Flexor Tendon Sheath Ganglions: Results of Surgical Excision

Peter J. L. Jebson · Edwin E. Spencer Jr.

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Abstract The purpose of our study was to review the clinical features and determine the results following surgical excision of a flexor tendon sheath ganglion. A retrospective analysis of 24 consecutive patients (25 ganglions) who underwent excision of a painful flexor tendon sheath ganglion by the same surgeon was performed. The patient's medical and operative records were reviewed. Each patient was invited to return for an evaluation, which consisted of a clinical interview, completion of a questionnaire, and physical examination. Those patients that were unable to return underwent a detailed telephone interview. Sixteen patients returned for a clinical evaluation, while eight patients underwent a telephone interview. There were 15 women and nine men, with an average age of 43 years (range, 21–68 years). The dominant hand was involved in 15 patients. The long finger was most commonly involved (11 cases). The ganglion arose from the A1 pulley in 13 cases, between the A1 and A2 pulleys in three cases, and from the A2 pulley in nine cases. At an average follow-up of 18.5 months (range, 5–38 months), all of the patients were satisfied with their final result. No patient developed a recurrence and all returned to their previous functional level. There were two minor complications that resolved uneventfully; one patient experienced mild incisional

tenderness, while an additional patient experienced transient digital nerve paresthesias. We conclude that surgical excision is a simple, safe, and effective method for treating a painful ganglion of the digital flexor tendon sheath.

Keywords Ganglion · Flexor tendon · Excision

Introduction

The ganglion is the most common soft tissue tumor of the hand, representing approximately 50–70% of all upper extremity masses [1]. Ganglions are usually solitary and occur in specific locations in the hand and wrist. The most common ganglion locations are the dorsal and volar wrist regions, respectively. The third most common type is a ganglion of the digital flexor tendon sheath, which has been classically described as arising from the first annular (A1) pulley. There is no consensus regarding the preferred treatment of a flexor tendon sheath ganglion. Historically, the large number of therapeutic options described suggests that a predictable treatment approach could not be agreed upon [2–18, 20]. However, recent literature indicates that there are two acceptable treatment options: cyst aspiration or surgical excision. The most popular method involves cyst aspiration alone or in conjunction with corticosteroid injection. Nonoperative treatment has been advocated because of concerns regarding cost, scar formation, and recurrence following surgical excision [2]. Alternatively, surgical treatment has been advocated because of the potential for digital nerve injury, the high recurrence rates following aspiration, and the recognized complications of skin depigmentation and subcutaneous atrophy following corticosteroid injection [2, 13, 15, 18]. However, there is very limited information available with respect to the

P. J. L. Jebson (✉)
Division of Elbow and Hand Surgery,
Department of Orthopaedic Surgery,
University of Michigan Medical Center,
1500 E. Medical Center Drive, TC 2912-0328,
Ann Arbor, MI 48109-0328, USA
e-mail: pjebson@med.umich.edu

E. E. Spencer Jr.
Knoxville Orthopaedic Clinic,
Knoxville, TN, USA

Table 1 Epidemiologic data and questionnaire.

Epidemiologic Data and Questionnaire

Patient Name

MR#

DOB

Age at surgery

Gender male female

Occupation at time of surgery

Current occupation

Workers' Compensation? yes no

Date of surgery

Duration of follow-up

Pre-operative Findings

Hand	Thumb	Index	Right	Long	Left	Ring	Small
Finger							
Prior aspiration			yes		no		
# of times aspirated	0		1	2	3	>3	
Prior surgical excision			yes		no		
Prior attempts at manual rupture			yes		no		
History of trauma to finger/hand							
<u>prior</u> to onset of pain and/or mass			yes		no		

If yes, please describe

Duration of symptoms (i.e. pain/mass)
prior to surgery _____ months

What particular activities were aggravated by the mass?

Any history of ganglions elsewhere?

Additional diagnoses (ie CTS, trigger finger)

Surgical Procedure

Anesthetic type

Any additional procedures?

Cyst location
on A1
between A1 and A2
on A2
other

Table 1 (continued)**Intra-operative complications?**

What was/were the patient's reason for choosing surgery?

- ☐ pain
☐ cosmesis
☐ concerned about malignancy
☐ limited functional use of hand
☐ triggering of finger

Post-Surgical Outcome

Did the mass recur?	yes	no
Was aspiration performed	yes	no
Was surgery performed	yes	no

Have any cysts developed on either hand? (be specific about hand location)

Do you have any pain	yes	no
Do you have any incisional pain	yes	no

Do you have any incisional tenderness	yes	no
If yes, is it	occasional	
	frequent	
	constant	

Complications:

Digital nerve injury/neurapraxia	yes	no
Flexor tendon subluxation	yes	no
Digital triggering	yes	no
Recurrence of mass	yes	no
Infection	yes	no
Wound dehiscence	yes	no
Loss of digital motion	yes	no
Scar sensitivity	yes	no

Is your hand appearance....	satisfactory	or	unsatisfactory
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Compared to before surgery, is your current hand function..... better	the same	worse
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Are you satisfied with your surgery?	yes	no
If no, please specify why.		

outcome following excision, with only two published series [2, 15]. Therefore, the purpose of this study was to review the clinical findings and results of surgical excision of a flexor tendon sheath ganglion in a consecutive group of patients.

Materials and Methods

Approval for research on human subjects was gained from the institutional review board before the study began. A retrospective review of all patients who underwent excision of a flexor tendon sheath ganglion by the same surgeon at the University of Michigan Medical Center was performed. Twenty-seven consecutive patients with 28 ganglions of the digital flexor tendon sheath were identified. Each patient had confirmation of the diagnosis postoperatively by histopathologic examination. The patient's medical and operative records were reviewed. A presumptive clinical diagnosis of a flexor tendon sheath ganglion was made when the patient described the presence of a painful, variable-sized mass at or near the palmodigital or metacarpophalangeal crease; the location of the mass did not

change during digital motion; the size of the mass remained constant or varied with activity (i.e., increased in size with activity and decreased with rest or inactivity); and the mass could be palpated on the flexor tendon sheath during physical examination. Each patient was invited to return for an evaluation, which consisted of a clinical interview, completion of a questionnaire (Table 1), and physical examination performed by an independent examiner (ES) who had not been involved in the patient's care. Physical examination consisted of a measurement of digital active range of motion with a goniometer, assessment of the neurovascular status, and palpation for a recurrence and incisional tenderness/hypersensitivity. Three patients (three ganglions) were lost to follow-up. The study cohort comprises the remaining 24 patients (25 ganglions).

Sixteen patients (17 ganglions) returned for a clinical evaluation, while eight patients (eight ganglions) declined a clinical evaluation but underwent a detailed telephone interview. There were 15 women and nine men, with an average age at the time of ganglion excision of 43 years (range, 21–68 years). The dominant hand was involved in 15 patients (15 ganglions). The patients were employed in various occupations (Table 2). None of the patients were receiving workers'

Table 2 Study population epidemiologic data.

Patient	Age	Gender	Occupation	Finger	Cyst Location	Surgical Indication
1	65	F	Homemaker	Long	A1	Pain, triggering
2	45	F	Cashier	Index	A1	Pain
3	68	F	Retired	Long	A2	Mild pain, cosmesis
4	23	F	Nurse	Long	A1	Pain, limited use
5	58	F	Teacher	Small	A2	Pain, limited use
6	53	F	Custodian	Ring	A1	Pain, triggering, limited use, cosmesis
7	42	M	Radiographer	Index	A2	Pain, limited use
8	26	M	Grad student	Index	A2	Pain, limited use, concern for malignancy
9	39	M	Programmer	Long	Between A1/A2	Pain, limited use
10	21	M	Sales	Index	A2	Pain, limited use
11	31	F	Cashier	Long	Between A1/A2	Pain, paresthasias
12	49	F	Teacher	Ring	A1	Pain, triggering
13	33	M	Sales	Long	A1	Pain, triggering, limited use
14	24	F	Homemaker	Index	A1	Pain, limited use
15	47	F	Daycare	Thumb	A1	Pain, triggering, limited use
16	28	M	Engineer	Long	A2	Pain, limited use
17	58	M	Truck driver	Small	A1	Pain, triggering, limited use
18	29	F	Bartender	Long	A2	Pain, limited use
19	37	F	Hair stylist	Long	A1	Pain
20	36	F	Grounds keeper	Small	A1	Pain, limited use, triggering
21	44	M	Manager	Ring	A1	Pain, limited use
22	26	F	Social worker	Long	A2	Pain, limited use
23	59	M	Foreman	Long	A2	Pain
24 ^a	46	F	Secretary	Thumb	A1	Pain, limited use
				Index	Between A1/A2	

M = male, F = female

^a Patient #24 had two flexor tendon sheath ganglions

compensation or involved in litigation. Each patient presented with a painful digital mass that compromised hand function, particularly those activities that involved grasping and squeezing. All of the patients reported that the cyst remained constant in size with no discernible relationship between cyst size and activity. The mass had been present for an average of 9 months (range, 1–72 months) prior to the initial clinical evaluation. Seven patients (seven ganglions) also noted triggering in the involved digit. None of the patients had diabetes mellitus, rheumatoid arthritis, or gout.

None of the patients had a history of penetrating trauma, but one patient recalled a minor traumatic episode preceding the development of the mass. Three patients had undergone prior aspiration and corticosteroid injection at an outside institution. One patient had previously ruptured the mass with digital compression. Surgery had not been previously performed in any of the patients. Two patients had a prior history of a dorsal wrist ganglion in the same hand, while two other patients subsequently developed a flexor tendon sheath ganglion in the same hand but in a different finger postoperatively.

Surgical Treatment

Indications Surgical excision was offered as an alternative to observation or aspiration if the patient presented with a painful flexor tendon sheath ganglion that interfered with hand function.

Surgical Technique All patients underwent local or regional anesthesia (Bier's block) combined with tourniquet ischemia. Loupe magnification was used for each case. All lesions were exposed volarly, utilizing a Bruner zig-zag incision with the mass located beneath the base of the skin flap. The flap was carefully elevated and the radial and

Figure 1 The ganglion is excised with a surrounding margin of tendon sheath.

Figure 2 The origin of the excised ganglions.

ulnar digital neurovascular bundles were isolated and gently retracted. The ganglion was identified and its site of origin recorded in the operative dictation. The ganglion was excised with a surrounding 1- to 2-mm margin of tendon sheath (Fig. 1). If associated stenosing tenosynovitis (trigger finger) was present, the entire A1 pulley was incised. The flexor tendons were inspected by manual traction, and the wound irrigated. Sheath closure was not performed in any of the patients. The skin was closed with nonabsorbable suture and a nonrestrictive soft dressing was applied. All specimens were sent for histopathological analysis.

Results

The long finger was most commonly involved (11 ganglions), followed by the index finger (six ganglions), ring finger (three ganglions), small finger (three ganglions), and thumb (two ganglions). Approximately half of the ganglions originated from the A1 pulley. However, three ganglions originated between the A1 and A2 pulleys and nine from the A2 pulley itself (Fig. 2).

At an average follow up of 18.5 months (range, 5–38 months), all of the patients were satisfied with their surgical outcome. There were no recurrences, and each patient had returned to full, unrestricted, symptom-free activity. No patient had to change occupation. All seven patients with digital triggering had complete resolution following excision of the ganglion and release of the A1 pulley. Full active digital range of motion was present in all of the patients who returned for examination. None of the patients who underwent a telephone interview reported a loss of motion in the operated finger.

There were two minor complications. One patient experienced mild incisional tenderness that resolved completely following a short course of hand therapy. Another patient noted paresthesias in both the radial and ulnar

digital nerve distribution of the operated digit postoperatively. Complete resolution occurred within a month.

Discussion

Ganglions have been recognized since the time of Hippocrates, who suggested that they represent mucoid flesh, thus differentiating them from a ganglion of neural origin [4]. Although much has been written about this common hand tumor, little attention has been given to flexor tendon sheath ganglions, which are often referred to as volar retinacular cysts or “sesamoid” or “pearl-seed” ganglia [3]. This seems particularly surprising given that they are relatively common and often result in significant discomfort and loss of normal hand function.

The etiology of the flexor tendon sheath ganglion is unknown. Eller suggested that they originate from a localized rupture within the flexor tendon sheath [9]. Doyle believed that they result from a rent in the synovial membrane that heals but subsequently leaves an extracapsular piece of membrane that continues to secrete synovial fluid [8]. Nelson et al. and others have suggested a traumatic etiology, with a preceding injury occurring in approximately half of all patients [17]. However, the findings in our study are similar to others in that we could not find a clear association between antecedent trauma and the subsequent development of a flexor tendon sheath ganglion [6, 12, 15].

Involvement of the flexor tendon sheath occurs in approximately 5 to 16% of all hand and wrist ganglions [4, 6, 12, 16]. As has been reported with ganglions located in other areas of the hand, flexor tendon sheath ganglions seem to occur more commonly in women [1, 4, 15, 17]. The greater prevalence of young women with flexor tendon sheath ganglions has been attributed to this population's concern about cosmesis [12]. This seems unlikely, given that a flexor tendon sheath ganglion is usually quite small and inconspicuously located on the palmar surface of the hand. In our patient population, cosmesis was not a prevalent concern, which has been similarly noted by others [2, 15, 19].

All of our patients presented with the clinical complaints of a painful, tender, digital or palmar mass. The mass was typically small, firm, and subcutaneously located in either the distal palm or proximal portion of the digit. The resulting discomfort was particularly troublesome with grasping activities such as holding a steering wheel or lifting weights. The majority of patients reported that the pain interfered with hand function. This is a consistent finding in the literature. Flexor tendon sheath ganglions may be painful because of local neural innervation of the cyst, which has been demonstrated histologically by DeOrsay et al. [6] Certainly, the level of

disability in the patient with a ganglion of the flexor tendon sheath can be disproportionate to the size of the cyst. However, the resulting discomfort does not appear to cause the patient to urgently seek care because the symptoms were present for an average of 9 months prior to presentation in our patients. This delayed presentation has also been noted by Matthews, who reported approximately 10 months of symptoms prior to presentation in his series [15].

Approximately one fourth of our patients noted associated triggering of the affected digit. The association between stenosing tenosynovitis (trigger finger) and a ganglion of the flexor tendon sheath has not been previously reported. The ganglion originated at the A1 pulley in all seven patients. We postulate that this subgroup of patients have a more advanced form of trigger finger that may be recalcitrant to successful steroid injection or cyst aspiration.

None of our patients reported any noticeable change in the size of the mass from the time that they first became aware of it. This is in contrast to ganglions noted elsewhere in the hand that classically increase in size with activity and become smaller with rest. Our findings are similar to those in Matthews' series of patients and suggest that the behavior of a flexor tendon sheath ganglion is different from that of a ganglion elsewhere in the hand [15]. Several of our patients also noted a ganglion in another area of the hand or wrist. While this finding may simply be coincidental, the presence of a ganglion in the same or opposite hand or wrist has been reported in at least one other study of flexor tendon sheath ganglions, suggesting that some patients may be susceptible to the development of multiple ganglions in the hand and wrist region [15].

A variety of treatment modalities have been advocated for ganglions in general. Manual compression is the simplest yet least effective treatment approach. Theoretically, it should not be as successful for flexor tendon sheath ganglions because of their small size and tenderness. Radiation therapy was advocated in the early 1940s, with one series reporting a recurrence rate of only 19% [14]. This modality is no longer utilized because of concerns regarding the long-term sequelae of radiating the hand. Transfixion with a loop of catgut suture has also been advocated, with a reported failure rate of only 1% [5]. Aspiration of the cyst followed by injection with sclerosing agents such as iodine, carbolic acid, or ethanolamine has also been utilized but is no longer advocated because of the risk of soft tissue necrosis [4, 16]. Currently, the most popular treatment method involves cyst aspiration alone or in conjunction with corticosteroid injection. The earliest report specifically addressing aspiration and cyst wall rupture of flexor tendon sheath ganglions was by Bruner, who performed the technique on 15 patients, only one of whom developed a recurrence [3]. Similarly, Esteban et al.

experienced only one recurrence following fine needle aspiration in his series of six patients [10]. However, other investigators have not experienced such successful results. Richman et al. reported a cure in only nine of 13 patients (69%) who underwent aspiration, multiple attempts at cyst puncture, and digital compression [18]. Korman et al. reported similar results, with only 11 of 17 patients (65%) experiencing a cure following cyst puncture [13]. Postoperative immobilization for 3 weeks in a cast or splint with an aluminum outrigger did not improve the results. A recent study by Bittner et al. assessing the most cost-effective approach for treating a ganglion of the flexor tendon sheath documented a 66% cure rate overall [2]. A single attempt at aspiration was successful in 82 of 141 patients (77%), while a second aspiration resulted in cyst resolution in 11 of 20 patients (55%). The authors advocated a nonsurgical approach as the most cost-effective and recommended two attempts at cyst aspiration before considering surgical excision.

Excision has been advocated because of the potential for digital nerve injury and the high recurrence rates reported with aspiration [13, 18]. However, the results of surgical excision of a flexor tendon sheath ganglion are difficult to interpret because most series have grouped them with other hand and wrist ganglions. There are only two studies that have specifically assessed the results of excision of a flexor tendon sheath ganglion [2, 15]. In 1973, Matthews reported that none of the 34 patients in his series experienced a recurrence following excision that was performed primarily or following a failed aspiration [15]. Bittner et al. reported a recurrence in only one of their 43 patients who underwent cyst excision [2]. The results of both series are similar to the findings in our study. We have confirmed that surgical excision is successful and results in a low recurrence rate, minimal complications, and high patient satisfaction. Resection with a surrounding portion of the flexor tendon sheath is recommended to minimize the chance of recurrence because it has been suggested that recurrence is the result of inadequate removal of all degenerative myxoid tissue.

Although our study involves a small patient cohort and short-term follow-up, the findings confirm that surgical resection of a flexor tendon sheath ganglion is safe and effective. Excision appears to be more predictable than aspiration with respect to avoiding a recurrence. However, we agree with Bittner et al., that aspiration should be offered to patients as a more cost-effective approach with

less overall morbidity but a higher recurrence rate. We acknowledge that one or two attempts at cyst aspiration are effective for the majority of patients, particularly those who find surgery unappealing and inconvenient. However, we believe that excision has its own advantages and should be offered as an acceptable alternative to cyst aspiration.

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