

## THE HYPOGASTRIC ARTERY IN GYNAECOLOGICAL SURGERY\*

by

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The scope and extent of gynaecological surgery are increasing day by day due to modern improved anaesthesia, massive blood transfusion and understanding of the problem of fluid and electrolyte imbalance. Because of this increased extent of gynaecological surgery, uncontrollable bleeding from the site of operation is not unusual and ligation of major vessels becomes imperative in order to control such haemorrhage.

Various pathological conditions give rise to anatomical distortion of the pelvic vascular bed and growth of aberrant vessels which do not follow the normal anatomy. Chronic pelvic inflammation, endometriosis and malignancy are notorious for producing the above changes. Inflammatory conditions give rise to adhesions between the fallopian tubes, ovaries, broad ligaments, pouch of Douglas, omentum and intestines. Aberrant vessels grow within these masses and adhesive bands. Endometriosis also produces thick vascular adhesions and a plane of cleavage may be extremely diffi-

cult to find and may lead to injury to the vascular structures. Extension of malignancy outside the cervix (cancer cervix) and ovary (carcinoma ovary) usually bring about fixation of the cancerous masses to the lateral pelvic walls and fulminant bleeding may be precipitated during a radical operation. Sometimes it becomes impossible to pick up the bleeding vessels and the major vascular trunk needs to be tied up.

In the presence of a huge broad ligament haematoma due to perforation of the uterus or rupture uterus in young women, the hypogastric artery may require to be ligated to control bleeding and to save the uterus. Reactionary haemorrhage after abdominal or vaginal hysterectomy is a rare postoperative complication. After reopening the abdomen it is not easy to find out the exact bleeding vessel within the oedematous discoloured pelvis and the only way to save the patient may be by ligation of the hypogastric artery.

*Paper presented at the Conference of the International College of Surgeons at Dehra Dun during 1967/68 session*

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*Received for publication on 24-9-1968.*

### *Anatomy*

The hypogastric artery is the main vessel which supplies the pelvic viscera. It takes origin from the common iliac artery (one third of the way, i.e., two inches along

the line joining the aortic bifurcation to the midinguinal point) at its bifurcation opposite to the sacroiliac joint. It is about 4 cm long and descends to the upper margin of the greater sciatic foramen. It descends extra-peritoneally and crosses medial to the external iliac vein, psoas major and obturator nerve. In front of it runs the ureter; behind it lies its veins (Figs. 1 and 2).

The length of the internal and common iliac arteries bear an inverse proportion to each other. The place of division of the internal iliac artery varies between the upper margin of the sacrum and the upper border of the greater sciatic foramen.

It divides into an anterior trunk, which runs in the line of the parent vessel towards the ischial spine and a posterior trunk which passes backwards towards the foramen. The branches of the internal iliac artery arise erratically. Usually the superior gluteal and the two somatic segmental branches, e.g. iliac-lumbar and lateral sacral, arise from the posterior trunk and the other visceral and parietal branches come from the anterior division. The visceral branches are superior vesical, inferior vesical, middle rectal, uterine and vaginal, while the branches to the limbs and perineum are inferior gluteal, obturator and internal pudendal.

Grant, in his Atlas of Anatomy, has aptly described the pelvic viscera as lying within a basket woven out of large thin-walled veins among which the arteries thread their way. The basket is divided into vesical, uterine, vaginal and rectal venous plexuses. They drain largely into

the internal iliac vein, but partly via the superior rectal vein into the inferior mesenteric vein and so to the portal vein. The middle rectal vein is relatively large and drains into the internal iliac vein. The uterine vein communicates with the pampiniform plexus of ovarian veins.

#### *Material for study*

As mentioned in the beginning, ligation of the hypogastric artery becomes necessary under certain conditions. In the last ten years the author came across the following conditions where this became imperative.

#### 1. *Cancer surgery*

1. Radical operation (Wertheim's operation) for carcinoma cervix—5 cases—ligation of the hypogastric artery was done under the following situations during this operation.

(a) Injury to the right internal iliac vein during dissection of the hypogastric group of lymph nodes.

Both the right internal iliac artery and vein were ligated.

(b) Profuse bleeding from the torn superior vesical (obliterated hypogastric) artery due to laceration during dissection. Anterior division of the internal iliac artery was tied.

(c) Uncontrollable bleeding during dissection of the obturator group of lymph nodes on the left side.

This was perhaps due to injury to the obturator artery and vein and possibly the communicating vein between the obturator and external iliac vein was damaged. In spite of putting a lateral suture on the external iliac vein the bleeding could



not be controlled. Hence, ligation of the left hypogastric artery was done which controlled the bleeding.

(d) Profuse oozing from the sub-vesical area during dissection of the lower end of the ureter at its entrance into the bladder. This was due to a tear of the subvesical venous plexus. Bilateral ligation of the anterior division of the hypogastric arteries was performed.

(e) The anterior division of the internal iliac artery was ligated because of its direct continuity with the uterine artery of the right side. The anterior division of the right hypogastric artery was ligated.

Some gynaecologists believe that ligation of the hypogastric arteries in radical operations (Wertheim's type) is associated with a high incidence of uretero-vesical fistula. This is attributed to trophic changes in these organs.

2. Exenteration operation for carcinoma cervix — 2 cases.

Exenteration operation for carcinoma ovary — 1 case.

Total exenteration was performed in one case of cancer cervix and one case of ovarian carcinoma, while anterior exenteration was done in one case of cancer cervix. The main trunk of the hypogastric artery was tied on both the sides deliberately.

11. Reactionary haemorrhage after hysterectomy — 3 cases.

Vaginal hysterectomy 2

Abdominal hysterectomy 1

In all these cases bleeding occurred within 48 hours and there were constitutional signs of haemorrhage. The abdomen had to be reopened,

when the whole pelvis was found to be filled with large blood clots and the pelvic peritoneum was seen to be lifted up to the level of the inlet. The bleeding vessels could not be detected; hence bilateral ligation of the hypogastric arteries was done.

111. Secondary haemorrhage from the vault of the vagina on the 10th day after a vaginal hysterectomy — 1 case.

The patient had been having a low rise of temperature during the post-operative period with offensive vaginal discharge. The bleeding started on the 10th day. No bleeding point could be seen through a vaginal speculum. Packing of the vagina was done with no effect and the bleeding went on increasing. Hence, the abdomen was opened and the anterior divisions of the internal iliac arteries were tied on both the sides.

IV. Chronic pelvic inflammatory mass — 1 case.

While dissecting and lifting up the adherent tubo-ovarian mass on the right side, the broad ligament was torn at the base giving rise to severe bleeding. The bleeding vessel could not be detected and the haemorrhage was very profuse leading to collapse when the anaesthetist asked the surgeon to stop the operation for some time till the patient was recuperated to a certain extent by a massive blood transfusion. In the meantime, the local area was kept tightly packed. When the operation was restarted the bleeding vessel still could not be held, so a right sided ligation of the hypogastric artery was done.



#### V. Broad ligament haematoma — 2 cases.

In two cases of procured abortion, the uterus was perforated and the uterine vessels were torn, giving rise to large broad ligament haematomas. The mass could be felt per abdomen. After opening the abdomen the broad ligament was incised, the clots were removed but the bleeding vessels could not be picked up. Ligation of the hypogastric artery of the affected side was done.

#### VI. Rupture of the uterus involving the right broad ligament — 1 case.

Rupture of the uterus involving the right broad ligament and the uterine vessels occurred in a third gravida who had no living children. The rent in the uterus was repaired, but the bleeding uterine vessels could not be picked up; so the hypogastric artery of the right side was tied.

#### Comments

Ligation of the hypogastric artery is a very important step in gynaecological surgery. It may be a life-saving procedure in uncontrollable haemorrhage in obstetric and gynaecological practice. There are several conditions for which this has to be done. The various indications for which this procedure had to be carried out in the present series have already been discussed. Apart from these indications, haemorrhage from an atonic uterus, severe bleeding from an inoperable cervical and vaginal carcinoma, secondary haemorrhage from the cervix after conization, post-caesarean section haemorrhage with marked atony of the lower uterine segment in cases

of placenta praevia are few rare conditions where this procedure may become necessary.

This operative procedure can be done intraperitoneally or extraperitoneally; but in all the cases in the present series it was done through an intraperitoneal approach. The transperitoneal route is preferred because the pathology can be readily visualized and the procedure is performed quickly without endangering the ureter and internal iliac vein. During lifting up of the hypogastric artery one has to be careful lest the accompanying hypogastric venous system, consisting of a complicated network of thin-walled veins, gets injured. The superior and inferior gluteal tributaries are particularly vulnerable. When they are torn, they retract out of reach of the surgeon resulting in torrential haemorrhage which is extremely difficult to control. The pudendal vein, as it comes out of the pelvis from the Alcock's canal, is another source of profuse bleeding. There is usually a communicating vein between the obturator and the external iliac veins. These veins may be implicated in the lateral extension of the growth from the cervical carcinoma. While doing a radical operation (Wertheim's type), specially during the finger dissection of the obturator glands, they may be injured causing severe bleeding. Due to retraction of the torn veins into the obturator canal, it becomes extremely difficult to get hold of them (Fig. 3).

The anterior division of the internal iliac artery is usually tied, but when the artery is longer than nor-

mal and divides low down, the main trunk may have to be tied. In the presence of a big haematoma, discoloration of the tissue and anatomical distortion, the anterior division may be difficult to recognise and the main vessel has, therefore, to be picked up. The artery is usually not clamped, but tied in two places after lifting it up with an aneurysm needle. The ligature used may be no. 2-0 silk or chromic catgut.

After ligation of the hypogastric artery, Burchell and Olson made serial aortograms to study the development of the collateral circulation and found that the collateral circulation functioned immediately in the lumbar, ilio-lumbar, middle sacral, lateral sacral, superior haemorrhoidal and middle haemorrhoidal collaterals. The haemorrhoidal arteries function only when the posterior division of the internal iliac artery is also tied. According to their observation the direction of the blood flow reversed in the distal artery, and in none of the cases recanalization of the internal iliac artery occurred.

Ligation of the hypogastric artery is not a new method of haemostasis in pelvic surgery. According to Brunschwig this is a very old step in gynaecological surgery. It was commonly practised at the end of the 19th century and the beginning of the present century. The first gynaecologic use of internal iliac artery ligation was described by Howard Kelly of John Hopkins Hospital in 1894. In 1896, Pryer recommended this procedure as a

treatment for all recurrent uterine malignancies and advised its use prophylactically prior to hysterectomy for these conditions.

In the present series, the results were very satisfactory in controlling the haemorrhage. Radman's results of hypogastric artery ligation in 9 cases at the Sinai Hospital were also excellent. It is thought by the present author and by Reich *et al* that this is a life saving measure and extremely useful in present day gynaecological surgery and obstetric emergencies requiring stoppage of uncontrollable obstetric haemorrhage without sacrificing the uterus.

#### Acknowledgement

My thanks are due to Prof. and Director, S. K. Sur Roy of the Department of Obstetrics and Gynaecology and Dr. B. Roy, Principal and Superintendent, R. C. Kar Medical College, Calcutta, for allowing me to use the hospital material when I was working there on a supernumerary assignment.

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*Figs. on Art Paper II & III*