

# Importance of training of Internal Iliac Artery ligation in the Obstetrics and Gynaecology Postgraduate Residency Curriculum

Apurva Somshekhar Sholapure<sup>1</sup>, Jyoti Vikas Rokade<sup>2\*</sup>, Kiran Rohit Shrivastav<sup>3</sup>,  
Aakash Somshekhar Sholapure<sup>4</sup>

<sup>1</sup>Senior Resident, Associate Professor, <sup>3</sup>Lecturer, Department of OBGY, Government Medical College, Miraj, INDIA.

<sup>4</sup>Intern, Tbilisi State Medical University, GEORGIA.

Email: [sholapureapurva@gmail.com](mailto:sholapureapurva@gmail.com), [jyotivikasrokade@gmail.com](mailto:jyotivikasrokade@gmail.com), [dr.kiranc09@gmail.com](mailto:dr.kiranc09@gmail.com), [assholapure@gmail.com](mailto:assholapure@gmail.com)

## Abstract

**Background:** Several surgical procedures, although important, are not mastered while doing post-graduate courses in obstetrics and gynaecology. Internal iliac artery ligation and ureteral tracing are few such surgical procedures. This paper shares the authors' experiences regarding the usefulness of this lifesaving procedure like internal iliac artery ligation in controlling pelvic hemorrhage and aims to remove the barriers to this procedure among practicing gynaecologists. This article shares our views on emphasizing the teaching of this procedure in the postgraduate curriculum to improve future outcomes.

**Keywords:** Postgraduate curriculum, Internal Iliac artery ligation.

## \*Address for Correspondence:

Dr Jyoti Vikas Rokade, Associate Professor, Department of OBGY, Government Medical College, Miraj, INDIA.

Email: [jyotivikasrokade@gmail.com](mailto:jyotivikasrokade@gmail.com)

Received Date: 038/12/2022 Revised Date: 12/01/2023 Accepted Date: 03/02/2023

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/). 

## Access this article online

Quick Response Code:	Website: <a href="http://www.medpulse.in">www.medpulse.in</a>
	DOI: <a href="https://doi.org/10.26611/10122512">https://doi.org/10.26611/10122512</a>

## INTRODUCTION

Obstetric bleeding remains a leading cause of maternal mortality and major maternal morbidity in developing countries. Postpartum hemorrhage (PPH) is the leading cause of maternal mortality worldwide, ranging from 13% in developed countries to 34% in developing countries.<sup>1</sup> Internal iliac artery ligation, like many other modalities, is a proven method of controlling obstetric bleeding and is also established for limiting blood loss during certain gynaecological surgical procedures.<sup>2,3</sup> Ligation of the internal iliac artery was first performed by Howard Kelly in 1893.<sup>4</sup> It has been

used extensively in the control of pelvic hemorrhage in both obstetrics and gynecology in emergency situations. Internal iliac artery ligation has the advantage of requiring less operative time and fertility-sparing potential compared to obstetric hysterectomy.<sup>5</sup> Ligation of the internal iliac artery to control severe bleeding is infrequently used in obstetrical and gynaecological practice today. This is not because the procedure is ineffective, dangerous, or difficult to perform. But because many practitioners are not aware about the approach, operating technique, have fear to injure this vital artery and ureter. Many times untrained assistants panic during the situation to perform the procedure especially for the first time. All this has led to consider this procedure on a secondary priority to obstetric hysterectomy. Unfortunately even in teaching institutes internal iliac artery ligation or its dissection is not done frequently or confined to one particular unit leading many residents devoid of knowledge of anatomy or dissection of this important vessel. It is not known how many women will die from bleeding as a result of this oversight in medical training. For these reasons, we feel it is timely and important to report our experience to define the position of internal iliac artery ligation in clinical

practice. Bilateral internal iliac artery ligation works by reducing blood flow, lowering pulse pressure beyond the ligation site, and converting arterial blood flow to venous blood flow. Unilateral ligation reduced the pulse pressure by about 75% on that side and with bilateral ligation, the reduction was 85%. The mean arterial pressure was reduced by 25% but the blood flow by almost 50%. Thus, bilateral internal artery ligation almost reduces the pulse pressure to that of a venous system and allows clotting to occur. Blood flow does not stop completely due to the presence of collateral channels that open immediately after ligation of the internal artery and flow is reversed so that all branches of the iliac artery are again filled with flowing blood but at reduced pressures. This collateral system opens immediately and is so efficient that even bilateral internal iliac artery ligation does not result in tissue necrosis or interfere with subsequent menstrual or reproductive function.<sup>6,7</sup> Common surgical procedures can be fully mastered by assisting specialists and consultants during postgraduate training, while less common surgical procedures can easily escape training. These unusual procedures require a thorough knowledge of pelvic anatomy, which is why learning anatomy and getting an orientation to such procedures right from post-graduate training is important to safely perform such important life-saving surgical procedures.

## METHODS

Internal iliac artery ligation technique can be learned in various methods as mentioned below.

### 1) Cadaveric Dissection<sup>8</sup>:

This can be accomplished by revisiting dissecting room and attending a CME (Continuing Medical Education) workshop on autopsy. This provides Obstetrician-Gynaecologist focused learning. This is the closest thing to real practice in simulating surgery on a human cadaver. It remains the most effective means of teaching anatomy knowledge in undergraduate and postgraduate settings. The anatomy of internal iliac artery which is as follows can better be understood. The common iliac artery bifurcates at the level of the lumbo-sacro junction in front of the sacro-iliac joint. The external iliac artery runs lateral and superior, while the internal iliac artery descends medially and inferiorly towards the sacral hollow. The ureter runs antero-laterally to the internal iliac artery just below the bifurcation. Posterior to the internal iliac artery lies the internal iliac vein, which is very close and vulnerable to trauma during attempts to ligate the artery. The internal iliac artery runs for 3-4 cm before dividing into anterior and posterior divisions. The posterior division divides into three branches: the ilio-lumbar, lateral sacral and the superior gluteal arteries-the latter leaves the

pelvis through the greater sciatic foramen to supply the gluteal muscles. The anterior division usually has eight branches: the superior and inferior vesical, obturator, middle haemorrhoidal, uterine, vaginal and the terminal internal pudendal and inferior gluteal arteries. There are, however, variations and the internal pudendal and obturator arteries can arise from the posterior division.

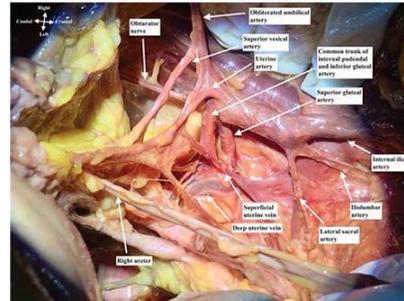


Figure 112: Right internal iliac artery dissection: medial view

### 2) Practising the visualization of retroperitoneal structures by dissection during elective procedures:<sup>9</sup>

The key is to familiarize oneself with the anatomy of the retroperitoneal space, which is best done when performing an elective abdominal hysterectomy in gynaecology. The uterus is elevated out of the abdominal incision and the fundus is tilted away from the side to be ligated. Good retraction of the pelvic contents and displacement of the arteries are needed to visualize the veins. Meticulous dissection with scissors is required to separate the internal iliac vein from the artery if they are adherent. The mid-portion of the round ligament is clamped and divided between two forceps. This permits entry to the retroperitoneal space and the avascular posterior leaf of the broad ligament is further opened with sharp dissection. Using a moistened gauze on a sponge forceps the retroperitoneal space is opened with gentle blunt dissection. If not immediately visible the common iliac artery and its bifurcation can be located by palpation. At this point, the ureter should be identified and retracted medially with the attached peritoneum. Either using a gentle suction cannula or a moistened 'peanut' sponge, identify the bifurcation of the common iliac and clear the areolar tissue around the internal branch with the help of mixer forceps. Once a plane has been developed between them, a Mixer or other fine right-angled forceps, or the forceps designed by Reich and colleagues<sup>13</sup> are gently introduced between them. This is best done onto the tip of a finger of the opposite hand, which allows gentle manipulation of the tips of the closed forceps, while feeling if there is still tissue present which requires division by sharp dissection. Simply pushing the forceps between the artery and the vein in an uncontrolled fashion is dangerous. It is also inadvisable to try separating the artery and the vein by opening the tips of the forceps forcibly until a path

has been found between them. It is also wise to identify the external iliac artery and be in a position to palpate the femoral pulse. The main hazard is trauma to the adjacent external iliac veins or to the internal iliac vein, which lies just beneath the internal iliac artery. To prevent this the mixer should always be passed from lateral to medial direction. The peritoneum should be closed with interrupted 2–0 Vicryl because a continuous suture can kink the ureter.

### 3) Prophylactic ligation of the internal iliac artery whenever required:<sup>10</sup>

In most developing countries, medical facilities are poor. In addition there are inadequate blood banks and blood transfusion services. Hemorrhage contributes significantly to operative morbidity and mortality. Prophylactic bilateral internal iliac artery ligation BIIAL during pelvic surgery can be helpful in such situations. Also, this opportunity can be used as a method of training postgraduates in obstetrics and gynaecology. The two most frequent gynaecological malignancies requiring radical pelvic surgery were carcinoma of the cervix and endometrial carcinoma. It can also be used in a patient with placenta accreta spectrum. It creates a relatively bloodless operative field for surgical procedures. Another advantage of this is that it reduces the need for blood transfusions.

### 4) Wide use of therapeutic ligation of the internal iliac artery:

Common indications for which this procedure used are uterine atony unresponsive to oxytocics, extension of lower segment caesarean incision into broad ligament or vagina, post-abortion bleeding, postpartum hemorrhage, abdominal pregnancy with pelvic implantation of the placenta, placenta accreta with intractable bleeding, hemorrhage from placenta previa, abruption placentae with Couvelaire uterus, uterine rupture, paravaginal hematoma and extensive cervical and/or vaginal lacerations, advanced pelvic organ cancer etc. But as these are emergency procedures, one may not find an opportunity to teach the residents meticulously.

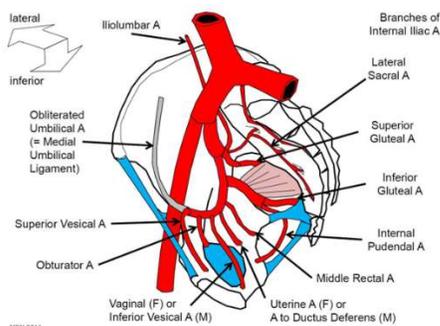


Figure 2: Graphical presentation of branches of Internal Iliac artery

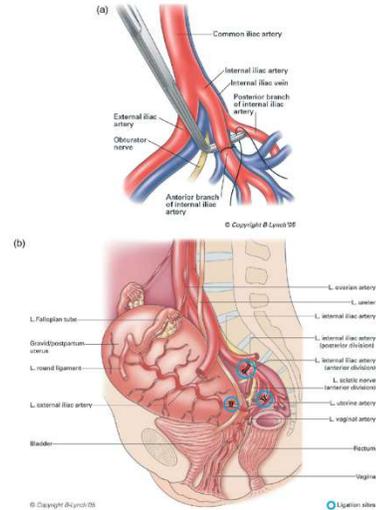


Figure 3<sup>11</sup>: Site of Internal iliac artery ligation



Figure 4<sup>13</sup>: Intraoperative ligation of internal iliac artery

### PITFALLS OF THE PROCEDURE AND METHODS TO TACKLE THEM <sup>11</sup>:

The principal pitfall related to the ligation of the internal iliac artery is a delay. Whilst hemorrhagic shock is irreversible, this operation will now not triumph over it. Insufficient transfusion is another pitfall with excessive hemorrhage. Blood loss is often severely underestimated. Failure to remember that the vaginal artery is a separate branch of the internal iliac artery, in place of a branch of the uterine artery, may additionally lead to the pitfall of a pointless and useless hysterectomy for manipulation of bleeding. Harm to the external iliac artery from retractors or wrong ligation of this vessel can result in limb amputation. Additionally, accidental ligation of 1 or both ureters could result in renal function impairment. Unintended incorporation of the anterior division of the sciatic nerve may also result in foot drop. Ligation of the common or external iliac causes an acutely ischemic leg. The classical symptoms are whiteness or pallor of the foot and absence of distal pulses – however, these can be

difficult to evaluate in a hypotensive, vasoconstrictive patient. If there is doubt that the main artery may be ligated, a test for a pulse in the external iliac artery above the inguinal ligament must be done, past the location of ligation; the femoral pulse inside the groin; or the Doppler signals on the ankle. If the incorrect artery has been tied, the ligature has to be removed. If this fails to repair a terrific pulse (or if the artery has been transected), a vascular healthcare provider must be called so as to repair the vessel. Damage to either or each ureter must be prevented by way of cautious visualization and dissection. In life-threatening surgical procedures or behind-schedule intervention to control massive hemorrhage, unintended damage to a ureter may additionally arise. Ligature is greater possibly than transection. Prompt diagnosis and remedial surgery via a urological colleague are crucial. Unintentional ligation of 1 ureter may not lead to renal failure however boom morbidity. Damage to the common or iliac vein or one of its predominant tributaries outcomes in brisk hemorrhage. It could threaten the patient's life, specifically inside the context of pre-current blood loss from postpartum hemorrhage. Extra care must be taken when dissecting the area behind the origin of the internal iliac artery and while keeping apart the arteries from the veins. If unexpected venous bleeding does occur, the first step should be to apply pressure to the vicinity. Adequate suction must be organized. Swabs set up on sponge-holding forceps can then be implemented distal and proximal to the site of damage to compress the veins and permit the defect to be visualized. If the venous fault is not visible, deep inside the pelvis in the back of the iliac artery, then transaction of the iliac artery to reveal the vein may also solve the problem. The artery can then be re-anastomosed. While the defect within the vein has been seen, its edges may be held collectively using atraumatic forceps consisting of Stiles, before being sutured. Restoration of the vein is better accomplished with a nonabsorbable vascular suture, including polypropylene on a spherical-bodied needle. For big iliac veins, a 3/0 is a reasonable choice: needles smaller than those furnished with four/zero sutures can be hard to retrieve throughout the restoration of massive veins and present a small hazard of turning into 'lost' within the vein. Eventually, it is essential to avoid incorporating branches of the anterior division of the sciatic nerve into any ligature. The healthcare professional should stand in which he/she is most comfortable and this may be influenced by right- or left-handedness. The choice of the practitioner's function also relies upon the capacity and dexterity of the assistant. If the assistant is especially inexperienced, then it can be specifically useful for the doctor to modify sides throughout the procedure.

## CONCLUSION

Internal iliac artery ligation is an emergency lifesaving procedure that every Obstetrician and Gynaecologist must be able to perform. It is relatively simple operation but worth learning, when performed by surgeon having adequate knowledge of pelvic anatomy. Unfortunately, the procedure is not popularly performed by many qualified surgeons doing pelvic surgery. The probable reasons are, lack of confidence in doing the procedure, fear of complications and lack of observation of the procedure any time during the academic curriculum. Postgraduate training programme must include orientation of trainees to this life saving procedure. It is important for every pelvic surgeon to learn lifesaving procedure like internal iliac artery ligation. Pelvic surgeons must get out of fear for the technical considerations. Although, it may not always be effective in control of pelvic hemorrhage, it is more conservative procedure than obstetric hysterectomy in young women with intractable pelvic hemorrhage, involving lesser morbidity and giving chance of future fertility.

## REFERENCES

1. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006;367:1066-74
2. Joshi V, Otiv S, Majumder R, Nikam Y, Shrivastava M. Internal iliac artery ligation for arresting postpartum haemorrhage. *BJOG* 2007; 114(3):356- 61.
3. Papp, Z; Tóth-Pál, E; Papp, C; Sziller, I; Gávai, M; Silhavy, M; Hupiczi, P. Hypogastric artery ligation for intractable pelvic hemorrhage. *Obstet Gynecol Survey*. 2006;61(4):224-6.
4. Kelly, H. A.: Ligation of Both Internal Iliac Arteries for Hemorrhage in Hysterectomy for Carcinoma Uteri, *Bull Johns Hopkins Hosp* 5:53-54 (April) 1894.
5. Wagaarachchi P.T, Fernando L. Fertility following ligation of internal iliac arteries for life-threatening obstetric haemorrhage: Case report. *Human Reproduct* 2000;15(6):1311-3
6. Burchell, R.C. (1968), *PHYSIOLOGY OF INTERNAL ILIAC ARTERY LIGATION*. *BJOG: An International Journal of Obstetrics and Gynaecology*, 75: 642-651
7. Likeman, R.K. (1992), *The Boldest Procedure Possible for Checking the Bleeding - A new look at an old operation, and a series of 13 cases from an Australian hospital*. *Australian and New Zealand Journal of Obstetrics and Gynaecology*
8. Mahale, Arun R., et al. "Learning internal iliac artery ligation and pelvic ureter course through cadaveric dissections." *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, vol. 7, no. 11, Nov. 2018, pp. 4516+
9. Thomas F. Baskett, Andrew A. Calder, Sabaratnam Arulkumaran. *Munro Kerr's Operative Obstetrics*, 12th edition. Elsevier Saunders 2014
10. Gharoro, E. P., Abedi, H. O., and Isiyawwe, J. O. (1999). Prophylactic internal iliac artery ligation in gynecologic

- pelvic surgery. *International Journal of Gynecology and Obstetrics*, 65(3), 307-309.
11. B-Lynch, C., Keith, L. G., and Campbell, W. B. (2012). Internal iliac (hypogastric) artery ligation. *A Comprehensive Textbook of POSTPARTUM HEMORRHAGE: An Essential Clinical Reference for Effective Management*, 441-447.
  12. Selçuk İ, Yassa M, Tatar İ, Huri E. Anatomic structure of the internal iliac artery and its educative dissection for peripartum and pelvic hemorrhage. *Turkish Journal of Obstetrics and Gynecology*. 2018 Jun;15(2):126-129. DOI: 10.4274/tjod.23245. PMID: 29971190; PMCID: PMC6022419.
  13. Sucu, S., Özcan, H. Ç., Karuserci, Ö. K., Demiroğlu, Ç., Tepe, N. B., and Bademkiran, M. H. (2021). Is there a role of prophylactic bilateral internal iliac artery ligation on reducing the bleeding during cesarean hysterectomy in patients with placenta percreta? A retrospective cohort study. *Ginekologia Polska*, 92(2), 137-142.

Source of Support: None Declared  
Conflict of Interest: None Declared

