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CASE REPORT

Persistent Sciatic Artery: A Cadaveric Case Study

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Abstract

Objective: The persistent sciatic artery is a rare anomaly associated with a high rate of abnormal dilatation, blockage and stenosis prompting in extreme thrombosis, caudal embolisation, or aneurysm rupture. This is a case report a 50-year-old African female cadaveric specimen in the Human Anatomy Laboratory in the, Department of Human Anatomy at, Uzima University.

Methods: Student cadaver groups at Uzima University were assigned with a ratio of 9:1 meaning that 9 students received one cadaver to work on. There were a total of 9 cadavers. A peculiar structure was noted behind the right thigh after exposure of gluteal muscles during routine session of dissection in one of the 9 cadavers allocated for dissection.

Results: The structure, identified as a persistent sciatic artery, was a large vessel that exited the pelvis through the greater sciatic foramen below the pirifomis muscle, and descended superficial to the sciatic nerve. Muscular and articular branches branched off from artery throughout its course. The artery descended on the posterior of the thigh where it was crossed by the long head of biceps femoris muscle. The sciatic artery continued as the popliteal artery traveling alongside the popliteal vein, which was retraced from the infrapiriform fossa. The femoral arteries were hypoplastic and had no obvious connections with the persistent sciatic artery.

Conclusion: It is a vital practice to recognize the position and tendency of the persistent sciatic artery to develop aneurysms and subsequent deep vein thrombosis that may be life threatening. Furthermore, knowledge of this anatomical variation is important when deciding the surgical intervention approach during bypass grafting.

Key Words: *Persistent sciatic artery; Aneurysm; Deep vein thrombosis; Femoral artery*

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Introduction

During embryological development, the sciatic nerve is supplied by the sciatic artery. A persistent sciatic artery is a rare vascular anomaly, in which this embryological axial limb vessel artery is not obliterated during development. This is an embryological representation of the internal iliac artery in the thigh that runs superficially, in close proximity, and sometimes within the sheath of sciatic nerve from the greater sciatic foramen down to the level of the knee [1-3]. Within the pelvis, it gives off superior gluteal and internal pudendal arteries. This topographical position is best for diagnosis by palpating along the sciatic nerve [4].

The sciatic nerve is the largest branch of sacral plexus and the thickest nerve in the body (2cm) with an average length of 24.3 cm [5]. It begins in the pelvis, goes through the greater sciatic foramen and inferior to the piriformis muscle, terminating at the superior angle of popliteal fossa by dividing into tibial and common peroneal nerves [6]. The tibial part is formed by ventral divisions of anterior rami of L4, L5, S1, S2, and S3. The common peroneal part is formed by dorsal divisions of anterior primary rami of L4, L5, S1, S2, and S3. The sciatic nerve innervates the muscles of the posterior thigh (hamstrings), muscles of the leg and the foot [7] making it the dominant nerve of the lower limb. It is irrigated by inferior gluteal artery, which when compromised (e.g., pressure related neuropathy), may cause paresthesia along the distribution of the sciatic nerve.

During growth and development of the lower limb bud, the principle source of blood supply comes from the sciatic artery, which involutes and redirects blood flow to the femoral artery, assuming the role by the third month of development [8-10]. In certain instances, however, the sciatic artery does not regress and continues as a prolongation of the inferior gluteal artery (Figure 1). This case is usually coupled with an abnormally developed hypoplastic superficial femoral artery. The two combinations may predispose individuals to vasculopathies, such as aneurysm formation [11-13].

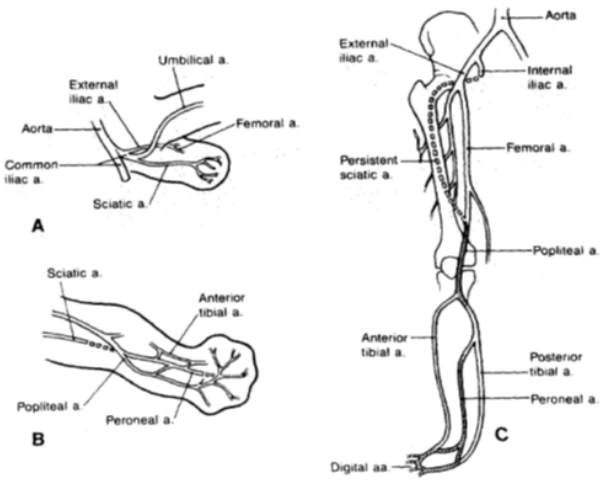

Figure 1) *Major arterial supply to the lower limb bud in early development from sciatic artery, continuation of internal iliac artery (A). After 22 mm stage, femoral artery has usually developed into major artery, making connection with popliteal artery while most of the sciatic artery regress (B). After complete development (C), remnants of sciatic artery normally persist as popliteal arteries (Shelby et al., 1993).*

Case Report

A 50-year-old female African cadaver, with unknown cause of death, was obtained by the Faculty of Medicine at Uzima University for cadaveric dissection by first year medical gross anatomy course in accordance with the Anatomy Act Cap 249, Republic of Kenya. All ethical issues were considered in writing the case report. The identity, discretion, confidentiality, and permission regarding the specimen were all maintained. Aside from the exposed carotid vessels used for primary trans-arterial perfusion by government mortuaries, there was hardly any significant surgical history observed on the cadaver. The postmortem report recovered from the hospital recorded the cadaver was a 50-year-old female of an average height and weight.

After secondary embalming, the specimen was carefully dissected in order to expose the lower limb structures. The persistent sciatic artery was discovered during dissection of the gluteal region and posterior thigh. Examination of our specimen preserved for dissection revealed an extremely large artery that passed out of the pelvis through the greater sciatic foramen, below the pirifomis muscle, and descended posteriorly with the sciatic nerve through the gluteal region (Figure 2).

Figure 2) *Legend: Black Arrow–Sciatic artery; Yellow Arrow–Sciatic Nerve; Blue Arrow–Popliteal Artery and vein Green Arrow–Tibial Nerve; Red Arrow–Common Fibular Nerve; Purple–Descending geniculate Artery BF–Biceps Femoris; ST–Semitendinosus; SM –Semimembranosus; VM –Vastus medialis; G–Gracilis (reflected).*

Discussion

Persistent sciatic artery has a silent presentation and according to Timur et al. (2006) [13], has an incidence rate of approximately 0.025%- 0.04% with a mean age diagnosis of 57 years. Gender distribution has proven almost equal with 56% being women and 44% being men based on his review of the literature [1]. 70% of persistence sciatic artery cases recorded appeared unilaterally [14]. Aneurysm development in persistence sciatic artery was found in 44% of cases [12].

Multiple classifications of persistent sciatic artery have been reported. Georgakis & Soames [15] did a cadaveric study in twenty human lower limbs from twenty cadavers. Fourteen were females aged 84 years (± 9.6) and six males aged 80 years (± 8.2). They identified at least one sciatic artery supplying the sciatic nerve in the gluteal region but with multiple variations. Twenty-eight sciatic arteries were identified. Fourteen of which rose from the medial circumflex femoral artery, eleven from the inferior gluteal artery, two from the first perforating artery, and one from the internal pudendal artery. In five lower appendages, two sciatic arteries were recorded as being independent branches from the medial circumflex femoral and inferior gluteal arteries in four limbs and separate branches of the medial circumflex femoral artery in one limb. In one limb, four sciatic arteries were observed: one from the inferior gluteal artery, two from the medial circumflex femoral artery, and one from the first perforating artery. In the remaining fourteen limbs, a single sciatic artery was observed, which in one case arose from the internal pudendal artery, a previously unreported observation [15]. Omer et al. [16] categorized these variations into Types 1,2a,2b,3,4,5a, and 5b (Table 1).

Persistent sciatic artery sometimes shows variant vascular symptoms, such as chronic or acute limb ischemia and a pulsatile mass in the buttocks caused by aneurysmal dilatation [17]. Occasionally, according to Madson et al. (1995) [18] persistent sciatic artery has been associated with other anomalies, including Mullerian and left renal agenesis, A-V fistula formation, hypertrophy or hypotrophy, multiple hemangiomata, neurofibromatosis, or anomalies

TABLE 1
Types of persistent sciatic artery

Types	Persistent sciatic artery origin	Persistent sciatic artery	Superficial femoral artery
Type 1	Internal iliac artery	Fully developed	Fully developed
Type 2	Internal iliac artery	Fully developed	Partially developed in Type 2a and absent in Type 2b
Type 3	Internal iliac artery	Partially developed; proximally	Fully developed
Type 4	Internal iliac artery	Partially developed; distally	Fully developed
Type 5	Medan sacral artery	Fully developed	Fully developed in Type 5a and Type 5b undeveloped

of leg arteries. Additionally in a case report of a 14-year-old boy by Madson et al. (1995) [18], persistent sciatic artery has been associated with gross varicosities as well as limb length discrepancies. During examination, where femoral pulse is nonexistent and there is presence of popliteal pulse (i.e. Cowie's sign persistent sciatic artery) should form part of the differential diagnosis [12-13]. It is, therefore, fundamental to analyze this abnormality adequately and prior to any surgical intervention, minimizing the risk of iatrogenic injury to the patient. This analysis can be achieved through the use of diagnostic techniques like angiography, ultrasound, computed tomography, and magnetic resonance imaging.

Conclusion

Failure of the sciatic artery to regress and continuing to supply the lower extremity in adults is an erratic vascular anomaly that may be of surgical significance. Knowledge about the persistent sciatic artery as the chief vessel into the lower limb may lead to appropriate bypass of sudden blockage of the superficial femoral artery. The persistent sciatic artery is prone to aneurysm, and this may cause critical limb ischemia as a result of thrombosis or embolization of thrombus within the abnormally enlarged vessels.

Acknowledgment

Permission was obtained from the Department of Human Anatomy of Uzima University. First year medical students at the University were present at the time of identifying the tract.

Ethical Approval

Legally, Uzima University, a medical institution, with permission from the Ministry of Health, is permitted by the Anatomy Act Cap 249 to procure unclaimed bodies for studies.

Informed Consent

The samples used were from bodies that remained unclaimed for period exceeding eight months sourced from public mortuaries of government hospitals. Acquisition warranted documention from the ministry of health, through the medical superintendent, authorizing the specimen for anatomical studies in Uzima University. Informed consent of the patient did not apply since this was a cadaveric case study. However, all ethical issues were considered in writing the case report, for example, the cadaver's identity, privacy, confidentiality were all maintained and permission to use the cadaver for our study was obtained from the Department of Anatomy of Uzima University.

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