

Corona Mortis: Surgical Anatomy, Physiology and Clinical Significance

Eftychios Papagrigrorakis, Konstantinos Gkarsioudis, Panagiotis Skandalakis, Dimitrios Filippou

Abstract— Corona mortis (CM) is classically defined as the arterial anastomosis between the obturator artery and the inferior epigastric artery that crosses the posterior aspect of the superior ramus of the symphysis pubis. Its clinical impact is considered great, as it lies within the surgical field of numerous specialties (general surgeons, orthopedists, gynecologists, urologists). Our systematic study of the literature revealed a diversity in the incidence of the Corona Mortis between cadaveric and patient studies. The new technological advances and especially the CT angiography, applied on the retropubic region vessels, have given the chance to obtain more precise depictions and thus estimations on the real incidence of corona mortis. This review intends to extract for the first time the corona mortis' incidence from the major CT angiographic studies in bibliography and compare it with the incidence of CM in the major cadaveric studies. Special attention was given to the question whether this anastomosis is that important as its name implies (mortis) in the clinical setting or not.

Index Terms— Corona Mortis, retropubic region, Obturator artery, vascular anatomy, arterial anastomosis.

I. INTRODUCTION

Corona mortis (CM) is a term classically used to refer to the arterial anastomosis between the external iliac artery (more commonly the inferior epigastric artery) and the obturator artery (Fig. 1) [1] – [4]. It runs along the posterior aspect of the superior pubic ramus and its laceration can prove life threatening in trauma cases or in scheduled operations [2], [5] – [7]. Due to its clinical importance many studies have dealt with the exact incidence of corona mortis, interestingly presenting quite diverse results. Lately with the advances in CT tomography, radiologists have shed some more light upon the exact anatomy of the retropubic region and the corona mortis anastomosis with the aid of CT angiography [8], [9], [11]. The purpose of this review is to extract the incidence of the corona mortis from the major CT angiographic studies in bibliography for the first time and compare it with the incidence of CM in the major cadaveric studies. One last question to be answered is whether this anastomosis is really that fatal, deserving the “mortis” part in its name.

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Figure 1. Corona Mortis

II. CORONA MORTIS – THE CT ANGIOGRAPHIC STUDIES

The classical definition of corona mortis is the retropubic anastomosis between the inferior epigastric artery and the obturator artery (Fig. 1). Lately there has been an increasing interest among radiologists in identifying the retropubic vascular patterns of CM with the use of CT angiography [8] – [10]. With the application of the recent imaging advances (such as 3D reconstructions), reliable depictions of the vascular anatomy can be obtained [8], [9], [11]. This is of great importance for the preoperative planning of pelvic osteotomy operations and some gynecological surgical procedures but can also be lifesaving in the hands of interventional radiologists in trauma cases of pelvic fractures [9], [10], [12], [13]. The estimated incidence of arterial CM varies in the largest studies in bibliography from 14% (Han et al [10] in the largest series in literature-660 pelvic sides) to 33% (Table I).

TABLE I Angiographic studies of arterial CM

Study	Number of hemipelvises	Arterial CM (%)
Steinberg et al ¹⁴	200	33
Smith et al ¹¹	100	29
Karakurt et al ⁸	98	28.5
Keizo et al ⁹	196	14.3
Han et al ¹⁰	660	14

III. CORONA MORTIS – THE CADAVERIC STUDIES

The clinical impact of the exact vascular anatomy of the retropubic region has always been big, considering the multiple specialties surgically involved in the region. Orthopedists use the ilioinguinal approach in trauma cases to fix acetabular and pelvic fractures but also in scheduled operations, performing pubic osteotomies [1], [5], [9], [15], [16]. Gynecologists and urologists have to be aware of the retropubic vascular hazards, especially during the minimally invasive surgical treatment of stress urinary incontinence, with the application of retropubic space techniques but also for pelvic lymphadenectomies [10], [17]. General surgeons are involved in the area as well, especially when performing endoscopically hernia repairs (endoscopic total extraperitoneal (TEP) inguinal hernioplasty) [18], [19]. Due to the great surgical interest in the region many cadaveric studies have dealt with the presence of CM and its patterns in the retropubic space. The results from the major studies in bibliography about the incidence of CM are listed in Table II. The incidence of CM in cadaveric studies varies from 19% to 65%.

TABLE II Incidence of arterial CM in cadaveric studies

Study	Number of hemipelvises	Arterial CM %
Rusu et al ²⁰	40	65%
Teague et al ¹	79	43%
Gilroy et al ²¹	105	33-38%
Darmanis et al ¹⁵	80	36%
Tornetta et al ²	50	34%
Okcu et al ²²	150	19%

IV. CORONA MORTIS – IS IT REALLY THAT FATAL?

Accepting the hypothesis that the CT angiography is a more non investigator dependent and a more objective method to judge the presence or not of an artery, from Table I and Table II it is evident that the incidence of CM found in cadaveric series is generally quite bigger than in CT angiography studies.

Another intriguing observation is that, despite the high incidence of retropubic vessels in cadaveric series, in the clinical setting there is a substantially low occurrence of serious bleeding, demanding intervention [1], [5], [15].

Darmanis et al reports that in almost 500 anterior approaches (ilioinguinal and modified Stoppa) for the treatment (ORIF) of pelvis and acetabulum fractures with, they recognized and ligated CM in only five patients and in just one case there was a severe bleeding that demanded RBC transfusion [15].

Teague et al in the clinical part of his study found retropubic anastomoses in only 37% of his ilioinguinal exposures, while the cadaveric part of the study showed an incident of 59% [1]. Letournel E et al reported in a series of 150 ilioinguinal approaches only one large retropubic vessel [5]. Thus an interesting question is raised. Is CM that common and in this way so important in the clinical setting or is it a frequent cadaveric finding which is much less important for the surgeon in the operating room?

A common theory among authors explaining the above diversity between cadaveric and angiographic studies supports that, the hemipelvises included in cadaveric studies mainly belong to an aged population. In older people common vascular diseases such as arterial atherosclerosis and deep vein thrombosis could result to some extent in the occlusion of vessels that, could then lead to the formation of collateral circulation and thus induce the development of a large CM from the underlying vascular plexus or the enlargement of a small aberrant obturator vessel [15].

Another hypothesis, regarding mostly trauma cases, suggests that a pelvic or acetabular fracture disturbs the regional blood circulation. This can be the result of either a vessel laceration or trauma and stress induced vascular spasm. Under these circumstances in the trauma setting, a CM vessel could go unnoticed by the surgeon [1], [5], [15], [22].

Last, in cadaveric series is the post mortem changes in intravascular fluids and protein structures, followed by enzymatic processes that could lead to vessel structure alterations and observation differences [10].

V. CONCLUSION

Corona Mortis describes an arterial anastomosis between the inferior epigastric artery and the obturator artery, crossing the posterior pelvic rim. It has long attracted the interest of surgeons involved in the retropubic field as proved by the numerous cadaveric studies that have since decades dealt with its incidence. However the latest studies with the aid of CT angiography have presented a lower incidence regarding the presence of the vessel in patients. This lower frequency agrees with the longstanding observation, that in the clinical setting there is a substantially low occurrence of serious bleeding, demanding intervention, despite the high incidence of retropubic vessels in cadaveric series. This leads to the conclusion that more comparative studies between cadaveric and patients' studies are essential to show the real incidence of CM and re-estimate its clinical importance.

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