with improved sample sizes are needed to demonstrate the superiority of ultrasound-guided aspiration versus blind aspiration. Due to a high recurrence rate following aspiration (both ultrasound-guided and blinded), a lower threshold for surgical intervention is likely reasonable.

Level of Evidence This is a Level IIIb study.

Keywords

- ganglion cyst
- ultrasound
- recurrence
- volar
- dorsal

Ganglion cysts are a common upper extremity pathology encountered by hand surgeons. In fact, they are the most frequent soft tissue tumor encountered in the upper extremity, with the wrist being the most common location.¹ Ganglion cysts of the wrist may arise from either an inflamed tendon sheath or from a degenerative and arthritic underlying joint; 60 to 70% occur on the dorsal aspect of the wrist, most commonly in the scapholunate region. Approximately 20% of wrist gang-

lions are volar, most commonly found between the flexor carpi radialis tendon and the first extensor compartment.²

Controversy remains as to the most effective treatment for this pathology. Observation, percutaneous aspiration, and open versus arthroscopic surgical excision are all options. Open surgical excision has demonstrated significantly lowered recurrence compared with aspiration, with a recurrence rate of 21 versus 59% shown in a recent systematic review and meta-

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analysis.³ However, surgical excision of wrist ganglions may be associated with an increased risk of complications such as wound infection or damage to the surrounding anatomical structures. Also, surgical excision likely carries a more prolonged postoperative recovery and an increased cost of care. Despite the inferior recurrence rate, given the ease of performing in-office aspiration of a wrist ganglion, the potential complications, and increased morbidity associated with surgical excision, aspiration still remains a valid treatment option.

Ultrasound is becoming a widely used modality within orthopaedics both for its role in assisting and improving bedside procedures and for its diagnostic utility. There is relatively little literature examining the role of ultrasound-guided aspiration of wrist ganglions. Zeidenberg et al published a study in the radiology literature on a series of 39 patients at 9-month minimum follow-up who had been treated with ultrasound-guided aspiration. They found a 20% recurrence rate in this group.⁴ Ultrasound provides the benefit of directly visualizing the needle tip within a ganglion prior to aspiration. Additional benefits might include minimizing the risk of damage to surrounding soft tissues and neighboring anatomical structures.^{6,7} At the time of our literature review, no studies were found comparing ultrasound-guided versus blind aspiration of wrist ganglion cysts. We hypothesize that ultrasound-guided aspiration will lead to improved recurrence rates and better patient outcomes compared with blind aspiration of ganglion cysts of the wrist.

Thus, we ask the following questions regarding ultrasound-guided aspiration of cysts of the wrist:¹ Are ganglion cysts of the wrist less likely to reoccur if they are aspirated under ultrasound guidance versus “blind” aspiration without the use of ultrasound guidance?² Do recurrence rates vary by patient demographic information?³ Are recurrence rates impacted by various adjunct therapies such as steroid injections and needle fenestration?⁴ Do follow-up Quick-DASH (Disabilities of the Arm, Shoulder, and Hand) scores (a metric for patient functionality) vary based on whether a cyst was aspirated with or without the use of ultrasound guidance and is functionality based on whether or not the cyst recurred?

We hypothesize that ultrasound guidance is not superior to blind aspiration and that cyst recurrence would portend poorer outcomes.

Patients and Methods

A chart review was conducted of all ganglion cysts of the wrist joint treated at our institution over 6 years (2009–2015). A total of 186 patients were identified from this chart review. Of these 186 patients, 114 were treated with attempted aspiration of the ganglion cyst; 27 of these 114 individuals underwent ultrasound-guided aspiration. Phone calls were placed to all 114 patients who had undergone attempted aspiration of their wrist ganglion cyst. Of these 114 patients, 52 could be reached by telephone and agreed to participate in the study. The information collected from these phone calls included confirmation of prior aspiration, other treatment history, obtaining up-to-date ganglion presence (e.g., recurrence status), any additional treatments undergone, and patient-reported Quick-

DASH scores of upper extremity function from the afflicted wrist. Among those 52 patients who were successfully contacted by telephone, recurrence rates were compared between those whose cyst was treated with ultrasound-guided (13 patients) and those whose cyst was treated with blind aspiration (39 patients). Additionally, patient-reported Quick-DASH scores were compared between patients who experienced a recurrence after aspiration versus those who did not suffer a recurrence. Mean follow-up time was 3.5 years in the patients with ultrasound-guided aspiration and 2.7 years in the patients with blind aspiration. Total mean follow-up time was 2.9 years.

Statistical analysis was performed using JMP Pro 12 (SAS Institute Inc., Cary, NC). For continuous variables, a *t*-test analysis was used to obtain *p*-values. For categorical or dichotomous variables, contingency tables were created and three analyses were performed: Fisher's exact test, a Z-score test for two population proportions, and N-1 chi-square test. There was no difference in statistical significance for any variables among these three tests. Given the relatively small sample sizes involved with this study, Fisher's exact test was used and reported.

Results

• *Are ganglion cysts of the wrist less likely to reoccur if they are aspirated under ultrasound guidance versus “blind” aspiration without the use of ultrasound guidance?*

Recurrence rates were 69% (9 patients) and 74% (29 patients) for the ultrasound-guided and blind aspiration groups, respectively (*p*-value: 0.73), showing no significant difference in recurrences of wrist ganglion between the two groups (→ **Table 1**). The average follow-up time was 2.9 years to the time of phone follow-up from the time of aspiration.

• *Do recurrence rates vary by patient demographic information?*

The average age at the time of aspiration was 40 years for the “blind” group versus 44 years for the ultrasound group. The “blind” group comprised 74% female and the ultrasound group comprised 85% female, with only two male patients in the ultrasound-guided aspiration group. In the “blind” group, 47% were African-American and 42% were Caucasian, whereas in the ultrasound-guided group, 75% were Caucasian and 25% were African-American. In the “blind” aspiration group, 74% of the cysts were dorsal and 18% were located on the volar aspect of the wrist; comparatively, in the ultrasound-guided aspiration group, 54% of the cysts were located dorsally versus 39% volarly. Of the aforementioned variables, none showed a statistically significant difference between the two groups, with all calculated *p*-values greater than 0.05.

• *Are recurrence rates impacted by various adjunct therapies such as steroid injections and needle fenestration?*

Steroid was injected at the time of aspiration in 82% of patients in the “blind” aspiration group and in all (100%) of the patients who received ultrasound-guided aspiration. In the ultrasound group, 39% of the cysts were fenestrated with a needle at the time of aspiration compared 18% fenestration in the “blind” aspiration group. Neither steroid injection nor

Table 1 Recurrence rates and demographic data for “blind” and ultrasound-guided aspiration groups

	Ultrasound-guided aspiration	“Blind” aspiration	p-Value
Ganglion recurrence rate	69%	74%	0.73
Average age (years)	44	40	0.39
Female, %	85	74	0.71
African-American, %	25	47	0.31
Caucasian, %	75	42	0.09
Volar location, %	39	18	0.15
Steroid injected, %	100	82	0.17
Fenestrated by needle, %	39	18	0.15
Average Quick-DASH score	10.1	14.3	0.49
Average follow-up (years)	3.5	2.7	0.26

Abbreviations: DASH, Disabilities of the Arm, Shoulder, and Hand.

needle fenestration showed a statistically significant difference between the two groups, with all calculated *p*-values greater than 0.05.

• *Do follow-up Quick-DASH scores (a metric for patient functionality) vary based on whether a cyst was aspirated with or without the use of ultrasound guidance and is functionality based on whether or not the cyst recurred?*

Quick-DASH scores in the “blind” aspiration group were higher (14.3) compared with the ultrasound-guided group (10.1). There was not a statistically significant difference between the two groups, with calculated *p*-values greater than 0.05. Additionally, for those patients who experienced a ganglion recurrence after aspiration (either “blind” or ultrasound-guided), Quick-DASH scores at the time of phone follow-up were greater (17.4) compared with the Quick-DASH scores of those patients who did not experience a recurrence (2.11); this was a statistically significant difference (*p*-value: 0.008).

Importantly, the average time to phone follow-up from initial aspiration for the “blind” aspiration group was 2.7 years versus 3.5 years for the ultrasound-guided aspiration group. For the recurrences encountered in the ultrasound group, the average reported time to recurrence after aspiration was 275 days compared with 226 days to recurrence for the “blind” aspiration group. Neither of these time variables was statistically significantly different between the two groups.

Discussion

This study aimed to determine whether ultrasound-guided aspiration of ganglion cysts of the wrist leads to reduced recurrence rates compared with blind aspiration. Limitations

of this study include its small sample size and relatively low rate of successful phone follow-up. This study would benefit from the addition of more study participants to increase sample sizes and improve power. Additionally, given the retrospective design of our study and the lack of randomization of subjects to blind or ultrasound-guided aspiration groups, there could have been additional factors not identified in our study that led the treating physician to pursue ultrasound-guided versus blind aspiration based on certain patient presentations, cyst locations, or other factors.

• *Are ganglion cysts of the wrist less likely to reoccur if they are aspirated under ultrasound guidance versus “blind” aspiration without the use of ultrasound guidance?*

This research demonstrates no significant improvement in recurrence rates with the use of ultrasound-guided aspiration of ganglion cysts of the wrist. Despite a thorough review of the literature, we found no prior studies comparing ultrasound-guided versus blind aspiration of ganglion cysts. The 69% recurrence rate with ultrasound-guided aspiration that we found in our analysis is higher than that seen in other studies. Zeidenberg et al showed in a series of 39 patients followed for 9 months a 20% recurrence rate with ultrasound-guided aspiration.⁴ Although this recurrence rate is significantly less than that demonstrated in our study, the average follow-up time was 15 months, shorter than the 42-month mean follow-up time in our group. Additionally, Zubowicz and Ishii reported removal rates of 85% using blind aspiration performed on 47 patients one, two, or three times, depending on the rapidity of recurrence. Again, while the reported successful removal rate without recurrence is significantly higher than that of our study, the follow-up was only 12 to 20 months, far less than our mean 42-month follow-up.⁵ Breidahl and Adler conducted a case series of 10 patients who underwent ultrasound-guided treatment of ganglion cysts.⁷ Of these, seven were located at the wrist. Of those seven ganglia, two resolved completely, one recurred 1 year after attempted aspiration, three experienced a reduction in the size of the ganglion with improved symptoms but persistence of the cyst, and one patient did not experience any noticeable relief. Other research on blind aspiration of wrist ganglion cysts showed a wide range with similar high recurrence rates as those seen in our data. The recurrence rates reported in the literature for blind aspiration of wrist ganglions range from 27 to 89%.^{8,9} It appears as though the length of follow-up has a direct corollary with the percentage of cysts that recur.

• *Do recurrence rates vary by patient demographic information?*

This research demonstrates no significant variation in recurrence rates based on patient demographic information. Although, the study may be underpowered to detect such a difference as this was a secondary endpoint.

• *Are recurrence rates impacted by various adjunct therapies such as steroid injections and needle fenestration?*

This research demonstrates no significant variation in recurrence rates in patients who underwent additional adjunct therapies such as steroid injections and needle

fenestration. Although, the study may be underpowered to detect such a difference as this was a secondary endpoint.

• *Do follow-up Quick-DASH scores vary based on whether a cyst was aspirated with or without the use of ultrasound guidance and is functionality based on whether or not the cyst recurred?*

This research shows worse functional outcomes (higher Quick-DASH scores) in patients who experience a recurrence of wrist ganglion cysts after initial attempted aspiration. Thus, it is important to attempt to improve the efficacy of our aspiration techniques in an effort to improve patient outcomes and satisfaction.

The intuitive benefits of using ultrasound to guide aspiration attempts are numerous, notably visual confirmation of accurate needle placement to ensure optimal and sufficient aspiration of the ganglion cyst. Additional benefits include minimization of damage to surrounding soft tissues and neighboring anatomical structures, as well as potentially fewer needle sticks leading to decreased procedural-related discomfort for the patient. These benefits combined with the relatively low risk of harm that comes with the addition of the use of ultrasound make for a compelling argument in the use of the management of ganglion cyst aspiration. Despite the results of this study showing no improvement in recurrence rates with the use of ultrasound guidance, there may be particular situations in which the use of ultrasound guidance for aspiration is warranted. Volar ganglion cysts as well as ganglion cysts that are in the vicinity of neurovascular structures may certainly benefit from the use of ultrasound-guided aspiration to ensure avoidance of damage to surrounding nerves, vessels, and soft tissues. For clinical settings that already have an ultrasound available on-site, there is little downside in using ultrasound to guide aspiration attempts. Additionally, it should also be considered that use of ultrasound guidance for needle placement may constitute an additional billable procedure for physicians in certain practice settings.

Regardless of aspiration technique and the use of ultrasound, recurrence rates of ganglion cysts of the wrist are high, as demonstrated both in our study and throughout the literature. This should be discussed with patients, and they should be counseled on the risks, benefits, and likelihood of success of aspiration versus excision. While a less-invasive option is always a preferred initial treatment, given the overall poor efficacy of aspiration, proceeding straight to surgical excision may provide patients

with a more reliable solution with a quicker return to symptom-free function.

Future studies should look toward a randomized, prospective controlled trial to further investigate the possible benefit of ultrasound-guided aspiration of ganglion cysts of the wrist. Additionally, this study could be expanded to investigate the role of ultrasound in the management of ganglion cysts in other anatomical locations beyond the wrist. More research would also be useful in assessing any morbidity associated with ultrasound-guided aspiration. Although it can be assumed that procedure-related morbidity and complications would likely be less with aspiration in comparison with open resection, it would be useful to investigate if ultrasound-guidance led to an improvement in treatment-associated morbidity compared with morbidity and complications associated with blind aspiration.

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None.

Conflict of Interest

None declared.

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