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Evaluation of treatment results for proximal fibula and surrounding tumoral lesions

Proximal fibula and surrounding tumoral lesions

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Abstract
Aim: The proximal fibula has a specific anatomy and tumoral lesions are rarely observed in this region. The aim of this study was to present the diagnosis, treatment methods, and postoperative outcomes for tumoral lesions observed in and around the proximal fibula together.
Materials and Methods: Data of 22 patients with tumor in or around the proximal fibula were retrospectively investigated. The preop, and postop findings, treatment administered and pathologic diagnosis data of the patients were collected. The postop Toronto Extremity Salvage Score (TESS), Musculoskeletal Tumor Society score (MSTS), Physical score (PCS-12), and Mental score (MCS-12) data for patients were recorded and analyzed with SPSS (ver. 23).
Results: The mean age of patients was 28.45 years (min: 11, max: 60). The mean follow-up duration was 16.81 ± 7.52 months. Of patients, 13 were male (59.1%) and 9 were female (40.9%). Lesions were present on the right side in 13 patients (59.1%) and on the left side in 9 patients (40.1%). Patients most commonly attended with complaints of pain and peroneal compression. Osteochondroma and giant cell tumor were the most commonly encountered pathological diagnoses. There was no significant difference observed between the form of the treatment and postop follow-up scores of the patients.
Discussion: The strongest aspect of our study is that it contributes a 22-case series to the limited literature in this field. Additionally, the preop clinical presentation, postop follow-up outcomes and surgical treatment forms of the patients are presented together. In this case series including rarely-observed cases, eight different pathologic diagnoses are presented.
Conclusion: Knee stability should definitely be evaluated during proximal fibula surgeries. The most commonly observed pathologic diagnoses in this region are presented in our study. When considering benign tumors in this region, the diagnoses in our series should be remembered. Additionally, it should not be forgotten that patients may apply with peroneal compression findings.

Keywords
Proximal fibula; Tumor; Peroneal palsy

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Introduction

Proximal fibula is a rare localization for tumors. The majority of tumors observed in this region have a benign character. However, a portion of these benign lesions may display local aggressive properties [1].

According to the diagnosis of tumor, a variety of choices are applied for surgical treatment including en bloc resection of the proximal fibula, intralesional or marginal resection [2]. Complications that may occur after en bloc resection are not well-defined in the literature. However, mainly peroneal symptom risks and knee instability occur. The risk of knee instability is due to the insertion of the lateral collateral ligament and biceps femoris in the fibula head [3].

Some tumors with proximal fibula localization present with peroneal entrapment findings. This complication may be observed after surgery. The main reason for this is the tendency of the peroneal nerve to become entrapped [4]. The main cause of this is the close relationship with the proximal fibula around the knee and surficial track. Additionally, changing compartments during progression around the knee and exposure to frequent tension forces in this mobile region may explain this tendency. The peroneal nerve is weak from the vascular aspect [5] [6].

The proximal fibula has specific anatomy and tumoral lesions are rarely observed in this region. The aim of this study was to present the diagnosis, treatment methods and postoperative findings for tumoral lesions observed in and around the proximal fibula together.

Material and Methods

The study began after receiving local ethics committee permission. The study retrospectively included patients with surgical treatment due to mass in the proximal fibula and surroundings from 2015 to 2018. Those with nonsurgical surveillance and without follow-up information were excluded from the study.

Those with benign tumors were included in the study. There were no patients with malignant tumors in the study. All diagnoses were pathologically confirmed. Local X-ray, MRI scan and CT scan and bone scintigraphy were performed preoperatively. The study included a total of 22 patients. The patients' age, gender, and sociodemographic data were obtained from file records. Additionally, presenting symptoms were noted. Pathologic diagnoses and surgical treatment forms were obtained from file data. Patient follow-up was at 2 weeks, 1.5 months, 3 months, 6 months, 12 months and annually. Patient follow-ups examined pathology results and direct radiography. Knee stability of the patients was checked. Varus stress tests were performed. Those with the risk of lesion recurrence at check-up had MRI taken. Postop patients had Toronto Extremity Salvage Score (TESS), Musculoskeletal Tumor Society score (MSTS), Physical score (PCS-12), and Mental score (MCS-12) calculated. During surgery, all patients were approached with proximal lateral incision on the lower leg. After suspending and protecting the peroneal nerve, the fibula head was accessed. After curettage, patients with cementing or grafting had the fibula head lid opened and accessed. After curetting lesions, the remaining bone tissue was shaved with a high-speed burr. After this procedure, the cavity was filled with graft or cement. Apart from this, masses in the proximal fibula were removed with en bloc resection. Soft tissue masses were removed with marginal excision and samples were sent to pathology. Patients with bone procedures used splints until stitches were removed for postoperative pain control. Patients with soft tissue mass removed had the leg wrapped with an elastic bandage.

Statistical analysis: Statistical analysis was performed using SPSS ver. 23.0 (SPSS Inc., IBM, NY, USA). Continuous variables are given as means and standard deviations. Comparison of four independent groups was performed with one-way analysis of variance (ANOVA) test. Post-hoc comparison of groups was performed with the Bonferroni test. P- values lower than 0.005 were considered statistically significant.

Results

The mean age of patients was 28.45 years (min: 11, max: 60). The mean follow-up duration for patients was 16.81 ± 7.52 months. Of patients, 13 were male (59.1%) and 9 were female (40.9%) and 13 patients had a lesion on the right side (59.1%) and 9 patients had a lesion on the left side (40.1%). The masses were identified due to pain, swelling, peroneal compression findings or by chance (Table 1). The histologic diagnoses and surgical treatments performed are shown in Table 2.

Table 1. Clinical presentation of patients

	n	%
Pain	7	31.8
Swelling	1	4.5
Pain and Swelling	4	18.2
Coincidental	3	13.6
Peroneal compression findings	7	31.8
Total	22	100.0

Table 2. Pathologic diagnosis and surgical treatment of patients

Diagnosis	n	%	En bloc resection	Marginal Excision	Curettage + cement	Curettage + grafting
Giant cell tumor	5	22.7	2	0	3	0
Cholesterol granuloma	1	4.5	0	1	0	0
Ganglion	4	18.2	0	4	0	0
Osteochondroma	6	27.3	1	5	0	0
Aneurysmal bone cyst	3	13.6	0	0	2	1
Simple bone cyst	1	4.5	0	0	0	1
Fibrous cortical defect	1	4.5	0	0	0	1
Cyst hydatic	1	4.5	0	1	0	0
Total	22	100	3	11	5	3

Two patients had postop hematoma observed. Another two patients were observed to have serous discharge from the wound site. No problems were observed during follow-up. No patient had postop peroneal symptoms. Postop follow-up scores for patients were TESS 38±4.24, MSTS 30.54±3.37,

Figure . Case exampled treated for mass of proximal fibula and surroundings. A) 34-year old female patient, with curettage and cementing performed for aneurysmal bone cyst diagnosis. B) 49-year old male patient with en bloc resection due to giant cell tumor diagnosis C) 44-year old female patients with excision of the proximal fibula due to giant osteochondroma D) 23-year old female patients monitored for ganglion cyst causing peroneal nerve compression rooted in the proximal tibiofibular joint

PCS-12 51.33±3.66, and MCS-12 51.54±3.93. The mean size of lesions was 50.18 x 32.72 mm (min: 11, max: 110 mm). When applied surgical procedures and postop follow-up scores (TESS p:0.93, MSTS p:0.41, PCS-12 p:0.33, MCS-12 p:0.13) are compared, there were no significant differences observed between the groups. The distribution of histologic diagnoses and surgical procedures are shown in Table 2. Of the three patients with en bloc resection of the proximal fibula, one had LCL reconstruction performed. This procedure was performed after observing knee instability during the intraop examination of the patient.

Discussion

The strongest aspect of our study is contributing to the literature related to this rare tumor localization. When the literature about tumoral lesions in this region is investigated, a 22-patient case series is a very good number. The proximal fibula has a specific anatomy [7]. Varus instability, peroneal nerve palsy, and local recurrence may be observed after surgical procedures applied to tumors in this region [8]. Among all cases in our study with en bloc resection, we performed LCL reconstruction in one patient. LCL reconstruction after proximal fibula excision is controversial in the literature because there are other structures apart from the LCL, like the cruciate ligaments, which provide knee stability [9]. However, during surgery, the knee should definitely be examined with a varus stress test in 30° flexion [8]. Additionally, to obtain the best long-term outcomes in young patients especially, LCL reconstruction should definitely be performed [3].

Another worrying complication related to surgeries applied to proximal fibula tumors is peroneal nerve palsy [8] [10] [11]. In our study, there were patients presenting with preop peroneal nerve compression findings. However, no patient developed peroneal symptoms postop, thankfully. Surgery in this region should consider the anatomic proximity of the common peroneal nerve [12]. Aggressive proximal fibula tumors with significant dimension soft tissue mass may elevate and strain the peroneal nerve. As the nerve is bound to the proximal fibula by fascial bands, displacement of the nerve by the tumor may lead to neurologic complications associated with surgical interventions [13]. Considering the scarcity of the literature, the rates for this complication are not well-defined [8] [11]. In our study, no complications except for hematoma and serous discharge were observed. However, care should be taken about peroneal nerve compression findings in the preop period for tumors in this region.

Proximal fibula tumors comprise a small portion of all primary bone tumors occurring in the fibula and nearly one-third of all tumors in this anatomic location are benign [8]. Patients with aggressive benign tumors in the proximal fibula require surgical treatment. Most patients treated with en bloc resection, marginal excision or curettage, as in our study [14] [15]. The lesions observed in and around the proximal fibula were documented in our study according to pathologic diagnoses and surgeries performed (Table). In the literature, it is stated the giant cell tumors are observed as 3-5% of all bone tumors. They are locally aggressive and destructive lesions and may be observed in different bones [16]. They appear expansile radiologically. En bloc resection is recommended as giant cell tumors have higher local recurrence risk [17]. In our study, giant cell tumors were second place among the most commonly observed lesions. Some were treated with curetting-cementing while some were treated with en bloc resection (Figure). In our case series, osteochondroma was the most commonly encountered lesion. Cholesterol granuloma and cyst hydatic were very rarely observed pathologic diagnoses. Our study is important as it includes these two cases. These were treated with marginal excision. There was no significant difference in postop follow-up scores according to histologic diagnosis and surgical treatment performed. However, there is a need for studies with larger series about this topic.

The authors are aware of some limitations of this study. Firstly, it is a retrospective case series. Additionally, the lack of standardization of surgical treatment is a limitation of the study. This is due to the differences in histologic diagnoses.

Conclusions

In conclusion, in our study, we treated 22 masses with proximal fibula localization. Peroneal nerve palsy was not observed in any patient postop. Knee stability should definitely be evaluated during proximal fibula surgeries. Diagnoses in our series should be remembered when considering benign tumors in this region. Additionally, it should not be forgotten that patients may attend with peroneal compression findings.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest
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