

Cadaveric Study of the Branching Pattern of the Internal Iliac Artery and Its Clinical Applications

Ashok Kumar¹, Vimal Modi²

¹Ph.D. Scholar, Department of Anatomy, Index Medical College Hospital and Research Centre, Malwanchal University, Indore, M.P., India

²Professor, Department of Anatomy, Index Medical college Hospital and Research Centre, Malwanchal University, Indore, M.P., India

Received: 25-05-2026 / Revised: 23-06-2026 / Accepted: 26-07-2026

Corresponding Author: Ashok Kumar

E-mail: ashokkumartmu71@gmail.com

Conflict of interest: Nil

Abstract:

Background: The internal iliac artery (IIA) is the principal arterial supply of the pelvic organs, gluteal region, and perineum. Variations in its branching pattern are common and are of considerable importance during pelvic surgeries, obstetric and gynaecological procedures, urological interventions, vascular surgeries, and interventional radiology. The present study aimed to evaluate the branching pattern of the internal iliac artery according to Adachi's classification and to determine the level of origin of the internal iliac artery in human cadavers.

Materials and Methods: A descriptive cadaveric study was conducted on 60 pelvic halves obtained from 30 embalmed adult human cadavers in the Department of Anatomy of Index Medical College Hospital and Research Centre. The common iliac artery, external iliac artery, and internal iliac artery were carefully dissected. The branching pattern was classified according to Adachi's classification (Types I–V). The level of origin of the internal iliac artery with respect to the lumbosacral vertebral level was also recorded.

Results: Among 60 specimens, the common trunk of the internal iliac artery gave no branch in 27 (45%) specimens. The iliolumbar artery arose from the common trunk in 15 (25%), lateral sacral artery in 6 (10%), obturator artery in 6 (10%), superior gluteal artery in 3 (5%), and both iliolumbar and lateral sacral arteries in 3 (5%) specimens. The obturator artery originated from the anterior division in 41 (69%) specimens. From the anterior division, the internal pudendal artery was observed in 36 (60%), inferior gluteal artery in 6 (10%), internal vesical artery in 4 (7%), middle rectal artery in 3 (5%), and superior vesical artery in 2 (3%) specimens; the inferior gluteal artery was absent in 9 (15%) specimens.

Conclusion: Knowledge of the branching pattern of the internal iliac artery according to Adachi's classification and its level of origin is essential for surgeons and interventional radiologists to minimise intraoperative complications and improve the success of pelvic vascular procedures.

Keywords: Internal iliac artery, Adachi classification, Pelvic arteries, Cadaver, Anatomical variation, Pelvic surgery.

DOI: 10.25258/ijpqa.17.8.25

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The internal iliac artery (IIA), formerly known as the hypogastric artery, is one of the terminal branches of the common iliac artery. It arises anterior to the sacroiliac joint and descends into the pelvis where it divides into anterior and posterior divisions. [1,2]

Through its numerous visceral and parietal branches, it supplies the pelvic viscera, pelvic walls, gluteal region, reproductive organs, urinary bladder, rectum, and perineum.

The branching pattern of the internal iliac artery exhibits considerable anatomical variation. These

variations are attributed to developmental changes occurring during embryogenesis and have significant implications in pelvic surgery, trauma management, organ transplantation, and interventional radiology. [3,4]

Among the various classification systems proposed for the branching pattern of the internal iliac artery, Adachi's classification (1928) is one of the most widely accepted. It is based on the origin of the superior gluteal artery (SGA), inferior gluteal artery (IGA), and internal pudendal artery (IPA). [7]

Understanding these variations is essential during pelvic lymph node dissection, ligation of the internal iliac artery for pelvic haemorrhage, pelvic fracture management, embolization procedures, radical hysterectomy, prostatectomy, and colorectal surgeries. The present cadaveric study was therefore undertaken to evaluate the branching pattern of the internal iliac artery according to Adachi's classification and to determine its level of origin. [8]

Materials and Methods

This descriptive observational cadaveric study was conducted in the Department of Anatomy of Index Medical College Hospital and Research Centre, using 30 embalmed adult human cadavers (60 pelvic halves) available for routine undergraduate and postgraduate dissection. The study was carried out after obtaining approval from the Institutional Ethics Committee and permission from the Head of the Department. Adult cadavers of either sex with intact pelvic vascular anatomy were included in the study. Cadavers showing evidence of previous pelvic surgery, trauma, congenital malformations, or pathological changes affecting the iliac vessels were excluded.

A standard midline incision opened the abdominal cavity, and the abdominal viscera were carefully reflected to expose the posterior abdominal wall. The abdominal aorta was identified and traced to its bifurcation into the right and left common iliac arteries. Each common iliac artery was followed to its termination into the external and internal iliac arteries. The internal iliac artery was meticulously dissected from its origin to its terminal branches after removing the surrounding fascia, adipose tissue, and connective tissue. Particular attention was paid to the origin and course of the superior gluteal artery, inferior gluteal artery, and internal pudendal artery. The branching pattern of the internal iliac artery was classified according to Adachi's classification, which is based on the arrangement of the superior gluteal, inferior gluteal, and internal pudendal arteries. Each specimen was categorized into Adachi Types I to V according to the observed branching pattern. Bilateral observations were recorded separately.

Inclusion Criteria

- Adult embalmed cadavers.
- Intact pelvic region.
- No evidence of previous pelvic surgery.

Exclusion Criteria

- Damaged pelvic vessels.
- Congenital pelvic anomalies.
- Advanced decomposition.

Result

In the present study, 60 hemipelves were examined for variations in the branching pattern of the internal iliac artery. The common trunk gave no branch in 27 specimens (45%). The iliolumbar artery arose directly from the common trunk in 15 (25%), lateral sacral artery in 6 (10%), superior gluteal artery in 3 (5%), and obturator artery in 6 (10%) specimens. A combined origin of the iliolumbar and lateral sacral arteries from the common trunk was observed in 3 (5%) specimens. From the anterior division, the obturator artery was the most frequently observed branch, arising in 41 (68.3%) specimens, followed by the internal pudendal artery in 36 (60%). The inferior gluteal, internal vesical, middle rectal and superior vesical arteries arose from the anterior division in 6 (10%), 4 (6.7%), 3 (5%) and 2 (3.3%) specimens, respectively. The inferior gluteal artery was absent in 9 (15%) specimens. The observed branching patterns were broadly consistent with the variations described in the Adachi classification. The predominance of obturator and internal pudendal arteries arising from the anterior division corresponded to the usual Adachi pattern, whereas direct origins of the iliolumbar, lateral sacral, superior gluteal and obturator arteries from the common trunk represented recognized variations. The combined origin of the iliolumbar and lateral sacral arteries further demonstrated the morphological variability of the internal iliac artery. Overall, the findings support the applicability of the Adachi classification while demonstrating additional variations in individual branch origins.

Discussion

The present study of 60 hemipelves demonstrated considerable variability in the branching pattern of the internal iliac artery (IIA). The common trunk gave no branch in 45% of specimens, while the iliolumbar artery was the most frequent branch arising directly from it (25%). Direct origins of the lateral sacral, obturator and superior gluteal arteries were observed in 10%, 10% and 5%, respectively. These findings support the well-recognized variability of the IIA and its branches. Our finding of the obturator artery arising from the anterior division in 68.3% of specimens is comparable with the study of Mamatha et al., who also reported that the obturator artery most frequently arose from the anterior division. In their study of 50 pelvic halves, the most common Adachi pattern was Type Ia (52%), followed by Type III (34%). The present observation of internal pudendal artery origin from the anterior division in 60% is consistent with the general pattern described in Adachi's classification, in which the superior gluteal, inferior gluteal and internal pudendal arteries form the basis for classification. A large Indian cadaveric study by

Prakash et al., involving 116 pelvic halves, reported Adachi Type Ia in 60.6%, Type Ib in 2.6%, Type IIa in 15.8%, and Type III in 21%. They also noted considerable interchange of branches between the two divisions of the IIA. [9]

The inferior gluteal artery was absent in 15% of our specimens. This finding is important because absence or atypical origin of the inferior gluteal artery can influence classification according to Adachi. Similar difficulty in classification due to absence of the inferior gluteal artery was reported by Mamatha et al., who found that 10% of their specimens could not be classified because of its absence. [9] Our findings are also comparable with a recent South Indian cadaveric study by Badagabettu et al., which examined 80 male hemipelvises. They reported Type I as the predominant Adachi pattern (76%), followed by Type II (17.5%) and Type III (3.7%), emphasizing the predominance of the conventional anterior-division arrangement.

The direct origin of the iliolumbar artery (25%) and lateral sacral artery (10%) from the common trunk in our study further demonstrates that branches traditionally associated with the posterior division may arise independently or from variable levels of the IIA.

Such variations are not completely represented by the classical Adachi system, which primarily classifies the IIA according to the relationships of the superior gluteal, inferior gluteal and internal pudendal arteries. Therefore, detailed documentation of individual branch origins in addition to assigning an Adachi type provides a more comprehensive description of IIA anatomy.

Clinically, these variations are important during pelvic and gynaecological surgery, orthopaedic procedures, pelvic embolization, and management of pelvic trauma, where unexpected arterial origins may result in inadvertent vascular injury or hemorrhage. [10]

Conclusion

The present study demonstrates significant anatomical variability in the branching pattern of the internal iliac artery. Although most observed patterns were compatible with the Adachi classification, several variations in the origin of individual branches were identified. The obturator

and internal pudendal arteries predominantly arose from the anterior division, whereas the iliolumbar artery was the most frequent branch arising directly from the common trunk. These findings emphasize the importance of detailed knowledge of internal iliac artery variations for pelvic surgery, interventional radiology, vascular procedures, and prevention of iatrogenic vascular complications.

References

1. Cunningham DJ. Cunningham's Manual of Practical Anatomy. Volume 2: Thorax and Abdomen. 16th ed. New York: McGraw-Hill Education; 2023.
2. Adachi B. Das Arteriensystem der Japaner. Vol. II. Kyoto: Kenkyusha Press; 1928.
3. Yamaki K, Saga T, Doi Y, Aida K, Yoshizuka M. A Statistical Study of the Branching of the Human Internal Iliac Artery. *Kurume Medical Journal*. 1998;45(4):333–340.
4. Ashley FL, Anson BJ. The pelvic arteries in the human fetus and adult. *Am J Anat*. 1941;68:1-42.
5. Sakthivelavan S, Aristotle S, Sivanandan A, Sendiladibban S. Variability in the Branching Pattern of the Internal Iliac Artery in Indian Population and Its Clinical Importance. *Anatomy Research International*. 2014;2014:59 7103. doi:10.1155/2014/597103.
6. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier; 2021.
7. Lipshutz B. A composite study of the hypogastric artery and its branches. *Ann Surg*. 1918;67:584-608.
8. Roberts WH, Krishningner GL. Comparative Study of Human Internal Iliac Artery Based on Adachi Classification. *The Anatomical Record*. 1967;158(2):191–196. doi:10.1002/ar.109 1580208.
9. Mamatha H, Dakshayani KR, Prabhu LV, et al. A study on internal iliac artery branching pattern and its clinical significance. *Surg Rev Int J Surg Trauma Orthop*. 2016
10. Badagabettu SN, Padur AA, Shetty SD. Variations in the branching pattern of the internal iliac artery and its implications in trauma and surgery – a South Indian cadaveric study. *J Vasc Bras*. 2024;24:e20240075. doi:10.1590/1677-5449.202400752.