Pediatric Ganglion Cysts: A Retrospective Review

HAND
2019, Vol. 14(4) 445–448
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DOI: 10.1177/1558944717751195
hand.sagepub.com

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Abstract

Background: Ganglion cysts are the most common type of soft tissue tumors of the hand. In the pediatric population, monitoring may be appropriate unless cysts are painful, interfering with range of motion or parental concerns exist. Reported recurrence rates after surgical removal of pediatric ganglion cysts vary widely in the literature. Notably, recurrence rates are higher for children than adults, ranging from as low as 6% to as high as 35%. **Methods:** A retrospective review was performed of a single pediatric hand surgeon's patients undergoing excision of primary and recurrent ganglion cysts from 2010 to 2015. Variables measured included patient age at diagnosis of ganglion cyst, time to presentation, location of cyst, hand dominance, previous therapy, previous surgery, length of surgery, tourniquet time, length of follow-up, any associated complications, and recurrence of cyst. **Results:** Ninety-six patients were identified with an average age of diagnosis 10.2 years. Indications for surgery: 95.8% for pain or decreased range of motion, 4.2% for cosmetic or parental concern. About 75% of the cysts were dorsally located, with the remaining 24.2% being volar. A total of 5 (5.3%) recurrences were recorded. Tourniquet time was on average 9.8 minutes longer for cases that resulted in recurrence. Multivariate analysis of the data demonstrated a 25% increased risk of recurrence with patients who had a previous aspiration. **Conclusions:** This is a retrospective review of a single pediatric hand surgeon's outcomes of pediatric wrist ganglion cysts. Our recurrence rate of 5.3% is low for a pediatric population indicating potential merit in this surgeon's operative and postoperative techniques. We demonstrate significantly increased rates of recurrence when a cyst had been previously aspirated, possibly indicating scarring and disruption of planes resulting in difficult dissection, increased tourniquet times, and incomplete excision.

Keywords: cyst, ganglion cysts, pediatric, recurrence, soft tissue tumor

Background

Ganglion cysts are the most common type of soft tissue tumors of the hand. Pathologically benign, ganglion cysts demonstrate mucin-filled collections with a stalk attaching to the underlying joint space. The dorsal wrist is the most common location, accounting for about 60% to 70% of all ganglion cysts.¹⁰ Other common locations that can be found on the hand include the volar wrist, flexor tendon sheath, and distal interphalangeal joint. These lesions have a predilection for females and often occur in ages between the 20 and 40s, but have been documented in almost every decade of life.^{3,10}

In the pediatric population, conservative and surgical management options exist. Potential invasive treatments, including aspiration, may be handled differently than in the adult population as the pediatric patient may be unable to tolerate bedside procedures, as well as age-related concerns for the safety of anesthesia. One study in a pediatric population demonstrated a majority of ganglion cysts resolving by

1 year from presentation, suggesting that monitoring may be appropriate in children.^{5,10} Conservative management may be recommended unless cysts are painful or interfering with range of motion.

Aspiration, aspiration and injection of sclerosing agent, or serial aspiration of ganglion cysts are treatment options for those patients who would like to forego surgery.^{1,2,9,10} Of note, aspirations under local anesthesia are less well tolerated in young children, placing uncooperative pediatric patients at risk of injury to vital structures and may ultimately require sedation for safety during the procedure.

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Table 1. Table of Demographic Variables Associated With Recurrence or No Recurrence After Surgical Excision of Ganglion Cysts.

Demographic variables	No recurrence	Recurrence	P value
Age at diagnosis (years)	10.2	9.25	NS
Age at surgery (years)	11.8	12.4	NS
Gender			
Male	24 (92.3%)	2 (7.7%)	NS
Female	67 (95.7%)	3 (4.3%)	
Hand dominance			
Right	74 (94.9%)	4 (5.1%)	NS
Left	13 (92.9%)	1 (7.1%)	
Laterality of cyst			
Right	38 (90.5%)	4 (9.5%)	NS
Left	53 (98.2%)	1 (1.8%)	
Location of cyst			
Dorsal	68 (94.4%)	4 (5.6%)	NS
Volar	22 (95.6%)	1 (4.4%)	

Note. P value of <.05 indicates statistical significance. NS = nonsignificant.

Various methods of surgical excision for dorsal wrist ganglion cysts include open or arthroscopic excision. Recurrence rates for surgical removal of these cysts are widely variable in the literature ranging from 1% to 40% for open procedures.⁸ This large variability in the recurrence rate has led some studies to question the effectiveness of surgical intervention. Despite this, surgical resection still remains first-line treatment for recurrent cysts, painful cysts, or those that are not self-resolving.⁴ Notably, recurrence rates are reportedly higher for children than adults, ranging from as low as 6% to as high as 35%.^{6,8}

Suggested surgical maneuvers to decrease ganglion recurrence include excision of cysts down to the stalk, excision of a cuff of ligament, or splinting for immobilization of the wrist. This study focuses on a single surgeon's use of all of these techniques in a solely pediatric population. Our aim is to evaluate a pediatric population of ganglion cysts located to the wrist and assess the risk of recurrence after surgical intervention.

Material and Methods

A retrospective review was performed for a single pediatric hand surgeon's patients undergoing excision of primary and recurrent ganglion cysts. Consent and compliance to all patient information and data was obtained and approved prior to the initiation of this study and performed in agreement to our institutional review board (IRB). Patient charts were examined from 2010 to 2015. All patients seen in the plastic surgery clinic with *International Classification of Diseases, Ninth Revision (ICD-9)* code of 727.41 and patients who had surgery with Current Procedural Terminology (CPT) codes of 25111 (excision of primary ganglion cyst) and 25112 (excision of recurrence ganglion cysts) were reviewed.

Any patients who were not operated on by the primary surgeon were removed from the data set. Children over the age of 13 were removed from the data set to prevent potential inaccuracies in the study by including more mature patients who may physiologically mimic adults. Variables measured included patient demographics including age at diagnosis, time to first presentation, location of cyst, and hand dominance. Treatment variables were recorded including any use of imaging, previous aspirations, previous surgeries, age at time of surgery, indications for surgery, length of surgery, tourniquet time, length of follow-up, any associated complications, and recurrence of cyst. Chart reviews were completed to evaluate for potential recurrences in addition to CPT codes of 25112 (excision of recurrence ganglion cysts) if the patient did ultimately require surgical intervention. Any patients with less than 1 year follow-up were removed from the data.

All analyses were performed using SAS 9.3 (SAS Institute, Cary, North Carolina) with 2-sided P values considered statistically significant at alpha level of 0.05. Basic group comparisons were compared with Wilcoxon rank sum tests for continuous variables or Fisher exact tests for categorical variables.

Results

A total of 187 patients were identified using the CPT codes 25111 and 25112, for excision of ganglion cyst, primary or recurrent. After exclusion of 85 patients not operated on by the primary hand surgeon of this study and 6 more patients being excluded after either having unavailable data or less than 1 year follow-up, 96 patients with complete data were evaluated. Average follow-up was 18.6 months (range, 12-45 months). Two main variable categories that could be risk factors for recurrence were then analyzed. The demographic variables, noted in Table 1, demonstrated that patients who did not have a recurrence after surgical excision had an average age at diagnosis of 10.2 years and average age of 11.8 years at time of surgery. Patients who did have a recurrence of their ganglion cyst after surgical excision had an average age at diagnosis of 9.3 years and average age of 12.4 years at time of surgery. The majority in both recurrence and no recurrence groups were right handed. Females made up a majority of the patients in total, but no significant difference existed in gender whether recurrence or no recurrence occurred. Cysts were usually on the left wrist, although no significant difference in recurrence occurred based on laterality. Finally, the location of the cyst favored dorsal over volar, but recurrence did not change depending on the side of the wrist.

Outcome variables were then studied (Table 2). Indications for surgery include pain, decreased range of motion, and parental concern. Imaging prior to surgery, the presence

Table 2. Table of Outcome Variables Associated With Recurrence or No Recurrence After Surgical Excision of Ganglion Cysts.

Outcome variables	No recurrence	Recurrence	P value
Indications for surgery			
Cosmetic	4 (100%)	0 (0%)	NS
Pain	75 (93.7%)	5 (6.3%)	
Range of motion	11 (100%)	0 (0%)	
Prior imaging			
No	79 (94.1%)	5 (5.9%)	NS
Yes	12 (100%)	0 (0%)	
Previous aspirations			
No	85 (96.6%)	3 (3.4%)	$P < .05$
Yes	6 (75%)	2 (25%)	
Resident present			
No	60 (95.2%)	3 (4.8%)	NS
Yes	31 (93.9%)	2 (6.1%)	
Tourniquet used			
Time (in min)	27.0	36.8	NS
Complications			
No	85 (94.4%)	5 (5.6%)	NS
Yes	4 (100%)	0 (0%)	

Note. P value of $<.05$ indicates statistical significance. NS = nonsignificant.

of a resident, and associated complications demonstrated no difference in recurrence. Noted complications included 2 dysesthesias, 1 infection, 1 hypertrophic scar, and the 5 recurrences (5.3%). Tourniquet time was on average 9.8 minutes longer for cases that resulted in recurrence, although this was not statistically significant.

Our data demonstrated 5 recurrences in total. Three were females and 2 were males who had recurrent ganglion cysts. Their ages ranged from 4 to 12 years. Time to recurrence was 3 to 45 months. Multivariate analysis of the data demonstrated a 25% increased risk of recurrence with patients who had a previous aspiration ($P < .05$).

Discussion

This retrospective review reports a single pediatric hand surgeon's outcomes of pediatric wrist ganglion cysts. Multiple surgical maneuvers are used by the primary surgeon in an attempt to decrease ganglion recurrence. These techniques include the use of a tourniquet, complete excision of the cyst down to the stalk with electrocauterization of the base of the stalk, and finally 7 to 10 days of splinting for immobilization of the wrist. Patients are followed in the clinic at 1-week, 1-month, 3-month, and 1-year intervals postoperatively. Our recurrence rate of 5.3% is low for a pediatric population indicating potential merit in this surgeon's operative and postoperative techniques.^{3,6,10} This study parallels reports in the literature with a predilection of cysts in females in pediatric cases compared

with adults. Previous studies indicate observation as an appropriate first-line treatment in pediatric patients for at least 1 year.^{5,7,10} Symptomatic cysts or cysts remaining longer than 1 year should be considered for excision. In our study, the average time to operation was greater than 1 year, allowing ample time for spontaneous resolution. Of those patients undergoing surgery, the vast majority were secondary to issues with pain. Most intriguing of our results is the demonstration that previous aspirations subsequently increased the likelihood of recurrence after surgical incision by 25%. Our statistically significant increased rates of recurrence when a cyst had been previously aspirated could possibly indicate scarring, disruption of surgical planes resulting in difficult dissection during surgery or potential ganglion cyst abnormalities of wider and aberrant stalks. These challenges could explain our average tourniquet times increased by 9.8 minutes in recurrence cases and potentially lead to incomplete excision of the cyst and stalk.

In conclusion, this retrospective study of a single pediatric hand surgeon has merit in the low recurrence rate and ultimately demonstrates that previous cyst aspiration, although a viable nonsurgical option, could lead to issues during definitive surgical procedures. Further study to elucidate this point is warranted. In a pediatric population, aspiration may be a difficult clinical procedure secondary to patient compliance, and patients may potentially benefit from surgical excision as their primary option. This new addition of information to the literature may prove useful to physicians and patients when deciding between aspiration and surgery of ganglion cysts.

Ethical Approval

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 (5).

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

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.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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