

## An unusual variation in the formation and termination of the sciatic nerve - a case report

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### ABSTRACT

The sciatic nerve (SN) presented with the unusual patterns in which five smaller fibers instead of one or two nerves at the level of the Piriformis muscle. Those five fibers measured 7.5 cm from their origin to where they joined to form the SN. The SN terminated in the popliteal fossa by giving rise to three terminal branches: the tibial nerve, common peroneal nerve, and another unusual nerve that supplied the medial head of the gastrocnemius. This case is unusual because the SN presents with different positional variations of its two components in relation to the piriformis muscle but not five fibers, in addition the SN normally bifurcates instead of trifurcating when it reaches in the popliteal fossa.

The case presented a Type A pattern of SN to the piriformis muscle. This type of pattern has been documented to be the most common in some parts of Africa. Some authors have reported two patterns of trifurcation of the SN. One is a pattern where the SN gave rise to the tibial, superficial, and deep peroneal nerves at the popliteal fossa, and another is a trifurcation pattern where it gave rise to the tibial, common peroneal, and sural nerves. The case is different as it presents an unusual unreported pattern where the SN trifurcates by giving rise to the tibial, common peroneal, and nerve that supplies the medial head of the gastrocnemius muscle. The current variation has never been reported elsewhere.

**Keywords:** Sciatic nerve, Sciatica, Anatomical Variation, Case Report

### INTRODUCTION

The word “Sciatic” originates from the Greek word “Ischiadikos”, which means subject to trouble in the hip or loins [1]. The sciatic nerve is the longest, thickest, and widest nerve in the human body, which supplies the muscles of the posterior thigh and leg [2]. The SN exits the pelvis through the greater sciatic notch, passing under the piriformis muscle. At that muscle, the sciatic nerve may have different variations classified as follows:

Type A undivided trunk of the SN below undivided muscle; Type B: Divisions of nerve below and between undivided piriformis muscle; Type C: Divisions below and above undivided muscle; Type D: undivided trunk of the SN between heads of piriformis, Type E: Divisions between and above heads, Type F: undivided trunk of the SN passes above undivided muscle, and type G: divisions below undivided muscle [3]. Normally, when the sciatic nerve reaches the popliteal fossa, it bifurcates into the tibial nerve (TN) and common

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peroneal nerve (CPN) [4]. However, bifurcation of the sciatic nerve can take place higher than expected and may lead to an incomplete block of the sciatic nerve during popliteal block anesthesia [5]. In about 7% to 21% of studied populations, the sciatic nerve or its two divisions penetrate the piriformis muscle instead of passing under it [6]. Variations in the exit of the sciatic nerve to the piriformis muscle may lead to nerve compression, which may result in piriformis syndrome [7]. The sciatic nerve may have an iatrogenic injury, with the most frequent mechanisms of intraoperative nerve damage, including stretching and direct injury due to compression or laceration [2, 8]. The sciatic nerve can be subjected to traction forces during procedures such as total hip arthroplasty, especially when this procedure is performed via a posterior approach [9]. The sciatic nerve can also be damaged after a traumatic posterior hip dislocation, especially in cases where there is a coexistence of variations in this region, which likely increases the risk of injury [10]. Anatomical variation of the sciatic nerve to the piriformis muscle can increase the intraoperative risk of injury, either due to improper Hohmann retractor placement or by direct injury when a piriformis muscle tenotomy is required [10]. Minimal invasive surgeries such as hip arthroscopy may damage the sciatic nerve due to its proximity if there is a variation in the origin and course of the sciatic

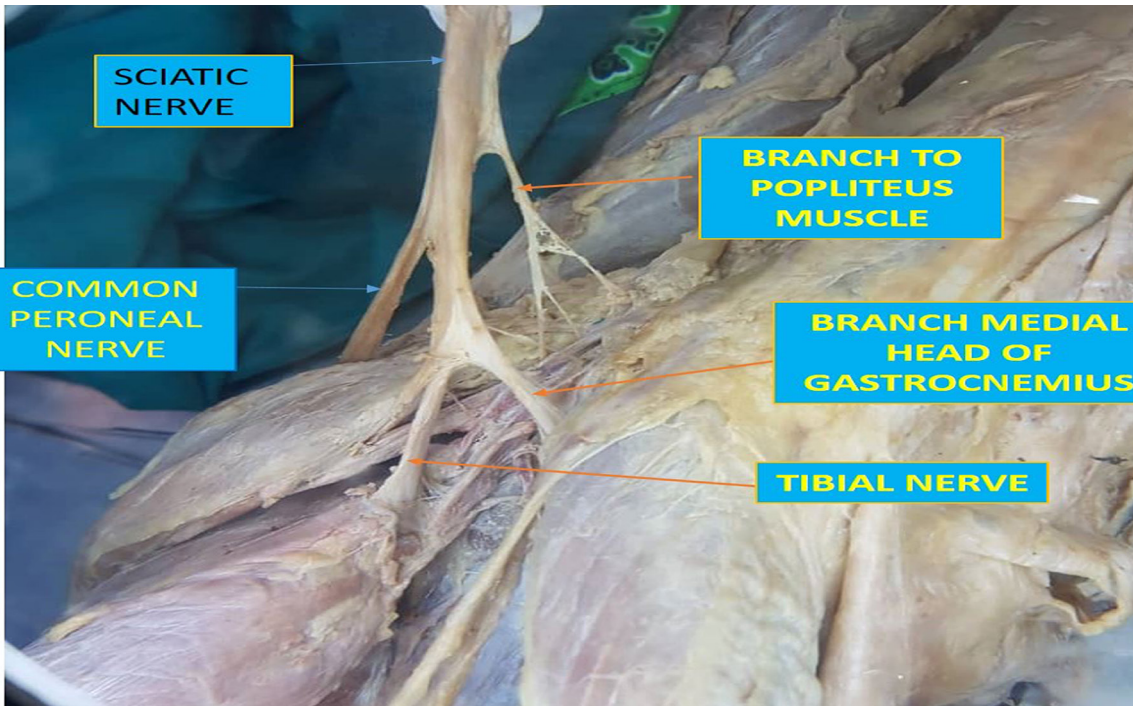
nerve. Additionally, knowledge of the variation in bifurcation of this nerve is clinically important, especially in cases where sciatic nerve blockade is to be conducted [11].

### CASES PRESENTATION

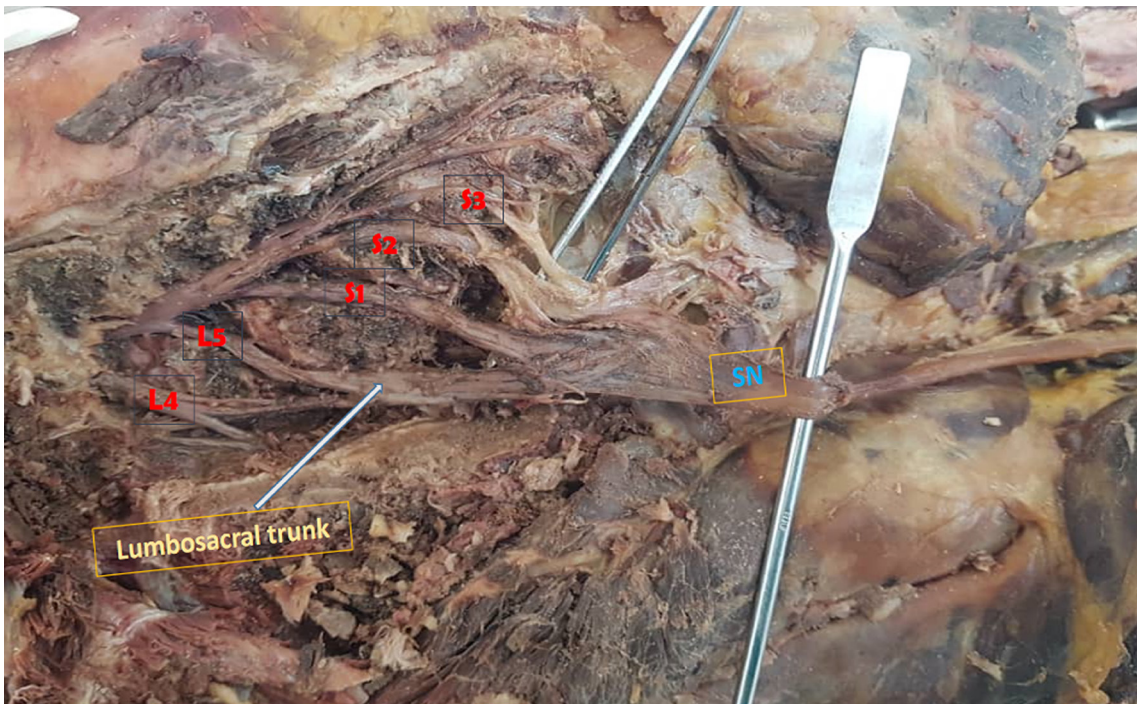
This case was identified while dissecting in the Anatomy laboratory of the School of Medicine and Pharmacy at the University of Rwanda. A 46-year-old male cadaveric donor was dissected following the steps outlined in the Grant Dissector Handbook of Sauerland [12]. The case presented an unusual pattern of formation and termination of the SN. It was observed that in the left gluteal region, the sciatic nerve had five smaller fascicles below the piriformis muscle (Figure 1). The fascicles measured 7.5 centimeters from the nerve roots to the formation of the common trunk of the sciatic nerve. From the point where the fascicles joined to form the common trunk of the sciatic nerve to its termination at the popliteal fossa, the sciatic nerve measured 32.4 centimeters in length. The sciatic nerve gave a branch that supplied the popliteus muscle in the posterior compartment of the leg before it terminated at the popliteal fossa (Figure 2). The sciatic nerve trifurcated at its termination by giving rise to the tibial nerve, common peroneal nerve, and another unusual branch that supplied the medial head of the gastrocnemius muscle.



**Figure 1: Unreported pattern where many separated fascicles pass under the piriformis before making one sciatic nerve trunk. PM: piriformis muscle, SN: sciatic nerve**



**Figure 2: The trifurcation of the sciatic nerve and the muscular branch to popliteus muscle**



**Figure 3: The origin of the sciatic nerve (SN). L: Lumbar, S: Sacral**

There were no variations at the origin of the SN in the case presented (Figure 3), but variations in the length of the lumbosacral trunk were observed and

documented. The case presented showed that the left lumbosacral trunk was longer (4cm) than the right (2.5cm). Similar variations in the distribution

of the sciatic nerve were also observed on the right, but there were no smaller fibers joining to form the common trunk of the SN.

## DISCUSSION

The case presented a Type A pattern of SN to the piriformis muscle, which has been documented to be the most common in some parts of Africa [3, 7]. However, in the study conducted by Samara et al. in Texas in 2016 [16], the most common type of variation observed was Type B, where the common fibular portion pierces the piriformis muscle. Berihsu and Debeb [17] reported two patterns of trifurcation of the SN. They observed a pattern where the SN gave rise to the tibial, superficial, and deep peroneal nerves at the popliteal fossa and another trifurcation pattern where it gave rise to the tibial, common peroneal, and sural nerves. Our case is different as it presents an unusual unreported pattern where the SN trifurcates by giving rise to the tibial, common peroneal, and nerve that supplies the medial head of the gastrocnemius muscle.

When the sciatic nerve roots leave the vertebrae, the nerve fibers converge to form a single nerve in the pelvis [13]. However, in the current case, many separated fascicles formed a single nerve below the piriformis muscle. This may predispose the nerve to irritations and the development of sciatic pain. Irritation to the sciatic nerve leads to a condition called Sciatica and may be caused by pathological conditions such as sciatic nerve tumor, ossified bone tissue (hip/femur), hip adductor muscle tear(s), malignant invasion to the sciatic nerve, and piriformis pyomyositis [15]. Sciatic pain due to compression by the piriformis muscle is called piriformis syndrome. It has the following symptoms: tenderness over the sciatic notch, focal mid-buttock pain, the pain is aggravated by long time sitting and/or maneuvers, which increase the tension of the piriformis muscle like the external rotation of the hip [4, 14]. Compression of individual fascicles, in this case, may have challenging clinical features.

## CONCLUSION

Many sciatic nerve variations have already been reported. However, the current case proves that other variations have not been observed and reported yet. The researchers should be aware

that sciatic nerve studies are still needed. In addition to that, this case report is a source of information for future researchers and will be a good tool in raising awareness about the existence of the sciatic nerve variations in Rwanda. This will guide the clinicians, surgeons, anaesthesiologists, physiotherapists, massage therapists, and other health professionals during decision-making and treatment. Especially investigating if there are any variations before carrying out any medical interventions approximate or related to the sciatic nerve.

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