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Pediatric Ganglion Cysts of the Hand and Wrist: An Epidemiologic Analysis

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Abstract We analyzed all hand and wrist ganglions in patients aged 12 years and younger that were treated at our institution during a 3-year period. Our patients were predominately female (1.8:1). Volar ganglions were more common (1.2:1), whereas dorsal ganglions have been reported to be more common in adults. Ganglions had a higher incidence of arising from tendon sheaths in our patients (33%) compared to what has been previously reported for ganglions in studies of all age groups (5% to 16%). While observation and/or splinting alone will likely be helpful in resolution of a majority of pediatric hand and wrist ganglions, surgical excision should be employed in those that are symptomatic and/or do not resolve with observation.

Keywords Ganglion · Pediatric · Hand · Wrist

Ganglion cysts are mucinous tumors that usually arise from underlying joint capsules or tendon sheaths and are the most common soft tissue masses of the hand [4]. Wrist ganglions in adults are predominantly dorsal [4] and are most commonly treated with surgical excision; however, observation and aspiration are employed as well.

While a multitude of data exist for adult hand and wrist ganglions, there is a paucity of data for the pediatric population. With an incidence of 10% in the population under the age of 20 and 2% of those under the age of 10 [4], pediatric ganglions are likely underreported, as they are typically asymptomatic lesions that do not cause functional problems.

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Pediatric hand and wrist ganglions seem to have different epidemiologic characteristics than those of adults, as a majority are found on the volar aspect of the hand and wrist in patients less than 10 years of age [8]. Although the most effective method of treatment is debatable, observation and splinting have been shown to be the most effective methods [5], and observation remains the most common treatment modality.

The aims of this study were to determine the most common site of pediatric hand and wrist ganglions and also the most effective method of treatment with regards to recurrence rate.

Materials and Methods

We included in this study all patients aged 12 years and younger who presented with hand and wrist ganglions during a 3-year period (2004 to 2007). Patients' age, gender, time interval between onset and presentation, method of treatment, and follow-up time were all recorded. Factors such as injury (which could lead to ganglion formation) were documented, as well as presenting symptoms such as discomfort and/or pain. In patients treated surgically, the origin of the ganglion was also documented. Patients were divided into three groups: group I consisted of children aged 5 years or less, group II children from 6 to 10 years of age, and group III children aged 11–12.

Results

During a 3-year period, 1,629 patients were treated at our institution for hand and wrist ganglions. Of these 1,629 patients, 48 were children aged 12 and under and were

included in this study (31 female, 17 male, female to male ratio 1.8:1), with an average age at presentation of 7.2 years. There were 14 patients in group I, 18 patients in group II, and 16 patients in group III (Table 1). A total of 49 ganglions were evaluated, as one patient in group II had bilateral volar wrist ganglions.

There were 22 (45%) dorsal and 27 (55%) volar hand and wrist ganglions. Sixteen (33%) ganglions were noted to be arising from tendon sheaths. Group I had five dorsal and nine volar hand and wrist ganglions, with tendon sheath origin in five (36%) patients. Group II had ten dorsal and nine volar hand and wrist ganglions, with tendon sheath origin in five (26%) patients. Group III had seven dorsal and nine volar hand and wrist ganglions, with tendon sheath origin in six (38%) patients (Table 2).

Eleven ganglions (22%) were symptomatic at presentation, with complaints including pain (n=7), discomfort (n=3), and a combination of pain and tingling (n=1). Six patients reported a history of injury to the affected hand and/or wrist.

Twenty-five (51%) ganglions occurred in the patient's dominant hand and 20 ganglions (41%) occurred in the nondominant hand. Two patients (4%) described themselves as ambidextrous, and two patients (4%) were so young that their parents had not yet identified their respective hand dominance.

Twenty-seven (55%) of the ganglions were managed by observation, with nine (three dorsal, six volar, one arising from tendon sheath) present in group I, 13 (six dorsal, seven volar, three arising from tendon sheaths) in group II, and five (one dorsal, four volar, three arising from tendon sheaths) in group III.

Two ganglions (4%) were aspirated, and one ganglion (2%) was ruptured by injection of sterile saline.

Three ganglions (6%) were treated with splinting, all of which were in group III. One was treated with a wristlet for 2 months before undergoing surgery, one patient was treated with a wristlet and observation, and one patient was treated with an aluminum finger splint and observation.

Nineteen ganglions (39%) were surgically excised. Five patients in group I underwent surgery, and four ganglions were noted to be arising from tendon sheaths: two from flexor sheaths in the A1 pulley region, one from the extensor carpi ulnaris (ECU) tendon sheath, and one from the extensor pollicis longus (EPL) tendon sheath. One surgical patient in group I had a volar ganglion that arose from a carpal–metacarpal joint (CMCJ; Table 3)

Six ganglions were excised in group II: three dorsal ganglions with scapholunate joint involvement and one volar ganglion with scaphotrapezoid joint involvement. One excised ganglion in this group arose from the flexor sheath in the A1 pulley region, and another excised ganglion arose from the extensor digitorum communis (EDC) tendon sheath (Table 4).

Eight patients in group III underwent surgery, three with dorsal wrist ganglions traced to the scapholunate joint, one with a dorsal wrist ganglion from the dorsal radiocarpal joint, and one with a volar wrist ganglion traced to the scaphotrapzial joint. The remaining three patients had ganglions arising from tendon sheaths: one from the EDC tendon sheath, one from the flexor carpi radialis (FCR) tendon sheath, and one from the flexor pollicis longus (FPL) tendon sheath (Table 5).

Upon reviewing patient charts, there were two recurrences (11%) in the 19 surgical patients. One of them was a patient in group II with a dorsal wrist ganglion that recurred 2 years after excision, and the other was a patient in group III with a ganglion arising from the FCR tendon sheath that recurred 3 months after surgery.

Twenty of the observation patients were only evaluated during their initial clinic visit, and the remainder had an average follow-up of 10 weeks (2–36 weeks). The surgical patients had an average follow-up of 3 weeks (2–5 weeks). In order to establish more complete follow-up, an attempt was made to contact all patients' parents/guardians by

Table 1 Patient demographics.

Group	Age	Number of patients	Male	Female	Number of ganglions
I	<5	14	5	9	14
II	5–10	18	8	10	19
III	10–12	16	4	12	16
Total		48	17	32	49

Table 2 Location and tendon involvement.

Group	Dorsal	Volar	Tendon sheath origin
I	5	9	5
II	10	9	5
III	7	9	6
Total	22	27	16

Table 3 Group I treatment.

Treatment	Dorsal	Volar	Tendon sheath origin
Observation	3	6	1
Surgery	2	3	4
Aspiration	0	0	0
Ruptured	0	0	0

Tendons involved: flexor sheath (A1 pulley region; n=2), ECU (n=1), EPL (n=1). Joints involved: CMCJ (n=1)

Table 4 Group II treatment.

Treatment	Dorsal	Volar	Tendon sheath origin
Observation	6	7	3
Surgery	4	2	2
Aspiration	0	0	0
Ruptured	0	0	0

Tendons involved: flexor sheath (A1 pulley region; $n=2$), EDC ($n=1$), FPL ($n=1$), unspecified ($n=1$). Joints involved: scapholunate ($n=3$), scaphotrapezoid ($n=1$), proximal interphalangeal joint ($n=1$)

phone to determine any further incidence of recurrence. We were able to reach 23 of 48 patients' parents/guardians, representing 24 ganglions. Eleven of these ganglions were managed with observation, ten with surgery, two with aspiration, and one with rupture by saline injection. The average follow-up represented was 22 months (8–49 months) for observation, 24 months (11–44 months) for surgery, 12 months (8–16 months) for aspiration, and 19 months ($n=1$) for rupture with saline injection. In the observation group ($n=11$), seven ganglions resolved, three never resolved but were reported to be nonbothersome, and one increased in size. In the surgery group ($n=10$), nine reported no recurrence, (though one of them had already undergone re-excision of a recurrent ganglion). One ganglion treated with aspiration had no recurrence, and the other recurred and later spontaneously resolved. The one ganglion treated with rupture by saline injection did not recur.

Discussion

Determining the true incidence of ganglia in children is difficult; they are frequently unreported, as they often are asymptomatic and do not cause any functional deficiency. They may also be treated with observation by primary care practitioners and never referred to a tertiary center. Further, some ganglions resolve spontaneously and are never reported to health care practitioners.

We divided our patients into groups after reviewing data indicating that hand and wrist ganglions are most commonly volar in patients less than 10 years old [8]. They were also divided based on the decision to undergo surgery, which we reasoned was entirely the parents' decision in group I, with the patient likely providing more input in groups II and III.

It has been reported that volar ganglions predominate in patients less than 10 years of age [8], and our results are in agreement. Thirty-three percent of the pediatric ganglions we treated arose from tendon sheaths, which is slightly less than the 35% reported by Colon and Upton [2]. Still, others have reported an even higher incidence of tendon sheath involvement in pediatric patients [10]. Studies involving patients of all ages have reported tendon sheath origin in only 5% to 16% of patients [1].

Female predominance of pediatric ganglions has been well-documented in the literature, with female-to-male ratios of 1.6:1 [3], 4:1 [8], and 4.7:1[10] all being reported. Although not as high as some in previous studies, our population nevertheless shows a strong female prevalence, with a female-to-male ratio of 1.8:1. Female prevalence also existed among the three age groups, with 64% females in group I, 58% in group II, and 75% in group III.

Although there is no general consensus regarding the best treatment for pediatric ganglions, most prefer observation and splinting, with Wang and Hutchison reporting 79% resolution [10], Rosson and Walker 76% resolution [7], and Petricig and Pepe 66% resolution [5] by observation alone. Nineteen of 26 (73%) patients treated by observation never returned to our clinic after initial evaluation and instruction to return on an as-needed basis. Of the 11 ganglions for which we were able to achieve further follow-up, seven resolved, three remained but were nonbothersome, and one enlarged.

Aspiration is another method currently utilized for treating ganglion cysts, with reported resolution rates for adult ganglions ranging from 13% to 85% [6, 7, 11]. Due to the risk of vascular injury and higher recurrence rates, aspiration is not frequently attempted in volar cysts. Colon and Upton have reported greater than 20% success rate after aspirating pediatric ganglions involving joints but less than 20% resolution after aspirating tendon sheath ganglions [2]. MacKinnon and Azmy reported a recurrence rate of 43% with aspiration in 32 patients under the age of 14 years [3]. In our series, aspiration was only performed on two patients (both from group III). One of these patients had no recurrence, while the other recurred and later spontaneously resolved. One patient in group III had a volar ganglion of the base of the long finger ruptured by sterile saline injection, also with no recurrence.

Surgical excision in adults has yielded a high success rate, with recurrence rates as low as 4% for dorsal cysts and 7% for volar cysts [9]. Although surgery has not been the mainstay of treatment for ganglion cysts in children, Satku

Table 5 Group III treatment.

Treatment	Dorsal	Volar	Tendon sheath origin
Observation	1	4	3
Surgery	5	3	3
Aspiration	1	1	0
Ruptured	0	1	0

Tendons involved: flexor sheath (A1 pulley region; $n=1$), EDC ($n=1$), FCR ($n=1$), FPL ($n=1$), unspecified extensor tendon ($n=1$), unspecified flexor tendon ($n=1$). Joints involved: scapholunate ($n=3$), radiocarpal ($n=1$), scaphotrapezium ($n=1$)

and Ganesh reported a recurrence rate of 35% in 45 surgical patients [8], Mackinnon and Azmy a recurrence rate of 12.5% [3], and Colon and Upton a recurrence rate of 6% [10]. Colon and Upton reported the most common sites of recurrence to be tendon sheaths near the thumb CMCJ [2]. Our population demonstrated two recurrences in 19 patients, a recurrence rate of 11%. Our two patients with recurrences were a patient in group II with a dorsal scapholunate joint ganglion and one in group III with an FCR tendon sheath ganglion.

Conclusions that can be drawn from our patient population are that pediatric ganglions are more commonly found on the volar surface of the hand and wrist, whereas they are most commonly dorsal in the adult population. Pediatric ganglions also more commonly have tendon sheath origin. While observation and/or splinting will likely be helpful in resolution of a majority of pediatric hand and wrist ganglions, we feel that meticulous dissection and excision under magnification is indicated in pediatric ganglions that are symptomatic, do not resolve after approximately 2 months of observation and/or splinting, or recur after previous spontaneous resolution.

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