

A Study on the Variations of the Branching Pattern of the Internal ILIAC Artery

Akshara V. R., Dr. Minnie Pillay

Abstract: The internal iliac artery formerly known as the hypogastric artery is the main artery of the pelvis. The exact arrangement of branches of the internal iliac artery is variable. Knowledge about these variations is of great value, for surgeons while performing surgery in the pelvis. Fourty pelvic halves were dissected to study the variations in the origin of the principal branches of the internal iliac artery. The principal branches were superior vesical, the internal pudendal, inferior gluteal and superior gluteal. The origin of the cited arteries were arranged in a tabular form and categorized into their types and sub types on classification system expounded by Ashley and Anson. and compared with the data available from other sources to find out the variations and similarities existing between the various population groups. Among 40 pelvic halves, 37 specimens showed Type III pattern, 2 specimens showed Type V pattern and 1 specimen showed type IV pattern. In order to minimize blood loss or prevent subsequent acute or delayed ischemia or venous stasis surgeons working in the pelvic area should be well oriented to the normal individual or pathologic pelvic blood supply.

Keywords: Internal iliac artery, branching pattern, variations

1. Introduction

The branching pattern of internal iliac artery is highly variable. Among the branches only the superior vesical, internal pudendal, inferior gluteal and superior gluteal arteries are considered as principal branches, their origin and course being less erratic and randomized than the others. The concentration of organs and anatomical structures within the closely packed confines of the pelvis makes the study of vascular pattern and their variations of much importance (Prabhu LV et al 1995). Tumours or septic processes following perforations of pelvic organs require extended organ resection. Such major surgical interventions in the pelvis need ligation and transections of the supplying arteries and veins. Sometimes inadvertent injuries of involved or adjacent vessels require expert handling. In order to minimise blood loss or prevent subsequent acute or delayed ischaemia or venoustasis, surgeons working in the pelvic area should be well oriented to the normal individual or pathological pelvic supply (Dzsinich 2004). The present study deals with the variations of the branching pattern of the principal branches of the internal iliac artery.

2. Materials and Methods

Fourty pelvic halves, thirty six male and 4 female, were dissected to study the branching pattern of the internal iliac artery. All dissections were done in the Department of Anatomy, School of Medicine, Amrita Institute of Medical Sciences, Kochi. The emphasis was mainly on the principal branches of the internal iliac artery and because of their clinical importance. The principal branches, ie superior vesical, the internal pudendal, inferior gluteal and superior gluteal were traced to their origins. The other branches of the internal iliac artery are known to be too random and anomalous in their origins by earlier workers in the field to follow any classifiable system (Prabhu LV et al 1995). Since the vaginal and uterine branches being gender and organ specific, and since male cadavers outnumbered female cadavers, they were excluded from the present study.

The origins of the cited arteries were arranged in a tabular form and categorized into their types and sub types, based on classification system expounded by Ashley and Anson (1941). The results were analyzed and compared with the data available from other sources to find out the variations and similarities existing between the various population groups.

Ashley & Anson (1941) described nine branching patterns involving the four principal branches of the internal iliac artery. The following, in brief, is the accepted pattern of classification of variations. (Figure 1).

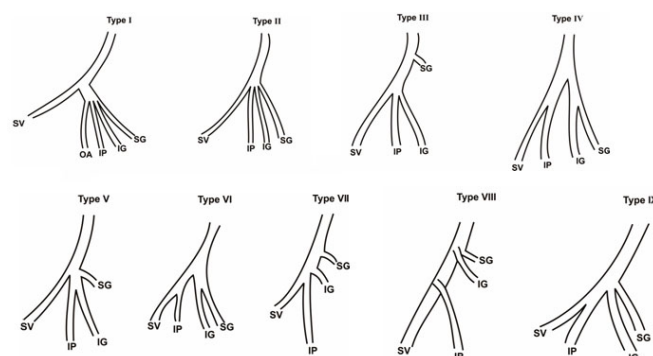


Figure 1: Branching pattern of internal iliac artery based on the classification by Ashley and Anson

SV : Superior Vesical
IP : Internal Pudendal
IG : Inferior Gluteal
SG : Superior Gluteal
OA : Obturator

3. Observations

Among 40 pelvic halves, 37 specimens (92.5%) showed type III pattern (Fig 2), two specimens (5%) belonged to type V pattern (Fig 3) and 1 specimen (2.5%) showed type IV pattern (Fig 4). The order of frequency of cases in this series of dissections is III>V>IV. Based on available data on population groups, in the Americans, Poles and Japanese, the frequency of types were reported to be in the order

111>IV>V>VI. In the present study on Indians too, type III pattern was the most frequent. The observations on the principal branches of the internal iliac artery is summarized in the (Tables 1).

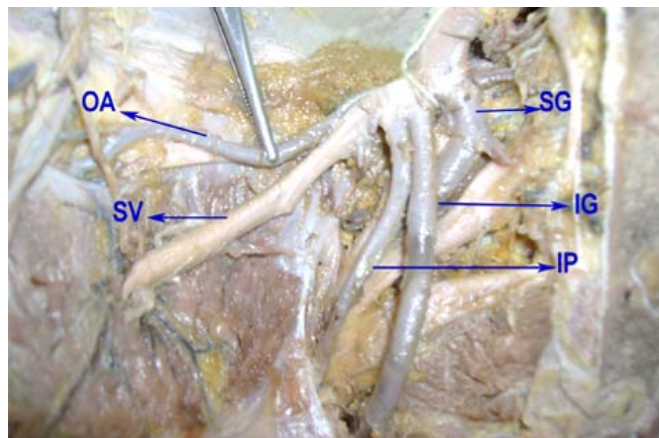


Figure 2: showing type III branching pattern-superior gluteal arising separately and the other principal branches from the common trunk

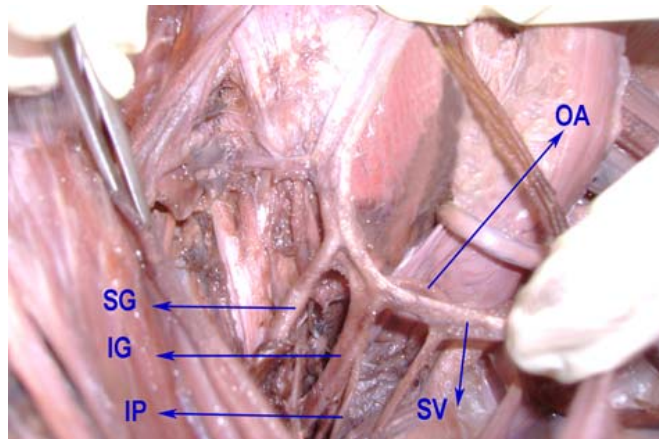


Figure 3: Showing type V pattern-the inferior gluteal and internal pudendal arise from a common trunk, the superior vesical and superior gluteal arising as separate branches

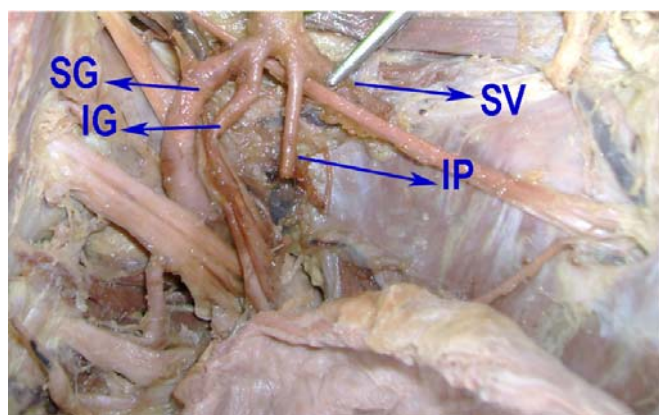


Figure 4: showing type IV branching pattern-the two common stems give off two branches each, the gluteals from one, and the others from the next

Table 1: Types of Internal Iliac Artery as Observed in the Present Series of Dissections

Type	Right	Left	Number	Percentage
I	0	0	0	0
II	0	0	0	0
III	20	17	37	92.5
IV	0	1	1	2.5
V	1	1	2	5
VI	0	0	0	0
VII	0	0	0	0
VIII	0	0	0	0
IX	0	0	0	0
Total	21	19	40	100

4. Discussion

The internal iliac arteries provide nutritive flow to all organs of the pelvis and to the pelvic wall. Distal collateral circulation may develop through connections between the deep femoral and tributaries of the internal iliac arteries. Hence vascular anatomy of internal iliac artery is important. Forty pelvic halves were dissected and observed for the branching pattern of the internal iliac artery. In the current series, three major branching patterns out of nine types described by Ashley and Anson (1941) were observed. The types noticed were type III, type IV and type V. Thirty seven specimens showed type III pattern (92.5%), two specimens belonged to type V (5%) and one specimen showed type IV (2.5%). Prabhu LV et al (2001) had dissected 40 pelvic halves and they noticed that about 65% cases (26 out of 40 specimens) showed type V pattern, which is different from the present study. According to their work, the major branching pattern was of type V, and corresponds to Americans, Poles and Japanese. 51.2% of Japanese, 38% poles, 54% American Whites and 71.6% American Blacks showed type V pattern (Prabhu LV et al 2001).

Table 111: Distribution of Internal ILIAC Arterial types according to Population Groups

Type	Japanese	Poles	American Whites	American Blacks	Indians (work done by Prabhu LV et al. ²)	Indians (in the present study)
I	0	0	0.5	0	0	0
II	0	0	2.5	1.7	0	0
III	18.5	28	11	5	27.5	92.5
IV	23.1	24	18	15	5	2.5
V	51.2	38	54	71.6	65	5
VI	4.1	9	8.5	5	0	0
VII	0	0	5	0	0	0
VIII	0	0	0	1.7	0	0
IX	0	0	0.5	0	0	0
Special types	0.8	15	0	0	0	0
Total	97.4	99	100	100	100	100

In one of the specimens, it was noticed that the inferior gluteal and superior gluteal arteries were arising from a common trunk. According to Bergman et al (1988), the inferior gluteal may form a common trunk with the superior gluteal artery, it may be doubled and join the obturator artery. The internal iliac artery may give branches without dividing into anterior and posterior

divisions, and branches of the anterior and posterior divisions of the internal iliac artery may exchange origins. Reddy et al (2007) noted a rare variation of absence of inferior gluteal artery, and also that the origin of superior gluteal artery was from the anterior division of the internal iliac artery.

Knowledge of vascular anatomy of pelvis is very important, particularly the variations in the origin of the obturator artery. This is important while performing pelvic and groin surgeries which require appropriate ligation, and such aberrant origins may be a significant source for persistent bleeding in treating of acute trauma. Knowledge of the vascular anatomy will aid surgeons in avoiding haemorrhage during the Burch procedure. The rapid development of surgical and investigatory techniques in obstetric manorvres or urogenital interventions makes it imperative for a thorough understanding of vascular tree in the abdomen and the pelvis (Hollinshead HW, 1971).

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