

How to Cite:

Bhardwaj, R., Bhatnagar, S., Suttarwala, I., Joshi, H. R., Hathila, S., & Vaniya, V. H. (2022). Variations in the origin of iliolumbar artery with its clinical significance. *International Journal of Health Sciences*, 6(S8), 3018–3025.
<https://doi.org/10.53730/ijhs.v6nS8.12818>

Variations in the origin of iliolumbar artery with its clinical significance

Rashmi Bhardwaj

Ph.D. Research Scholar Department of Anatomy, Medical College Baroda, Vadodara, Gujarat

Supriti Bhatnagar

Assistant Professor Department of Anatomy, TMMC & RC, Moradabad

Ila Suttarwala

Associate Professor Department of Anatomy, Medical College Baroda, Vadodara, Gujarat

Himanshu R. Joshi

Associate Professor Department of Pathology, Autonomous State Medical College, Etah

Corresponding author email: drhimanshu1987@gmail.com

Shital Hathila

Assistant Professor Department of Anatomy, Medical College Baroda, Vadodara, Gujarat

V. H. Vaniya

Professor Department of Anatomy, Medical College Baroda, Vadodara, Gujarat

Abstract---Introduction: The iliolumbar artery mainly arises from the posterior division of the internal iliac artery. It extends oblique superiorly and laterally in front of the sacroiliac joint and lumbosacral trunk. It crosses the obturator nerve and external iliac vessels & reaches the medial edge of the psoas major. The aim of our study was to know the origin variability of the iliolumbar artery. This helps to prevent any iatrogenic injury during various surgeries. Materials and Methods: 50 formalin-fixed adult human pelvic halves with known sex were procured from the Department of Anatomy, Medical College, Baroda. Site of origin of the iliolumbar artery was identified. Results: In the current study, we observed that the origin of the iliolumbar artery was from the posterior division of IIA in 52%, 38% from the trunk of the internal iliac artery, 4% from the single trunk with obturator artery from posterior division, and 6% absent. Conclusion:

The variable origins of the ILA from different branches of the internal iliac artery should be taken into account during the surgical procedures involving the lower abdominal & pelvic region so as to modify the surgical tactics to prevent undesired hemorrhagic complications.

Keywords--Iliolumbar artery, pelvic hemorrhage, clinical significance.

Introduction

The iliolumbar artery (ILA) arises from the posterior division/trunk of the internal iliac artery, a branch of the common iliac artery (from the abdominal aorta). It originates within the pelvic cavity and from its origin it arches backwards and ascends laterally out of the pelvic inlet towards the iliac fossa. It travels anterior to the sacroiliac joint and lumbosacral nerve trunk, passing behind the obturator nerve, external iliac vessels to reach the medial border of the psoas major muscle. The iliolumbar artery divides into lumbar and iliac branches just posterior to the medial border of the psoas major muscle. These two branches supply the surrounding structures and muscles of the posterior abdominal wall. The iliolumbar artery is usually the first branch of the posterior division of the internal iliac artery & the only pelvic artery ascending from pelvic cavity. The variability of origin of the ILA leads to variability in its course result in modifying arterial supply of the surrounding structures (lumbosacral trunk etc.) which is significant for surgeons, radiologists, orthopedics, Obstetricians and Gynecologists to minimize the postoperative complications. The Iliolumbar artery can be damaged during the surgical procedures of lumbar/lumbosacral vertebrae, lumbosacral spinal endoscopic procedures²³ and in procedures of embolization. Iliolumbar artery is used as a feeding pedicle in iliac crest flaps.¹ Its proximity to the sacroiliac joint leads iliolumbar artery at risk of damage during posterior pelvic fractures (open book or shearing fractures).^{4,5} The present study aims to discover the variations in the origin of the iliolumbar artery as well as review the incidence of the variations in the ILA origin in the various other studies.

Materials and Methods

50 formalin-fixed adult human pelvic halves with known sex (11 males and 14 females) were procured from the Department of Anatomy, Medical College, Baroda. Specimens were collected for the routine dissection. Any cadavers with previously operated pelvic region were excluded from the study. The common iliac artery, the external and internal iliac artery with its branches were dissected after removing the fat, and loose connective tissue surrounding the arteries. The site of origin of the iliolumbar Artery (ILA) was identified & noted. The course of ILA was traced & its relation with surrounding structures was observed.

Observations & Results

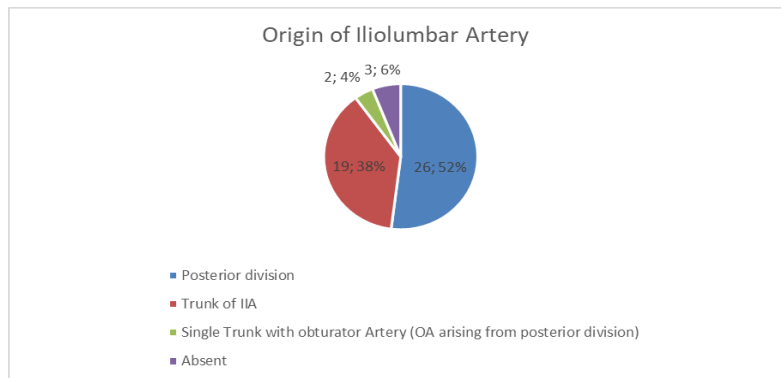
The origin of the iliolumbar artery, observed in the total 50 specimens of our study, was classified into 3 different categories.

1. From the posterior division of the internal iliac artery which is normal type.
2. Directly from the trunk of the internal iliac artery before its division into anterior & posterior trunk. (Figure 1)
3. From the Single trunk with obturator artery arising from posterior division of the internal iliac artery. (Figure 2)

It was observed that 24 out of 50 (48%) bisected pelvises demonstrated a variation of the iliolumbar artery origin, as given in table 1.

Table 1. Shows the incidence of variations in the origin of the iliolumbar artery

| S. No | Origin of Iliolumbar Artery | No. of Specimen | Percentage |
|-------|--|-----------------|------------|
| 1 | Posterior division proper | 26 | 52% |
| 2 | Trunk of IIA | 19 | 38% |
| 3 | Single Trunk with obturator Artery (Arising from posterior division) | 2 | 4% |
| 4 | Absent | 3 | 6% |



The pie chart shows the incidence of variations in the origin of the iliolumbar artery

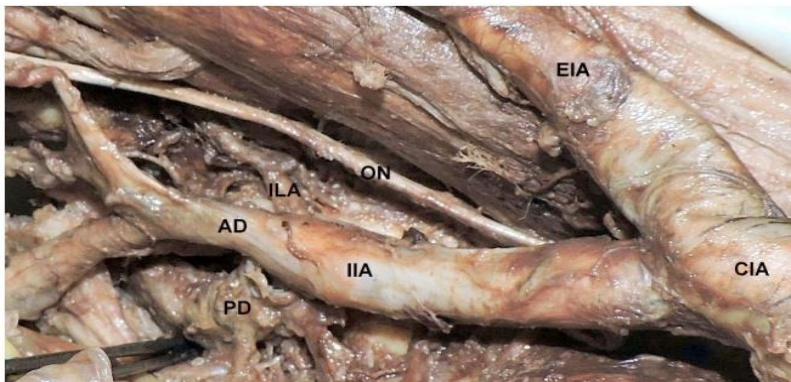


Figure 1: Right pelvic half shows the origin of the Iliolumbar artery directly from the trunk of the internal iliac artery. CIA: Common iliac artery; EIA: External iliac artery IIA: internal iliac Artery; AD: Anterior Division; PD: Posterior Division; IIA: Iliolumbar Artery ON: Obturator nerve

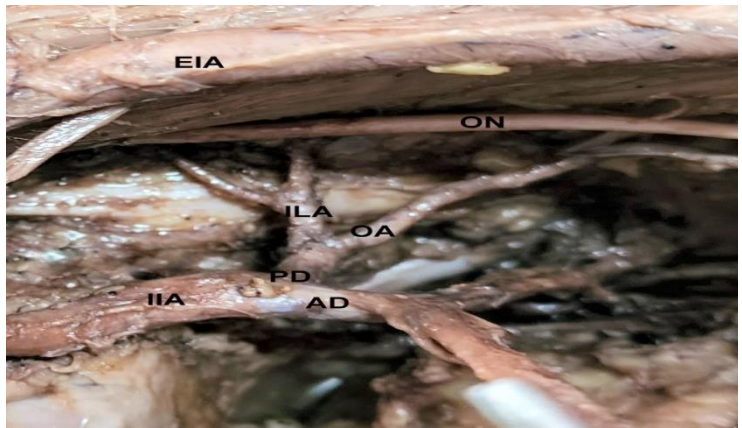
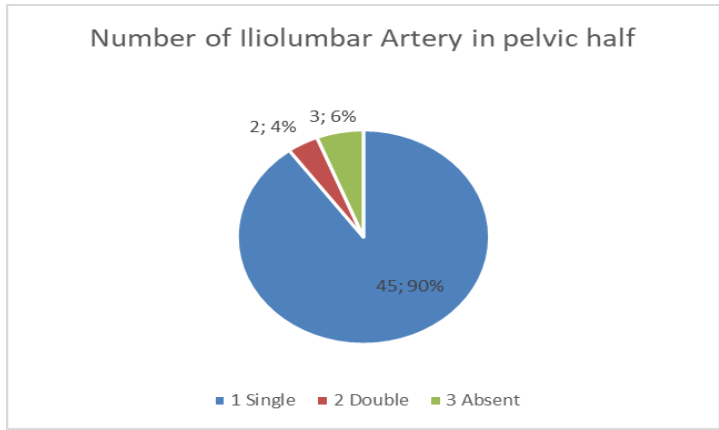


Figure 2: Left pelvic half shows the origin of the Iliolumbar artery from the common Trunk with obturator Artery arising from Posterior division of the internal iliac artery. EIA: External iliac artery IIA: internal iliac Artery; AD: Anterior Division; PD: Posterior Division; IIA: Iliolumbar artery OA: Obturator artery

Current study also shows the number of iliolumbar arteries present in the hemipelvis Iliolumbar artery is present as a single branch in 45 out of 50 (90%) specimen, as double branches arising from two different points from internal iliac artery in 2 specimens (4%) (Figure 3) and is absent in 3 specimens (6%) as shown in Table 2.

Table 2 shows the number of Iliolumbar arteries present in the pelvic half

| S. No. | Number | Frequency | Incidence (%) |
|--------|--------|-----------|---------------|
| 1 | Single | 45 | 90 % |
| 2 | Double | 2 | 4 % |
| 3 | Absent | 3 | 6 % |
| Total | | 50 | 100% |



Pie chart 2 shows the Number of Iliolumbar artery in the pelvic half.



Figure 3: Left pelvic half shows the double origin of the Iliolumbar artery, one direct from the trunk of the Internal iliac Artery & other from the Posterior division of the internal iliac artery. CIA: Common iliac artery; EIA: External iliac artery IIA: internal iliac Artery; AD: Anterior Division; PD: Posterior Division; ILA: Iliolumbar artery OA: Obturator artery

Discussion

The iliolumbar artery and its branches are susceptible to iatrogenic injuries during various surgical procedures involving sacroiliac joint like anterior approaches to the sacroiliac joint for arthrodesis or internal fixation, resulting in intraoperative hemorrhages.⁶ The surgeons, especially while doing pelvic surgeries, should be aware of the normal anatomy of the iliolumbar artery and its variations for the successful ligation of the internal iliac artery and for the safe surgical outcomes. The location and the variations of the iliolumbar artery are significant for surgeons since it is used as a supply pedicle in bone flaps. In our study, we observed that the origin of the Iliolumbar Artery was from the posterior division in 52% (26), 38% (19) from the trunk of the internal iliac artery, 4% (2) from the single trunk with obturator artery from posterior division, and 6% (3) it was absent. The posterior division of the internal iliac artery is the most common origin of the ILA. Valchkevich Dzmitry et al⁸, Waseem Al Talalwah et al¹¹ & Teli CG et al¹² observed that the origin of Iliolumbar Artery was from the posterior division in 73.3% (22) 77.90% & 80% (32) respectively, a finding which was similar with our study. While in other studies of parul et al⁷, Ravi Shankar Gadagi et al⁹, Turan Koç et al¹⁰, Kiray A et al¹³, Yuvaraj Maria Francis¹⁴, Rusu MC et al¹⁵, the iliolumbar artery originated from trunk of IIA in 66.66% (16), 36.67% (11), 57.14% (12), 71.4% (30), 75%, 52.50% respectively - a finding which was different from our study. A comparison of variations with respect to the origin of the iliolumbar artery (ILA), with different studies is tabulated in table 2. In our study we found origin of ILA mainly from either posterior division of IIA or from the trunk of IIA. There were no branches coming from the common iliac, external iliac or gluteal arteries as has been reported by various other authors.

Several authors have classified the origin of ILA differently. Rusu et al classified the ILA origin into different levels; Level A: ILA from the CIA. Level B: ILA from the CIA bifurcation. Level C: ILA from the main trunk of the IIA. Level D: ILA from the origin of the posterior division of the IIA. Level E: ILA from the posterior division of the IIA.¹⁵ In our study, type 1 corresponds to level E category whereas type 2 corresponds to level C category. The atypical type 3 in which ILA was arising from single trunk with obturator Artery from posterior division did not correspond to any of the above Rusu et al levels of classification & was not reported by any other study.

In one cadaver, on both sides, it was observed that the ILA was taking the double origin from two different points, one from trunk & other from posterior division of IIA. Turan Koç et al¹⁰ & Amaç Kiray¹³ also reported such cases in 4 & 2 (4.8%) specimens respectively. In our study we also observed absence of ILA in 3 specimens (6%). So far very few reports have been documented on the absence of iliolumbar artery. Ravi Shankar Gadagiet al⁹ Lipshutz et al¹⁸ and Al Talalwah et al¹¹ reported the absence of IA in 8 specimens (26.67%), 5 subjects and 4.7% respectively. In case ILA was absent, it was replaced by fourth lumbar artery¹⁸.

Table 2 Incidence of origin variability of the iliolumbar artery by different authors

| S.No. | Author | Sample Size | Trunk | Posterior Division of IIA | Lateral sacral artery | Obturator Artery | Superior Gluteal Artery | Common Iliac Artery | External Iliac Artery | From 2 Different point | Absent |
|-------|---|-------------|-------------|---------------------------|-----------------------|------------------|-------------------------|---------------------|-----------------------|------------------------|------------|
| 1 | Parul (2021) ⁷ | 24 | 66.66% (16) | 29.17% (7) | 4.16% (1) | - | - | - | - | - | - |
| 2 | Valchkevich Dmirty ⁸ (2020) | 30 | 16.6% (5) | 73.3% (22) | 3.3% (1) | 3.3% (1) | 3.3% (1) | - | - | - | - |
| 3 | Ravi Shankar ⁹ (2018) | 30 | 36.67% (11) | 23.33% (7) | - | - | - | 13.33% (4) | - | - | 26.67% (8) |
| 4 | Yuyaraj Maria F ¹⁴ (2018) | 80 | 75% | 25% | - | - | - | - | - | - | - |
| 5 | Turan Koç ¹⁰ (2016) | 21 | 57.14% (12) | 23.8% (5) | - | - | - | - | - | 19.4 (4) | - |
| 6 | Waseem Al Talalwah ¹¹ (2014) | 342 | 13.80% | 77.90% | - | - | 0.70% | 2% | 0.30% | - | 4.70% |
| 7 | Teli Chanrika ¹² (2013) | 40 | 20% (8) | 80% (32) | - | - | - | - | - | - | - |
| 8 | Kiray A ¹³ (2010) | 42 | 71.4% (30) | 19% (8) | - | - | - | 4.8% (2) | - | 4.8% (2) | - |
| 9 | Rusu et al ¹⁵ (2010) | 30 | 52.50% | 32.50% | - | - | - | 8.75% | - | - | - |
| 10 | Chen et al ¹⁶ (1999) | | 96.30% | - | - | - | - | 3.70% | - | - | - |
| 11 | Present study | 50 | 38% (19) | 52% (26) | - | - | - | - | - | 4% (2) | 6% (3) |

Conclusion

A detailed analysis of the ILA and its origin variability can improve our understanding of the vascular complications and complication of serious hemorrhage affecting this region. The present study is done to increase the success of diagnostic evaluation and to improve the effectiveness of surgical approaches in this region. The ILA may have distinct and important patterns that are important to identify during surgical procedures. Acute hemorrhages or postoperative hematoma may occur if the iliolumbar artery is injured during surgery. The iliolumbar artery's anatomical variations may be significant when gathering the vascular iliac bone graft. The surgeon should keep in mind that the variant origin of ILA can make anterior lumbosacral junction exposure and posterior sacroiliac fixations, more difficult. The branching and distribution

patterns along with sexual differences can be further highlighted with future studies in a greater number of subjects.

References

1. Al Talalwah W, Al Dorazi SA, Soames R. The origin variability of the iliolumbar artery and iatrogenic sciatica. *European Journal of Orthopaedic Surgery & Traumatology*. 2015 Jul 1;25(1):199-204.
2. Chen R, Liu Y, Liu C, Hu Y, Xu D, Zhong S, Li ZH. Anatomic basis of iliac crest flap pedicled on the iliolumbar artery. *SurgRadiol Anat*. 1999; 21(2):103–107.
3. Ebraheim NA, Lu J, Biyani A, Yang H. Anatomic considerations of the principal nutrient foramen and artery on the internal surface of the ilium. *SurgRadiol Anat*. 1997;19: 237-39.
4. Harrington JF Jr. Far lateral disc excision at L5-S1 complicated by iliolumbar artery incursion: case report. *Neurosurgery*. 2001;48: 1377-80
5. Kelly HA. Ligation of both internal arteries for hemorrhage in hysterectomy for carcinoma uteri. *Bull Johns Hopkins Hosp* 1894; 5:53-4
6. Kiray A, Akçal O, GÜvencer M, Tetik S, Alıcı E. Iliolumbar veins have a high frequency of variations. *ClinOrthopRelat Res* 2004;(425):252-7.
7. Kiray A, Akçalı O, Tayefi H, Koşay C, Ergür I. Anatomical variations of iliolumbar artery and its relation with surgical landmarks. *ActaorthopaedicalettraumatologicaTurcica*. 2010; 44(6):464-8.
8. Koç T, Gilan YY, Aktekin M, Kurtođlu Z, Dađtekin A, Aytaç G, Coşgun E. Evaluation of the origin and branching patterns of the iliolumbar artery and its implications on pelvic and vertebral surgery. *Saudi Medical Journal*. 2016 Apr; 37(4):457.
9. Kulkarni SS, Lowery GL, Ross RE, Ravi Sankar K, Lykomitros V. Arterial complications following anterior lumbar interbody fusion: report of eight cases. *Eur Spine J* 2003;12:48-54.
10. Lipshutz B. A composite study of the hypogastric artery and its branches. *Ann Surg*. 1918; 67: 584–608
11. ParulUpadhayay, RanjeetaHansdak, Sneha Agarwal Assessment of the iliolumbar artery: its structural variations and applied aspect *International Journal of Research in Medical Sciences* 2021 Aug;9(8):2304-2308 DOI: <https://dx.doi.org/10.18203/2320-6012.ijrms20213074>.
12. Ravi Shankar Gadagi, Santosh Kumar Mulage. The origin variability of the iliolumbar artery: a cadaveric study with clinical significance. *Int J Anat Res* 2018;6(3.3):5708-5712. DOI: 10.16965/ijar.2018.320
13. Rusu MC, Cergan R, Dermengiu D, Curcă GC, Folescu R, Motoc AG, Jianu AM. The iliolumbar artery—anatomic considerations and details on the common iliac artery trifurcation. *Clinical Anatomy*: 2010 Jan; 23(1):93-100.
14. Teli CG, Kate NN, Kothandaraman U. Morphometry of the iliolumbar artery and the iliolumbar veins and their correlations with the lumbosacral trunk and the obturator nerve. *JCDR*: 2013 Mar; 7(3):422.
15. Valchkevich D, Borel A. Anatomical Variation of Iliolumbar Artery and its Clinical Significance. *Arch Biomed Eng&Biotechnol*. 3(5): 2020. ABEB.MS.ID.000572. DOI: 10.33552/ABEB.2020.03.000572.

16. Winters HA, van Harten SM, van Royen BJ. The iliolumbar artery as the nutrient pedicle for an iliac crest graft: a new technique in the reconstruction of the lumbar spine. *PlastReconstrSurg* 2002;109:249-52.
17. Yiming A, Baqué P, Rahili A, Mayer J, Braccini AL, Fontaine A, et al. Anatomical study of the blood supply of the coxal bone: radiological and clinical application. *SurgRadiol Anat.* 2002;24:81-86
18. Yuvaraj Maria Francis¹, Thotakura Balaji², Hannah SugirthabaiRajilaRajendran³, Vaithianathan Gnanasundaram⁴, Aruna Subramanian⁵ andBalaji Karunakaran⁶ Study on Variations in the Origin and Branching Pattern of Internal Iliac Artery in Cadavers *Biomedical & Pharmacology Journal*, December 2018 Vol. 11(4), p. 2201-2207.