Case Report | Journal of Orthopaedic Case Reports 2020 December: 10(9):Page 1-6

Tibial Nerve Schwannoma: An Unexplained Cause of Lateral Foot Pain – A Rare Case Report and Review

Rakesh Kumar[1], Rajni Ranjan[1], Madhan Jeyaraman[1], Sudhir Kumar[1]

Learning Point of the Article:

An unexplained lateral foot pain needs a meticulous examination of the entire length of the tibial nerve which should be confirmed by MRI scan and the excision biopsy remains the gold standard treatment of choice for schwannoma of the peripheral nerve.

Abstract

Introduction: Schwannoma is a benign tumor that arises from the peripheral nerve sheath. It presents as a discrete, often tender, and palpable nodule associated with neurogenic pain or paresthesia when compressed or traumatized. The growth rate is usually slow, and these lesions seldom exceed 2 cm in diameter.

Case Report: We report the case of a schwannoma arising from the tibial nerve located in the left popliteal fossa. The patient presented with the left foot pain in the lateral plantar region without any motor deficit. The pre-operative diagnosis was made with magnetic resonance imaging (MRI) scan. He was subjected for neurolysis and excision biopsy of the lesion. The surgical specimen consisted of encapsulated white-yellow mass with irregular contours, measuring 2 × 3 cm. The cut section revealed cystic degenerations with areas of hemorrhage and necrosis. The patient reported symptom free in the post-operative period and during follow-up. Marginal excision appears to be recommended therapy for this tumorous lesion, without any evidence of recurrence during follow-up.

Conclusion: A benign nerve sheath tumor of a peripheral nerve could be a possibility for long-standing neuropathic pain in the foot, ankle, and leg, wherein all other possibilities have been ruled out. The meticulous examination of the entire length of the tibial nerve including sciatic nerve by palpation and percussion was helpful in diagnosis which should be confirmed by MRI scan. The excision biopsy remains the gold standard treatment of choice for schwannoma of the peripheral nerve.

Keywords: Schwannoma, popliteal fossa, tibial nerve.

Introduction

Among all peripheral nerve sheath benign tumors, schwannoma is the most common tumor arising in the Schwann cells of the peripheral nervous system [1]. They are well-encapsulated, slow-growing neoplasms that form within the perineurium and follow an indolent natural course [2]. The schwannomas are most commonly seen between the third and fourth decade of life with no gender predilection and an infrequent rate of malignant transformation [3,4].

Schwannomas are most commonly seen in head-and-neck region followed by lower extremities, especially in the foot and ankle [5]. They occur more frequently in the posterior tibial nerve and very rarely seen in tibial nerve in popliteal fossa [6, 7]. Knight et al. in their review about benign solitary schwannomas, they documented 8.97% of cases of tibial nerve schwannomas [1]. Solitary schwannomas present as an asymptomatic mass or cause compressive neuropathy due to mass effect and displacement of nerve bundles. A typical presentation is pain and numbness of the plantar foot which can be mistaken due to lumbar radiculopathy. The clinical diagnosis can be missed or delayed due to the indolent course of these tumors, leading to the development of tarsal tunnel syndrome [8, 9, 10]. The management of schwannoma is meticulous resection of mass without any damage to the adjacent nerve due to their nerve sheath origin.

We report a patient with a lower extremity schwannoma affecting

Access this article online

Website: www.jocr.co.in

DOI: 10.13107/jocr.2020.v10.i09.1880

Author's Photo Gallery


Dr. Rakesh Kumar


Dr. Rajni Ranjan


Dr. Madhan Jeyaraman


Dr. Sudhir Kumar

[1]Department of Orthopaedics, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh. India.

Address of Correspondence:
Dr. Madhan Jeyaraman,
Department of Orthopaedics, School of Medical Sciences and Research, Sharda University, Greater Noida - 201 306, Uttar Pradesh. India.
E-mail: madhanjeyaraman@gmail.com

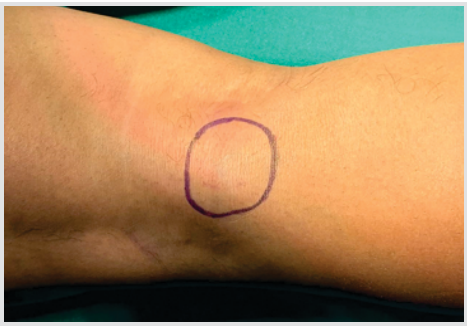

Figure 1: Clinical image of the left popliteal fossa (marked area) showing the extent of the lesion.

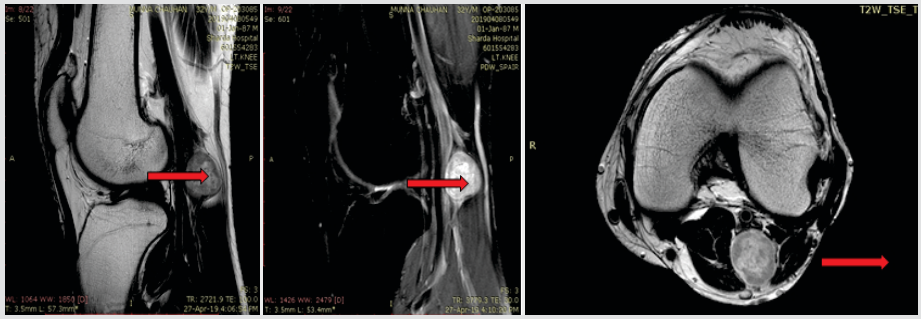

Figure 2: (a) (sagittal section, T1) and (b) (sagittal section, T2): Magnetic resonance imaging (MRI) of the left popliteal fossa showing tumorous tissue (shown in red arrow) around tibial nerve. (c) MRI of the left popliteal fossa (axial section) T2 W images showing tumorous lesion around tibial nerve (shown in red arrow).

the tibial nerve with lateral foot pain after obtaining informed and written consent from the patient.

Case Report

A 32-year-old male presented at our institution with a history of pain over the lateral aspect of the left foot for 2 years of insidious onset. He complained of pins and needle sensation over plantar aspect of the left foot. There was no significant history of trauma. He noticed swelling behind the left knee in the past 6 months which was initially peanut shaped and gradually progressed to the present size.

On examination, there was an oval mass of 2 × 3 × 1 cm, firm, non-pulsatile, non- fluctuant, non-transilluminating in the left popliteal fossa (Fig. 1) which was mobile in both directions. Skin over the swelling was pinchable. The patient was neurologically stable except with decreased sensation over lateral aspect (plantar region) of the left foot. Notably, the left popliteal and dorsalis pedis pulses were felt.

Magnetic resonance imaging (MRI) of the left popliteal fossa revealed encapsulated round to oval shaped, eccentrically placed lesion seen within the intermuscular space in the posterior aspect of knee joint. Lesion shows homogenous isointense on T1 and heterogeneous hyperintense signal on T2. There are hypointense foci seen within the hyperintense area on T2 which is suggestive of fascicular sign. The sagittal image showed continuity of mass lesion with the tibia nerve displaying fat split sign, lesion measuring 2 × 3 × 1 cm (Fig. 2a, 2b, 2c).

Under spinal anesthesia, the patient underwent neurolysis of tibial nerve and excision biopsy of tumorous lesion (Fig. 3a, b) by incising the epineurium of tibial nerve since the tumorous lesion was eccentrically placed. As there was no disruption of tibial nerve continuity, no nerve repair was done. Gross resected specimen of tumorous mass of 2 × 3 × 1 cm and the cut specimen showing areas of hemorrhage, necrosis, and cystic spaces interspersed along the tumorous lesion (Fig. 4a, b). Histopathological examination (×40) of the lesion showed biphasic tumor consisting of compact hypercellular Antoni A areas and myxoid hypocellular Antoni B areas and nuclear palisading around fibrillary process of Verocay bodies without any neural elements seen (Fig. 5). Immunohistochemistry (IHC) staining of the resected lesion revealed strong positivity for S-100 staining (Fig. 6).

The patient was regularly followed up at timely intervals for 9 months since the excision of the lesion. The follow-up period was uneventful. The patient had improved sensation over lateral aspect (plantar region) of the left foot and without any recurrence of tumorous lesion during the follow-up period.

Discussion

Schwannoma is also known as neurilemomas, neurocytomas, peripheral gliomas, neurinomas, and neurolemmomas. Being the most common peripheral nerve tumor, Schwannoma is usually an asymptomatic, slow-growing, solitary, eccentric, firm, well-

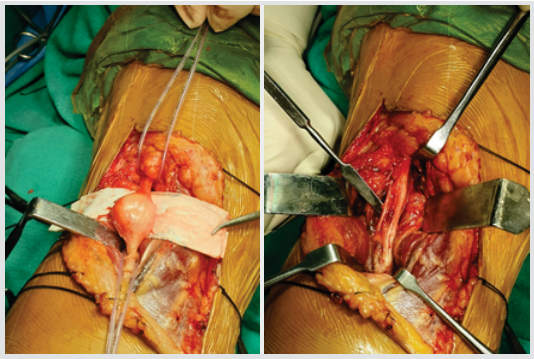

Figure 3: (a and b) Intraoperative images showing the dissected tibial nerve schwannoma in the left popliteal fossa and complete excision of schwannoma from fascicles of tibial nerve, respectively.

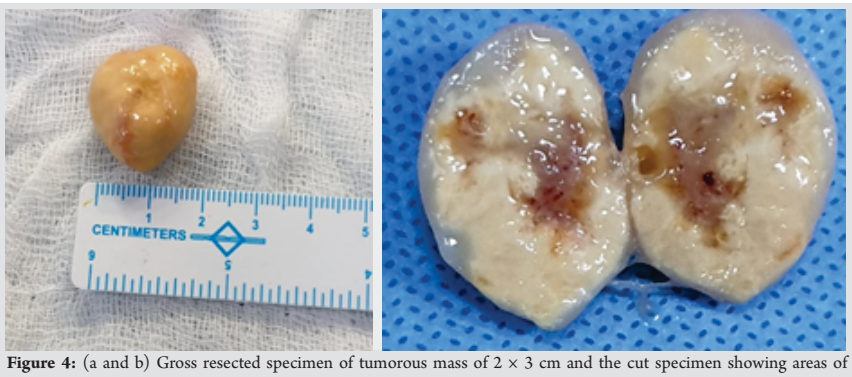

Figure 4: (a and b) Gross resected specimen of tumorous mass of 2 × 3 cm and the cut specimen showing areas of hemorrhage, necrosis, and cystic spaces interspersed along the tumorous lesion.

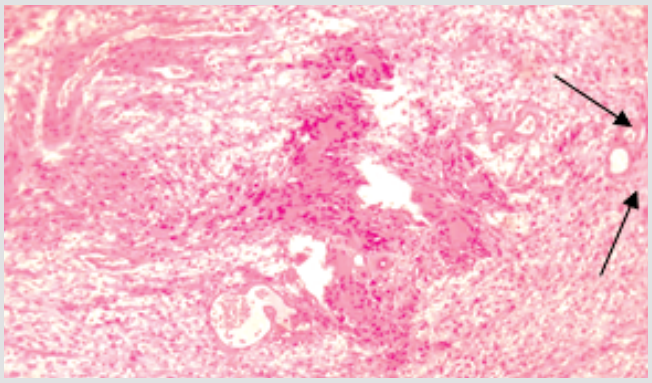

Figure 5: Histopathological examination (×40) of the lesion showing biphasic tumor consisting of compact hypercellular Antoni A areas and myxoid hypocellular Antoni B areas and nuclear palisading around fibrillary process of Verocay bodies without any neural elements seen.

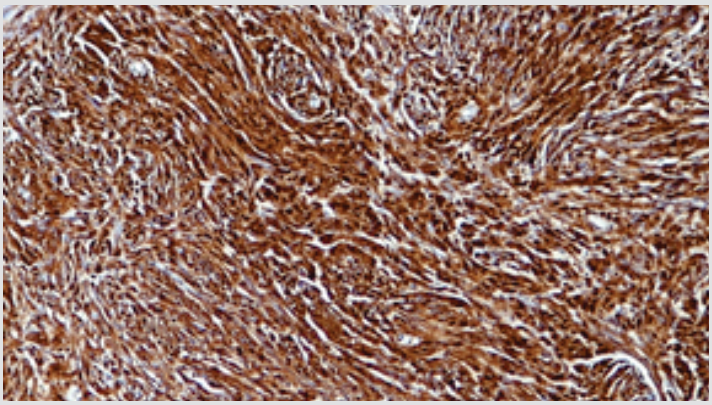

Figure 6: Histopathological examination staining of the lesion showing strongly positive for S-100 staining.

Table 1: Review of lower extremity schwannoma from 2013 to 2020

Author and year of the study	Delay in diagnosis	Clinical presentation	Diagnostic modality	Histopathological findings	IHC findings	Management
Komurcu*et al*. [23] (2013)	2 years 6 months	Soft mass in popliteal fossa without any neurological deficit	USG of knee and MRI of knee	Hypocellular Antoni B and spindle-shaped Schwann cells containing Antoni A areas with nuclear palisading	S-100 protein positivity	Surgical exploration and excisional biopsy
Hallahan*et al*. [10] (2014)	10 years	Mass on left ankle without any neurological involvement	Core needle biopsy and MRI of the left ankle	Sheets of spindle cells with nuclear palisading with Verocay bodies	S-100 protein positivity	Marginal excision of the tumor
Banshelkikar and Nistane [24] (2015)	5 years	Swelling around inner aspect of the left ankle with pain over ankle and foot	MRI of the left ankle	Antoni A and Antoni B pattern with nuclear palisading and Verocay bodies;	-	Enucleation of the tumorigenic mass
				Spindle-shaped cells with fibrillary eosinophilic cytoplasm, round to oval nuclei, and inconspicuous nucleoli		
Madi *et al*. [25] (2016)	2 years	Chronic left calf pain and tingling sensation in the left foot with swelling behind the left knee	USG of the left knee	Verocay bodies with perivascular hyalinization and hemosiderin and fibrin deposition	-	Excision biopsy of the mass
Min*et al*. [26] (2016)	1 year 6 months	Swelling behind the left knee without any neurological deficit	USG of left knee	Verocay bodies without areas of hemorrhage and necrosis	-	Excision biopsy of the lesion
Lakhotia*et al*. [27] (2016)	3 months	Pain in posterior pelvis near the right sacroiliac joint	MRI of pelvis	Features of subperiosteal cellular benign schwannoma	S-100 protein positivity	Excision biopsy of the lesion
Nahar and Goyal [28] (2018)	2 years	Persistent dull aching pain of the left lower limb, which got aggravated during walking without any neurological deficit; painless mass behind the left knee joint	FNAC of mass and USG and MRI of the left knee	Encapsulated spindle cell tumor with g minimally pleomorphic fusiform nuclei with wavy eosinophilic cytoplasm; Antoni A and Antoni B areas along with Verocay bodies were seen	-	En-mass resection of tumor with preservation of sciatic fascicles
Patil [29] (2018)	2 months	Swelling in the posterior aspect of knee without any neurological involvement	USG and MRI of knee joint	Areas of moderate to high cellularity and scant stromal matrix comprising elongated cells with cytoplasmic processes arranged in fascicles along with less densely cellular areas consisting of loose meshwork of cells	-	Surgical excision of mass
	1 year	Pain over back of knee and calf region	USG of popliteal fossa			
	1 year	Swelling over the anterolateral aspect of the right leg lower third region	USG and MRI of ankle joint			
	1 year 4 months	Pain and paresthesia in the lateral aspect of upper one-third of the left leg	CT and MRI of the left leg			
Jha *et al*. [30] (2019)	6 years	Left foot and ankle pain with symptoms of tarsal tunnel syndrome	MRI of the left ankle and foot	Spindle-shaped Schwann cells with eosinophilic cytoplasm and basophilic nuclei in a collagenous stroma with thick, hyaline walls vessels	-	Surgical removal of mass along with decompression of tarsal tunnel
Satyarthee*et al*. [31] (2019)	2 years	Painless mass behind the right knee with paresthesia and difficulty in sitting on chair	MRI of the right knee	Well-capsulated lesion with Antoni A and B areas	-	Microsurgical total excision of mass lesion with separation of nerve fascicles from lesion
Moussa *et al*. [32] (2020)	10 years	Painful swelling on the anterior aspect of his distal left tibia	MRI of the left distal tibia	Well-encapsulated lesion formed of spindle cells with thin wavy spindle nuclei and nuclear palisading (Verocay bodies) and without mitosis or areas of hemorrhage and necrosis	S-100 protein positive	*En bloc* excision of the mass from anterior left tibia
Patro *et al*. [33] (2020)	2 years	Painful lump in the left distal femur	USG and MRI of the left knee	Features of Antoni A and Antoni B areas and Verocay bodies without areas of hemorrhage and necrosis	S-100 protein and collagen type IV positivity	Excisional biopsy of the lesion
	1 year 6 months	Painful swelling in the left tibia	MRI of the left leg			
	1 year 2 months	Painful swelling in the right tibia	MRI of the right leg			
Current study	2 years	Pain over lateral aspect of the left foot with pins and needle sensation; swelling behind the left knee joint	MRI of the left knee	Biphasic tumor with compact hypercellular Antoni A areas and myxoid hypocellular Antoni B areas and nuclear palisading around fibrillary process of Verocay bodies without any neural elements	S-100 protein strongly positive	Neurolysis of tibial nerve at popliteal fossa with excision biopsy

CT: Comported tomography, USG: Ultrasonography, MRI: Magnetic resonance imaging

Table 2: Differential diagnosis of schwannoma			
Features	Schwannoma	Neurofibroma	Malignant peripheral nerve sheath tumor
Association	Closely associated with NF-1 with multiple schwannomas	Associated with NF-1 with multiple schwannomas	Associated with NF-1 with solitary schwannoma
Nerve continuity	Present	Present	Present
USG findings	Hypoechoic lesion	Hypoechoic lesion	Mixed echogenicity
MRI findings			
Relation to nerve	Eccentric lesion	Central lesion	Central lesion
Target sign and split fat sign	+++	+++	---
Intratumoral cyst	Common	Rare	Occasional
Bone affection	+	+	+++
Post-contrast enhancement	Peripheral and heterogeneous	Central enhancement	Peripheral and heterogeneous

USG: Ultrasonography, MRI: Magnetic resonance imaging

circumscribed, and encapsulated tumor [11, 12]. The peripheral location and non-involvement of the main course of the nerve are seen in our patient where the mass was displacing the proximal and distal branches of the tibial nerve at popliteal fossa.

Schwannoma runs a varied symptomatology from asymptomatic phase to mild-to-severe phase of nerve involvement [13]. In our case, symptoms occurred as a result of nerve compression caused by the growth of the tumorous mass. Even though schwannoma occurs at any age, it is commonly seen between the second and fifth decade of life, with no gender or racial predilection [14]. Most of the schwannoma lesions are solitary but multiple schwannomas are associated with neurofibromatosis [15]. Although schwannoma is benign, the malignant potential of the tumor has been elicited when they are associated with von Recklinghausen disease [16]. Schwannomas are most commonly seen in head and neck (25–45%) [17], mediastinum (20%) [18], upper extremity (19%) [19], retroperitoneum (5–10%) [20], pelvis (<0.5%) [21], and lower extremities (13.5–17.5%) [22]. Various studies in the literature reported that schwannomas are common in the anterior and flexor areas of the upper extremities and the posterior aspects of the lower extremities [12, 13]. The review of lower extremity schwannoma from 2013 to 2020 is tabulated in [Table 1] [10, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33].

The clinical diagnosis can be missed or delayed due to the indolent course of these tumors, leading to the development of tarsal tunnel syndrome [8, 9, 10]. The delay in diagnosis of schwannoma is due to the relative slow growth potential, mobility of the mass, and affection toward the surrounding soft tissues. The use of imaging modalities to diagnose peripheral nerve sheath tumors is of prime importance. Among all imaging modalities, MRI enhanced the preoperative diagnosis of nerve sheath tumors and provided information regarding the gross characteristics, size, location, and relationship of the tumorous mass as well as infiltration with surrounding structures [34]. In our case, MRI revealed encapsulated round to oval lesion seen within the intermuscular space in the posterior aspect of knee joint which is homogenous isointense on T1 and heterogeneous hyperintense signal on T2-weighted images. The management of tumor remains easy when the tumor mass is located eccentrically along the perineurium. It is important to note that schwannomas have to be differentiated from neurofibroma and malignant peripheral nerve sheath tumor as they all have similar radiological features with subtle differences which are tabulated in [Table 2].

In our case, the patient underwent neurolysis of tibial nerve at popliteal fossa and excision biopsy of tumorous lesion. The cut section of the excised mass showed round, smooth, well-defined, heterogeneous mass with cystic degeneration with areas of hemorrhage and necrosis. The histopathological examination (40×) of the biopsied lesion revealed the features of schwannoma which was confirmed by S-100-positive IHC staining of the resected lesion. The patient reported symptom free interval during the immediate post-operative period. No recurrence was noted during the follow-up period of 9 months.

Conclusion

A benign nerve sheath tumor of a peripheral nerve could be a possibility for long-standing neuropathic pain in the foot, ankle, and leg where all other possibilities are ruled out. The meticulous examination of the entire length of the tibial nerve including sciatic nerve by palpation and percussion was helpful in diagnosis which should be confirmed by MRI scan. The excision biopsy remains the gold standard treatment of choice for schwannoma of the peripheral nerve.

Clinical Message

The meticulous examination of the entire length of the tibial nerve including sciatic nerve by palpation and percussion was helpful in diagnosis which should be confirmed by MRI scan. The excision biopsy remains the gold standard treatment of choice for schwannoma of the peripheral nerve.

References

1. Knight DM, Birch R, Pringle J. Benign solitary schwannomas: A review of 234 cases. J Bone Joint Surg Br 2007;89:382-7.
2. Carvajal JA, Cuartas E, Qadir R, Levi AD, Temple HT. Peripheral nerve sheath tumors of the foot and ankle. Foot Ankle Int 2011;32:163-7.
3. Schweitzer KM Jr., Adams SB Jr., Nunley JA 2nd. Multiple schwannomas of the posterior tibial nerve: A case series. Foot Ankle Int 2013;34:607-11.
4. Albert P, Patel J, Badawy K, Weissinger W, Brenner M, Bourhill I, et al. Peripheral nerve schwannoma: A review of varying clinical presentations and imaging findings. J Foot Ankle Surg 2017;56:632-7.
5. Watanabe K, Fukuzawa T, Mitsui K. Tarsal tunnel syndrome caused by a schwannoma of the posterior tibial nerve. Acta Med Okayama 2018;72:77-80.
6. Nawabi DH, Sinisi M. Schwannoma of the posterior tibial nerve: The problem of delay in diagnosis. J Bone Joint Surg Br 2007;89:814-6.
7. Tladi MJ, Saragas NP, Ferrao PN, Strydom A. Schwannoma and neurofibroma of the posterior tibial nerve presenting as tarsal tunnel syndrome: Review of the literature with two case reports. Foot (Edinb) 2017;32:22-6.
8. Rajasekaran RB, Shanmuganathan R. Schwannoma of the posterior tibial nerve presenting as tarsal tunnel syndrome: A case report with emphasis on the role of microscope during surgery. Case Rep Orthop 2018;2018:4704362.
9. Jack CM, Jones G, Edwards MR, Singh SK. A case report of three peripheral schwannomas attached to the Achilles paratenon. Foot 2010;20:78-80.
10. Hallahan K, Vinokur J, Demski S, Faulkner-Jones B, Giurini J. Tarsal tunnel syndrome secondary to schwannoma of the posterior tibial nerve. J Foot Ankle Surg 2014;53:79-82.
11. Maraziotis T, Panagiotopoulos E, Panagiotopoulos V, Panagiotopoulos K. Neurilemoma of the popliteal fossa: Report of two cases with long subclinical course and misleading presentation. Acta Orthop Belg 2005;71:496-9.
12. Ozdemir O, Ozsoy MH, Kurt C, Coskunol E, Calli I. Schwannomas of the hand and wrist: Long-term results and review of the literature. J Orthop Surg (Hong Kong) 2005;13:267-72.
13. Ryu SJ, Zhang HY. Neurilemmoma of deep peroneal nerve sensory branch: Thermographic findings with compression test. J Korean Neurosurg Soc 2015;58:286-90.
14. Jacobson JM, Felder JM, Pedroso F, Steinberg JS. Plexiform schwannoma of the foot: A review of the literature and case report. J Foot Ankle Surg 2011;50:68-73.
15. Odom RD, Overbeek TD, Murdoch DP, Hosch JC. Neurilemoma of the medial plantar nerve: A case report and literature review. J Foot Ankle Surg 2001;40:105-9.
16. Weiss S, Goldblum J, Folpe AL. Schwannoma. In: Enzinger and Weiss's Soft Tissue Tumors. 5th ed. Maryland Heights, MO: Elsevier Mosby; 2008. p. 853-62.
17. Shrikrishna BH, Jyothi AC, Kulkarni NH, Mazhar MS. Extracranial head and neck schwannomas: Our experience. Indian J Otolaryngol Head Neck Surg 2016;68:241-7.
18. Onakpoya UU, Adeniyi BO, Eyekpegha JO, Ogunrombi AB. Large posterior mediastinal schwannoma in a 45-year-old woman. Lung India 2017;34:109-10.
19. Tang CY, Fung B, Fok M, Zhu J. Schwannoma in the upper limbs. Biomed Res Int 2013;2013:167196.
20. Petrucciani N, Sirimarco D, Magistri P, Antolino L, Gasparrini M, Ramacciato G. Retroperitoneal schwannomas: Advantages of laparoscopic resection. Review of the literature and case presentation of a large paracaval benign schwannoma. Asian J Endosc Surg 2015;8:78-82.
21. Dawley B. A retroperitoneal femoral nerve schwannoma as a cause of chronic pelvic pain. J Minim Invasive Gynecol 2008;15:491-3.
22. Kransdorf MJ. Benign soft-tissue tumors in a large referral population: Distribution of specific diagnoses by age, sex, and location. AJR Am J Roentgenol 1995;164:395-402.
23. Komurcu E, Golge UH, Kaymaz B, Erdogan N. Popliteal schwannoma mimicking baker cyst: An unusual case. J

Surg Case Rep 2013;2013:rjt066.

24. Banshelkikar S, Nistane P. Intrasubstance schwannoma of posterior tibial nerve presenting as lumbo-sacral radiculopathy. J Orthop Case Rep 2015;5:35-7.
25. Madi S, Pandey V, Mannava K, Acharya K. A benign ancient schwannoma of the tibia nerve. BMJ Case Rep 2016;2016:bcr2016215620.
26. Min KD, Yoo JW, Cho WI, Hwang SH. Tibial schwannoma mimicking a popliteal cyst. J Korean Orthop Assoc 2016;51:266-71.
27. Lakhotia D, Jeph S, Sharma S. Subperiosteal schwannoma of pelvis-a rare case and review of literature. J Clin Diagn Res 2016;10:RD01-3.
28. Nahar S, Goyal A. A large schwannoma of sciatic nerve-a case report. J Peripher Nerv Surg 2018;2:86-9.
29. Patil SN. A report of 4 cases, on a rare entity of schwannoma in limbs i.e, outside the central nervous system. Natl J Clin Orthop 2018;2:1-8.
30. Jha AJ, Basetty CR, Viner GC, Tedder C, Shah A. Posterior tibial nerve schwannoma presenting as tarsal tunnel syndrome. Cureus 2019;11:e5303.
31. Satyarthee GD, Moscote-Salazar LR, Lalwani S. Tibial nerve schwanoma: Short review of surgical management. Rom Neurosurg 2019;33:71-3.
32. Moussa MK, El-Yahchouchi C, Lahoud J, Moussallem CD. Subperiosteal schwannoma of the Mid-Tibia: A cause of long-lasting unexplained pain. Cureus 2020;12:e10269.
33. Patro BP, Das SS, Behera S, Amrit G, Patra SK, Kumar DS. Subperiosteal schwannoma: A rare cause of unexplained pain around the knee. Eurasian J Med Oncol 2020;4:54-9.
34. Pino C, Ghazle H, Bhatt S, Dogra V. Schwannoma of the tibial nerve. J Diagn Med Sonogr 2010;26:205.

Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Kumar R, Ranjan R, Jeyaraman M, Kumar S. Tibial Nerve Schwannoma: An Unexplained Cause of Lateral Foot Pain – A Rare Case Report and Review. Journal of Orthopaedic Case Reports 2020 December;10(9): 1-6.