Ganglion cysts arising from the proximal tibiofibular joint: Treatment approach and associated outcomes - A systematic review of the literature

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INTRODUCTION:
Ganglions cysts in the proximal tibiofibular joint (PTFJ) are a rare entity that can cause neuropathic symptoms due to nerve compression. Their anatomic location makes their treatment challenging and there is no consensus on the optimal management to minimize recurrence and incomplete symptom recovery. This systematic review evaluates demographic characteristics, clinical and surgical outcomes in patients with proximal tibiofibular joint (PTFJ) cysts. We sought to: (1) Describe the demographic and clinical variables of patients presenting with PTFJ cysts, (2) review the most common treatment approaches for this condition, and (3) analyze potential risk factors for cyst recurrence and failure to completely recover from symptoms.
METHODS:
A systematic review was performed using the PubMed and Embase databases: “tibiofibular” AND “cyst”. Sixty-one articles were evaluated for inclusion and exclusion criteria, and for quality analysis. Inclusion criteria were peer-reviewed articles that included clinical and/or surgical outcomes of patients with PTFJ cysts and evidence through imaging or during surgery of a connection between the ganglion cysts and the PTFJ. Letters to the editor and studies that did not describe each patient’s outcome individually were excluded. All articles were screened by two reviewers independently, and conflicts were resolved by a third reviewer. CARE and STROBE checklists were utilized for quality assessment. Demographic data, clinical data and therapeutic approach were presented in narrative form and in descriptive statistics. Median and interquartile ranges (IQR) were used to describe quantitative data. Non-parametric tests were used for comparative analysis. Comparison of ≥ 3 variables was performed using the Kruskal-Wallis test. This review was registered at PROSPERO (CRD42022329536).
RESULTS:
Fifty-nine articles were included with a total of 145 patients. Median age at diagnosis was 45 years (IQR 32-61) and median time from symptom onset to diagnosis was 3 months (IQR 2-7). Median follow-up after initial treatment was 24 months (IQR 12-60). One-hundred-and-eight patients (108/145, 74.5%) were male. Most patients developed symptoms (134/140, 95.7%), the most common being motor deficits (67.2%), followed by pain (47%) and sensory deficits (44.8%). The most commonly affected nerves were the common peroneal nerve (59.9%) and the deep peroneal nerve (21.7%). Almost as many patients had intraneural compromise (56/158, 48.7%), as those who did not (59/158, 51.3%). The majority of patients did not report any relevant past medical history (35/56, 62.5%). Among those who did, the most important ones were history of knee trauma (12.5%), history of knee arthritis (12.5%) and being a contact sports athlete (12.5%).
Cyst excision was the most common procedure (75.3%), followed by PTFJ resection (13.8%), cyst aspiration (6.3%) and PTFJ arthrodesis (4.6%). Patients who underwent aspiration showed the highest recurrence rate (9/11, 81.8%) and the shortest median follow-up time (3 months). Recurrence rates were 31.8% for cyst excision (40/147), 4.4% for PTFJ resection (4.4%) and 0% for PTFJ arthrodesis (0/8). Although PTFJ arthrodesis showed the lowest cyst recurrence rate, complete recovery from symptoms was lower within this population (42.9%) than in the PTFJ resection (70.8%) and cyst excision (46%) groups.
Multivariate analysis showed that patients with history of knee arthritis had a 20.01 times higher risk of cyst recurrence (OR=20.01, p=0.02). However, having a PTFJ arthrodesis as treatment was an important protective factor against cyst recurrence (OR=0.03, p=0.01). Complete recovery from symptoms was also significantly associated with lower risk of recurrence (OR=0.04, p=0.006). Additional multivariate analysis was performed to determine risk factors for failure to completely recover from symptoms. Females were 0.76 times less likely to fail to completely recover from symptoms (OR=0.24, p=0.033). Ligation of the articular branch was also a significant protective factor against incomplete recovery from symptoms (OR=0.29, p=0.014). Important risk factors were intraneural compromise of the cyst (OR=3.93, p=0.042), cyst recurrence (OR=6.04, p=0.003) and being a contact sports athlete (OR=9.85, p=0.035).
DISCUSSION AND CONCLUSION:
Ganglions of the proximal tibiofibular joint are usually symptomatic and most often affect the common peroneal nerve. Cyst excision is the most common surgical procedure for this condition. PTFJ arthrodesis, although extremely effective, has the lowest rate of complete recovery from symptoms among surgical modalities. Ligatiion of the articular branch was a protective factor against incomplete recovery of symptoms.

Figure 1. Flowchart for our literature search and selection of relevant articles. Px: patient, ID: identification.

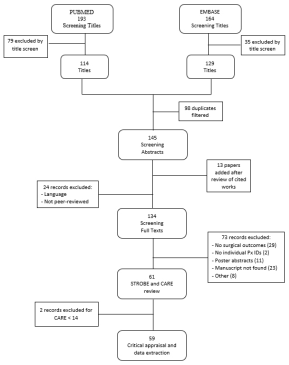

Table 1. Demographic and clinical characteristics of patients with proximal tibiofibular joint ganglion cysts. Dx: diagnosis. CPN: common peroneal nerve, DPN: deep peroneal nerve, SPN: superficial peroneal nerve, PN: peroneal nerve, TN: tibial nerve, NOS: not otherwise specified, TKA: total knee arthroplasty.
+Data displayed in Age. Time from symptom onset to Dx. Follow-up and Cyst size refers to the median and interquartile range (brackets). For the remaining variables. data between brackets refers to the percentage of patients.
*These cells display the percentage of patients as a subcategory of the non-indented cell located above.

Age at Dx^{+}		45 (32 - 61)
Time from symptom onset to Dx^{+} (mo.)		3 (2 - 7)
Follow-up^{+} (mo.)		24 (12 - 60)
Cyst size^{+} (mm)		33 (21 - 70)
Gender (n= 145)	Male	108 (74.5)
	Female	37 (25.5)
Intraneural compromise (n= 158)	No	59 (51.3)
	Yes	56 (48.7)
Symptoms (n = 140)	No	6 (4.3)
	Yes	134 (95.7)
	Pain*	63 (47)
	Paresthesia / Sensory*	60 (44.8)
	Motor deficits*	90 (67.2)
	Other*	34 (25.4)
Affected nerve (n=97)	CPN	58 (59.8)
	DPN	21 (21.7)
	SPN	5 (5.2)
	PN (NOS)	6 (6.2)
	TN	6 (6.2)
	Multiple	8 (8.3)
Arthrogram done (n= 132)	No	116 (87.9)
	Yes	16 (12.1)
Associated condition (n= 56)	No	35 (62.5)
	Contact sports athlete	7 (12.5)
	History of knee trauma	7 (12.5)
	History of knee ligamentous injury	2 (3.6)
	Knee arthritis	7 (12.5)
	Previous knee surgery	3 (5.4)
	Non-joint replacement*	1 (33.3)
	Joint replacement* (partial or TKA)	2 (66.7)

Table 2. Demographic. clinical characteristics and associated outcomes of patients with proximal tibiofibular joint ganglion cysts according to treatment approach. PTFJ: proximal tibiofibular joint, Dx: diagnosis. Qx: surgery.

+Data displayed in Age at Dx, Time from Dx to Qx, and Follow-up refers to the median and interquartile range (brackets). For the remaining variables. data between brackets refers to the percentage of patients.

		Cyst aspiration (n = 11)	Cyst excision (n = 131)	PTFJ resection (n = 24)	PTFJ arthrodesis (n = 8)	p
Age at Dx^{+} (years)		62.5 (34.5 - 65)	42 (31 - 58)	49 (40 - 61)	47 (30 - 48)	0.462
Time from Dx to Qx^{+} (mo.)		-	6 (3 - 12)	1 (0 - 3)	36 (6 - 78)	0.124
Follow-up^{+} (mo.)		3 (1 - 6)	24 (7.5 - 49)	12 (6 - 24)	18 (6 - 66)	0.018
Gender (female)		6 (54.6)	29 (23.6)	6 (25)	2 (25)	0.125
Associated condition	Contact sports athlete	1 (12.5)	7 (14.9)	0 (0)	0 (0)	0.505
	History of knee trauma	0 (0)	6 (12.8)	3 (23.1)	0 (0)	0.474
	History of knee ligamentous injury	0 (0)	5 (10.6)	1 (7.7)	0 (0)	0.778
	History of knee arthritis	0 (0)	7 (14.9)	4 (30.8)	1 (100)	0.041
	Previous knee surgery	3 (37.5)	4 (8.5)	2 (15.4)	0 (0)	0.152
Ligation of articular branch		0 (0)	42 (35.6)	16 (69.6)	0 (0)	<0.001
Recovery from symptoms	None	2 (20)	4 (4.6)	0 (0)	1 (14.3)	0.021
	Partial	7 (70)	43 (49.4)	7 (29.2)	3 (42.9)	
	Complete	1 (10)	40 (46)	17 (70.8)	3 (42.9)	
Cyst recurrence (yes)		9 (81.8)	40 (31.5)	1 (4.4)	0 (0)	<0.001
Time to cyst recurrence^{+} (mo.)		3 (1 - 5.5)	6 (4 - 18)	-	-	0.068

Table 3. Univariate and multivariate analysis of risk factors for cyst recurrence. PTFJ: proximal tibiofibular joint, Tx: treatment, Qx: surgery, Dx: diagnosis.
*Multivariate analysis was adjusted for surgical Tx and recovery from symptoms.

		Crude			Adjusted		
		OR	95% CI	p	OR	95% CI	p
Gender	Male	-	-	-	-	-	-
	Female	1.61	0.79 - 3.28	0.192	2.003	0.63 - 6.39	0.240
Age at Dx		0.99	0.98 - 1.01	0.570	1.004	0.98 - 1.04	0.761
Time from symptoms to Qx		0.99	0.97 - 1.02	0.662	1.02	0.95 - 1.09	0.632
Intraneural compromise	No	-	-	-	-	-	-
	Yes	2.08	0.93 - 4.64	0.074	2.05	0.57 - 7.36	0.273
Associated condition	No	-	-	-	-	-	-
	Contact sports athlete	1.05	0.23 - 4.78	0.950	0.36	0.05 - 2.61	0.309
	History of knee trauma	1.05	0.23 - 4.78	0.950	1.16	0.17 - 7.87	0.877
	History of knee ligamentous injury	8	0.85 - 75.73	0.07	17.05	0.57 - 508.95	0.102
	History of knee arthritis	2.41	0.76 - 7.61	0.135	20.01	1.61 - 248.33	0.020
	Previous knee surgery	3.07	0.78 - 12.07	0.108	2.1	0.29 - 14.97	0.460
Surgical Tx	Cyst aspiration	-	-	-	-	-	-
	Cyst excision	0.1	0.02 - 0.49	0.005	0.27	0.05 - 1.59	0.148
	PTFJ resection	0.01	0.001 - 0.13	<0.001	0.03	0.002 - 0.43	0.010
	PTFJ arthrodesis	-	-	-	-	-	-
Recovery from symptoms	No	-	-	-	-	-	-
	Partial	0.28	0.06 - 1.45	0.130	0.36	0.04 - 3.47	0.378
	Complete	0.02	0.004 - 0.13	<0.001	0.04	0.003 - 0.39	0.006