



Peroneal Intraneural Ganglion Cyst Arising from Proximal Tibiofibular Joint: Advantages of Magnetic Resonance Imaging on Preoperative Diagnosis

Zeynep Maraş Özdemir¹, Ayşegül Sağır Kahraman¹, Mustafa Karakaplan², Haldun Topgül², Cemile Ayşe Görmeli¹ Meryem Merve Hamurcu³

¹Inonu University, School of Medicine, Department of Radiology, Malatya, Turkey

²Inonu University, School of Medicine, Department of Orthopedics and Traumatology, Malatya, Turkey

³Inonu University, School of Medicine, Department of Pathology, Malatya, Turkey

Abstract

Peroneal intraneural ganglion cysts usually occur in adult male population and may cause neurological symptoms. Most patients complain of pain and palpable mass located near the lateral part of the fibular neck where peroneal nerve passes through. Most of the patients share complaints of pain and palpable masses located near the lateral part of the fibular neck where peroneal nerve passes through. We would like to present the case of a 14-year-old girl who presented in our clinic with pain and mass at the lateral side of her knee and drop foot due to a peroneal intraneural ganglion cyst, a rare cause of lower extremity paralysis. In order to regain best possible recovery, quick diagnosis and immediate treatment are essential in such cases. Magnetic resonance imaging (MRI) provides reliable and proper information and while also shedding light on therapeutic approaches.

Key Words: Ganglion Cyst; Peroneal Nerve; Superior Tibiofibular Joint; Magnetic Resonance Imaging.

Proksimal Tibyofibular Eklemden Kaynaklanan Peroneal Sinir Yerleşimli İntranöral Ganglion Kisti: Preoperatif Tanıda Manyetik Rezonans Görüntülemesinin Katkıları

Özet

Peroneal intranöral ganglion kisti, genelde erişkin yaşta erkeklerde ortaya çıkar ve nörolojik bulgulara yol açabilir. Hastaların çoğunda peroneal sinirin geçtiği fibula boynu laterali komşuluğunda ele gelen şişlik ve ağrı şikayeti ile karşılaşmaktadır. Tanıda elektromiyografi ve radyolojik görüntüleme yöntemleri kullanılmaktadır. Biz burada dizinin dış yan tarafında ağrılı şişlik ve düşük ayak klinik tablosu ile başvuran 14 yaşında kız hastada alt ekstremité paralizisinin nadir nedenlerinden biri olan peroneal sinir yerleşimli intranöral ganglion kisti olgusunu sunduk. Sinir fonksiyonlarının geri kazanılabilmesi için mümkün olan en kısa zamanda cerrahi müdahale yapılmalıdır. Manyetik rezonans görüntülemesi (MRG) bu lezyonun hızlı ve doğru tanısına katkı sağlamakta ve tedavi yaklaşımlarına ışık tutmaktadır.

Anahtar Kelimeler: Ganglion Kisti; Peroneal Sinir; Süperior Tibyofibular Eklem; Manyetik Rezonans Görüntülemesi.

INTRODUCTION

Peroneal nerve entrapment in the lower extremities and related neurological signs are frequently encountered cases. Generally caused by trauma-related or post-traumatic compression of casts, such issues, though rarely, may also be associated with intraneural ganglion cysts (1, 2). The pathophysiology of intraneural ganglion cyst is still one of the controversial issues today; some authors claim that ganglion cyst is originated in proximal tibiofibular joint (1, 3-9), while others mentioned that it is a degeneration of the nerve sheath (10, 11).

Intraneural ganglion cyst is common in adult males but it is rare in childhood (2, 3, 11). To prevent irreversible loss of nerve function, especially in children, surgical intervention should be applied as soon as possible (1, 9). The most important factors in determining the treatment approach are the accurate preoperative diagnosis of this lesion (intraneural or extraneural ganglion cyst) and the

disclosure of pathophysiology of the lesion (whether it is joint related or not) (4-7).

In this case report, we aim to present magnetic resonance imaging (MRI) findings which has lead to an accurate and rapid preoperative diagnosis for a surgical evaluation of an intraneural ganglion cyst localised in the peroneal nerve, a rarely encountered medical issue in daily practice

CASE REPORT

A 14-year-old girl was admitted to the orthopedic and traumatology department at Turgut Ozal Medical Center with complaints of pain in the left leg and difficulty in walking. The patient related her story of falling on her knee while skipping rope three months ago which was followed by swelling on the outer side of her knee; in time, her complaints turned to loss of sensation and inability to hold her foot up. We could not detect any abnormalities in her medical story. But the physical

examination revealed soft tissue swelling at the level of the fibular head, and loss of dorsiflexion and pronation of the left foot. The supination and plantar flexion of the foot were normal. Having clinically determined drop foot, we also found steppage gait characterised by walking with upthrown steps by bending her hip and knee joints as the fingers of her foot kept pointing down. There were no further abnormalities in the physical examination. The laboratory findings were normal

The electromyography (EMG) examination showed decrease in motor responses of the peroneal nerve starting from the fibular head level as well as a certain amount of conduction block. The ultrasonography (US) and Doppler examination displayed a tubular shaped lobulated cystic lesion, adjacent to the fibular head, in the subcutaneous connective tissue. Furthermore, the MRG examination disclosed a 2.2x1.6x1.2cm cystic mass lesion with curvilinear course lateral to the fibular head, located in the deep soft tissue neighbouring the proximal tibiofibular joint (Figure 1).

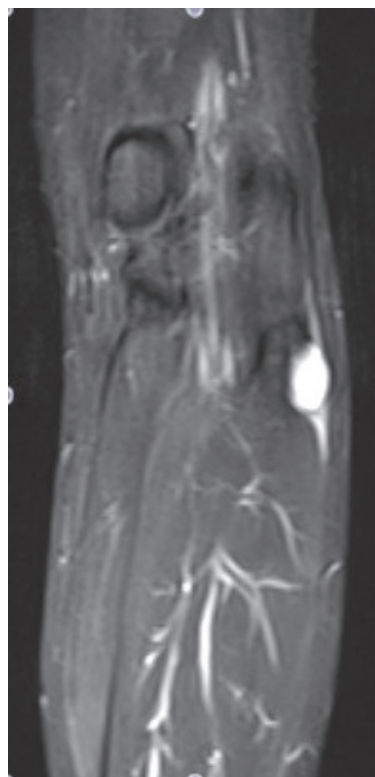


Figure 1. Coronal MR image showing the cystic mass lesion at the level of the fibular head and neck.

There was no contrast enhancement after the intravenous contrast material injection. In addition to these findings, we also observed mild edematous signal changes in the peroneus longus muscle to the proximal of the crurismarking the acute phase of denervation.

During the operation, after applying a 10-cm incision close to the mass settlement and going through the cutaneous and subcutaneous tissues, we reached the mass. The exploration of the mass showed that the cyst originated from the peroneal nerve. During the removal of the cyst which was made without damaging the nerve, we saw that the mass continued anteriorly along the articular branch on the joint level (Figure 2). At this point, we cut the articular branch and excised the mass. The histopathological examination revealed wall shaped parts with sparse spindle cells filling thick-walled cystic spaces which in turn made us consider ganglion cyst as a possible diagnosis (Figure 3).

The follow-up 3 months after the operation showed complete improvement of nerve functions.

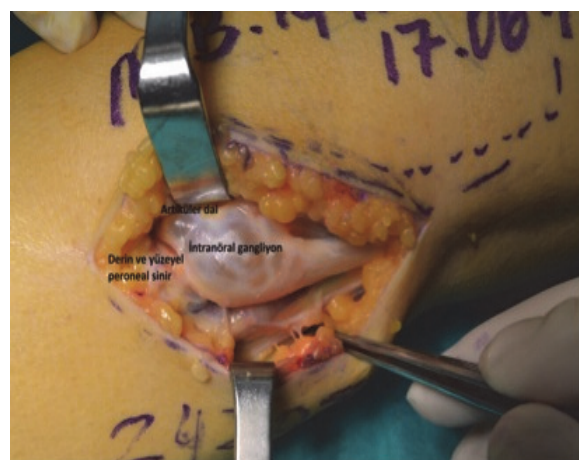


Figure 2. Surgical exploration revealing an intraneural ganglion of the peroneal nerve and its connection to the articular branch.

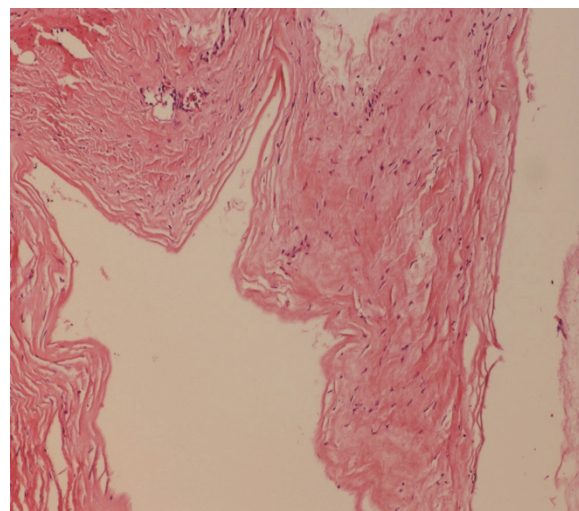


Figure 3. The histopathological examination showing ganglion cyst wall including sparse spindle cells (H&E x 100).

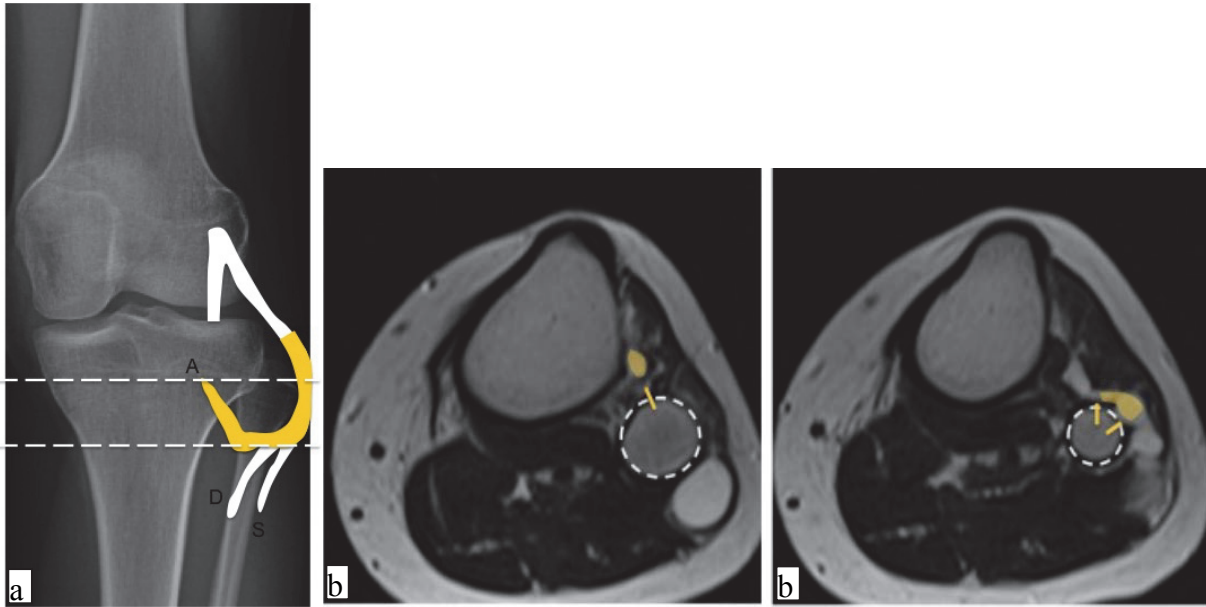


Figure 4. a-b. Schematic drawings on plain radiography (a) showing peroneal nerve branches (A: articular, D: deep, S: superficial) while the yellow line marks intraneural ganglion. On the axial T2-weighted MR images (b) showing "tail sign," (the image on the left) at 11-12 hours on the axial plane cutting the middle of the fibular head and "transverse limb sign" (the image on the right) at 12-2 hours on the axial plane cutting the middle of the fibular neck.

DISCUSSION

Intraneural ganglion cysts typically localised in the nerve sheath and often cause compression-related neurological symptoms (12). In these cases, early diagnosis and surgical treatment is important to prevent permanent axonal damage (1,12). But prior to the operation, it is essential to make the intraneural-extraneural distinction in addition to an evaluation of general imaging findings. It is also significant to determine lesion's relation to the joints before the operation in order to have successful clinical outcomes. This assessment, however, is not always easy; inaccurate or incomplete diagnosis may cause treatment failures and relapses (1,3 - 9, 13).

The manifestation mechanism of peroneal intraneural ganglion is still being debated today while studies often refer to two widely accepted theories. One of these theories, more widely accepted in recent years, is the synovial (articular) theory which claims that ganglion arises from the proximal tibiofibular joint and moving along the recurrent articular branch by dissecting the epineurium between nerve fascicles, proximally reaches out to the deep-superficial peroneal nerve, the common peroneal nerve, and sometimes even to the sciatic nerve (1,4-9,12,14). According to the second theory, myxoid degenerative changes take place in the nerve sheath, causing the cyst formation (1,4,12,14). Our case supports the synovial theory because, as the imaging and operative findings showed, the ganglion took its origin from the articular branch of the nerve and moved towards the common peroneal nerve with deep-superficial branches.

More common in adult males, such lesions come out with symptoms such as palpable mass adjacent to the lateral of the fibular head, pain in the anterolateral face of the thigh and foot dorsum, and muscle weakness in the anterior compartment, and drop foot (12). Although the condition may develop due to lumbar plexopathy, lower lumbar radiculopathy, or sciatic nerve lesions, the most common cause is still the peroneal nerve lesions (15). Traumatic or iatrogenic injury in the fibular head, compression during or after sleep, anaesthesia, or cast applications, intraneural hemorrhage, nerve sheath tumors, and exocytoses are considered in the differential diagnosis of peroneal nerve lesions (2,9,11,13).

Although EMG helps in determining the conduction block and localisation of the lesion throughout diagnosis process, there is need for radiological imaging techniques to perform differential diagnosis. The morphological features of intraneural ganglion cysts that can be detected by various imaging methods are exactly the same with those cysts located elsewhere (14).

On US and computerized tomography, these lesions are in the form of tubular or round shaped, sometimes bilobulated or multilocular cystic lesions with smooth and thin walls (11). In MRI, these lesions typically look hypointense in T1-weighted images and, again, hyperintense on T2-weighted signals that do not show any contrast enhancement but minimal peripheral brightening after intravenous contrast material injection. With the aid of its general characteristics, therefore, ganglion cysts can easily be differentiated from other cysts and solid mass lesions (like schwannoma, myxoma, and synovial sarcoma) (12,14).

A recently published study defines a set of findings that enables intraneural and extraneural localisation of the cyst and whether the cyst has any relationship to joints in addition to the traditional MRI imaging findings (7). In this article, authors mention some, what they call, signs on the axial plane of MR images like "tail sign," "signet ring sign," and "transverse limb sign." According to this study, "tail sign," which occurs at 11-12 hours (considering fibular head as a clock dial) on the axial plane cutting the middle of fibular head, shows the relationship between the cyst and superior tibiofibular joint. By the same section, "signet ring sign," at 4-5 hours, shows that the cyst is located in the peroneal nerve. Going through the middle of the fibular neck, and designated as the "transverse limb sign" at 12-2 hours, the section shows the progression of the cyst in the horizontal part of the articular branch (Figure 4.a-b) (7). In addition, this paper also puts emphasis on the idea that intraneural ganglion cysts typically have tubular forms along the common peroneal nerve and its branches while extraneural ganglion cysts share oval or round shapes along fascial planes (7).

The only way of treating peroneal intra-articular ganglion cysts is surgery. Especially in children, immediately after compression findings, urgent intervention is required in order to obtain satisfactory clinical results (9). Cyst decompression seems like an inadequate method with a high recurrence rate in the literature (1,4,8,9). Therefore, today, in addition to decompression of the cyst, studies recommend the elimination of articular joint connection through excision (1,3,4,8,9). Hence, it is important to evaluate these findings with the help of imaging studies during the preoperative assessment for such an evaluation may change surgical processes.

MRI provides accurate and reliable information in the diagnosis (intraneural-extraneurally distinction) and treatment planning (determining a possible cyst-joint connection) of these lesions. In turn, this helps reduce the relapse rate and obtain successful clinical results.

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Correspondence/İletişim

Zeynep MARAŞ ÖZDEMİR
Inonu University School of Medicine, Department of
Radiology, MALATYA, TURKEY
E-mail: zynpmaras@yahoo.com

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