Excisional biopsy of suspected benign soft tissue tumors of the upper extremity: correlation between preoperative diagnosis and actual pathology

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Abstract

Background Tumors of the upper extremity are common and mostly benign. However, the prevalence of discordant diagnosis of a solid hand tumor is less studied. The objectives of this retrospective study were (1) to determine the proportion of patients with a different (discrepant or discordant) pathological diagnosis compared to the preoperative diagnosis, (2) to determine the prevalence of the types of pathologies encountered at excisional biopsy for suspected benign tumors, and (3) to determine the types of tumors diagnosed when the surgeon does not make a preoperative diagnosis.

Methods One hundred and eighty-two suspected benign soft tissue tumors of the upper extremity with a preoperative diagnosis other than ganglion cyst were excised by one of three surgeons over a 10-year period. A preoperative diagnosis was applied for 125 tumors. No preoperative imaging was used.

Results Only 26 of the 125 tumors (21 %) with a preoperative diagnosis were discrepant. The tumors that were most likely to have a discrepant diagnosis were vascular tumors (32 %) and other less common benign tumors (33 %). Among the entire cohort of 182 tumors, lipomas (19 %), giant cell tumors of tendon sheath (GCTTS; 19 %), and vascular tumors (16 %) were the most frequent pathological diagnoses. Among the 57 tumors that did not have a preoperative diagnosis, most were vascular tumors (23 %), fibromas (14 %), and GCTTS (11 %).

One tumor without a preoperative diagnosis was a malignant tumor, but we consider this unusual and possibly spurious. **Conclusions** A hand surgeon's preoperative diagnosis without imaging is usually correct prior to excision of a mass in the hand. Discrepant diagnoses are usually benign and do not alter treatment.

Level of evidence: Prognostic II

Keywords Benign tumor · Discordant diagnosis · Discrepant diagnosis · Operative treatment · Pathology · Soft tissue tumor · Upper extremity

Introduction

Tumors of the upper extremity are mostly benign, and malignant tumors are thought to be rare [10]. Ganglion cysts are the most common tumors and represent 50 to 70 % of benign upper extremity tumors [1], followed by giant cell tumors of tendon sheath, lipomas, hemangiomas, fibromas, and peripheral nerve tumors [3, 4, 7, 9]. Of all soft tissue tumors found in the human body, 15 % is localized in the hand [4].

Ganglion cysts are easy to diagnose when they are in a characteristic location, change in size, or transilluminate. Studies have questioned the necessity of routine pathological examination after ganglion excision in the upper extremity [5, 8]. A study by Guitton and colleagues [5] showed that the prevalence of a discrepant diagnosis in wrist ganglions was 1.4 %, and the prevalence of a discordant diagnosis was 0. Guitton and colleagues [5] classified a diagnosis as discrepant in case the preoperative diagnosis and the pathological diagnosis were different and did not lead to treatment changes, whereas a diagnosis was discordant if the difference leads to changes in treatment management. On the other hand,

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malignant soft tissue tumors are frequently misdiagnosed as ganglion cysts [2].

Experienced practitioners can diagnose many benign soft tissue tumors by interview and examination alone [6]. The prevalence of discordant diagnosis of a solid hand tumor is less studied.

The main aim of this retrospective study was to determine the proportion of patients with a different (discrepant or discordant) pathological diagnosis after excisional biopsy compared to the preoperative diagnosis. Secondary research questions were as follows: (1) What is the prevalence of the various types of pathologies that are encountered at excisional biopsy for suspected benign soft tissue tumors of the upper extremity and (2) what are the types of tumors diagnosed when the surgeon does not make a preoperative diagnosis for a suspected benign soft tissue tumor?

Materials and Methods

Patient Selection

This study is based on secondary use of data from a retrospective cohort study about predictors of undergoing surgical treatment for subcutaneous benign upper extremity tumors [11]. Fifteen-hundred and eighty-seven soft tissue tumors in 1,538 patients were included in the previous study [11]. The patients were diagnosed in a single practice by one of three surgeons over a 10-year period (January 2001 until February 2012). Our Human Research Committee approved this study.

For this study, patients were included if they met the following criteria: (1) 18 years or older, (2) any benign subcutaneous soft tissue upper extremity tumor, (3) underwent excisional biopsy and specimen sent to pathology, (4) consultation of one of our three hand surgeons, and (5) first visit after July 2001 and before July 2011. Patients were excluded based on the following criteria: (1) pregnancy, (2) suspected ganglion cyst, (3) cutaneous tumors, (4) foreign bodies, (5) arthritis deformity or osteophyte, (6) suspected malignant tumor, (7) suspected tenosynovitis, and (8) patients with a known condition of multiple tumors, e.g., sarcoidosis or neurofibromatosis.

Among the 1,587 tumors evaluated in the office, 528 (34 %) were removed. Two tumors were expected to be gout. Two patients had 2 tumors with the same preoperative and pathological diagnosis that were excised during one procedure, and only 1 of these tumors was included in the analysis for each patient so that tumor cases would not be related to each other. We also excluded 340 preoperatively suspected ganglion cysts (64 %) and 2 excisional biopsies with no pathology specimen (1 definitely and the other possibly with no tumor identified).

One hundred and eighty-two tumors in 179 patients met all inclusion and exclusion criteria. The cohort consisted of 73 tumors in men (40 %) and 109 tumors in women (60 %) with a mean age of 51 years $\pm$ 15 years (range, 19 to 82). No preoperative diagnosis was applied for 57 suspected benign tumors (i.e., 31 % unknown; Table 1).

Chart Review and Definitions

The following variables were retrospectively recorded from the medical records: sex, age, race, location of the tumor, pain, neurovascular symptoms, preoperative diagnosis, treating surgeon, treatment, and pathological diagnosis. The preoperative diagnosis by the hand surgeon was determined from the medical record. The pathological diagnosis was retrieved from pathology reports in patients' medical records.

The location of tumors was divided into five groups: finger, hand, wrist, forearm, and elbow. The preoperative diagnoses were divided into nine groups: (1) lipoma (including fibrolipoma and angiolipoma), (2) giant cell tumor of tendon sheath (GCTTS), (3) fibroma (including fibromatosis and dermatofibroma), (4) vascular tumors (e.g., (hem)angioma, lymphangioma, varix, Masson lesion, venous malformation, organized thrombus/hematoma, fibrovascular lesion), (5) glomus tumor, (6) neurological tumor (e.g., schwannoma, neurofibroma, (traumatic) neuroma, perineurioma), (7) leiomyoma or angiomyoma, (8) other (e.g., calcification, chondroma), and (9) unknown benign tumor.

The primary outcome was a different (discrepant or discordant) postoperative diagnosis. The diagnosis was classified as concordant if the preoperative and pathological diagnosis were the same. The diagnosis was classified as discrepant if there was a discrepancy between the preoperative and pathological diagnosis, which did not lead to a change in treatment. Lastly, the diagnosis was classified as discordant if the discrepancy between the preoperative and pathological diagnosis leads to a change in treatment. The secondary outcome was the prevalence of the various types of pathologies that occur in surgically treated suspected benign upper extremity tumors. Finally, we assessed the types of tumors that are diagnosed when the surgeon is unsure prior to surgery.

Statistical Analysis

A post hoc power analysis, powered for the first secondary study question, showed that based on the 21 % prevalence of a discrepant diagnosis in our sample of 125 cases with a preoperative diagnosis, the prevalence would be within 7 % of the true proportion (14 % width of confidence interval) based on a 95 % confidence interval estimate. Proportions and prevalence are reported with 95 % confidence intervals.

Table 1 Overview of the tumors in the cohort ($n=182$)

Parameter	Mean	SD	Range
Age (years)	51	15	19–82
Number of visits before first treatment	1.6	1.1	0–8
Parameter	Number	%	
Sex			
Male	73	40	
Female	109	60	
Race			
White	152	84	
Black	8	4	
Hispanic	13	7	
Asian	6	3	
Other or unknown	3	2	
Surgeon			
Surgeon A	80	44	
Surgeon B	32	18	
Surgeon C	70	38	
Location			
Finger	108	59	
Hand	35	19	
Wrist	6	3	
Forearm	24	13	
Elbow	9	5	
Pain			
No	130	71	
Yes	52	29	
Neurovascular status			
No problem	178	98	
Problematic	4	2	
First actual treatment			
Aspiration	1	1	
Surgery	181	99	

n number, SD standard deviation

Results

Discrepant Pathological Diagnosis

Of the 125 tumors with a preoperative diagnosis, 26 (21 %; 95 % confidence interval, 14–28 %) had a discrepant diagnosis according to the pathological diagnosis. The preoperative diagnosis “glomus tumor” was not discrepant. The most discrepant diagnoses were vascular tumors (32 %) and other less common tumors (33 %; Table 2).

Prevalence of the Various Pathologies

Of the 182 excisional biopsies for suspected benign soft tissue tumors, the 4 most common tumors were lipomas (19 %), GCTTSs (19 %), vascular tumors (16 %), and neurological tumors (13 %; Table 3).

Pathological Diagnosis of Preoperative Unknowns

Among the 57 tumors without a preoperative diagnosis, the most common tumors were vascular tumors (23 %), fibromas (14 %), GCTTSs (11 %), and lipomas (9 %; Table 4).

One patient with an uncertain preoperative diagnosis had a digital papillary adenocarcinoma—the only malignancy in the series.

Discussion

The objective of this retrospective study was to determine the proportion of patients with a different (discrepant or discordant) pathological diagnosis after excisional biopsy compared to the preoperative diagnosis. Only 21 % of the 125 preoperative diagnoses was discrepant.

This study had a number of limitations. The first limitation of this retrospective study was its relatively small cohort consisting

Table 2 Preoperative diagnoses and discrepant pathological diagnoses ($n=125$)

Preoperative diagnosis	Number	Discrepant diagnosis (n)	Pathology of discrepant diagnosis	Correct preoperative diagnosis (%)
Glomus tumor	8	0		100
Lipoma	29	3	Neurological (2), pleomorphic hyalinizing angiectatic tumor (1)	90
Fibroma	7	1	Vascular (1)	86
Neurological tumor	21	5	Angioleiomyoma (1), fibroma (2), vascular (2)	76
GCTTS	38	10	Angioleiomyoma (1), fibroma (3), ganglion (4), lipoma (1), vascular (1)	74
Vascular tumor	19	6	Ganglion (1), glomus tumor (2), lipoma (3)	68
Other	3	1	Ganglion (1)	67

n number, *GCTTS* giant cell tumor of tendon sheath

Table 3 Prevalence of various types of pathology diagnoses in surgically treated suspected benign upper extremity tumors ($n=182$)

Pathology diagnosis	Number	Percentage of all tumors	95 % CI for percentage of all tumors		Unknown preoperative diagnosis (n)	Percentage preoperative unknown	Discrepant preoperative diagnosis (n)	Percentage discrepant	Percentage correctly diagnosed preoperatively	Preoperative diagnoses
			Lower	Upper						
Lipoma	35	19	13	25	5	14	4	11	74	GCTTS (1), vascular (3), unknown (5)
GCTTS	34	19	13	24	6	18	0	0	82	Unknown (6)
Vascular tumor	30	16	11	22	13	43	4	13	43	Fibroma (1), GCTTS (1), neurological (2), unknown (13)
Neurological tumor	23	13	7.8	18	5	22	2	8.7	70	Lipoma (2), unknown (5)
Fibroma	19	10	6.0	15	8	42	5	26	32	GCTTS (3), neurological (2), unknown (8)
Glomus tumor	13	7.1	3.4	11	3	23	2	15	62	Vascular (2), unknown (3)
Other ^a	13	7.1	3.4	11	9	69	1	7.7	23	Lipoma (1), unknown (9)
Ganglion	11	6.0	2.5	9.5	5	45	6	55	0	GCTTS (4), other (1), vascular (1), unknown (5)
Angio(leio)myoma/leiomyoma	4	2.2	0.048	4.3	2	50	2	50	0	GCTTS (1), neurological (1), unknown (2)

n number, CI confidence interval, $GCTTS$ giant cell tumor of tendon sheath

^a Other=calcified nodule, chondroma with ossification, digital adenocarcinoma, fibrovascular adipose tissue (2), histiocytic and foreign body giant cell reaction, granular cell tumor, nodular fasciitis, noncaseating granulomas not further identified (2), pleomorphic hyalinizing angiectatic tumor, reactive fibrosis, synovial chondromatosis

of 182 tumors (57 without a preoperative diagnosis), and the second limitation was the evaluation by only three surgeons. The results may not be generalizable. A strength of this study was the long period of study (10 years).

Vascular tumors and fibromas were the hardest to diagnose preoperatively among the most common benign tumors of the upper extremity. Neurological tumors, lipomas, and GCTTSs were the easiest to diagnose preoperatively. This is probably due to the fact that these are the most common benign tumors, and they have characteristic presentations [7]. In general, the most common diagnoses are easy to diagnose prior to surgery (GCTTSs, vascular tumors, and fibromas [3, 4, 7, 9]). Vascular tumors are one exception: they are common (16 % of all tumors), but only 43 % was correctly diagnosed preoperatively. The four most common tumors that we encountered in our cohort were lipomas, GCTTSs, vascular tumors, and neurological tumors. This is consistent with the current literature [3, 4, 7, 9].

Tumors with no preoperative diagnosis were most often vascular tumors, fibromas, and GCTTSs which are all among the most common upper extremity tumors. Tumors that occur less frequently such as angiomyomas, leiomyomas, and the single malignancy were not diagnosed preoperatively. Preoperative imaging (e.g., magnetic resonance imaging) might have established the diagnosis (e.g., for vascular tumors). The debate raised by this data is whether preoperative imaging would alter management and improve outcomes. We do not routinely image suspected benign tumors.

One malignancy among fewer than 200 solid tumors and 1 in 57 preoperative, preimaging unknowns in the hand over a 10-year period is concerning if it is representative of the true malignancy rate, but it is possible and even likely that this is a spurious finding. This study is not large enough to comment on the rate of malignancies among solid tumors in the hand. Excisional biopsy of a malignant tumor in the finger would not change management (amputation), but it might affect

Table 4 Pathology of preoperative unknown benign tumors ($n=57$)

Pathology diagnosis	Number	Percentage	95 % CI (%)	
			Lower	Upper
Vascular tumor	13	23	12	34
Other	10	18	7.4	28
Fibroma	8	14	4.7	23
GCTTS	6	11	2.3	19
Lipoma	5	8.8	1.2	16
Neurological tumor	5	8.8	1.2	16
Ganglion	5	8.8	1.20	16
Glomus tumor	3	5.3	-0.71	11
Angio(leio)myoma/leiomyoma	2	3.5	-1.4	8.4

n number, CI confidence Interval, $GCTTS$ giant cell tumor of tendon sheath

limb-sparing surgery in the hand. Again, the role of preoperative imaging merits investigation here.

With respect to suspected benign soft tissue tumors, most patients (66 %) decide not to remove them, hand surgeon diagnoses are accurate about 80 % of the time without imaging, and unknowns are usually common benign tumors. Discrepant diagnoses are usually benign and do not alter treatment. Future studies should address the role of preoperative imaging, the true risk of malignancy, and variation in operative rates by hand surgeon and surgeon experience with much larger databases.

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Statement of Human Rights 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.

Statement of Informed Consent Informed consent was waived for this study.

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