

Variations in the branching pattern of tibial nerve in foot: a review of literature and relevant clinical anatomy

A. Priya¹, S.K. Ghosh¹, J.A. Walocha², R.S. Tubbs^{3–8}, J. Iwanaga^{3, 4, 9, 10}

¹Department of Anatomy, All India Institute of Medical Sciences, Phulwarisharif, Patna, India

²Department of Anatomy, Jagiellonian University, Krakow, Poland

³Department of Neurosurgery, Tulane Centre for Clinical Neurosciences, Tulane University School of Medicine, New Orleans, LA, United States

⁴Department of Neurology, Tulane Centre for Clinical Neurosciences, Tulane University School of Medicine, New Orleans, LA, United States

⁵Department of Anatomical Sciences, St. George's University, St. George's, Grenada, West Indies

⁶Department of Structural and Cellular Biology, Tulane Centre for Clinical Neurosciences, Tulane University School of Medicine, New Orleans, LA, United States

⁷Department of Neurosurgery and Ochsner Neuroscience Institute, Ochsner Health System, New Orleans, LA, United States

⁸Department of Surgery, Tulane Centre for Clinical Neurosciences, Tulane University School of Medicine, New Orleans, LA, United States

⁹Dental and Oral Medical Centre, Kurume University School of Medicine, Kurume, Fukuoka, Japan

¹⁰Division of Gross and Clinical Anatomy, Department of Anatomy, Kurume University School of Medicine, Kurume, Fukuoka, Japan

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Considerable variations have been reported regarding the branching pattern of tibial nerve (TN) close to its termination in foot. In order to comprehend the clinical anatomy of heel pain awareness of all the possible variations in relation to terminal branching pattern of TN (close to the tarsal tunnel) is essential. The present study was conducted to undertake a comprehensive review of the variations in TN branches in foot with particular emphasis on the implications for sensory distribution of these branches. Articles were searched in major online indexed databases using relevant key words. The pattern of termination of TN was noted as either trifurcation or bifurcation. Bifurcation pattern was more commonly observed and is associated with the medial calcaneal nerve (MCN) either arising high or low relative to the tarsal tunnel. The most commonly noted type of bifurcation was proximal to malleolar-calcaneal axis but within the tarsal tunnel. Across all five types of bifurcation reported in literature, the termination points of TN ranged from 3 cm proximal to 3 cm distal to malleolar-calcaneal axis and, therefore, the area beyond this region can be considered as safe zone for performing invasive procedures. MCN showed considerable variations in its origin both in trifurcation and bifurcation pattern pertaining to number of branches (one/two/three) at the point of origin. The origin of inferior calcaneal nerve was observed to be relatively less variable as it mostly arose as a branch of lateral plantar nerve and sometimes as a direct branch from TN before termination. The frequent variation of MCN

Address for correspondence: Prof. J. Walocha, Department of Anatomy, Jagiellonian University, ul. Kopernika 12, 31–034 Kraków, Poland, e-mail: jwalocha@cm-uj.krakow.pl

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in the tarsal tunnel should be kept in mind while undertaking decompression measures in medial ankle region. (Folia Morphol 2023; 82, 2: 231–241)

Key words: tibial nerve, tarsal tunnel, heel pain, plantar nerves, medial calcaneal nerve, inferior calcaneal nerve

INTRODUCTION

The classical trifurcation of the tibial nerve (TN) deep to the flexor retinaculum of the foot (lacinate ligament) was reported by Horwitz in 1938 [34]. This pattern corresponds to the medial plantar nerve (MPN), lateral plantar nerve (LPN) and medial calcaneal nerve (MCN) arising as terminal branches of the tibial nerve within the tarsal tunnel (TT) (Fig. 1) [25]. Over the years, researchers have reported several variations in the origins of the terminal branches of tibial nerve in this region [18, 28, 31, 46]. In most cases the variation involves the origin of the MCN. When the classical trifurcation is not reported, the MCN arises either proximal to the TT (here the TN terminates as the MPN and LPN, thus showing a bifurcation pattern) or as a branch of one of the plantar nerves, more commonly the LPN [20, 21, 30]. Several authors have viewed the variations in the level of bifurcation of the TN in relation to the TT and the malleolar-calcanal axis (MCA). Many have also classified the bifurcation into types (Fig. 2) [7, 15, 20, 27, 32, 35, 36, 41, 52, 54, 62, 73, 78]. The TT is an osseo-fibrous tunnel that houses the aforesaid terminal branches of the TN, which frequently undergo compression, causing an entrapment neuropathy known as TT syndrome [25, 49]. Thus, for clinicians to comprehend the surgical anatomy of TT syndrome, awareness of all the possible variations of the TN and its branches in the TT is essential.

The TN can also give rise to the inferior calcaneal nerve (ICN) as a branch close to its termination [34]. The ICN is reported to arise as a branch of LPN at the level of the medial malleolus in most cases, so it is often referred to as the first branch of the LPN [13, 16, 65]. Incidentally the "ICN" is also known eponymously in the literature as the 'Nerve of Baxter' [28, 65]. It can arise as a direct branch of the TN or as a branch of the LPN, but its origin is always distal to that of the MCN the origin of MCN as per published literature [30].

As discussed above, the terminal branches of the TN are involved in the sensory supply to the foot [6, 9]. The MPN is involved in the cutaneous supply

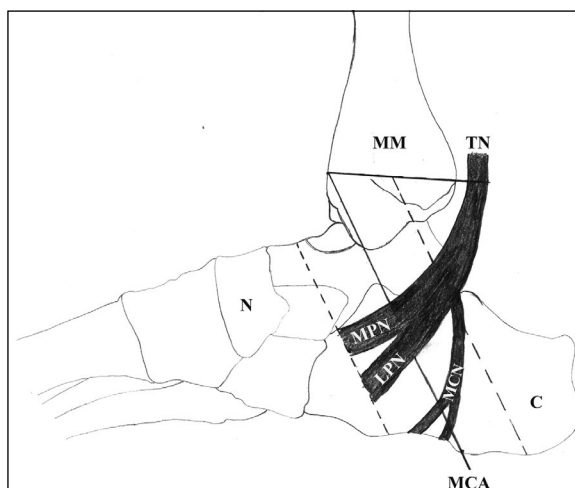


Figure 1. Lateral scheme of the ankle region showing trifurcation of the tibial nerve (TN) in the tarsal tunnel (TT). The horizontal dotted line is an imaginary line marking the beginning of the TT. The dotted oblique lines show the extent of the TT proximo-distally. The plane oblique line is the malleolar-calcanal axis (details of the malleolar-calcanal axis [MCA] are found in the Results section); MM — medial malleolus; N — navicular; MPN — medial plantar nerve; LPN — lateral plantar nerve; MCN — medial calcaneal nerve; C — calcaneus.

of the medial aspect of the sole and adjacent sides of the great, second and third toes and the medial side of the fourth toe. The cutaneous branch of the LPN supplies the lateral side of the sole and the lateral side of the fourth toe along with adjacent sides of the little toe. The MCN provides sensory innervation to the heel pad and to the superficial tissues overlying the inferior aspect of the calcaneus (Fig. 3). ICN provides sensory innervations to the anterior aspect of the calcaneus (Fig. 3) [68]. In accordance with their sensory distribution, compression of these nerves, which is particularly common within the tarsal tunnel, is associated with pain around the heel and along the sole [9].

In view of the foregoing, it can be inferred that variations in the branching pattern of the TN close to its termination in the foot are clinically significant because the sensory distribution of these nerves encompasses the heel and the sole. Hence it was hypothesized that exploring the reported variations in

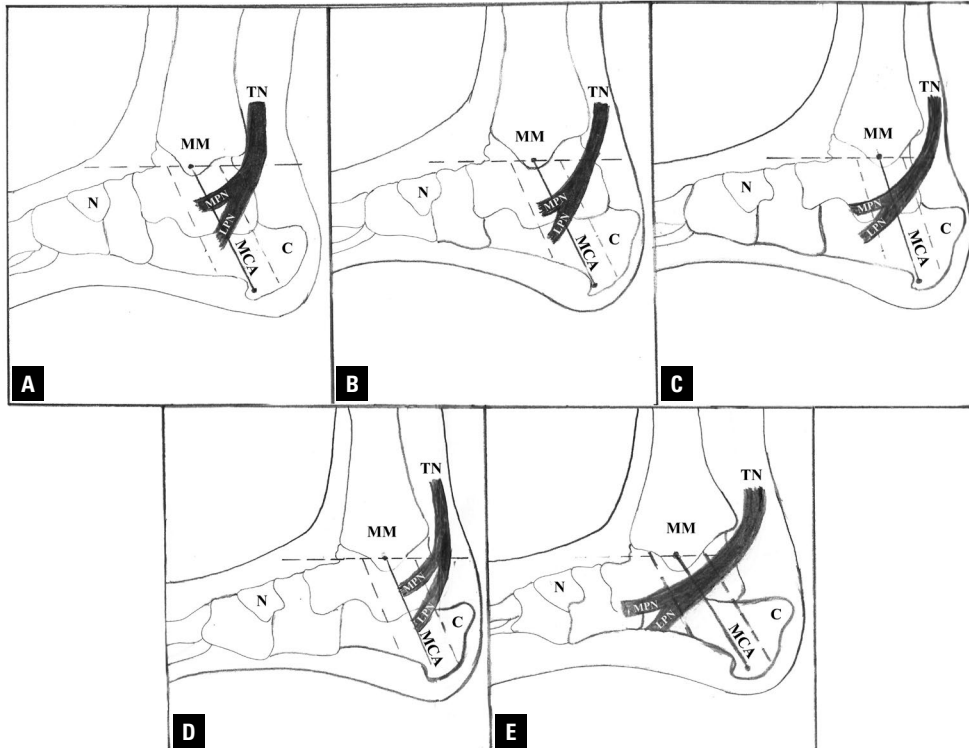


Figure 2. Schematic representation of types of bifurcation of tibial nerve with reference to the malleolar-calcaneal axis and tarsal tunnel (TT). The dotted oblique lines showing the extent of the TT proximo-distally. The plane oblique line is the malleolar-calcaneal axis (details of malleolar-calcaneal axis [MCA] are found in the Results section); **A.** Type I: the bifurcation was proximal to the axis and inside the TT; **B.** Type II: the tibial nerve (TN) bifurcated at the axis; **C.** Type III: the bifurcation was distal to the axis and inside the TT; **D.** Type IV: the bifurcation was proximal to the axis and outside the TT; **E.** Type V: the bifurcation was distal to the axis and outside the tunnel; MM — medial malleolus; N — navicular; MPN — medial plantar nerve; LPN — lateral plantar nerve; MCN — medial calcaneal nerve; C — calcaneus.

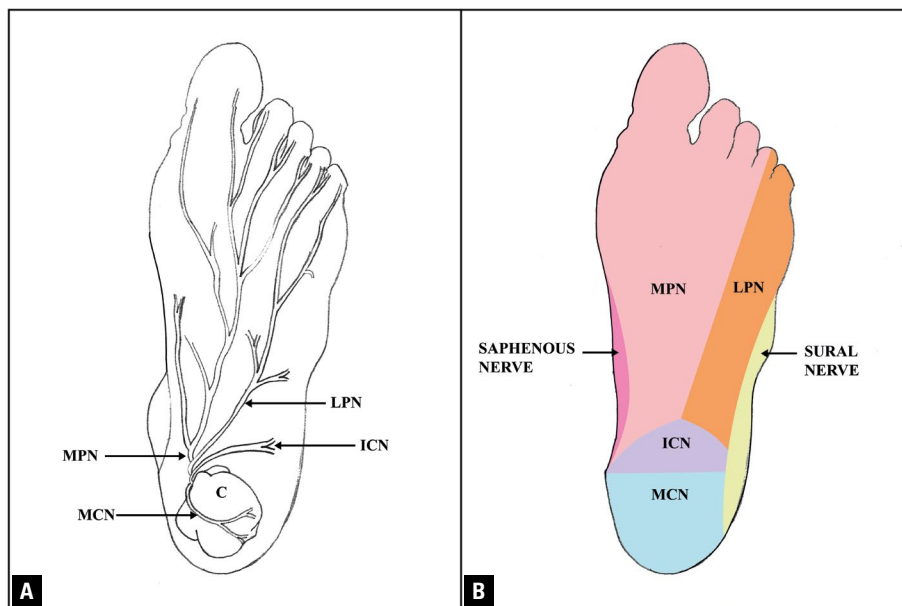


Figure 3. **A.** Illustration of branching pattern of medial plantar nerve (MPN), lateral plantar nerve (LPN), medial calcaneal nerve (MCN), and inferior calcaneal nerve (ICN) in the plantar aspect of the foot; **B.** Sensory innervation of MPN, LPN, MCN, and ICN in the plantar aspect of the foot.

the available literature and analysing the findings both anatomically and clinically. Accordingly, the present study was conducted to review the variations in the TN branches in the foot comprehensively. A brief account of the commonly reported pattern of termination of the TN in the foot (trifurcation/bifurcation) will be followed by details of variations in the origin, number, and classification of the MCN and ICN. The article will also present a short discussion of the clinical implications of variations in the TN branches in the foot in relation to the sensory distribution of these nerves.

METHODS

The study was conducted between January 2021 and October 2021. An extensive literature search was undertaken from the following indexed databases:

- Medline and PubMed (United States National Library of Medicine, Bethesda, MD);
- Scopus (Elsevier, Amsterdam, The Netherlands);
- Embase (Ovid Technologies, Inc., New York, NY);
- CINAHL Plus (EBSCO Information Services, Ipswich, MA);
- Web of Science (Clarivate Analytics, Philadelphia, PA);
- Google Scholar (Google, Inc., Mountain View, CA).

The literature search was based on key terms relevant to anatomical details of variations in the branches of the TN in the foot: “tibial nerve branches in foot”, “variations in tibial nerve branches in foot”, “terminal branches of tibial nerve”, “variations in origin of plantar nerves” and “variations in origin of calcaneal nerves”. The literature search was limited to studies with relevant information. After searching almost 80 articles and meticulously inspecting the references in each, we acknowledged a further 42 related articles, detailed analysis of which directed us to 35 highly relevant studies. In the present study, the literature was reported in accordance with the PRISMA statement and established guidelines were followed [51, 56]. All the authors searched the literature independently and they were blinded to each other’s findings. After the search was completed, the authors’ findings were compiled and final observations were prepared.

RESULTS

Variations in branching patterns of the TN and its terminal branches were noted, especially at the level of the tarsal tunnel. The sequential research history of these variations is represented in Figure 4. Trifurcation

of the TN was reported by Horwitz [34], Kim et al. [45], and Yang et al. [78] (Fig. 1). We also observed that the origin of the MCN was highly variable. The MCN has been reported to branch inside the TT [20, 23, 27, 30, 34, 41, 52, 62, 77], or proximal to it [18, 20, 57, 73, 77].

When the MCN arises proximal to the tarsal tunnel, the TN terminates in a bifurcation. Variations in the level of this bifurcation in relation to the TT (Table 1) [3, 7, 8, 15, 18, 20, 27, 31, 32, 34–36, 41, 42, 52, 54, 61, 62, 71, 73, 78] and MCA (Table 2) [3, 7, 18, 31, 52, 78] have also been documented in previous studies. Dellon and Mackinnon [20] first proposed the term MCA in 1984 as the guideline for locating the point of bifurcation of the TN. MCA is a line passing from the tip of the medial malleolus to the medial tubercle of the calcaneus. The TT was defined as extending 2 cm proximal and distal to the MCA, shown as oblique dotted lines in Figure 1.

Classification of tibial nerve bifurcation

The classification was first proposed by Bilge et al. [15] and extended by Torres and Ferreira [73] and Inthasan et al. [36]. Five types of bifurcation of the TN are distinguished on the basis of its relationship to the MCA and the TT (Fig. 2): type I — the bifurcation is proximal to the axis and inside the TT; type II — the TN bifurcates at the axis; type III — the bifurcation is distal to the axis and inside the TT; type IV — the bifurcation is proximal to the axis and outside the TT; type V — the bifurcation is distal to the axis and outside the TT. We collected data on the prevalence of the different types of bifurcation described in several studies (Table 3) [7, 15, 20, 27, 31, 32, 35, 36, 41, 52, 54, 62, 71, 73, 78].

Variations of the MCN and ICN

The more frequent variations in the mode of origin and number of branches of the MCN and ICN are tabulated (Table 4) [5, 18, 20, 21, 23, 27, 30, 31, 34–36, 41, 45, 52, 54, 57, 62, 66, 69, 71, 73, 77, 78]. The most common variant origin of the MCN is from the LPN in form of two branches. In contrast, Dellon and Mackinnon [20], Havel et al. [31], and Davis and Schon [18], concluded that the MCN arises from the MPN.

Classification of the MCN and ICN

However, very few studies on the classification of the MCN and ICN are available. Havel et al. [31], Dellon and Mackinnon [20], and Yang et al. [78] found 9, 17,

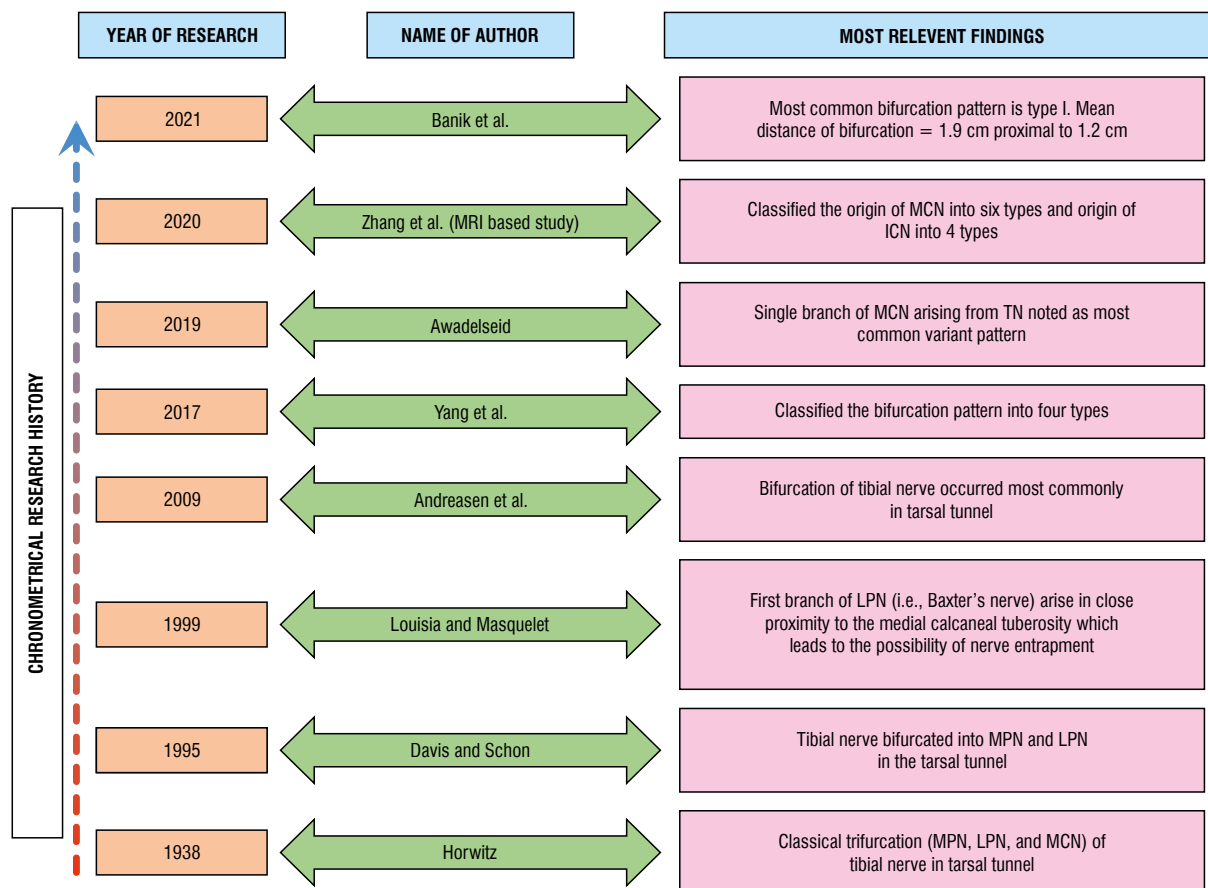


Figure 4. A timeline representation of the research history of the variations reported on branching on branching of tibial nerve (TN) in foot in a sequential manner based on chronology; ICN — inferior calcaneal nerve; LPN — lateral plantar nerve; MCN — medial calcaneal nerve; MPN — medial plantar nerve; MRI — magnetic resonance imaging.

and 21 branching patterns of the MCN respectively [20, 77, 78]. Govsa et al. [30], classified the MCN into eight types and the ICN into four types. Zhang et al. [79], used multiplanar reconstruction to obtain three-dimensional datasets of variations in the branching pattern of the MCN and ICN. Accordingly, they classified the MCN and ICN into six and three types, respectively. Classification of the MCN: type I — one MCN originating from the TN; type II — one MCN originating from the LPN; type III — two MCNs, one from the TN, and the other from the LPN; type IV — two MCNs, both originating from the TN; type V — two MCNs, with a common origin from the TN; type VI — three MCNs, one from the TN and two from the LPN. Classification of the ICN: type I — origin of ICN from the TN; type II — origin of the ICN from the bifurcation of the LPN; type III — origin of the ICN from the TN.

DISCUSSION

The pattern of termination of the TN in the foot has been well described in the literature. As well as

the usual trifurcation of the TN (i.e. MPN, LPN, and MCN) [25, 33, 43, 75], a bifurcation pattern (i.e. MPN and LPN) has also been noted if the origin of the MCN is very high or low [20, 21, 30, 75]. Authors have classified the bifurcation of TN into five types, of which type I (bifurcation proximal to the MCA but in the TT) is most frequent [7, 15, 32, 35, 36, 41, 52, 54, 71, 77, 78]. Some have also measured the distance of the bifurcation from the MCA and found it usually to be within 2 cm proximal to the axis [7, 18, 52, 77]. Research on this topic has gained momentum and some recent studies have classified variant origins of the MCN and ICN [30, 78, 79], emphasizing the risk of symptomatic nerve entrapment if they lie near the TT or the medial calcaneal tuberosity, respectively. All these variations in the termination of the TN in the foot are crucial to making the best treatment decision for intractable heel pain (especially medial and inferior aspects of the heel), which is very commonly reported these days.

Table 1. A chronological representation of the point of bifurcation of the tibial nerve in relation to the tarsal tunnel as reported in published literature

Author, year [reference]	Type and no. of sample	Bifurcation proximal to the tarsal tunnel (%)	Bifurcation in the tarsal tunnel (%)	Bifurcation distal to the tarsal tunnel (%)
Horwitz, 1938 [34]	100 feet	4	96	–
Dellon and Mackinnon, 1984 [20]	31 feet	6	94	–
Heimkes et al., 1987 [32]	60 feet	–	100	–
Havel et al., 1988 [31]	68 feet	7	93	–
Nagoaka, 1990 [61]	62 feet	15	85	–
Bareither et al., 1990 [8]	126 feet	31	69	–
Davis and Schon, 1995 [18]	20 feet	10	90	–
Louisia and Masquelet, 1999 [52]	15 feet	27	73	–
Bilge et al., 2003 [15]	50 feet	–	96	4
Ndiaye et al., 2003 [62]	20 feet	10	90	–
Fernandes et al., 2006 [27]	30 feet	10	86.7	3.3
Joshi et al., 2006 [41]	112 feet	–	99.9	0.89
Andreasen Struijk et al., 2010 [3]	10 feet	10	80	10
Torres and Ferreira, 2012 [73]	50 feet	12	88	–
Malar, 2016 [54]	20 feet	–	100	–
Tamang et al., 2016 [71]	30 feet	–	100	–
Kalpana and Komala, 2017 [42]	50 lower limbs	92	6	2
Yang et al., 2017 [78]	60 cases	18	82	–
Iborra et al., 2018 [35]	12 feet	8.3	91.7	–
Inthasan et al., 2020 [36]	40 legs	50	50	–
Banik and Guria, 2021 [7]	10 lower limbs	–	100	–

Table 2. A chronological representation of the distance of bifurcation of the tibial nerve from the malleolar-calcaneal axis as reported in published literature

Author, year [reference]	Type and no. of sample	Mean distance of bifurcation of tibial nerve from malleolar-calcaneal axis				
		Proximal to the axis		At the axis	Distal to the axis	
		≤ 2 cm	> 2 cm		≤ 2 cm	> 2 cm
Havel et al., 1988 [31]	68 feet	45.5	7.3	38.2	8.8	–
Davis and Schon, 1995 [18]	20 feet	90	10	–	–	–
Louisia and Masquelet, 1999 [52]	15 feet	33.3	26.7	33.3	6.7	–
Andreasen et al., 2010 [3]	10 feet	–	10	80	–	10
Yang et al., 2017 [78]	60 cases					
Banik and Guria, 2021 [7]	20 lower limbs	55	–	30	15	–

Values are presented as percentages.

Clinical presentation of heel pain due to plantar nerve (MPN and/or LPN) compression

The origin of MPN as one of the terminal branches of the TN within the TT (both in trifurcation and bifurcation pattern of TN termination) has been uniformly reported in published literature [11, 20, 25, 28, 77]. The MPN can be compressed deep to the flexor retinaculum, adjacent to the crossover point of the flexor

digitorum longus and flexor hallucis longus tendons (master knot of Henry) [19, 53]. The MPN can be compressed by regular and repetitive eversion of the foot, common among runners. The condition presents as pain along the medial side of the sole (medial plantar neuropraxia) and around the navicular tuberosity (Jogger's foot) [26, 59]. Entrapment of the MPN in a clinical setting is popularly referred to as "Jogger's

Table 3. A chronological representation of the findings of various studies regarding classification of bifurcation into types as reported in published literature

Author, year [reference]	Type I	Type II	Type III	Type IV	Type V
Dellon and Mackinnon, 1984 [20]	22.58	54.84	16.13	6.45	–
Heimkes et al., 1987 [32]	100	–	–	–	–
Havel et al., 1988 [31]	45.59	38.24	8.82	7.35	–
Louisia and Masquelet, 1999 [52]	37.7	28.6	7.1	28.6	–
Ndiaye et al., 2003 [62]	–	–	90	10	–
Bilge et al., 2003 [15]	84	12	–	–	–
Joshi et al., 2006 [41]	85.2	14.7	0.89	–	–
Fernandes et al., 2006 [27]	23.34	33.33	30	10	3.33
Torres and Ferreira, 2012 [73]	52	14	22	12	–
Malar, 2016 [54]	85	10	5	–	–
Tamang et al., 2016 [71]	90	10	–	–	–
Yang et al., 2017 [78]	70	7	–	18	–
Iborra et al., 2018 [35]	91.7	–	–	8.3	–
Inthasan et al., 2020 [36]	50	–	–	50	–
Banik and Guria, 2021 [7]	55	30	15	–	–

Values are presented as percentages. For description of the types mentioned in the table, please refer to Results section of the text, subheading: classification of tibial nerve bifurcation

foot” [17, 26, 59]. This condition is characterized by chronic pain along the middle portion of the plantar surface of the foot (typically the pain radiates along the medial longitudinal arch), a burning sensation in the heel and tenderness over the area corresponding to the site of nerve compression (proximal part of the medial longitudinal arch beneath the navicular bone) [22, 48, 70]. All these clinical manifestations are attributed to the sensory distribution of the MPN in the foot (Fig. 3) [68]. The clinical condition (Jogger’s foot) is typically reported among joggers and long distance and marathon runners. As such, marathon training and average weekly running of over 20 km increase the risk of developing the condition [76]. A person with a flat foot is particularly predisposed to it because the risk of nerve injury/compression is greater when the foot touches the ground with force [12, 26, 53].

Isolated compression of the LPN or its branches is uncommon (apart from Baxter neuropathy) because, as with the MPN, the origin of the LPN as a terminal branch of the TN shows little or no variation (in both the trifurcation and bifurcation patterns of TN termination) according to published reports [11, 20, 25, 28, 77]. The LPN is usually compressed along with the MPN in tarsal tunnel syndrome, mostly following trauma (ankle sprain/fracture) in and around the ankle region. The condition presents clinically

as paraesthesia along the sole [63]. In other words any compression of the LPN is usually associated with compression of the MPN [26, 50]. A tendency to overpronate during walking or running whereby the foot rolls to a considerable extent, is associated with an increased risk of LPN compression [2]. As the symptoms overlap with plantar nerve compression, a reliable method for identifying LPN compression is to elicit the associated area of tenderness. In LPN entrapment there is palpable tenderness along the medial side of the heel over the plantar surface and the area corresponding to the abductor hallucis muscle. In a clinical setting, it is important to differentiate plantar nerve compression (MPN and/or LPN) from plantar fasciitis and TT syndrome [2, 14, 70]. Plantar fasciitis, although common among runners but may also affect person with sedentary lifestyle [33]. It is a self-limiting condition and is associated with heel pain that is aggravated by activity (weight bearing) after episodes of rest [29]. On the other hand heel pain in MPN/LPN compression is constant, with or without weight bearing [29]. Tarsal tunnel syndrome is a rare condition with diagnosis seldom established. The condition is more commonly reported in females and can involve any age group [44]. The Tinel sign, which is characteristic of TT syndrome is commonly used in the clinical setting to differentiate the condition from plantar nerve compression [37, 38].

Table 4. A chronological representation of the most frequent origin and the number of branches of the calcaneal nerves (MCN and ICN) as reported in published literature

Author, year [reference]	Most frequent pattern			
	MPN		ICN	
	Origin	No. of branches	Origin	No. of branches
Horwitz, 1938 [34]	LPN	–	–	–
Dellon and Mackinnon, 1984 [20]	LPN	2 branches	–	–
Rondhuis and Hudson, 1986 [66]	TN	1 branch	–	–
Didia et al., 1990 [23]	TN	2 branches	–	–
Davis and Schon, 1995 [18]	TN	2–3 branches	LPN	–
Havel et al., 1988 [31]	TN	1 branch	–	–
Louisia and Masquelet, 1999 [52]	TN	2 branches	LPN	2 branches
Moraes Filho et al., 2000 [57]	TN	1 branch	–	–
Fernandes et al., 2006 [27]	TN	2 branches	–	–
Dellon et al., 2002 [21]	TN	2 branches	–	–
Ndiaye et al., 2003 [62]	TN	1 branch	–	–
Joshi et al., 2006 [41]	TN	1–2 branches	–	–
Govsa et al., 2006 [30]	TN	2 branches	TN	1 branch
Torres and Ferreira, 2012 [73]	TN	1 branch	LPN	1 branch
Kim et al., 2015 [45]	TN	2 branches	LPN	1 branch
Sharma et al., 2015 [69]	TN	2 branches	–	–
Malar, 2016 [54]	TN	2 branches	–	–
Tamang et al., 2016 [71]	LPN	2 branches	–	–
Yang et al., 2017 [78]	LPN	2 branches	–	–
Iborra et al., 2018 [35]	–	–	LPN	–
Awadelseid, 2019 [5]	TN	1 branch	–	–
Inthasan et al., 2020 [36]	TN	3 branches	LPN	1 branch
Warchol et al., 2021 [77]	TN	1 branch	–	–

ICN — inferior calcaneal nerve; LPN — lateral plantar nerve; MPN — medial plantar nerve; TN — tibial nerve

The risk of compression of the calcaneal nerves (MCN/ICN) and the clinical presentation of heel pain in such condition

Variations in the origin of MCN have been reported, but the nerve commonly arises as a branch of the TN [11, 20, 25, 28, 77]. The proximity of the origin of the MCN to the TT determines the risk of entrapment and subsequent compression of the nerve [10, 24, 28]. In other words, the risk of compression of the MCN is greater in the trifurcation pattern of TN termination. Entrapment and compression of the MCN is associated with over-pronation during walking or sustained pressure from ill-fitting shoes. The condition presents as heel pain, exaggerated after running or standing for long periods, and mimics “Jogger’s foot” to an extent [67, 74]. Chronic heel pain due to compression of the MCN can present with symptoms overlapping those of plantar fasciitis and Jogger’s

foot [10, 47]. It can present among runners/joggers with a prolonged history of ill-fitting shoes [2, 43]. As with Jogger’s foot, patient often complains of pain radiating along the sole to the medial arch of the foot [1, 72]. However, heel pain due to MCN compression is aggravated by activity. i.e. running/walking (unlike Jogger’s foot but similar to plantar fasciitis) [29, 40]. MCN compression can be differentiated from plantar fasciitis by eliciting palpable tenderness over the medial malleolus [55].

The origin of the ICN is very variable as reported in research articles [11, 20, 25, 28, 77]. However, this nerve is at maximum risk of compression when it arises as a branch of the LPN (first branch of LPN/Baxter’s nerve) [4, 79]. The ICN can be compressed secondary to micro trauma (calcaneal spur/ internal foot derangement) or to plantar fasciitis [58]. The increased risk can be attributed to the proximity of

the flexor retinaculum or TT in the foot and the compression of this nerve presents as pain around the anterior aspect of the calcaneus (heel pain) and the condition is known as Baxter neuropathy [52, 58]. The patient presents with heel pain that radiates along the inner aspect of the calcaneus to the medial arch of foot [26, 60]. The diagnosis is established by eliciting tenderness of the nerve on the inside of the heel and a positive Tinel's sign [10, 39, 64].

The plantar aspect of the foot particularly on the medial side is very relevant in terms of clinical anatomy of pain experienced in the area due to a number of pathological conditions. Clinical examination along with sound knowledge of anatomical details are key elements in ensuring a proper diagnosis. Therefore, the authors are hopeful that the cumulative data concerning these variations will serve as a guide to preventing misdiagnosis of several conditions (Jogger's foot/Plantar fasciitis/neuroma) that present as heel pain.

Limitations of the study

We concede that the present study is a narrative review and, therefore, has its limitations. We have tried to present comprehensive data on this research topic, but a further evidence based meta-analysis which be clinically beneficial.

CONCLUSIONS

The commonest pattern of termination of the TN in the foot is bifurcation. The most frequent type of bifurcation type I, entails an increased risk of nerve entrapment in the TT. As the distance of the specific bifurcation point ranged from 3 cm proximal to 3 cm distal to the MCA, a point outside this region was assumed to be relatively safe for invasive procedures in the medial aspect of the ankle.

The MCN has invariably been observed to originate from the LPN as two branches. This fact should be considered during decompression surgeries for TT syndrome and when selecting the injection site for therapeutic TN block for chronic heel pain.

Although ICN is not involved in direct sensory innervation of the calcaneal region, variations in its origin of ICN should be kept in mind because its compression can cause pain and difficulty in walking. It also causes the patient to assume the antalgic position of foot while walking, increasing the risk of injury. Therefore, looking at the complexity of the branches of the TN in foot, clinicians should re-evaluate plan-

tar fasciitis patients and deem the MCN and ICN the probable causes of refractory heel pain.

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