

## ORIGINAL RESEARCH

# A Morphometric Study of Common Iliac Artery, Internal Iliac Artery and External Iliac Artery at SMS Medical College, Jaipur

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### ABSTRACT

**Introduction:** The right and left common iliac arteries are the two terminal direct branches of abdominal aorta. Similarly internal iliac artery and external iliac artery are the two terminal branches of the common iliac arteries supplying the pelvis and the lower extremities. The present study is an observational analysis of morphometry of Common iliac artery (CIA), internal iliac artery (IIA) and external iliac artery (EIA) in human cadavers.

**Materials and Methods:** Thirty formalin fixed cadavers were dissected in the Department of Anatomy, SMS Medical College, Jaipur. The abdominal aorta, common iliac arteries, internal iliac arteries and external iliac arteries were exposed with fine dissection and their lengths were measured. The statistical analysis was done by excel.

**Results:** The average length of the right common iliac artery was 6.07 cm ( $\pm 0.97$ ) and that of the left common iliac artery was 5.53 cm ( $\pm 1.18$ ) in males (n=21). In females (n=9) the average length of the right common iliac artery was 4.07 cm ( $\pm 0.9$ ) and of the left common iliac artery was 4.44 cm ( $\pm 1.13$ ). The average lengths of right and left internal iliac arteries in males were 3.65 cm ( $\pm 0.96$ ) and 4.14 cm ( $\pm 1.0$ ) respectively. Similarly, the average lengths of right and left internal iliac arteries in females were 4.33 cm ( $\pm 0.78$ ) and 4.6 cm ( $\pm 2.49$ ) respectively. The average lengths of right external iliac arteries in male and female (9.27 cm  $\pm 1.37$  and 10.73 cm  $\pm 2.49$  respectively) cadavers were more than the average length of left external iliac arteries in both male and female (8.76 cm  $\pm 1.06$  and 10.27 cm  $\pm 3.1$  respectively) cadavers. No statistical difference was observed in CIA, IIA and EIA lengths between males and females.

**Conclusions:** The knowledge of the morphometric and morphological anatomy of the of major vessels of lower abdomen and pelvis is of great clinical significance. The course, length or branching pattern of these vessels are having their clinical impact based on the prior proper knowledge. The interventional radiologists and vascular surgeons should be aware of this knowledge.

**Key words:** Common Iliac, External Iliac, Internal Iliac, Anatomy, Morphology, Morphometry.

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### INTRODUCTION

Common iliac artery (CIA) is the terminal branch of abdominal aorta and begins at the level of the lower part of the body of the 4th lumbar vertebra. Each common iliac artery then runs obliquely and laterally towards pelvic margin, where it divides into external and internal iliac artery usually at the level of the intervertebral disc between the sacrum and the 5<sup>th</sup> lumbar vertebra<sup>1</sup>. The right CIA is slightly longer than the left CIA and in most of the cases as it has to traverse a more oblique course across the L5 vertebral

body. The right CIA is in lateral relation to the inferior vena cava, the right common iliac vein (CIV) and the ipsilateral Psoas Major muscle. The left CIA is related laterally only to the left Psoas Major muscle and is medial to the left CIV<sup>1,4,6</sup>. Both Common iliac arteries do not give lateral branches except in a few cases described where the testicular arteries were originated from the CIAs (< 1%)<sup>5</sup>. The CIA bifurcates at the point, which varies, and gives two terminal branches Internal and External iliac arteries. In most of cases the left CIA divides at a lower level than the right

CIA. the length of these arteries is having significant morphometric variations and should be acknowledged<sup>6,7</sup>.

Knowledge of these morphometric variations is important in general as well as vascular surgeries where the main trunk or branches need to be ligated<sup>8</sup>. Other clinical aspect like radiodiagnosis, radiological interventions, minimally invasive urologic and gynaecologic surgeries may also get benefits from the morphometric knowledge of variations of these major pelvic arteries.

Hence, aim of the present study is to find and present the morphometric variations as well as to examine the existence of statistically significant correlations between distances or sexes regarding measurements of Common iliac, internal iliac and external iliac arteries in western India.

## MATERIALS AND METHODS

Thirty embalmed cadavers were dissected during medical undergraduate and postgraduate teaching over the period of 3 years in the department of anatomy, Sawai Mansingh medical college, Jaipur. Out of these 21 pairs were from male cadavers and 9 from female cadavers. Fine dissection of lower abdomen and pelvic region of these human cadavers were done to expose the common iliac arteries which were then traced down to their point of bifurcation into the internal iliac artery and external iliac artery. Furthermore, tracing of the internal iliac artery to the point of its terminal branches into anterior and posterior divisions was done on both sides (Fig 1). In cases where the internal iliac artery was having variant branches, the termination was considered the point where the superior gluteal artery was given off, according to Adachi classification<sup>9</sup>. External iliac artery was exposed till inguinal ligament where it continued to become femoral artery. Common iliac artery, internal iliac artery and external iliac artery of both sides were included in the present study and measured. These arteries were measured from origin to termination by using threads and vernier callipers (Fig 2). A correlation was established between length of right and left common iliac arteries and also between common iliac artery and internal iliac artery of both sides. All the statistical analysis was done by excel.

## RESULTS

In all 30 cases studied both CIA didn't give any branch except the normal terminal branches (Table 1). In all cases the iliac artery originated from the common iliac artery. The average length of the right common iliac artery in males (n=21) was 6.07 cm ( $\pm$  0.97) and that of the left common iliac artery was 5.53 cm ( $\pm$  1.18). In

females (n=9) the average length of the right common iliac artery was 4.07 cm ( $\pm$  0.9) and of the left common iliac artery was 4.44 cm ( $\pm$  1.13). The average lengths of right and left internal iliac arteries in males were 3.65 cm ( $\pm$  0.96) and 4.14 cm ( $\pm$  1.0) respectively. Similarly, the average lengths of right and left internal iliac arteries in females were 4.33 cm ( $\pm$  0.78) and 4.6 cm ( $\pm$  2.49) respectively. The average lengths of right external iliac arteries in male and female (9.27 cm  $\pm$  1.37 and 10.73 cm  $\pm$  2.49 respectively) cadavers were more than the average length of left external iliac arteries in both male and female (8.76 cm  $\pm$  1.06 and 10.27 cm  $\pm$  3.1 respectively) cadavers. No statistical difference was observed between iliac arteries of male and female (Table 2).



**Fig 1: Measuring internal iliac artery. Abdominal aorta (AA), Common iliac artery (CIA), External Iliac artery (EIA), Internal iliac artery (IIA), \* posterior division of internal iliac artery, @ anterior division of internal iliac artery**



**Fig 2: Measuring right common iliac artery. Inferior vena cava (IVC), Abdominal aorta (AA), Left common iliac artery (LCIA), External Iliac artery (EIA), Internal iliac artery (IIA)**

**Table 1: Measurements of common iliac arteries (CIA), internal iliac artery (IIA), external iliac artery (EIA).**

Data (n=30)	RIGHT CIA (in cm)	LEFT CIA (in cm)	RIGHT IIA (in cm)	LEFT IIA (in cm)	RIGHT EIA (in cm)	LEFT EIA (in cm)
Minimum	2.9	2.9	2.4	2.4	7.8	7.8
Maximum	7.1	7.6	5.2	7.9	12.3	14.4
Average	5.47	5.19	3.86	4.28	9.71	9.21
Std Dev	1.32	1.26	0.95	1.56	1.59	1.98

**Table 2: Statistical data of common iliac arteries (CIA), internal iliac artery (IIA), external iliac artery (EIA).**

Data (n=30)	RIGHT CIA (in cm)	LEFT CIA (in cm)	RIGHT IIA (in cm)	LEFT IIA (in cm)	RIGHT EIA (in cm)	LEFT EIA (in cm)
<b>MALE (N=21)</b>						
Minimum	4.1	3.8	2.4	2.4	7.8	7.8
Maximum	7.1	7.6	5.2	5.8	12	10.9
Average	6.07	5.53	3.65	4.14	9.27	8.76
Std dev	0.97	1.18	0.96	1	1.37	1.06
<b>FEMALE (N=9)</b>						
Minimum	2.9	2.9	3.4	2.6	8.6	8
Maximum	4.9	5.2	5.2	7.9	12.3	14.4
Average	4.07	4.4	4.33	4.6	10.73	10.27
Std dev	0.9	1.13	0.78	2.49	1.66	3.1

## DISCUSSION

The knowledge of the morphometric and morphological anatomy of the of major vessels of lower abdomen and pelvis is of great clinical significance. In a study of E. Panagouli et al aimed to examine the morphometric features of the common iliac arteries, the findings revealed that the mean length of the left CIA was 6.12 cm, while the right CIA had a mean length of 6.03 cm. In the present study the mean length of the left CIA was 5.19 cm and of the right CIA was 5.47 cm. The measurements found in our study were lesser than the study of E. Panagouli et al as the average height is also an important factor in the length of these great vessels of abdomen and pelvis. Additionally, a strong correlation was found between the lengths of the left and right CIA in the dissected cadavers.

The internal iliac artery supplies the pelvic organs, along with the osseous and muscular components of pelvic walls. IC Fatu et al conducted a study of statistical analysis of the internal iliac artery and its branches compared to the data recorded in the literature and point out differences in length and calibre between males and females. No other study was found with the morphometric analysis of external iliac artery.

In present study there were differences in CIA, IIA and EIA lengths between males and females but these differences were not statistically significant. These finding were similar to the study of E Panagouli et al in the context of CIA and are in accordance with the study of IC Fatu et al which was on IIA. Morphometric studies of CIA, IIA and EIA are still few in number. Thus, authors suggest that more studies should be done to analyse the ethnic variations in length and calibre of

CIA, IIA and EIA. Similar studies can be planned radiologically on live cases and can be compared to the cadaveric studies.

## CONCLUSION

The repeated anatomical study of major arteries of the human and the pelvic vessels needs to be conducted as these studies are important to empower a vascular surgeon and an intervention radiologist with the knowledge to produce a better outcome. The literature showing the morphometric data about common, internal and external iliac arteries are less in number though the knowledge of which is essential in vascular surgery and interventional radiology. In future studies can be conducted with a larger sample to demonstrate the statistical significance of different arterial length correlations on a bigger sample on cadaveric as well living samples with the involvement of radiology.

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