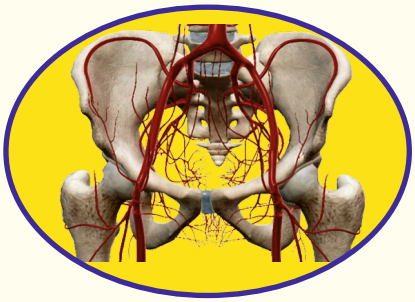
INTRODUCTION



CHAPTER

1

INTRODUCTION

Anatomy is derived from the Greek word “anatome” which means cutting up. It is one of the core basic science subjects (Ghazanfar H et al., 2018). The discipline of anatomy, while providing the fundamental knowledge of the structure of the human body, also underpins the study of physiology and pathology as well as a host of clinical specialties including clinical medicine, surgery and radiology (Shaffer K, 2004; Heylings DJ, 2002). Human cadaveric dissection has been used as the core teaching tool in anatomy for centuries and has become a greatly acknowledged fact that good medical or surgical practice could only be based on adequate knowledge of human anatomy which can only be learned from cadaveric dissection (Ghazanfar H et al., 2018).

The word dissection is derived from Latin word dissecure ‘to cut into pieces’. The rise of ancient Greek medicine paved the way for the inception of human cadaveric dissection as a tool for teaching anatomy in 3rd century BC. Unfortunately, the practice of human dissection was prohibited in Europe during the middle ages due to religious and popular beliefs. However, during the 14th century, religious authorities gave permission for human dissection only within the university premises and these were conducted once/twice annually on corpses of executed criminals. However, by the beginning of 15th century, cadaveric dissection became a regular event in European universities and the supply of criminal bodies proved insufficient. This made the anatomists began to rely on extra-legal sources which involved grave-robbing, body snatching and even murder for anatomical dissection. In response to the strong public outcry against these ongoing malpractices, many European countries passed legislations during the 18th and 19th centuries, legalising the procurement of unclaimed bodies of poor from workhouses and charitable hospitals for dissection in medical schools. The most prominent among these legislations was the Anatomy Act (1832) passed by the British government which not only allowed the use of unclaimed bodies but also prohibited the tradition of using corpses of executed criminals for anatomical dissection. Till the first part of the 20th

century, instances of voluntary body donation were very low as socio-cultural prejudice against human dissection remained high. However, in the second half of 20th century, the approval of the UAGA in the United States of America in 1968 ensured a steady supply of human bodies to the medical schools through body request. Presently, body donation constitutes the sole source of human bodies for dissection in medical schools in most parts of the world (Ghosh SK, 2015).

"One must start on a cadaver and end up operating on a patient, unless one wishes to start with a patient and end up with a cadaver." Ernest Juvara (1870–1933)

(Palade R, 2005)

Cadaveric dissection has been considered a necessity in the learning of gross anatomy and thought to contribute significantly to a future professional career. Cadaveric dissection helps medical students by helping them in understanding the three-dimensional relationship of different anatomical structures and appreciating anatomical variations (Ghazanfar H et al., 2018). A deep understanding of anatomy is fundamental for safe clinical practice. There has been a steady increase in medico-legal litigation for surgical malpractice. In the UK, between 1995 and 2000, there was 7 times an increase in claims associated with anatomical incompetence submitted to the Medical Defence Union. Out of which, 32% of claims against general and vascular surgeons particularly damage to underlying structures. Cahill and his colleagues showed that a significant number out of the 80,000 avoidable deaths per year in the US may be due to anatomical errors as well as the doctor's incompetence (Bhattarai L et al., 2022).

The human body is a very complicated and sophisticated unit that develops from two single cells that merge and subsequently divide into 37.2 ± 0.81 trillion cells. During development, divergence from the DNA-encoded body plan happens, which on one side allows further improvements or variations, but on the other side can lead to developmental defects or death (Kachlík D et al., 2020).

Variant anatomy is a field of anatomical science that concerns the abnormalities of the human body structure. What is considered normal with regard to the human body

structure is arbitrary and it is based on thousands of years of experience and agreements among specialists and their societies and committees In case of variant anatomy, these abnormalities do not typically interfere with the function of a given part of the human body and, thus, do not usually manifest as pathological nosological units (Kachlík D et al., 2020).

Anatomical variations are not only very interesting and thought-provoking for anatomists but also of principal concern for clinicians. Theodore E. Keats stated in his editorial that "I have spent a large portion of my professional life collecting and documenting normal anatomical variants, and I find the task endless. It seems that Mother Nature is boundless in the infinite variations in the way we are constructed." Keats has also argued that "the interpretation of normal variants must always include proper incorporation with clinical history and physical findings, or we may inadvertently give patients diseases which they do not have, and this is probably the worst mistake we can make in medicine". Cahill and Leonard stated in 1999 that 10% of surgical errors in the USA are due to the lack of knowledge of existing anatomic variations. The presence of an anatomical variant can be revealed during a diagnostic or therapeutic intervention and can be an unpleasant surprise for the intervening specialist. Hence, the need for precise knowledge of human anatomy has to be emphasized, especially in the technical fields of medicine (ultrasonography, magnetic resonance, computed tomography, endoscopy, surgery, etc.) in which this knowledge can lead to a better and more accurate diagnosis, help in preventing a variation which can be mistaken as a pathology, as well as allow better therapeutic interventions. That is why expert educational committees in the USA and the Netherlands have included anatomical variations in their anatomy programs, objectives, and syllabi (Kachlík D et al., 2020).

In human body, there is developmental variation of blood vessels, nerves, organs, bones, external features and almost all the tissues. The variations in vascular system are quite common. Internal iliac artery (IIA) found in pelvic cavity is an area of the interest in this study.

Among the several cavities present in the body, pelvic cavity, often referred as is a bowl-like structure that sits below the abdominal cavity. The true pelvis, or lesser pelvis, lies below the pelvic brim. This landmark begins at the level of the sacral promontory posteriorly and the pubic symphysis anteriorly. The space below contains the bladder, rectum, and part of the sigmoid colon. In females, the pelvis also houses the uterus, fallopian tubes, and ovaries (McEvoy A and Tetrokalashvili M, 2022).

The internal iliac artery is the "artery of the pelvis". It supplies most of the blood to the pelvic viscera, namely; rectum, urinary bladder, prostate and seminal vesicle in male, uterus in female and musculoskeletal part of the pelvis. However, it also supplies branches to the gluteal region, medial thigh region and the perineum including erectile tissues of the penis and the clitoris (Shah A and Khan YS, 2022).

IIA is also called as hypogastric artery according to the older terminology is given off by the common iliac artery (CIA) at its bifurcation anterior to the pelvic brim at the level of the sacroiliac joint. The artery descends posteriorly within the pelvic cavity towards the greater sciatic foramen. At the upper border of this foramen, it ends by dividing into anterior and posterior divisions (Bergman et al., 2015, Tunstall, 2016). The visceral branches of the anterior division are superior vesical artery (SVA), inferior vesical artery (IVA), middle rectal artery (MRA), uterine and vaginal arteries. The last two branches are present in females, wherein the vaginal artery replaces the inferior vesical artery. The parietal branches of the anterior division are obturator artery (OA), inferior gluteal artery (IGA), and internal pudendal artery (IPA). The branches from the posterior division are all parietal, namely, iliolumbar artery (ILA), lateral sacral artery (LSA), and superior gluteal artery (SGA) (Standring and Gray, 2008).

The concentration of organs and anatomical structures within the closely packed confines of the pelvis makes the study of vascular patterns and their variations of paramount importance not only for the anatomists but also for surgeons, obstetricians and gynaecologists, urologists, vascular surgeons and radiologists. Moreover, Internal iliac artery exhibits great number of variations unlike the external iliac artery which is constant and relatively simple in its morphology. The embryological explanations for the

variations in the arterial pattern are based on unusual selection of channels from a primary capillary plexus, wherein the most appropriate channels enlarge while others retract and disappear thereby establishing the final arterial pattern (Kumar S and Minz S, 2017).

During posterior pelvic fractures, anterior and anterolateral spinal approaches, lumbosacral spinal endoscopic procedures, lateral disc excision, anterior approaches to the sacroiliac joint for arthrodoses or internal fixation, injury to the iliolumbar artery may occur. During surgical repair of fracture of superior ramus of pubis, the obturator artery may be injured due to anomalous origin from the external iliac artery which might lead to profuse bleeding (Yuvaraj M, 2018). In some instances, ligation or embolization of individual branches such as the uterine artery for hysterectomy, or prostatic branches for tumour management, may be required (de Assis AM et al., 2015, Naguib NN, 2008). In addition, aneurysms of the IIA and atherosclerotic disease may occur in some patients, which might necessitate open surgery or endovascular intervention. Understanding the possible morphological patterns of the IIA would be invaluable for a clinician performing such vascular interventions. Furthermore, minimally invasive surgery used in urologic and gynaecologic surgery also requires a proper understanding of the branching patterns of the IIA (Puntambekar S, 2017). Hence, the knowledge regarding the course and branches of internal iliac artery is necessary which will greatly help the surgeon during surgical procedures of the pelvic region. Moreover, Population-specific information about the IIA would be significant in planning and managing various vascular conditions in the pelvis.

For this reason, there have been many studies (Ashley and Anson, 1941; Fisher, 1959; Hollinshead, 1978; Iwasaki et al., 1987; Lippert and Pabst, 1985; Morita et al., 1974; Pieroh et al., 2021; Roberts and Krishingner, 1967; Senior, 1919; Suzuki, 1951; Yamaki et al., 1998; Yasukawa, 1954) on the distribution patterns of this artery and related region, mostly using the main classification established by Adachi et al. (1928) the creation of which was possible thanks to the work of previous anatomists (Gegenbaur, 1892; Henle, 1868; Luschka, 1862; Meckel, 1816; Rauber et al., 1914) who successfully expanded knowledge about this region.

The present study has been undertaken to observe not only the variation in origin, length, diameter, branching pattern of internal iliac artery but also levels of origin of important individual branches of IIA like obturator artery, iliolumbar artery, superior vesical, middle rectal and uterine artery. Isolation of internal iliac artery and tracing of the major branches will provide add information about it and thereby enlightening the radiologists and operating surgeons on every aspect of IIA in Indian population.