

Anatomical Variation of Sciatic Nerve Course in Saudi Population: A Magnetic Resonance Imaging Study

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Abstract

Objective: Cadaveric dissection in Saudi Arabia is not allowed for any purposes; therefore, it is difficult to know the types and incidence of abnormal anatomical variants in our population. We studied the anatomical variants of the sciatic nerve (SN) in the Saudi population in living persons in the pelvic region in relation to the piriformis muscle (PM) and its course in the thigh until it divides between the popliteal region and any anomalies of major branches.

Materials & Methods: This is a prospective study done in a Saudi population only of 70 persons in King Fahd hospital of university in AL Khobar from 17 April 2015 to 15 March 2016 for fulfilment of master degree in clinical anatomy from Dammam university. It was performed by magnetic resonance imaging (MRI, 3 Tesla). The total study population was 70 persons (140 limbs), 70% with low back pain and 30% volunteers, including 34 males (48.57%) and 36 females (51.43%).

Results: Anatomical variants were seen in 10/140 limbs (7.14%). Upper sciatic nerve variations were observed in 5/140 limbs (3.57%), and mid-thigh sciatic nerve variation (1.43%) and the remaining presentations (2.86%) were seen in common peroneal nerve bifurcation. Beaton & Anson classification was adapted to describe these anomalies. Type I, which is the normal sciatic nerve course, was seen in 97.85% of limbs, while 1.43% and 0.71% were type II and type III, respectively.

Conclusion: MRI can be used as a tool to verify the anatomical variants in our Saudi population instead of cadaveric dissection.

Keywords:- Sciatic Nerve, Anatomical Variation, Piriformis Muscle, Saudi Arabia.

I. INTRODUCTION

The original Greek word sciatica is derived from "Ischiadichus" [1] The sciatic nerve travels in the posterior compartment of the thigh. Formed in the pelvis from the ventral rami of the fourth lumbar to third sacral spinal nerves, is typically 2 cm wide at its origin and is the thickest nerve in the body. It enters the lower limb via the greater sciatic foramen inferior to the piriformis and descends between the greater trochanter and ischial tuberosity. In its descent along the posterior thigh and divides into the tibial and common fibular (peroneal) nerves proximal to the knee; however, the

level of bifurcation can be variable. The tibial and common fibular nerves are structurally separate and only loosely held together as the sciatic nerve [2]. Different anatomical variants of the sciatic nerve (SN) have been observed as it passes from the pelvis into the thigh, especially in relation to the piriformis muscle (PM). Anatomical variants have also been seen in the site of the sciatic nerve bifurcation into the tibial nerve (TN) and the common peroneal nerve (CPN).

Studies have been conducted previously to identify the purported relationship present between piriformis syndrome and the anatomical variant of the sciatic nerve [3]. Bartret et al. (2018), conducted a study to critically analyse the available literature related to the anatomical variant of the sciatic nerve. In this study, they explore 773 studies, the results showed that the sciatic nerve variants were found to be in the pelvis of 150 patients. However, the diagnosis has shown a statistically insignificant difference present between that normal and variant pelvis group. Moreover, it has been identified that the piriformis syndrome is found to be in 11.3% of variant pelvis group as compared to the normal pelvis with 9.0% [3].

The main branches also have different anatomical variants seen in different reports on cadaveric studies and recently by magnetic resonance imaging (MRI) studies. Since we lack a cadaveric dissection study in our population to explore these anatomical variants, MRI was chosen as the main tool for our study. Researches have shown that Multi-parametric magnetic resonance imaging (MRI) for the prostate can be used as an influential tool and progressively can be utilised in the studies related to imaging for the purpose of staging, surveillance, and diagnosis of cancer mainly prostate cancer [4]. It has been identified that the clinicians are now improvising their practices through these kinds of adaption hence, it has become more common practice for incidental results to be diagnosed first through MRI of the prostate gland. Inadequate description of clinically significant findings may not prompt appropriate patient management, while over-reporting of indolent findings comes at increased patient anxiety, cost of workup, and iatrogenic risk. This review article aims to improve awareness, review pathophysiology, and present key imaging features of incidental findings seen on prostate MRI. It ranges from rare to the most common ones hence, found to be significant clinically[5]. Moreover, it has been identified that there are numerous SN anomalies present in the pelvis, and

most variants are related to the PM as it descends out of the pelvis depending on the classification by Beaton and Anson [6]. Their classification is grouped into six types as Type I (Undivided SN below the PM), Type II (One division of the SN through and the other below the PM), Type III (One division above and the other below the PM), Type IV (Undivided SN through the PM), Type V (One division through and the other above the PM) and Type VI (Undivided nerve above the PM).

The passage of the CPN through the PM and the passage of the TN under the superior gemellus are rare. This variation was reported by in one case [7] [8]. Hence, this variation may be considered as Beaton & Anson type 7.

Low Back Pain is known to be the most common musculoskeletal disorder. As a result of low back pain, the functional capacity of an individual becomes impaired, their daily activities are affected the most and their health status is disturbed and due to the pain and related conditions, Quality of life is affected the most. Low Back Pain is resulted due to several issues like deterioration of the spine, intervertebral disc prolapsed, vicissitudes in the spine due to increasing age, spine injuries, tumour, infection, spinal canal stenosis, and arthritis. Among the identified conditions, it has been observed that disc herniation is one of the most common causes of low back pain [9]. Studies have shown that around 80% of human beings have experienced low back pain in different situations and conditions in their life [10]. It has been identified that the frequency of low back pain is increased with age and found to occur mostly in the range of 30 to 50 years of their life [11]. Moreover, it can be observed from the studies that the rate of recurrence of low back pain is found to have high surveillance and sorts between 20 percent to 44 percent in the working populace in the 1st year. Consequently, it has been depicted that this figure elevated up to 85 percent throughout the lifetime [11]. Moreover, studies conducted on the working community has shown that the low back pain may restrict the daily performance and activities related to self-care therefore, this result in disability among 11 percent to 76 percent [9]. Nevertheless, low back pain is the most common orthopaedic disorder, but it can neither be considered as a disease nor an indicative entity alone for the spine pathology [12]. Moreover, researches have shown that the pain radiations that is transferred directly to the legs known as sciatica, is known as the most common symptom present in disc prolapsed and it is known that pain occurs due to the compression of the nerve by the herniated nuclei pulposus of the disc [13]. The patients who experienced disc degeneration particularly in the herniated nuclei pulposus are the common finding and it increases the chance of pain and disability in these patients. By focusing on the compression of the sciatic nerve, it has been identified that this compression with the piriformis muscle can result in sciatica-like symptoms. Variations of sciatic nerves are of 6 different and predominant types. Among these types, the most common types of variation are known as type 1- sciatic nerve variation. Khan et al. (2019) conducted a study on 95 subjects who were diagnosed with sciatica. From the results of the study, it is found that 84.2 % of patients experienced the most common known as type 1- sciatic nerve variation, and type 2

is the second with a prevalence of 13.9% [14]. All the participants that have been included in the study had T1-weighted coronal, sagittal, and axial images obtained by using MRI [14]. Results of the study showed a huge difference between the prevalence of both types [14]. With reference to its prevalence, limited research is available to help patients who are diagnosed with sciatica [14]. The study conducted by Khan et al. (2019) has shown that there is a statistical significant relationship present between the medical diagnosis of sciatica and sciatic nerve variations.

It has been suggested from this research that the anatomical variations of sciatic nerves present in the gluteal region are very significant to consider by the orthopaedic surgeons because this area is susceptible to recurrent surgical manipulations. Detailed knowledge of diverse variations is not the only source to help the surgeon to remain careful in the surgery, nevertheless, they are required to plan consequently throughout the numerous medical interventions and supervision of this particular [5]. While doing so, the radiologist can also be motivated to repeat the MRI procedures on both the side. The reason behind this is differences can be present on both sides. The understanding related to this serious matter is also necessary for the junior doctors, interns and nurses so that they can avert hazards related to the intramuscular deep injection in the gluteal region.

The aim of this study is to study the course of the sciatic nerve from its origin to branching using MRI in the Saudi population to look for any anatomical variants.

II. METHOD

A. Study Design and Population

This is a prospective study in living Saudi populations with low back pain or post-lumbar disc operation. The study population were 70 persons (140 limbs) the study was done in King Fahd hospital of the university in AL Khobar from 17 April 2015 to 15 March 2016 for the fulfilment of a master's degree in clinical anatomy from Dammam university.

B. Study Technique

A 3 Tesla MRI system with high resolution was used to detect the sciatic nerve. A coronal T2, axial T1, fat suppression imaging was used for the pelvic region, and axial T1 and coronal STIR imaging for the popliteal region. The study included lumbar spine and pelvic imaging and then imaging of the popliteal area from mid-thigh to mid-leg, in which both lower limbs and both femoral nerves were evaluated at the same time. The MRI study was the regular study done for all the patients with low back pain and sciatica and those patients operated for lumbar disc prolapse, the former group had a non-contrast study and the latter group had a combination of non-contrast and contrast study.

C. Ethical Consideration

The research has been conducted after the approval of the Ethical Committee of the Department of Anatomy of Dammam university (the current name is Imam Abdelrahman university). All the participants involved in this study took

part voluntarily. Consent forms were given so that the participants understand the purpose of the study and know that they are free to leave the research at any time. Moreover, the participants who have not signed the consent forms are excluded from the research. The patient's consent was taken verbally about the study. They had 10-20 minutes extra to the 20 minutes of their regular MRI study (total of 30-40 minutes), if they did not agree, they had only their regular MRI investigation.

III. RESULTS

A. Demographic Data

This is a prospective study performed with Saudi citizens only. The study population consisted of 70 persons. They underwent MRI studies in the King Fahd hospital of Dammam University from 17 April 2015 to 15 March 2016. There were 49/70 persons (70%) with symptoms of low back pain, sciatica with a clinical diagnosis of lumbar disc prolapse or related diagnosis for low back pain, and 21/70 persons (30%) volunteered for the study. The mean age for the whole group was 44.56 years, the mode was 44 years, and the age range was 18-75 years. The study population consisted of 34 males (48.57%) and 36 females (51.43%). The mean age of the males was 42.09, the median was 42.50, and the mode was 48 years. The age range was 18-75 years. The female mean age was 46.89 years, the median was 48 years and the mode was 32 years. The age range was 21-71 years..

B. Abnormal Anatomical Variants of the Study Population

We had 10/140 limbs (7.14%) with abnormal anatomical variant, including 5/140 limbs (3.57%) with upper SN bifurcation, one in a female, and four in the limbs of males. A mid-thigh SN bifurcation was seen in one male (1.43%). The four remaining lower anatomical abnormal variations seen in males, as early CPN bifurcation (2.86%) above its original level of division. Thus, 9/14 (6.43%) of the involved limbs were in males and 1/140 (1.43 %) in a female.

C. Analysis of the Types of Abnormal Anatomical Variants

In upper type variants the nerve descends on both sides normally anterior to the PM (Fig. 2). This was considered type I according to the Beaton & Anson classification [6]. The study also showed the SN bifurcation in the pelvis in 5/140 limbs (3.57%). Type I was seen in 64/70 (95.71%) individuals of the total population and 137/140 (97.86%) of the total limbs. Bilateral SN bifurcation in both sides of the pelvis was seen in one person. Type II was seen in two cases (2/70, 2.86%); one in the left (Fig. 3 A) and other one in the right-side (Fig. 3 B). A type III Beaton & Anson variant where the CPN is passing dorsal and the TN is passing anterior to a single PM was seen in one male 1/70 (1.43%) involving the right-side limb (1/140, 0.71%) (Fig. 4). The details of all types of upper SN bifurcation anomalies are indicated in Table 1.

The mid-thigh anatomical variants showed one case of left mid-thigh SN bifurcation in a male (0.71%).

In the lower abnormal anatomical variants, three cases of early CPN division (3/70, 4.29%) in males were found for the nerve's major branches, which included 4/140 (2.89%) limbs. One of them had bilateral CPN division above the fibula (Fig. 5 A, B).

D. Figures and Tables

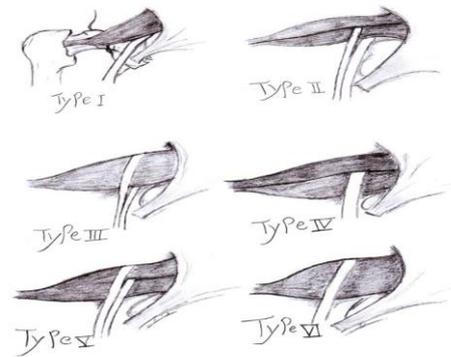


Figure 1: Schematic illustration of the six types of the Beaton and Anson's classification regarding the anatomical relationship between the piriformis muscle and sciatic nerve.

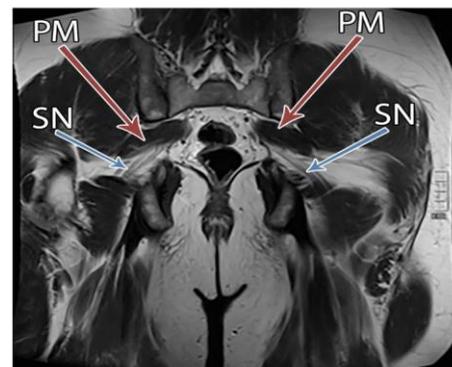


Figure 2: Coronal T2 image of the pelvis showing the normal course and appearance of the right and left SN as they pass anterior to the piriformis (red arrows) muscle into the sciatic notch (blue arrows).

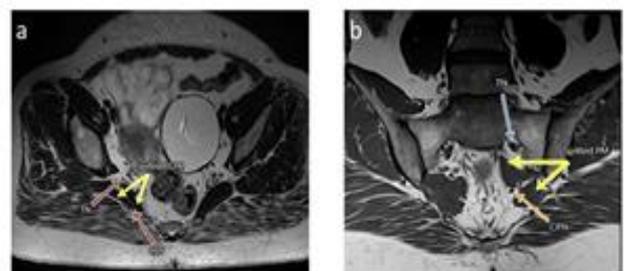


Figure 3: (A) Coronal T1 image of the pelvis showing the split left PM (yellow arrows) and the presence of two divisions of the SN, coursing anterior superior (TN) (blue arrow) and between the two bellies of the left piriformis muscle (CPN) (orange arrow). (B) Coronal T1 MR image of the pelvis with the presence of two divisions of the SN and a split PM on the right side. The CPN is passing in between the splitted muscle, and the TN is passing anterior (superior) to the anterior (upper) part of the PM.

IV. DISCUSSION

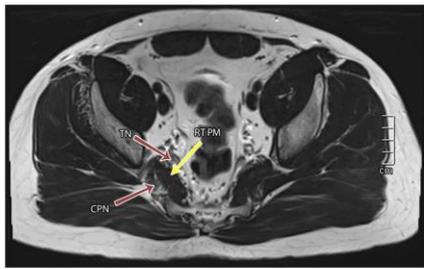


Figure 4: Coronal T1 image of the pelvis showing the presence of two divisions of the SN, coursing anterior and superior (TN) (red arrow) and one inferior (CPN) (red arrow) to the Rt piriformis muscle (yellow arrow).

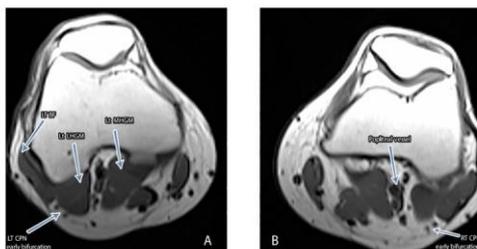


Figure 5: Axial T1 image showing early division of the common peroneal nerve on both sides before the knee joint level (arrows in A and B). BF= biceps femoris, LHGM= lateral head of the gastrocnemius muscle, MHGM= medial head of the gastrocnemius muscle.

Table 1: Distribution of the types of upper SN anatomical variants according to the Beaton & Anson classification

Sex	Upper			Total
	Type I	Type II B & A	Type III B & A	
Male	32	1(UL)	1(UL)	34
Female	35	1(UL)		36
Total	67	2	1	70
% for total	95.71%	2.86%	1.43%	100
% for limbs	137/140 (97.86%)	2/140 (1.43%)	1/140 (0.71)	100

Sciatic nerves are well known and have huge importance as these nerves are the densest nerve of the human body. These nerves are arising from the sacral plexus. Usually, these nerves arise from side to side of the greater sciatic foramen, after that, the nerves leave the pelvis and arrive into the gluteal area by transitioning underneath the piriformis in the form of a single nerve incorporated by a sole epineuria sheath. Afterward, this nerve divides successively into 2 distinct terminal nerves known as the common peroneal nerve also known as common fibular nerve, and the tibial nerve typically at a greater angle of the popliteal fossa. However, in some conditions, this nerve divides high, though remains in pelvis regions into its terminal branch which leaves the pelvis in a different type of way. Consequently, they are categorised into diverse kinds with respect to the piriformis muscle. It has been identified that this elevated division of the sciatic nerve is typically bilateral or unilateral typically leads to nerve compression that may result in piriformis syndrome, a partial block of the sciatic nerve in the course of popliteal anaesthesia block and similar cases. Studies have shown that a lot of diversification has been observed in the division of sciatic nerves more specifically in the high divisions. As a result of high divisions, sciatica occurs which is the injury of nerves. This condition mostly during the practice of intramuscular injection specifically in the gluteal area. Due to high divisions piriformis syndrome, failed Sciatica nerved block in anaesthesia, and injuries in the process of operation of the posterior hip. Hence, it has been identified that there is numerous kind of high divisions of the sciatic nerve in the pelvis, mostly, bilateral. However, in the case of unilateral, other parts and sides remain in normal condition. High division of sciatic nerve is not rated however to explore the 2 diverse kinds of high division of Sciatic nerve in rate present on both sides of the same cadaver. Due to the complexities of sciatic nerves and related disorders it has been observed that understanding related to the course of the sciatic nerve from its origin to branching is needed. In this research, different related perspectives will be explored by using MRI in the Saudi population to look for any anatomical variants of sciatic nerves.

The cadaveric dissection of the Saudi population is not allowed, so we cannot explore the incidence of abnormal anatomical variants in our community. Magnetic resonance imaging (MRI) allows direct anatomic visualization of a nerve and MRI neurography can show the detailed anatomy of the peripheral nerve [12]. MRI study can demonstrate various sciatic neuropathies in conditions such as fibrous or muscular entrapment, vascular compression, scarring related to trauma or radiation, tumours, and hypertrophic neuropathy [15]. Recently, studies have been conducted on paediatric patients. It has been identified through the researches that the peripheral anaesthetic obstruction of the sciatic nerve is beneficial for the pain relief related to post-operation after the completion of the orthopaedic measures related to the lower limb [16]. It has been depicted that the recognition of the sciatic nerve and the related branches related to the nearby functional structures of the knee suggestively donates to the blockade of the nerve successfully [16]. Though, researches

have also increased the knowledge related to the problems raised from the insufficient and unpredictable knowledge and understanding related to the anatomical characteristics of nerves present in the region of nerves. Additionally, the scarcity of knowledge related to the nerves' position in the knee all through the paediatric growth requirements that must be considered for the peripheral blockade of nerves so that it can be used readily for the paediatric patients [16]. According to the research conducted on clinical imaging, there is a need to analyse and document the comparative morphometric association of the nerves which are present inside the position of the knee all through the diverse stages of paediatric growth [17]. Ho et al. (2019), conducted research on the positions of the tibial, sciatic, and fibular nerves. Their positions were identified with reference to the functional structures of a total of 142 paediatric patients were included for the computed tomography (CT) and magnetic resonance imaging (MRI) [17]. Results of the study showed that a positive relation is present between the ages and the distance present between semitendinosus muscle and mutual fibular nerve. This research supported that it can be used significantly for predicting stature. Moreover, it has been identified that noteworthy alterations are present in between men and women, precisely after sexual maturity. Hence, it can be suggested that sexual dimorphism arises more specifically in the teenage years [16]. It has been observed that further research can be conducted to decrease the number of cases, especially in males by focusing on the reason for its high number in males.

A. The Prevalence of SN and its Branches' Abnormal Anatomical Variations

In the present study, the abnormal anatomical variants were seen in 8 cases (11.34%) as upper type, middle thigh, and lower major SN branches anatomical variant. On review of the literature, the present study showed normal SN anatomy from the pelvis until branching in 88.57% of patients. The normal anatomical variants of SN or its branches in the cadaveric studies from India were 75%, 93.75%, 52% in a Turkish report [18][1]. A Kenyan study on 82 cadaveric studies reported 67.1% normal SN anatomy [19]. In a review of 18 studies with 6,062 cadaveric dissections by (Smoll NR), the rate of normal SN anatomy was 83.1%. The normal descent of the SN, anterior to the piriformis muscle, was seen in 67 cases (95.71%) and 137/140 (97.86%) limbs in our study. There were three limbs with a unilateral abnormal exit from the pelvis. One case with bilateral SN bifurcation in the pelvis had a normal exit anterior to the PM. This result was higher than the one reported by Beaton & Anson 84.2% [20], and of a meta-analysis report of a total of 45 studies with 7068 limbs [21], as 85.2%. A report from turkey as 76% [22]. Kenya 79.88% and 90% of a recent Indian report [19] [21]. It was similar to an Eastern Europe report of 96%, which was a cadaveric study of 100 fetuses and 200 gluteal regions [22], and an Indian cadaveric study of (97.8%) [23]. I had one case of bilateral SN division into the TN & the CPN from its origin, and both pass anterior to the PM. The incidence of the high division of the sciatic nerve varies in the literature from 2% in India [24] to 20.1% in Kenya [23] and 48% in Turkey [25].

There was an almost equivalent male-to-female sex ratio (34 males/36 females) in our study; 7 out of 8 sciatic nerve branch anomalies were seen in males. The upper SN anomaly in relation to the PM was seen in 3 males and 1 female (Table 1). In a cadaveric study of 21 persons, 13 males and 8 females, the upper SN division with abnormal anatomy in relation to PM were seen in 18.2% of males and 63.6% of females [26]. A cadaveric study from India showed a sciatic nerve sex-related anomaly in the gluteal region in 11.11% of cases, while in females, the incidence rates of anomalies were 20% [27]. Piriformis syndrome and gynecologic conditions account for most cases of extra lumbar spinal sciatica in female subjects [28]. During pregnancy, the gluteal muscle group of the hip/pelvis is elongated and strained, including the piriformis [28]. Piriformis syndrome should be suspected in any patient with symptoms of hip or sciatic pain, especially after pregnancy [29]. The female-to-male ratio for piriformis syndrome is 6:1 [30]. A series of 34 patients recruited for electrophysiological studies also showed a female predominance of 6:1 [13]. A series of 26 patients showed a slight male predominance (1.4:1) [31]. There are various SN anomalies in the pelvis; most variants are related to the PM as it descends out of the pelvis. The incidence of anatomical variation of the SN to the PM is 15-30% in the literature [22]. Type I SN variation 84 - 90% as reported by Beaton and Anson [32] from the Western literature. Our result was 97.86%, as the result of Sabnis AS from India, as (97.8%) [25]. A middle east report of the incidence in Turkey showed a rate of 76% [22]. A recent MRI study from the USA was performed on 755 scans, and the prevalence of variant SN anatomy in relation to the PM was 87% for type I variants [10]. Type II bifurcation is the most common variation is the course of SN bifurcation in relation to the PM, in which the CPN travels between the two heads of the PF muscle and the TN inferior part of the muscle. The present study revealed 1.43% of type II SN bifurcations, seen as unilateral in one male on the left side (Fig. 3b) and in a female pelvis on the right side (Fig. 4). The results are comparable to those of a study from India, which reported an incidence of 1.5% [20]. The Turkish report was 16% [22]. It was 7.1% to 11.7% in a Western report.³ A recent radiological report from the USA using MRI cited a rate of 13% [10]. A meta-analysis study by Tomaszewski KA showed a higher prevalence in Asian populations (17.0%) compared to South American (9.8%), European (7.4%), North American 2.8%, and African (2.2%) populations. Sex difference analysis showed that the prevalence was twice as high in women than that in men, at 20.1% and 11.7%, respectively. This difference might be due to the great difference in pelvic anatomy between men and women. Women is more likely to have this anomaly due to the close location of the SN to pelvically located reproductive organs [23].

The present study had one male with a right-sided Type III anomaly (Fig. 4), accounting for 0.71% of the total limbs. Western reports give rates that range from 3.3% to 7.6% [24]. There was no type III SN anomaly observed in a recent MRI radiological study of the pelvic region from the USA [10]. A Kenyan study reported a rate 2.4% for limbs [19]. Indian studies varied from 0.7% to 2.22% per limbs [33]. The

highest result was from Turkey, at 8% [20]. The reports of the four largest cadaver series did not find types IV, V and VI.¹²A new subtype of type II, in which the SN passes anterior to the piriformis muscle but then an accessory smaller piriformis muscle separates TN and CPN, was reported in a radiological study of 104 buttocks of patients and described the accessory piriformis muscle as bifid; the peroneal nerve passed between two heads in 9.6% of cases [34]. Knowledge of the SN anatomical variations is important to avoid surgical complications and to prevent failure of sciatic block and SN injury during deep intramuscular injections. The SN is the most frequently injured nerve in the posterior dislocation of the hip and the fracture of the hip joint. It is also injured during total hip replacement surgery and in hemiarthroplasty of the hip. Positioning of individuals during gynecological surgeries, such as hysterectomy and dilatation and curettage, can affect the sciatic nerve. SN upper-division in the pelvis into the CPN and the TN may yield incomplete neurological deficits due to the escape of one of these branches in the above-mentioned conditions [35]. The differences in the exit routes of these two nerves are important in clarifying the clinical etiology of non-discogenic sciatica.

Left mid-thigh SN bifurcation was found in a 55-year-old male volunteer (0.7%). The general mid-thigh SN division occurred in 4%.¹⁴A rare case of SN division in the mid-thigh with reunion proximal to the normal anatomical bifurcation was reported by sonography [36].

Saleh et al [37]. from Saudi Arabia studied the level of division of the sciatic nerve into the CPN and the TN above the knee in 30 non-Saudi cadavers, because cadaveric studies in Saudi Arabia are not allowed, and reported that the sciatic nerve divided 50–180 mm from the popliteal crease. Vloka et al, concluded in their study that the SN divided at a mean distance ranging from 0-115 mm above the popliteal fossa [37]. We did not observe any anatomical variation of the main SN nerve trunk lower division. There was early CPN division into its major branches in three cases (4.29%), accounting for 4/140 (2.89%), one bilateral (Fig. 5 A, B), and the others unilateral. In a cadaveric study of forty fetal specimens (80 sides), with anatomical dissection of the CPN, the incidence rates of normal bifurcation at the level of the tuberculum of the fibula were 54/80 (67.5%) and 56/80 (70%) on the right and left sides, respectively. Above the tuberculum of the fibula, the incidence rates were 20/80 (25%) on the right and 14/80 (17.5%) on the left sides. Below the tuberculum of the fibula, the incidence rates were 6/80 (7.5%) on the right and 10/80 (12.5%) on the left sides. Variations were noted in the CPN number and branching patterns. The CPN is divided into three branches in 32/80 (40%) and 50/80 (62.5%) on the right and left sides, respectively. The deep peroneal nerve arose from the CPN and continued as a single trunk in 68/80 (85%) and 54/80 (67.5%) on the right and left sides, respectively. High tibial osteotomy might be associated with CPN injury and will result in weakness or paralysis of the foot, inhibiting dorsiflexion, with troublesome paresthesia and hypoesthesia, because the CPN passes within 3-6 mm of the posterior aspect of the fibular head and neck and is then divided into

the DPN and the SPN 22-28 mm distal to the fibular apex; the extensor hallucis longus muscle is innervated by a motor branch from the DPN that is located 74-82 mm distal to the fibular apex [38]. To avoid neurological complications during this surgical procedure, the fibular osteotomy should be carried out at the junction of the middle and distal thirds of the fibula without excessive medial and anterior fragment displacement; this relationship has been proven by the cadaveric anatomical study of 13 human cadavers to determine the relationship of the close anatomy of the CPN and the surgical area of high tibial osteotomy [39].

V. CONCLUSION

This is the first Saudi study to demonstrate the anatomical variants of the sciatic nerve, especially in relation to the piriformis muscle and its course until bifurcation. A detailed analysis has been done in comparison to males and females. Results showed that men are at high risk than females. The results are comparable with international data hence; further research can be done to identify the ways through which the identified risks can be minimized. This study has identified that patients with low back pain are susceptible to sciatic nerve pain. Therefore, more care is required to be given to patients who are at high risk of experiencing sciatic pain. Researchers can use the results of this study to identify the ways for complete treatment. It has been suggested that the treatment plan might be different on the basis of age, sex, and medical conditions.

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