



Bilateral High Division of Sciatic Nerve: A Cadaveric Case

Nervus Ischiadicus Bilateral Yüksek Ayrılması: Bir Kadavra Çalışması

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Abstract

Sciatic nerve (SN) is a large nerve arising from the gluteal region and extending toward the posterior locations of the femur. It divides into two terminal branches on the proximal point of popliteal fossa: tibial nerve and common peroneal nerve. SN supplies somatic motor fibers to muscles in the feet, legs and posterior locations of the femur, while also providing sensitive fiber to a large part of leg skin and feet. SN was found to have a different course in the dissection performed on the bilateral gluteal region of the case in this study, the cadaver of a male person aged 55. The course of SN is a single branch in the gluteal region but it showed two branches in the case of this study. This course was found to be a bilateral example of Type b based on the classification of Beaton and Anson. It is important to know the course of this nerve for the surgical interventions to be made on this region considering the interaction between SN and other anatomical structures.

Keywords: Cadaver, variation, sciatic nerve, tibial nerve, common peroneal nerve.

Öz

Nervus (n.) ischiadicus, gluteal bölgeden çıkan uyluk arka bölgede seyreden kalın bir sinirdir. Genellikle fossa poplitea'nın üst ucunda iki terminal dala ayrılır. Bunlar n. tibialis ve n. peroneus communis'tir. N. ischiadicus ayak, bacak ve uyluk arka bölgede bulunan kaslara somatomotor lifler, bacak derisinin büyük bir bölümüne ve ayağa sensitif lifleri yollar. Bu olguda 55 yaşındaki erkek kadavranın bilateral olarak yapılan gluteal bölge diseksiyonunda n. ischiadicus'un farklı seyrettiği görülmüştür. N. ischiadicus'un seyri gluteal bölgede tek dal olarak beklenirken iki dal halinde olduğu kaydedilmiştir. Beaton ve Anson sınıflandırmasına göre bilateral olarak tip b'ye örnek olduğu görülmüştür. N. ischiadicus'un bu bölgedeki diğer anatomik yapılarla etkileşiminden dolayı buraya yapılan cerrahi girişimler açısından seyrini bilmek önemlidir.

Anahtar Kelimeler: Kadavra; varyasyon; n. ischiadicus; n. tibialis; n. peroneus communis

INTRODUCTION

Sciatic nerve (SN), the largest nerve in human body, is a branch of sacral plexus formed as a result of the combination of L4-S3 anterior spinal nerve roots (1). It extends from infrapiriform foramen beneath the piriformis muscle, exiting the pelvis, and it continues over the external femur rotator muscles, progressing down the midline of femur (2). It generally divides into two terminal branches that are 1/3 distal from the lower part of the posterior location of the femur. These branches are tibial nerve (TN) (L4-S3) and common peroneal nerve (CPN) (L4-S2) (3, 4).

The most frequent types of division seen in SN are respectively as follows: the one exiting as a single branch from infrapiriform foramen and extending as two branches toward the upper part of popliteal fossa (64-

98.5%), the one continuing from infrapiriform foramen as two divisions (1.5-33.5%), and the one exiting from suprapiriform foramen as CPN, and from infrapiriform foramen as TN (0.3-10%) (1, 5-7).

Knowing the anatomic variants of SN is important for anatomists, neurologists, neurosurgeons, anesthetists and sports medicine physicians. Another important aspect is that the root nerves and course of this nerve should be known for the interventional procedures such as popliteal sciatic nerve block, total hip prosthesis operations and injections to be made on gluteal region or for the clinical pictures observed within the lower extremities (piriformis syndrome or sciatica) (1, 6, 8, 9). This study aimed to contribute to the literature by presenting the variation frequently seen in routine cadaveric dissection procedure.

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CASE REPORT

A variational case was observed on the SN during the bilateral gluteal region dissection performed on the cadaver of an American, Caucasian, 55-year-old male. The skin was dissected into three parts during the gluteal region dissection. The first incision was performed throughout the plica glutealis. The other incision was performed between the medial and lateral epicondyle on the posterior location of femur, in a form to pass through the posterior midline of knee to separate the specific area as upper and lower. The last incision was conducted by combining the midpoints of other two incisions. Specific parts of the skin were dissected in a manner to keep the subcutaneous tissue at its location. During this process, superior cluneal nerves, middle cluneal nerve, inferior cluneal nerves, posterior femoral cutaneous nerve, great saphenous vein and popliteal vein were detected. After aponevros was opened, gluteus maximus muscle, iliotibial tractus, hamstring and adductor muscles and gastrocnemius muscle were found. Long head of semitendinosus muscle and biceps femoris muscle were opened using a retractor, and TN and CPN were found in two branches on adductor magnus muscle at the lower section. The pieces incised to not damage the structures under the muscles, following the line between gluteus maximus muscle and medius body were lifted and divided into two. After muscles were dissected, gluteus minimus muscle, inferior gluteal artery and vein and external femur rotator muscles were detected. Bilaterally, CPN exited between the two upper locations of PM while TN was found to exit the pelvis through infrapiriform foramen. Results also indicated that both nerves bilaterally progressed behind the femur and reached popliteal fossa, continuing on a normal course (Figure 1a,1b,2a,2b).



Figure 1a) Left lower limb: sciatic nerve variation. PM1, 2: Piriform muscle, CPN: Common peroneal nerve, TN: Tibial nerve, LGmax: Left gluteus maximus muscle, LGmin: Left gluteus minimus muscle.

Figure 1b) Right lower limb: sciatic nerve variation. PM1, 2: Piriform muscle, CPN: Common peroneal nerve, TN: Tibial nerve, RGmax: Right gluteus maximus muscle, RGmin: Right gluteus minimus muscle.

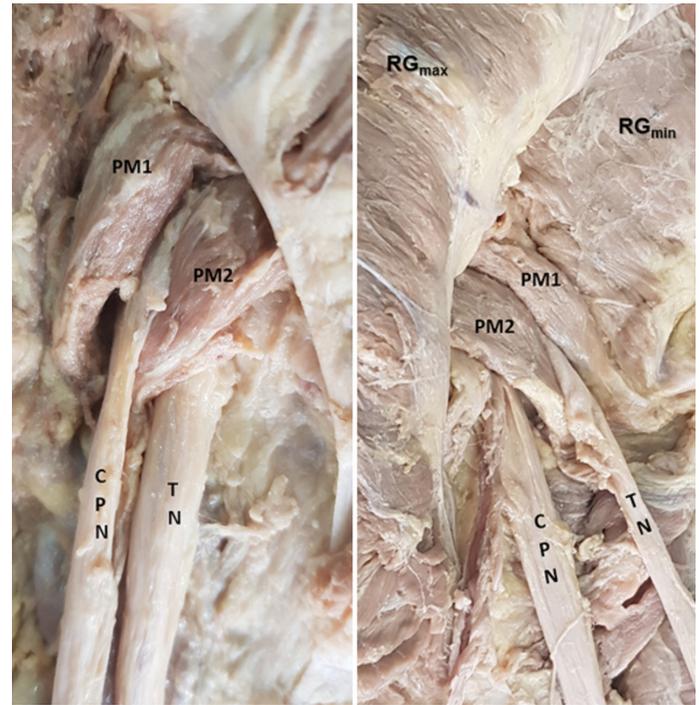


Figure 2a) Left lower limb: close view of the sciatic nerve variation PM1, 2: Piriform muscle, CPN: Common peroneal nerve, TN: Tibial nerve, (Type-B variation).

Figure 2b) Right lower limb: close view of the sciatic nerve variation PM1, 2: Piriform muscle, CPN: Common peroneal nerve, TN: Tibial nerve, RGmax: Right gluteus maximus muscle, rgmin: right gluteus minimus muscle, (Type-B variation).

DISCUSSION

Variational cases regarding SN were found to be relative common (1, 5, 6). The literature indicates that the classification based on PM and SN were performed on 120 cases by Beaton and Anson 1937. Accordingly, type a is SN arising as a single branch from the lower part of PM while type b is SN progressing through and behind PM as two branches. In addition, type c is SN that continues over and behind the muscle as two branches without penetrating through PM, type d is SN that arises from PM in an intact form, and type e is SN that divides PM as two superimposed pieces. Moreover, SN in type e gets combined in PM, exits the pelvis and extends through as a single branch. Type e basically resembles to type d. Type f reflects the SN that arises from the upper side and inside of PM as two branches, gets combined and exits from the pelvis, while type g is SN that exits the pelvis as a single branch over PM. Based on this classification, type f and g were not regarded as real cases. The study by Beaton and Anson found the rate of type a as 84.2%. Moreover, the rate of type b was 11.2%, and this rate was 3.3% for type c and 0.8% for type d (10). Beaton and Anson conducted another study with 240 samples the next year and found the rate of type a as 90%. Moreover, the rate of type b was 7.1%, and this rate was 2.1% for type c and 0.8% for type d (11).

The study conducted by Pokorny et al. on 91 cadavers found that SN was type a at the rate of 79.1%, type b at the rate of 14.3%, type c at the rate of 4.4%, and type d at the

rate of 2.2% (12). In another relevant study, SN was type a at the rate of 52%, type b at the rate of 16% and type c at the rate of 8% on 50 gluteal regions of the cadavers of 24 adult male people. Moreover, it was found to exit the pelvis as two branches from infrapiriform foramen at the rate of 24% (5). Jayamma et al. observed type c variation at the rate of 1.6% during the dissection on 60 gluteal regions of the cadavers of 30 adults (13). In a study where the 200 human fetuses were bilaterally examined, SN was found to be divided on popliteal fossa at 88.5%, and over popliteal fossa at 9.5%. Moreover, the rates of type b and c were 1.2% and 0.8%, respectively, in that study (1). In another study conducted on the cadavers of 20 Nepalese people, the rate of type a was 92.5% while it was 2.5% for type b and 5% for type c (14). Which is an example to the type b rate found as 11.2% and 7.1% in the classifications made by Beaton and Anson in 1937 and 1938.

Natsis et al. classified the gluteal regions of 147 people in accordance with Beaton and Anson. Accordingly, rate of type a was 93.6% while it was 4.1% for type b, and 0.3% type c, d and g. The remaining four regions were not classified as they showed a unique variation. One of them is the region where CPN arises from the superficial and intermediary bodies of PM which essentially has three bodies and where TN exits the pelvis from the deep structure. Moreover, CPN was found to progress from the dual body of PM, and TN and inferior gluteal vein was found to arise from infrapiriform foramen. However, inferior gluteal vein was found to continue through the modified branch of TN. Regarding the unique, bilateral third and fourth variation, an extra muscle was found of PM, and SN was found to leave the pelvis from infrapiriform foramen (7).

Arifoğlu et al. observed combined variation during the dissection on the dextral gluteal region of the cadaver of a 63-year-old male person. Posterior femoral cutaneous nerve and CPN were found to pass through the two muscular structures of PM, while TN was found to get separated from infrapiriform foramen. Gemellus superior muscle was found to be double which is also the case for PM (15). The cadaveric study conducted by Mas et al. found that SN arose from the infrapiriform foramen as two branches on the sinistral gluteal region of the cadaver of a 62-year-old male person. Moreover, on the right side, CPN was found to arise from infrapiriform foramen while TN was found to appear beneath the gemellus superior muscle (16).

Dhivya et al. conducted a dissection activity on 64 extremities of 32 cadavers and found that SN get separated on the upper angle covering popliteal fossa at the rate of 93.75 and on the upper locations of femur at 4.6%. Moreover, they found that PM was double at 1.5% in a superimposed form (17). Saha and Lal examined 42 gluteal regions of 21 cadavers. They reported that SN passed beneath PM and got separated into two branches on the upper half of popliteal fossa at the rate of 92.85%.

Within the one region out of three remaining gluteal regions, CPN was found to pass beneath PM, while TN was found to arise from the lower parts of gemellus superior muscle, and they indicated that TN got combined on the midline of femur and separated again on popliteal fossa. The other two gluteal regions belonged to the cadaver of the same male person. Moreover, SN arose from infrapiriform foramen as two branches on the left side, got combined on the midline of femur and separated on the popliteal fossa, and displayed normal course on the right side after arising from infrapiriform foramen as two branches (18). Regarding the case in this study, CPN was found to arise from two upper sections of PM. In addition, TN that arose from infrapiriform foramen was found to exit the pelvis and two nerves passed through popliteal fossa after continuing behind the femur.

More frequent nerve compressions may occur at the location where CPN and TN, the branches of SN, arise from the pelvis (5). Piriformis syndrome is the name of the disorder caused by the compression of SN by PM (1, 5, 16). It may occur as a complication in the cases where the nerve passes through the PM or happens following total hip arthroplasty (12, 16).

A relevant study from the literature indicated that suprapiriform foramen arose from SN and the nerve was covered with facial bands during the operation for a 38-year-old woman who applied owing to the complaints of paresthesia on sinistral hip, femur and calf locations. PM was dissected, and SN took a form to arise from infrapiriform foramen. Moreover, facial band was resected. Following the operation, patient's complaints disappeared (19). In conclusion, etiopathogenesis of SN may reflect a clinical picture as each anatomic variation indicates a clinical case (5). Moreover, it is important to know the anatomic variations of SN as patients may be affected during and following the operations performed as a result of the diagnoses regarding clinical cases.

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