Internal Iliac Artery Ligation: A Retrospective Analysis of Two Different Approaches

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ABSTRACT

Aim: To describe two different approaches of performing internal iliac artery ligation and their usefulness in different clinical situations.

Introduction: Internal iliac artery ligation is a very useful method to control pelvic hemorrhage. It can become a necessity at any point of time while performing obstetric or gynecological surgeries, and it is a procedure that needs to be accomplished in a matter of few minutes, before the patient goes into irreversible shock.

Techniques: Internal iliac artery ligation can be done by approaching the artery by opening the retroperitoneal space, either by dividing the round ligament or by opening the pouch of Douglas. The internal iliac artery is identified by locating the bifurcation of the common iliac artery with the ureter crossing it. The external iliac artery is the lateral branch of the common iliac artery and it runs a straight course to continue as the femoral artery in the lower limb. The ureter is identified by peristalsis, and the internal iliac artery is the short medial branch of the common iliac which runs a short course and immediately divides into an anterior and a posterior division, which in turn divide into a number of branches. The uterine artery is the branch of anterior division of the internal iliac artery. The internal iliac artery is ligated by passing a stout suture material under it with the help of a right-angled forceps, or it can be directly occluded with clips, applied using a clip applicator.

Conclusion: Both the approaches are equally effective and easy to perform. Approaching the internal iliac artery through the round ligament is easier in gynecological surgeries, whereas the pouch of Douglas approach is easier during cesarean section.

Clinical significance: Internal iliac artery ligation is almost always performed as an emergency, though the need to perform it can be anticipated in advance and the gynecologist can be prepared for it. It is essential for gynecologists to be conversant with this life and a uterus-saving procedure. There are two approaches of doing this procedure and the choice is entirely on the individual. It may not be possible to approach the pouch of Douglas when there are dense adhesions as in case of a frozen pelvis. And it may be time-consuming to approach the internal iliac artery by dividing the round ligaments when there is postpartum hemorrhage. Therefore, it is useful to know both the approaches, because one might encounter a situation where one may find it difficult to follow the technique one is familiar with.

Keywords: Internal iliac artery ligation, Pelvic hemorrhage, Pouch of Douglas, Right-angled forceps, Round ligament, Ureter.

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INTRODUCTION

It is a well-known fact that internal iliac artery ligation is a very important method to control pelvic hemorrhage. It can become a necessity at any point of time in obstetric and gynecological procedures, whether it is following vaginal delivery, trauma to pelvic organs, during cesarean section, or benign and radical surgeries. It is a procedure that has to be accomplished in a matter of minutes, lest the patient goes into irreversible shock.

Very often, obstetric hysterectomy is not the preferred option to control postpartum hemorrhage, especially in women who are very young and those who do not have live issues. Though hysterectomy should be done to save the patient’s life before it is too late, there may be lingering doubts of whether the obstetrician had exhausted all options like bilateral internal iliac artery ligation before resorting to hysterectomy. Bilateral internal iliac artery ligation controls pelvic hemorrhage by reducing the pulse pressure1-3 and does not impair menstruation or future fertility.1-6

In gynecological surgeries, hemorrhage may in some cases continue to occur even after the specimen has been removed. In such situations, bilateral internal iliac artery ligation has to be done before taking the (last ditch) decision of closing the abdomen with a pelvic pack in situ.

TECHNIQUES

Internal iliac artery ligation could be a planned or an expected procedure, as in the case of an elective cesarean section for complete placenta previa; or it could become a sudden, unexpected necessity during any pelvic surgery, or following delivery. Whenever a situation of profuse bleeding is encountered during surgery, the surgeon...
should remain calm and must immediately place mops
and apply pressure. One can try to catch the bleeders and
ligate them, but vessel walls retract after being cut and it
may not always be possible to catch them. The cardinal
rule of any surgery is not to apply clamps blindly and
take deep stitches without locating vital structures like
the ureters, lest they get cut or included in the pedicle. If
the patient is under spinal anesthesia, the surgeon should
request the anesthetist to give general anesthesia and to
collect a sample of blood for cross-matching.

The surgeon must then extend the incision to permit
better visualization, request the scrub nurse for Deaver
retractors and a right-angled forceps/mixer with stout
linen, or preferably clip applicators. Another assistant
should also be called to scrub in, if required, for better
assistance. Most cesarean sections and abdominal hyster-
ectomies are done under spinal anesthesia through a Pfann-
stenstiel incision. Radical surgeries are usually done under
general anesthesia through a vertical incision. When the
need for internal iliac artery ligation is encountered, one
must quickly and carefully convert a Pfannenstiel incision
to a much larger Maylard’s incision by cutting the rectus
muscles transversely. However, one must take care to
ligate the superior and inferior epigastric arteries which
anastomose in the rectus abdominus muscle.

In case of laparoscopic procedures, if laparoscopic
internal iliac artery ligation fails, then one should imme-
diately open the abdomen through a vertical incision. The
iliac vessels can be approached by one of the two methods.

**Approach 1: Through the Round Ligament**

The surgeon clamps and divides the round ligament, while the assistant holds the uterus/specimen. The fold
of peritoneum behind the round ligament is incised and the two folds of broad ligament are opened (Figs 1 and 2). The loose areolar tissue is carefully separated with sharp
dissection and cautery, or preferably with fingers. The
ureter can be seen entering the pelvis, crossing the bifurca-
tion of common iliac artery and it then runs downward and
medially along the fold of peritoneum (Fig. 3). The ureter
takes a sharp medial turn at the level of ischial spine and
then traverses below the uterine artery and enters the tunnel
of Wertheim, to finally enter the trigone of the bladder. The
external iliac artery is seen running a straight course into
the lower limb where it continues as the femoral artery. The
external iliac vein, which is much bigger in caliber, is seen
just below the external iliac artery. The internal iliac artery
is the shorter medial branch of the common iliac artery.
Below the iliac vessels lies the psoas muscle (Figs 4 and 5).

A right-angled forceps should be passed under the
internal iliac artery with the help of a blunt forceps, lest
any vascular structure gets traumatized leading to more
bleeding. The vessels should be ligated using a stout
linen or thick black silk (Fig. 6). Using a clip applicator
is much easier. One has to only apply clips directly onto
the vessel. There is no need to double ligate if the vessel is completely occluded, or to divide the cut ends. The assistant(s) should continuously suction, in order to keep the operating field clear, and should provide good exposure using retractors. The surgeon has to be careful not to ligate the external iliac artery or the ureter crossing the bifurcation of the common iliac artery. Though the three structures are easy to identify, one might end up passing the ligature around the wrong structure in the heat of the moment. We should feel the femoral pulsations and check the color of the urine immediately afterward.3

**Approach 2: Through the Pouch of Douglas**

This approach is useful in case of postpartum hemorrhage. Postpartum uterus is large, about 24 weeks size and pelvic tissues are edematous and congested. The uterus should be exteriorized and held by the assistant (Fig. 7). The assistant should push the rectum back with the other hand, thus stretching the pouch of Douglas. The surgeon should hold the fold of peritoneum in the pouch of Douglas and open the retroperitoneal space (Fig. 8). The ureters can be seen transperitoneally on the lateral side (Fig. 9). A finger can be gently inserted into the space and widened, taking care not to injure the ureter (Fig. 10). The peritoneum can be held with a long artery forceps and cut, taking care that there is no underlying structure. The axilla of the pelvis containing the bifurcation of common iliac artery with the ureter crossing it can be seen (Figs 10 to 12). The surgeon must quickly pass a right-angled forceps and ligate the internal iliac artery or alternatively use the clip applicator.

**DISCUSSION**

In our institute, we have done internal iliac artery ligation in a total of 11 cases in 2015 and 2016. All were done as

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**Fig. 4:** The arrow pointing down shows the ureter crossing the common iliac artery and the vessel below is the external iliac artery running straight into the lower limb. The lower arrow shows the internal iliac artery

**Fig. 5:** Both external and internal iliac arteries can be appreciated. Ureter is a structure better felt than seen and is present along the medial fold of peritoneum. Psoas muscle is seen below the external iliac artery (another view of fig. 4)

**Fig. 6:** The arrow pointing to the right is showing the internal iliac artery which has been ligated. The arrow pointing to the left is showing a small retroperitoneal hematoma which fortunately has stopped expanding

**Fig. 7:** Diagram showing the pouch of Douglas after the postpartum uterus has been exteriorized
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an emergency procedure to control unexpected torrential hemorrhage. Four cases were emergency cesarean section, five were cases of malignancy, and two were benign cases. Among the five cases of malignancy, three were cases of radical hysterectomy for carcinoma cervix, and two were cases of carcinoma ovary following neoadjuvant chemotherapy. Both the benign cases were patients who had undergone suboptimal surgery outside for extensive endometriosis and broad ligament fibroid respectively.

None of the patients developed any complications because of internal iliac artery ligation and the control of hemorrhage was dramatic in all.

We find that both the approaches are useful. The first approach through the round ligament is more commonly used and is suitable in gynecological cases. Very often, the round ligaments are already divided and there is a stay suture on the lateral cut end of the round ligament. In case of radical surgeries, the pararectal and paravesical spaces are already opened, and the ureter lies exposed. So, this approach is the preferred approach in gynecological cases.

In case of obstetric hemorrhage, the pelvic tissues are edematous and the vessels are congested. The postpartum uterus is big – 24 weeks in size. While trying to reach the iliac vessels by dividing the round ligament and opening

Fig. 8: Opening the retroperitoneal space through the pouch of Douglas

Fig. 9: Diagram showing the way to approach the axilla of the pelvis through the pouch of Douglas

Fig. 10: Inserting fingers into the retroperitoneal space and gently widening it to expose the iliac vessels. The congested ovarian vessels can also be appreciated

Fig. 11: Iliac vessels can be seen through the opening made in the pouch of Douglas

Fig. 12: The left iliac vessels are exposed. The arrow pointing to the right shows the bifurcation of the common iliac artery. The arrow pointing to the left shows the ureter which has been lifted up along with the overlying peritoneum
the leaves of broad ligament, one might damage the congested vessels, which will only add to further bleeding, obscuring the view and worsening the situation.\(^8\) It is very important to get fast and easy access to the axilla of the pelvis and to visualize the structures correctly. Ureter is identified by peristalsis when stimulated by a blunt forceps and it feels like a cord that slips between the fingers when held with the thumb and index finger. The external iliac artery is a straight vessel that runs below the inguinal ligament to enter the lower limb as the femoral artery. The inferior epigastric artery, a branch of external iliac artery, can be seen arising from it, lower down in the pelvis. The internal iliac artery is a short vessel that runs medially and immediately divides into anterior and posterior divisions, which in turn divide into a number of branches. Arteries are seen pulsating while the ureter shows peristalsis.

The disastrous consequences of ligating the wrong structure cannot be exaggerated.\(^7,8\) One should immediately proceed to ligate the internal iliac artery on both sides and simultaneously call a vascular surgeon or an urologist, as the case maybe, to untie the wrong ligature. The ureter is poorly vascularized in its lowest one-third and any damage at this site will require extensive repair than just untying of the ligature. Also, accidental ligation of the external iliac artery will result in ischemia and gangrene of the lower limb.\(^3\)

**CONCLUSION**

Internal iliac artery ligation is a simple procedure, but it needs to be learnt under supervision. It can be performed by anybody and can be performed in any operating theater with simple and easily available instruments. It can be accomplished in a matter of 3 to 5 minutes on both sides and has a dramatic effect on control of pelvic hemorrhage. On the contrary, uterine artery embolization requires expensive equipments and the presence of an expert intervention radiologist.

Internal iliac artery can be approached by two different techniques – through the round ligament or through the pouch of Douglas. The round ligament approach is suitable when pelvic hemorrhage is encountered during gynecological surgeries, while the pouch of Douglas approach is more suitable in cases of postpartum hemorrhage.

**CLINICAL SIGNIFICANCE**

Internal iliac artery ligation is almost always performed as an emergency, though the need to perform it can be anticipated in advance and the gynecologist can be prepared for it. It is essential for gynecologist to be conversant with this life- and a uterus-saving procedure. There are two ways of approaching the internal iliac artery. Both the approaches are quick and easy to perform, and the choice of approach depends on the individual.

However, it may not be possible to approach the pouch of Douglas when there are dense adhesions as in case of a frozen pelvis. And it may be time-consuming to approach the internal iliac artery by dividing the round ligaments when there is postpartum hemorrhage. Therefore, it is useful to know both the approaches because sometimes one might encounter a situation where one may find it difficult to follow the technique one is familiar with.

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