International Journal of Anatomy and Research,
Int J Anat Res 2014, Vol 2(2):375-79. ISSN 2321- 4287

Original Article

STUDY OF POSTERIOR DIVISION OF INTERNAL ILIAC ARTERY

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ABSTRACT

Background: The internal iliac artery originates from the common iliac artery at the level of sacroiliac joint. The internal iliac artery descends posterior to the greater sciatic foramen thereby dividing into anterior and posterior divisions. The posterior division of the internal iliac artery is known to give rise to three main branches i.e. iliolumbar artery, lateral sacral artery. Accidental haemorrhage is common during erroneous interpretation of anomalous blood vessels. The knowledge of the normal and the abnormal anatomy of the branches of the internal iliac artery is essential for obstetric surgeons.
Methods: 50 adult human pelvic halves were procured from embalmed cadavers of J.J.M. Medical College and S.S.I.M.S & R.C, Davangere, Karnataka, India for the study.
Results: Out of 50 specimens, ilio-lumbar artery took origin from posterior division, directly in 22 specimens (44%), with obturator artery in 5 specimens (10%) and with superior gluteal artery in 2 specimens (4%). From anterior division, with obturator artery in 6 specimens (12%) and with inferior gluteal artery in 1 specimen (2%). From common trunk, as direct branch in 10 specimens (20%), with lateral sacral artery in 1 specimen (2%), with vertebral branch in 1 specimen (2%), with superior gluteal artery in 1 specimen (2%) and was found to be absent in 1 specimen (2%). Posterior division of internal iliac artery given origin directly to superior gluteal artery in 44 specimens (88%), with ilio-lumbar artery in 1 specimen (2%), with obturator artery in 2 specimens (4%). Lateral sacral artery from posterior division was observed in 38 specimens (76%) and unpaired origin was observed in 7 specimens (14%).
Conclusion: Internal iliac artery supplies the pelvic viscera and musculature the knowledge of its branches helpful in pelvis surgeries.
KEYWORDS: Internal iliac artery , Superior Gluteal artery, Lateral sacral artery, Ilio lumbar artery.

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Access this Article online

Quick Response code

Web site: International Journal of Anatomy and Research
ISSN 2321-4287
www.ijmhr.org/ijar.htm

Received: 17 April 2014
Peer Review: 17 April 2014 Published (O):31 May 2014
Accepted: 12 May 2014 Published (P):30 June 2014

INTRODUCTION

In general, arteries pursue the shortest and the most direct course in order to reach their objective and that this course is partly determined by mechanical convenience. The angle at which branches leave a main arterial stem certainly depends to a considerable extent on haemodynamic factors. The internal iliac artery is the artery of the pelvis. It supplies most of the blood to the pelvic viscera.

Bilateral internal iliac artery ligation is an effective life saving method to control obstetrical and gynaecological haemorrhage and avoids a hysterectomy[1].

Internal iliac artery, approximately 4 cm long, begins at the common iliac bifurcation, level with the lumbosacral intervertebral disc and anterior to the sacroiliac joint. It descends posteriorly to the superior margin of the greater

sciatic foramen where it divides into an anterior trunk, which continues in the same line towards the ischial spine and a posterior trunk, which passes back to the greater sciatic foramen. The branches of the posterior trunk of the internal iliac artery are the iliolumbar, lateral sacral and superior gluteal arteries.

Bergman (1988) has reported that, internal iliac artery may be longer or shorter than usual. The branches may arise without the artery dividing into anterior and posterior division. Branches of the anterior and posterior divisions may exchange origins. Variations of branches of the posterior division as follows:

Ilio-lumbar artery : This artery may be absent, or partially replaced by one of the lumbars. It occasionally, gives rise to a lateral superior sacral artery.

Lateral sacral artery : The vessels from both sides may arise in common. Superior branches are sometimes absent and may be replaced by branches from the common iliac, internal iliac, ilio-lumbar or sciatic arteries. When inferior branches are absent, they are replaced by branches from the middle rectal, gluteal and sciatic arteries.

Superior gluteal artery : May arise from internal iliac artery sharing a common trunk with inferior gluteal artery and sometimes with internal pudendal artery[2].

Occasionally, the internal iliac artery is ligated to control pelvic haemorrhage. Ligation does not stop blood flow but reduces blood pressure, allowing haemostasis (arrest of bleeding to occur). Because of three arterial anastomoses (lumbar to ilio-lumbar, median sacral to lateral sacral and superior rectal to middle rectal), blood flow in the artery is maintained although reversed. This maintains the blood supply to the pelvic viscera, gluteal region and genital organs. Chen et al, presented a paper on the anatomy and clinical applications of iliac crest flap pedicled on the ilio-lumbar artery. The artery was constant, but with a few variations. Its length was 7.0±3.9 cm and the outer diameter 2.0±0.4 mm at the lateral edge of the psoas major muscle. The iliac crest flap pedicled on the ilio-lumbar artery is a reliable bone flap for clinical usage[3].

The study to characterize the anatomy of the internal iliac artery and its posterior division branches and to correlate these findings to internal iliac artery ligation was conducted on 54 female cadavers. Average length of internal iliac artery was 27.0 mm (range 0-52 mm). Posterior division arteries arose from a common trunk in 62.3% (66 of 106) of pelvic halves. In the remaining specimens, branches arose independently from the internal iliac artery, with the iliolumbar noted as the first branch in 28.3%, lateral sacral in 5.7% and superior gluteal in 3.8%. The average width of the first branch was 5 (range 2-12) mm. In all dissections, posterior division branches arose from the dorsal and lateral aspect of internal iliac artery. In the adult male cadaver, on the right side, the absence of inferior gluteal artery was observed, compensated by a branch coming from superior gluteal artery. The origin of superior gluteal artery was from the anterior division of internal iliac artery in the same specimen, which passed through the greater sciatic foramen and appeared in the gluteal region above the piriformis muscle. In this case, the axial artery has persisted as the proximal portion of the superior gluteal artery. In the cases like the present one, if the superior gluteal artery is compressed, the blood supply to the gluteus maximus muscle will be diminished since the inferior gluteal artery is absent[4].

The origins of the inferior epigastric and obturator arteries and the relationship between these arteries have been determined macroscopically in examination of 706 body halves of Japanese subjects. Three very rare inferior epigastric arteries were found to arise from the obturator artery leaving the internal iliac artery. It is generally interpreted that such anomalies occur as remnant or partial disappearance of the connection between the pubic branches of the inferior epigastric and obturator arteries. The inferior epigastric artery arising from the obturator artery is also thought to be a similar anomaly. Since the obturator artery from the inferior epigastric artery represents one form of extreme anomaly and the inferior epigastric artery from the obturator artery represents another form, it would seem that these two forms of extreme anomaly

should occur at similar frequencies. However, in our research, the incidence of the former was 10.5%, while that of the latter was a very low 0.4%. During normal development, inferior epigastric artery is established at an earlier stage than obturator artery as a channel for blood supply. The difference of blood flow resulting from this time lag is one of the reasons why the inferior epigastric artery from the obturator artery is very rare in comparison to the obturator artery from the inferior epigastric artery[5]. The superior gluteal artery perforator flap can be transferred pedicled to treat sacral pressure sores or to be transferred freely for the breast reconstruction[6].

MATERIALS AND METHODS

50 formalin fixed adult human pelvic halves were procured from the Department of Anatomy, J.J.M. Medical College and S.S.Institute of Medical Sciences and Research Centre, Davangere. Specimens were collected during routine dissection practicals conducted by the Department of Anatomy, J.J.M. Medical College and S.S.Institute of Medical Sciences and Research Centre, Davangere. A horizontal section through the abdomen at the fourth lumbar vertebral level was taken. The pelvic specimen thus obtained was divided into two equal halves by cutting through the pubic symphysis, the sacrum and coccyx. The level of origin of internal iliac artery was noted. The individual branches (parietal, visceral) arising from the anterior and posterior divisions were dissected upto their terminations inside the pelvis.

RESULTS

Out of 50 specimens, ilio-lumbar artery took origin from three sources. Posterior division, anterior division and common trunk of internal iliac artery. From posterior division, directly in 22 specimens (44%), with obturator artery in 5 specimens (10%) and with superior gluteal artery in 2 specimens (4%). From anterior division, with obturator artery in 6 specimens (12%) and with inferior gluteal artery in 1 specimen (2%). From common trunk, as direct branch in 10 specimens (20%), with lateral sacral artery in 1 specimen (2%), with vertebral branch in 1 specimen (2%), with superior gluteal artery in 1 specimen (2%) and was found to be absent in 1 specimen (2%)(Table no 1).

Table No. 1: Various sources of origin of ilio-lumbar artery as observed in 50 specimens.

Division	Origin	Specimen	Percentage
PD	+/N	22	44
	with OBA	5	10
	With SGA	2	4
AD	with OBA	6	12
	with IGA	1	2
CT	Direct	10	20
	with LSA	1	2
	with VA	1	2
	With SGA	1	2
	Absent	1	2
	Total	50	100

Superior gluteal artery took origin from both posterior and anterior divisions. Posterior division gave origin directly to superior gluteal artery in 44 specimens (88%), with ilio-lumbar artery in 1 specimen (2%), with obturator artery in 2 specimens (4%) and double superior gluteal artery was found in 1 specimen (2%) and from anterior division in 2 specimens (4%). It made its exit from the pelvis through the greater sciatic foramen above the pyriformis muscle(Table no 2).

Table No. 2: Various sources of origin of superior gluteal artery.

Division	Origin	Specimen	Percentage
PD	+/N	44	88
	with ILA	1	2
	With OBA	2	4
	Double	1	2
AD	Direct	2	4
	Total	50	100

Lateral sacral artery took origin from posterior division, anterior division and from common trunk of internal iliac artery. These vessels vary in caliber, number and distribution. Paired origin of lateral sacral artery from posterior division was observed in 38 specimens (76%) and unpaired origin was observed in 7 specimens (14%). From anterior division with inferior gluteal artery in 2 specimens (4%) and as a direct branch from common trunk in 3 specimens (6%)(Table no 3).

Table No. 3: Various Sources of origin of lateral sacral artery.

Division	Origin	Specimen	Percentage
PD	Paired	38	76
	Unpaired	7	14
AD	with IGA	2	4
CT	Direct	3	6
	Total	50	100

(+/N = Present and normal, OBA = Obturator Artery, SGA = Superior Gluteal Artery, IGA = Inperior Gluteal Artery, LSA = Lateral Sacral Artery, VA = Vaginal Artery, ILA = Ilio lumbar artery)

Fig. 1: Posterior division of internal iliac artery.

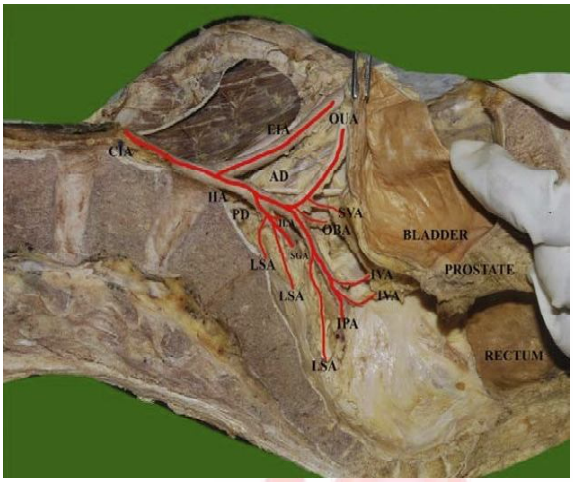

Fig. 2: Posterior division of internal iliac artery.

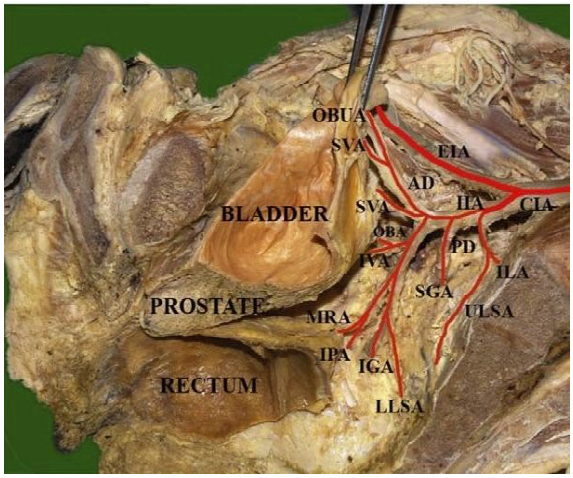

Table. 1: Analysis of Figure 1.

Sex	Side	Origin	Length of the IIA	Level Of division
Male	Left	Between L5 & S1	3 cm	1cm above greater sciatic foramen
BRANCHES FROM THE COMMON TRUNK : NIL				
BRANCHES FROM DIVISIONS :				
I) ANTERIOR DIVISION				
1) Obliterated umbilical artery	Present – normal			
2) Superior vesical artery	Present – normal			
3) Obturator artery	Present – normal			
4) Inferior vesical artery	Present - two branches			
5) Middle rectal artery	ABSENT			
6) Internal pudendal artery	Present gives inferior vesical artery and one lateral sacral artery			
7) Inferior gluteal artery	ABSENT			
II) POSTERIOR DIVISION				
1) Ilio-lumbar artery	Present – normal			
2) Superior gluteal artery	Present – normal			
3) Lateral sacral artery	Present - two from posterior division and one from internal pudendal artery from anterior division.			
VARIATIONS : Length is short. Internal pudendal artery gives inferior vesical artery and one lateral sacral artery. Middle rectal artery is absent. Inferior gluteal artery is absent.				

Table. 2: Analysis of Figure 2.

Sex	Side	Origin	Length of the IIA	Level Of division
Male	Right	Between L5 & S1	2.5cm	2.5cm above greater sciatic foramen
BRANCHES FROM THE COMMON TRUNK : Ilio-lumbar artery and upper lateral sacral Artery				
BRANCHES FROM DIVISIONS :				
I) ANTERIOR DIVISION				
1) Obliterated umbilical artery	Present - normal			
2) Superior vesical artery	Present - normal			
3) Obturator artery	Present gives inferior vesical artery.			
4) Inferior vesical artery	Present			
5) Middle rectal artery	Present			
6) Internal pudendal artery	Present gives middle rectal artery			
7) Inferior gluteal artery	Present gives lower lateral sacral artery			
II) POSTERIOR DIVISION				
1) Ilio-lumbar artery	Present from common trunk			
2) Superior gluteal artery	Present - normal			
3) Lateral sacral artery	Present - two branches,upper from common trunk, lower from inferior gluteal artery.			
VARIATIONS : Length is short. Common trunk gives ilio-lumbar and upper lateral sacral artery. Obturator artery gives inferior vesical artery. Internal pudendal and inferior gluteal artery- common trunk from anterior division. Internal pudendal artery gives middle rectal artery,and inferior gluteal artery gives lower lateral sacral artery.				

DISCUSSION

Arteries are essentially conducting channels through which blood is conveyed from the heart to the capillary bed. In the present study, the ilio-lumbar artery arose from posterior divisionin 29 specimens (58%), from anterior division in 7 specimens (14%) and from common trunk in 13 specimens (26%) and was found to be absent in 1 specimen (2%). Bergman states that, the ilio-lumbar artery may be absent, reduced or partially replaced by one of the lumbars. It occasionally gives rise to a lateral sacral artery[2].

In the present study, lateral sacral artery took origin from posterior division, paired origin in 38 specimens (76%) and unpaired in 7 specimens (14%). Lateral sacral artery took origin from anterior division with inferior gluteal artery in 2 specimens (4%) and from common trunk of internal iliac artery in 3 specimens (6%). Bergman states that, lateral sacral vessels from both sides may arise in common. The lateral sacrals may provide the inferior vesical and middle rectal arteries[2].

CONCLUSION

Ilio-lumbar artery took origin from posterior division in 29 specimens (58%), from anterior division in 7 specimens (14%) and from common

trunk in 13 specimens (26%). Lateral sacral artery took paired origin from posterior division in 38 specimens (76%) and unpaired origin from posterior division in 7 specimens (14%), from anterior division in 2 specimens (4%) and from common trunk in 3 specimens (6%). Superior gluteal artery were found to be constant in their origin and course.

Conflicts of Interests: None

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How to cite this article:

Pavan P Havaldar, Sameen Taz, Angadi A.V, Shaik Hussain Saheb. STUDY OF POSTERIOR DIVISION OF INTERNAL ILIAC ARTERY. Int J Anat Res 2014;2(2):375-79.