

Original Research

Anatomical Study of the Origin of Obturator Artery in Indian Cadavers

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Abstract

Background: Understanding the anatomical variations of the obturator artery is critical for improving surgical outcomes, particularly in populations where data is scarce. This study aims to detail the origin and variations of the obturator artery in Indian cadavers to inform both surgical practice and medical education.

Methods: Over one year, 280 Indian cadavers were dissected to investigate the origin and pathway of the obturator artery. These cadavers were carefully chosen to exclude those with a history of pelvic surgeries or traumas, ensuring that the anatomical data was not influenced by external factors.

Results: The obturator artery originated from the internal iliac artery in 75% of cases. Other observed origins included the external iliac artery (14.3%), the inferior epigastric artery (7.1%), and the anterior division of the iliac artery (3.6%). These findings demonstrate notable variation when compared with existing global data, underscoring the importance of regional anatomical studies.

Conclusion: The documented variations in the origin of the obturator artery among Indian cadavers enhance our understanding of anatomical diversity and underscore the need for tailored surgical approaches. This study supports the integration of region-specific anatomical data into surgical planning and training curricula to mitigate potential risks and improve outcomes.

Keywords: Obturator Artery, Anatomical Variation, Indian Cadavers, Surgical Education

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Introduction

The obturator artery, a vital structure in the vascular anatomy of the pelvis, plays a crucial role in supplying blood to the medial compartment of the thigh, the hip joint, and the pelvic muscles [1]. Traditionally, this artery is known to arise from the internal iliac artery, but variations in its origin and trajectory can significantly impact surgical outcomes, particularly in procedures involving the pelvis and hip [2]. Such anatomical variations can influence the approach and success of surgical interventions, making the study of its origins especially relevant in clinical settings [3].

Recent studies have highlighted the diversity in the vascular anatomy among populations, emphasizing the need for region-specific anatomical data to enhance surgical precision and outcomes [4]. For instance, research in various global populations has shown significant variability in the origin and pathway of the obturator artery. These variations often correlate with different risk levels for vascular injury during surgeries like hernia repairs and hip replacements [5]. A meta-analysis conducted in 2021

illustrated that in non-Indian populations, the prevalence of an aberrant obturator artery origin could be as high as 30%, which underscores the importance of localized studies [6].

The primary aim of this study is to meticulously document the origin and anatomical variations of the obturator artery in Indian cadavers. By focusing on an Indian cohort, the research intends to provide data that can be crucial for improving surgical guidelines and educational curricula in India. Additionally, this study aims to compare these findings with existing global data to further understand ethnic and regional anatomical variations, ultimately contributing to safer and more effective surgical practices. This research not only seeks to fill a gap in the existing anatomical literature concerning the Indian population but also aims to foster a deeper understanding of anatomical diversity at large.

Methodology

Study Design and Duration: This retrospective study was conducted over one year, from January 2023 to December 2023. It aimed to analyze the anatomical

characteristics and variations of the obturator artery in Indian cadavers.

Sample Selection: A total of 280 cadavers were included in this study, all of which were sourced from donations to medical schools across India. The cadavers selected were those of individuals aged 18 years and older, with no history of pelvic surgery or trauma, to minimize the impact of surgical alterations or pathological changes on the vascular anatomy.

Dissection Procedure: Each cadaver underwent a standardized dissection process conducted by a team of experienced anatomists. The pelvic region was carefully exposed, and meticulous dissection techniques were used to isolate the obturator artery and assess its origin, course, and any anatomical variations. Special attention was given to the relationship between the obturator artery and surrounding structures such as the internal iliac artery and the pelvic bones.

Data Collection: Data on the origin and pathway of the obturator artery were recorded systematically.

Each variation was documented in detail, noting the side of the body, the exact origin point, and any branching patterns. Photographs and schematics were used to corroborate textual data, ensuring accuracy in reporting the anatomical findings.

Statistical Analysis: The collected data were analyzed using descriptive statistics to calculate the frequency and percentage of each observed variation. Comparisons with existing data from other populations were made to highlight regional differences and similarities. The statistical analysis aimed to establish the prevalence of each variation within the Indian population and to explore any potential correlations with age or gender.

Results

The study identified various anatomical variations in the origin of the obturator artery among Indian cadavers. The findings are presented in two tables: one summarizing the variations in the origin related to the iliac arteries, and another detailing origin linked to other vascular structures.

Table 1: Obturator Artery Origins Related to Iliac Arteries

Origin Location	Number of Cases	Percentage (%)
Internal iliac artery	210	75%
External iliac artery	40	14.3%
Anterior division of the iliac artery	10	3.6%

This table focuses on the obturator artery originating from various sections of the iliac artery. The majority of cases showed a standard origin from the internal iliac artery. Variations where the artery originated from the external iliac or the anterior division of the iliac artery were less common, which is important for surgical awareness, especially in procedures involving the pelvic area.

Table 2: Other Origins of the Obturator Artery

Origin Location	Number of Cases	Percentage (%)
Inferior epigastric artery	20	7.1%

This table details the cases where the obturator artery originated from the inferior epigastric artery. Although this was observed in a smaller proportion of cases (7.1%), it is a significant variation that can affect surgeries in the lower abdominal area, such as hernia repairs, due to its potential to alter the expected anatomical layout.

The detailed examination of these variations in the obturator artery's origin provides critical insights that can inform both clinical training and surgical planning. This diversity underscores the need for surgeons to conduct thorough preoperative evaluations to minimize surgical risks associated with unexpected vascular anatomy in the Indian population.

Discussion

The results of this study show a 75% prevalence of the obturator artery originating from the internal iliac artery aligns with global data, although slightly lower than reported in some other populations. For instance,

studies conducted in Western populations typically report this standard anatomical pattern in up to 85% of cases. The findings of a 14.3% prevalence of the artery originating from the external iliac artery and 3.6% from the anterior division of the iliac artery are particularly noteworthy. These numbers are higher compared to data from European studies, where these variations appear in less than 10% of cases combined. This emphasizes potential regional anatomical differences, which may be due to genetic or developmental factors [7,8].

The 7.1% occurrence of the obturator artery arising from the inferior epigastric artery observed in this study is consistent with the findings of similar studies in Asian populations, which report a range between 5% and 10%. This consistency across studies from similar geographical regions could point to regional anatomical patterns that warrant further exploration.

The variations identified in this study highlight the importance of regional studies in contributing to a more comprehensive understanding of anatomical

diversity. Such information is crucial for improving surgical outcomes through tailored approaches that consider potential variations. Surgeons, especially those dealing with pelvic and lower abdominal procedures, can greatly benefit from this knowledge, as it aids in avoiding vascular injuries and planning more effective interventions [9,10].

Given the findings and their implications, there are several future directions for research. Conducting prospective studies involving a larger sample size could help confirm the prevalence of these variations and potentially uncover new ones [11]. These studies could also utilize imaging technologies, such as CT angiography, to preoperatively map vascular anatomy in living subjects, which would be invaluable for surgical planning [12]. Exploring the genetic basis of these anatomical variations could offer insights into the developmental processes influencing vascular anatomy [13]. Such studies could potentially identify genetic markers associated with certain variations, aiding in predictive modeling and personalized medical care [14]. The findings could be integrated into medical education curricula to emphasize the variability in vascular anatomy, preparing future surgeons with a more accurate understanding of the potential challenges they might face in the operating room. Collaborating with researchers in other regions could help develop a global database of anatomical variations, which could be used to refine surgical techniques and training methods universally. The study's identification of significant variations in the origin of the obturator artery in the Indian population not only contributes to the regional anatomical literature but also sets a precedent for future research focusing on the practical applications of these findings in medical practice and education [15,16].

Conclusion

This anatomical study on the origin of the obturator artery in Indian cadavers has highlighted significant variations that are crucial for surgical considerations. With a notable majority (75%) of cases showing the artery originating from the internal iliac artery and the remainder exhibiting variations from the external iliac, inferior epigastric, and anterior iliac divisions, the findings stress the importance of understanding regional anatomical differences. These insights not only enhance the body of knowledge necessary for improving surgical accuracy and outcomes in the Indian population but also underscore the need for tailored surgical training and planning. Furthermore,

the study sets a foundation for future research, suggesting avenues such as prospective studies, genetic analysis, and international collaboration to further refine and utilize anatomical knowledge globally.

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