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Original Research Paper

Anatomy

A STUDY OF CORONA MORTIS ON CADAVERIC HEMIPELVISES

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ABSTRACT

AIMS: to report the prevalence of arterial corona mortis and to describe its surgical and clinical applicabilities.

MATERIALS AND METHODS: We dissected 60 hemipelvises (50 men and 10 women) fixed in a 10% formalin solution for the purpose of gathering information on corona mortis. We measured the caliber and length of the obturator artery and its anastomotic branch with the aid of a digital caliper.

OBSERVATION AND RESULTS: arterial corona mortis was present in 45% of the studied sample. The most common origin of the obturator artery was the internal iliac artery. The caliber of the anastomotic branch was on average 2.7mm, whereas the caliber of the obturator artery was 2.6mm.

KEYWORDS : Corona Mortis

INTRODUCTION:

Corona mortis (CM), or death crown, is defined as an arterial or venous connection between the anastomotic branches of the obturator artery and the inferior epigastric artery over the superior branch of the pubis[5-9]. This anatomical variant is of clinical and surgical interest, as it is susceptible to iatrogenic lesions during hernia repairs, gynecological and orthopedic procedures, and may also be damaged in fractures of the pubis or acetabulum. The literature also reports the difficulty in performing CM hemostasis and the fact that this anatomical variation determines collateral circulation between EIA and the IIA[5-10].

After exiting the pelvis, the OA is divided into two terminal branches, an internal branch, with path at the inner border of the OF giving branches to the external obturator, pectin, and gracile muscles, and an external branch, which runs at the OF outer border to form the cruciform anastomosis[1].

The IEA, on the other hand, is a branch of the external iliac artery (IEA). Stemming a few millimeters above the inguinal ligament (LI), it runs horizontally and superiorly to the transverse fascia and runs anteriorly towards the arcuate line, between the rectus abdominis muscle and a posterior layer of its sheath. The IEA then anastomoses with an upper epigastric artery, a branch of the internal thoracic artery. During its trajectory, the IEA gives a branch to the spermatic cord, a suprapubic branch and an anastomotic branch (for the OA)[1,2,4].

This work aims to address the surgical and anatomical aspects of this arterial connection in 60 cadaveric hemipelvis.

MATERIALS AND METHODS:

We dissected 60 hemipelvises of adult corpses (50 men and 10 women) fixed in 10% formalin solution to analyze the vascular pattern of the pelvic region, specifically the origins and anastomoses of the OA. Among the pelvis dissected, 32 were left and 28, right. The study took place in the department of anatomy in a tertiary medical college in central India.

After the dissection and analysis of the OA origin, we measured its trajectory (form origin to OF) and its caliber (transverse diameter) with the aid of a digital caliper. If the anastomotic branch of OA was present, we also evaluated this vessel's length, caliber and distance from the upper branch of the pubis to the pubic symphysis.. We report morphometric data as mean ± standard deviation (SD). We compared the length and caliber of the anastomotic branch of both genders and sides using the Mann-Whitney-U test, considering a p-value <0.05 as significant).

RESULTS:

The most common origin for OA was the IIA (45%) There was one case where the OA originated from the femoral artery (1.66%). The percentage of all origins can be verified in (table 1). Of the 60 hemipelvises, 27 (45%) had arterial CM: 21 were men (77.77%) and six were women (22.23%) (Table 2). The Mann-Whitney U test did not reveal a statistically significant difference of the length and caliber of the anastomotic branch between genders or sides ($p>0.05$).

The mean OA caliber was 2.56±0.5mm. The mean OA length was 57±15mm. The anastomotic branch had a total length of 45±4.6mm, a mean caliber of 2.66±0.5mm and distance between the UBP and the pubic symphysis was on average 49.62±4.68mm. We summarize these results in (table 3).

DISCUSSION:

Anatomical variations of the OA origin are described in detail in the literature: it may originate from the EIA, from an ischial-pudendal trunk (formed by the internal pudendal and lower gluteal arteries), the upper or lower gluteal arteries, the internal pudendal artery, the femoral artery and from two distinct roots (one from the EIA and another from the IIA)[1-3,10,11]. The OA can also originate from the IEA, ilium-lumbar artery, lower bladder artery, vaginal artery, accessory hemorrhoidal artery, external pudendal artery, accessory pudendal artery, prostatic artery, and internal pudendal artery[1,14].

The IEA, on the other hand, has a varied origin in relation to its position, as it can originate as much as 6cm above the inguinal ligament[1-3]. This vessel may originate in the femoral artery and ascend to the pelvis through the femoral ring, from the deep femoral artery, from a common trunk with the deep circumflex artery of the ilium or from the OA itself and, in addition, there was a described case where the IEA originated from two distinct roots (from the EIA and IIA)[1,2]. Unusual branches of the IEA may be the dorsal artery of the penis (or clitoris), the superficial epigastric artery, the deep circumflex artery of the ilium, the medial femoral circumflex artery, and the accessory external pudendal artery. The suprapubic and funicular branches may be absent[1,3].

According to Testut and Latarjet[1], when the OA branches from the EIA, it can reach the OF through two distinct trajectories: 1) it can descend vertically through the lateral wall of the femoral vein or 2) it can enter the OF obliquely and inferiorly when crossing the superior wall of the femoral vein. The authors report that the second possibility is dangerous during hernia surgeries, due to its proximity to the hernial sac[3]. Goss[2] states that the most dangerous moment of this second trajectory is when the OA crosses the lacunar ligament. Our results showed that the OA originated along with the IEA (or

from it) in 36.68% of the cases, a significant percentage. In one of the hemipelvises studied, the OA originated from the femoral artery: a fact reported only once in a study by Sañudo et al.[11].

Although the anatomy books describe the usual presence of the anastomosis between the OA and IEA anastomotic branches, they do not use the term Corona Mortis, and few books cite its clinical and surgical importance. The term consists of two Latin words: "corona" (used in anatomy to design structures in the form of a crown or circular form), and "mortis", which comes from the term "mors", meaning death[4,15]. It definition is intriguing because some authors believe that it is any form of anastomosis between the IEA and the OA or between the IIA and the EIA[6,8,9,16,17], while others believe that CM is only the anastomosis of the OA and IEA anastomotic branches[5].

Authors like Gilroy et al.[16], Mahato[18] and Jusoh et al.[13] use terms such as "aberrant", "accessory" or "anomalous" to refer to CM. Gilroy[16] states that the prevalence of CM is high, and therefore should not be called by such terms. We share this opinion.

Reports of the arterial CM's length vary: 62mm according to Tornetta et al.[19], 52mm according to Hong et al.[20], 68mm according to Darmanis et al.[8] and 52.4mm according to Stavropoulou-Deli and Anagnostopoulou[21]. The CM's caliber is has on average between 2.6mm[8,20] and 3mm[21]. The present study revealed similar results, the length being 49.6±4.6mm, and the caliber, 2.6±0.5mm. The caliber should alarm surgeons and clinicians as this vessel can cause significant bleeding should it rupture.

The IEA and OA are susceptible to iatrogenic lesions during procedures due to their variable nature[7,15], as seen previously.

We observed that the vascular connections between the obturator, internal and external iliac and inferior epigastric systems are relatively common over the UBP. The diameter and trajectory of this anastomotic artery may vary. Iatrogenic lesions and pelvic and acetabular fractures can result in severe bleeding that puts the patient's life at risk. On the other hand, this anastomosis has a considerable role as a pathway of collateral circulation in peripheral arterial obstructive disease. Thus, we note the importance of studying this anatomical variation, since we do not consider it as unusual as previously thought.

1. Table showing origin of Origins of the obturator artery.

Origin	Number of cases	Total %
Internal Iliac Artery	27	45%
Superior gluteal artery	6	10%
Common trunk with the Inferior Epigastric Artery	22	36.38%
Inferior Epigastric Artery	4	6.66%
Femoral artery	1	1.66%
Total	60	100%

2. Prevalence of arterial Corona Mortis (CM) .

	Men	Women	Total
Arterial CM	21 (77.77%)	6 (22.23%)	27 (45%)
Absent	-	-	33 (55%)

3. Morphometric data of the obturator artery and its anastomotic branch.

	Anastomotic branch (n=60)	Obturator artery (n=60)
Caliber	2.66 ±0.5	2.567±0.5
Length	45±4.6	57.00±15
Distance (UPB×pubic symphysis)	49.62±4.68	-

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