

# Inferior Gluteal Artery Originating from the Posterior Trunk of the Internal Iliac Artery: Case Report

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## ABSTRACT

**Introduction:** Anatomically, the internal iliac artery (IIA) originates from the bifurcation of the common iliac artery, which occurs at the level of the intervertebral disc between the L5 and S1 vertebrae and from which branches arise to irrigate the viscera of the pelvis, pelvic musculoskeletal system, buttocks, perineum and medial portion of the thigh.

**Case Report:** during a study of the branches of the IIA in a male cadaver belonging to the Anatomy Laboratory of Santa Maria University Center (UNIFSM), Cajazeiras-PB, we observed an unusual anatomical variation in the origin of the right inferior gluteal artery. In the anterior division of the right IIA, we did not find the origin of the inferior gluteal artery as expected, as it originated from the bifurcation of the posterior trunk of the IIA.

**Conclusion:** in this way, we recognized one of the most unusual types of IIA according to Adachi's classification - type IIa.

**Keywords:** Anatomical variation; Internal iliac artery; Inferior gluteal artery; Pelvis.

## Introduction

The internal iliac artery (IIA) originates from the common iliac artery on bilaterally, approximately at the level of the intervertebral disc between L5 and S1 and lies anteromedial to the sacro-iliac joint. The vessel divides into an anterior and posterior trunk, which supplies the pelvic viscera, pelvic walls, perineum and gluteal region<sup>1,2</sup>. It is well established that the visceral and parietal arteries of the IIA branch in different ways, so it is important to understand the branching pattern of this artery, especially for medical practice<sup>3</sup>.

The arrangement of the branches of the IIA varies. Generally, the artery divides into an anterior and a posterior division, with the posterior division giving rise to the superior gluteal, iliolumbar and lateral sacral arteries<sup>1,2,4</sup>. The rest usually arise from the anterior division.

Knowledge of variations in the origin, course and branches of the IIA helps in the planning and performance of surgeries involving the areas supplied by the artery<sup>5,6</sup>. A high clinical value of this artery is caused by its importance during advanced gynecologic and obstetrics surgeries<sup>7</sup>. Damage to the IIA might lead to the considerable postoperative morbidity<sup>4</sup>.

Here we report a case of anatomical variation in the origin of the inferior gluteal artery from the posterior trunk of the IIA, together with the superior gluteal artery.

## Case Report

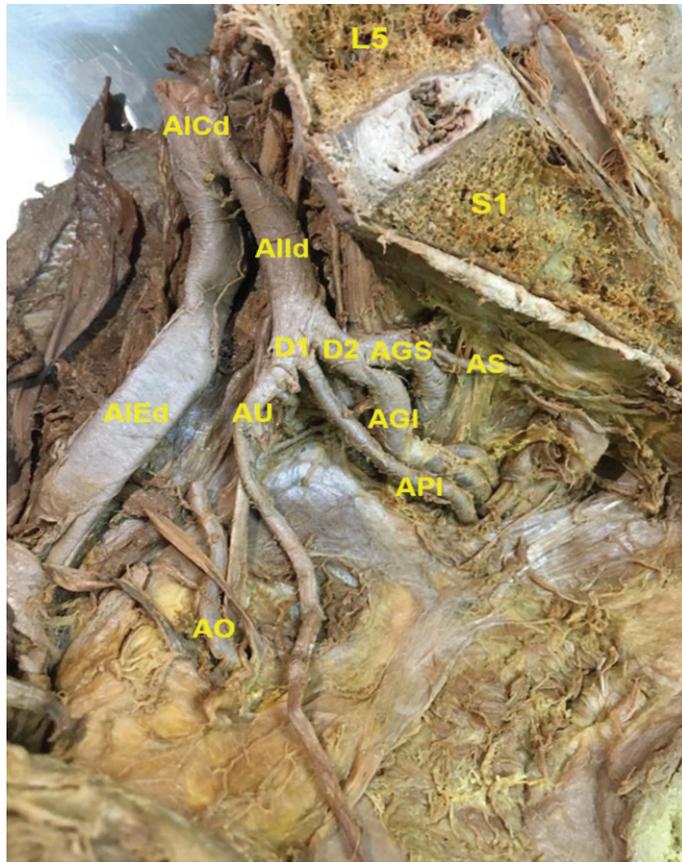
During a study of the branches of the IIA of a male cadaver belonging to the Anatomy Laboratory of Santa Maria University Center (UNIFSM), located in Cajazeiras-PB, fixed in 10% formalin, we recognized one of the most unusual types of IIA according to Adachi's classification<sup>8</sup> - type IIa.

In type IIa of Adachi's classification<sup>8</sup>, the superior and inferior gluteal arteries arise from a common trunk within the pelvis and the internal pudendal artery arises independently from another arterial trunk (Figure 1).

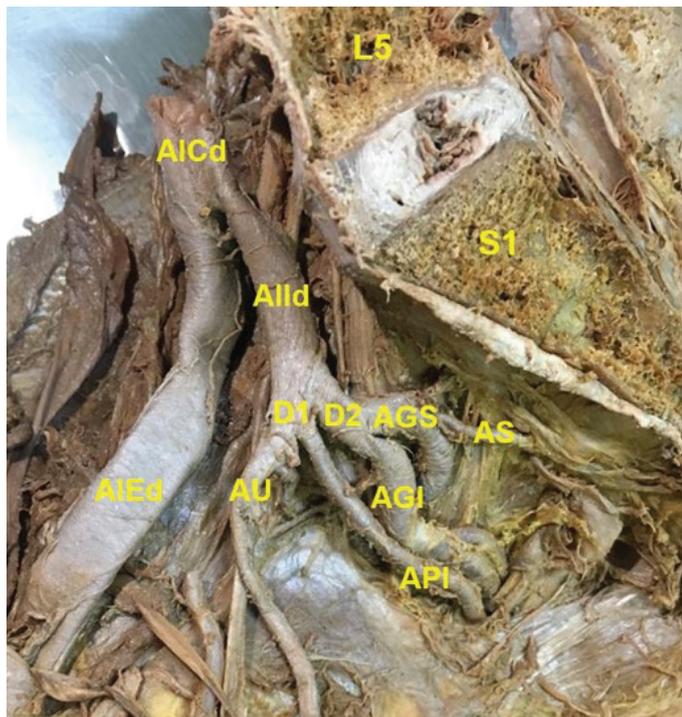
The right internal iliac artery (RIIA) was 3.19 cm long until it bifurcated into the anterior and posterior divisions. The anterior division runs anteriorly and with caudal obliquity, giving its commonly found branches, with emphasis on the absence of the inferior gluteal artery (Figure 2).

The posterior division, on the other hand, runs postero-inferiorly and extends 1.01 cm to its bifurcation in the superior gluteal artery, which runs postero-inferiorly to the greater sciatic foramen, passing above the piriformis muscle, and the inferior gluteal artery, with a postero-inferior course of 4.59 cm to the greater sciatic foramen, passing below the piriformis muscle (Figure 2).

We decided to demonstrate this type of anatomical variation in the vessels of the pelvis due to the fact that, according to Adachi's classification<sup>8</sup>, it is an unusual anatomical variation that the surgeon can observe in pelvic and sacral surgeries.



**Figure 1.** Branches of the Internal Iliac Artery.  
Caption: CIAR- Right Common Iliac Artery; EIAR- Right External Iliac Artery; IIAr- Right Internal Iliac Artery; D1- Anterior Division; OA- Obturator Artery; UA- Umbilical Artery; IPA- Internal Pudendal Artery; D2- Posterior Division; SGA- Superior Gluteal Artery; SA- Sacral Artery; IGA- Inferior Gluteal Artery; L5- Fifth Lumbar Vertebra; S1- First Sacral Vertebra.



**Figure 2.** Anatomical Variation of the Inferior Gluteal Artery.  
Caption: CIAR - Right Common Iliac Artery; EIAR - Right External Iliac Artery; IIAr - Right Internal Iliac Artery; UA - Umbilical Artery; D1 - Anterior Division; D2 - Posterior Division; SGA - Superior Gluteal Artery; IGA - Inferior Gluteal Artery; IPA - Internal Pudendal Artery; L5 - Fifth Lumbar Vertebra; S1 - First Sacral Vertebra.

### Discussion

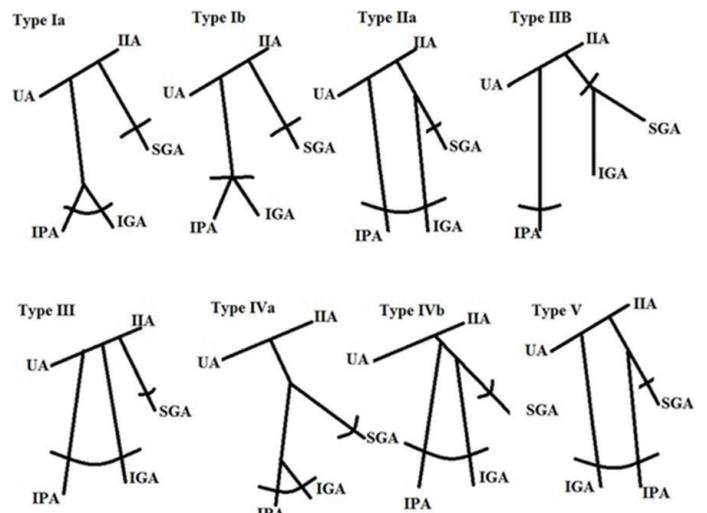
The IIA is one of the two terminal branches of the common iliac artery. The branch occurs at the level of the lumbosacral articular disc and in front of the sacroiliac joint. The artery consists of a trunk and two divisions, namely the anterior and posterior divisions. The arterial trunk descends subperitoneally in front of the sacroiliac joint and, as it approaches the superior margin of the greater ischial foramen, it divides into anterior and posterior divisions<sup>3</sup>.

The distribution pattern of the IIA implies its bifurcation into two branches, the anterior and posterior. According to previous research, the IIA can present several anatomical variations. The presence of these variations in the arteries is an important issue for the medical practice of various clinical-surgical specialties since during invasive procedures in the perineal and pelvic region these vessels can be ruptured<sup>9</sup>.

According to embryology, this artery derives from the proximal part of the umbilical artery, while the distal part of the umbilical artery is obliterated in the postnatal period. These developmental stages lead to several variations in the origin of the IIA and its branching pattern into two major trunks<sup>9</sup>.

Adachi<sup>8</sup> was the first to classify the IIA into five types based on the origins of the 4 main branches, namely the umbilical artery, the superior gluteal artery, the inferior gluteal artery and the pudendal artery, later updated by Ashley and Anson<sup>10</sup>. Although several studies on the variability of the IIA branch in different populations using the Adachi classification<sup>8</sup> types have been published, it is often at odds with observations from radiological studies<sup>11</sup>.

The classification of the IIA is based on Adachi's classification<sup>8</sup> (Figure 3):



**Figure 3.** The classification of the internal iliac artery based on Adachi's 1928 classification.  
Source: Mohammadbaigi *et al.*<sup>9</sup>  
Caption: IIA: internal iliac artery; IGA: inferior gluteal artery; IPA: internal pudendal artery; SGA: superior gluteal artery; UA: umbilical artery.

- **Type I:** the superior gluteal artery originates independently with the inferior gluteal and internal pudendal arteries, originating from a common trunk that divides inside (Type IA) or outside (Type IB) the pelvic cavity.

- **Type II:** the superior and inferior gluteal arteries originate from a common trunk, which divides inside (Type IIA) or outside (Type IIB) the pelvic cavity, with the internal pudendal artery originating independently.

- **Type III:** the superior and inferior gluteal and internal pudendal arteries originate independently from the IIA.

- **Type IV:** the superior and inferior gluteal and internal pudendal arteries originate from a common trunk.

- **Type V:** the internal pudendal and superior gluteal arteries originate from a common trunk with the inferior gluteal artery originating separately.

A study of the variability of origin of the parietal branches of the IIA showed that the inferior gluteal and internal pudendal vessels issued from a common trunk in 63.2% of cases. When the common trunk is divided within the pelvis it is classified as type IA, which was seen in 60.6%, while the bifurcation occurred below the pelvic floor in 2.6%, i.e. type Ib according to Adachi's classification<sup>3</sup>.

The success of IIA ligation is important for surgeons, as the effectiveness of ligating this artery in pelvic surgery varies from 42 to 75%. Knowledge of the anatomical variations of the IIA is essential during pelvic surgery to avoid serious intraoperative

complications. Sometimes, in the event of massive bleeding, bilateral IIA ligation is a lifesaving procedure when other measures fail, even despite possible undesirable consequences such as damage to the iliac vein or ischemic necrosis of the gluteal region. Thus, understanding the anatomical variation of the IIA is essential for surgeons to apply IIA ligation to prevent bleeding following pelvic surgeries, hysterectomies and orthopedic surgeries related to the hip joint<sup>3,4,9</sup>.

It is also of great importance in vascular surgery. Atherosclerotic lesions are frequently observed in the abdominal aorta, its branches, the common internal and external iliac arteries and at branch points. According to some studies, the lesions were mainly located in the proximal parts of the internal and external iliac arteries and there was a significant difference between the proximal and distal parts<sup>4</sup>.

## Conclusion

Success in medical surgical procedures depends on anatomical knowledge of the region to be approached, thus providing greater safety and a reduction in adverse events. Therefore, anatomical variations cannot be neglected.

In addition, knowledge of the existence of this type of anatomical variation gives us a better understanding of vascular connections and human anatomy, since its presentation, which can show some variables, is directly related to clinical-surgical practice when performing pelvic, gynecological, urological or orthopedic surgical procedures, by preventing bleeding and complications.

## References

1. Standring S, editor. Gray's Anatomy. The Anatomical Basis of Clinical Practice. 40<sup>th</sup> ed. Edinburgh: Churchill & Livingstone; 2008.
2. Moore KL, Dalley AF, Agur AMR. Anatomia orientada para a clínica. 8ª ed. Rio de Janeiro: Guanabara Koogan; 2019.
3. Nayak SB, Guru A, Reghunathan D, et al. Clinical importance of a star shaped branch of internal iliac artery and unusual branches of an abnormal obturator artery: rare vascular variations. J Vasc Bras 2016;15(2):168-72.
4. Yevstifeieva A, Krzeszowiak J, Lastovetskyi I, Mazurek A. Variations in branching patterns of internal iliac artery according to Adachi's classification - Literature review and presentation of a case. Transl Res Anat 2021;24:100119.
5. Naveen NS, Murlimanju BV, Vishal Kumar, et al. Morphological analysis of the human internal iliac artery in South Indian population. Online J Health Allied Sci 2011;10(1):1-4.
6. Sakthivelavan S, Aristotle S, Sivanandan A, Sendiladibban S, Felicia Jebakani C. Variability in the branching pattern of the internal iliac artery in Indian population and its clinical importance. Anat Res Int 2014;2014:597103.
7. El-Agwany AS. Retroperitoneal Major Pelvic Arteries' Anatomic Variation: Pictorial Essay and Significance in Obstetrical and Gynecological Surgery. Indian J Surg Oncol 2020;11(Suppl 1):65-68.
8. Adachi B. Das Arteriensystem der Japaner. Die Kaiserlich Japanische Universitat zu Kyoto, Kyoto: Maruzen 2, p. 136-42, 1928.
9. Mohammadbaigi H, Darvishi M, Moayeri A. Variations of anterior and posterior division of internal iliac artery: A systematic review and clinical implications. Biomed Res Ther 2019;6(5):3189-3206.
10. Ashley FL, Anson BJ. The hypogastric artery in American whites and Negroes. Am J Phys Anthropol 1941;28:381-395.
11. Al Talalwah W. Internal iliac artery classification and its clinical significance. Clasificación de la arteria iliaca interna y su significación clínica. Rev Argent Anat Clín 2016;6(2):63-71.

## Mini Curriculum and Author's Contribution

1. Bianca Caldeira Leite: writing of the manuscript and orthographic revision of the manuscript.
2. Maria Helena Lima Pinheiro: discussion of the results and writing of the manuscript.
3. Hiago Carvalho Montenegro: discussion of the results and writing of the manuscript.
4. Ana Luiza Batista Cavalcanti: discussion of the results and writing of the manuscript.

5. Rodrigo Quirino Nascimento: discussion of the results and writing of the manuscript.
  6. Victória Sampaio Moreira: discussion of the results and writing of the manuscript.
  7. Jalles Dantas de Lucena: discussion of the results and writing of the manuscript, conception and design of the study.
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