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ORIGINAL ARTICLE

Corona mortis exposition during laparoscopic procedure for gynecological malignancies

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Abstract Corona mortis (CMOR) is an anastomotic branch between the external iliac or inferior epigastric vessels and the obturator artery or vein, or any vascular connection between the obturator and the external iliac systems in general with high anatomic variability. The aim of this study was to evaluate the type of anastomosis, if arterial, venous or both and the other subtypes of CMOR. Twenty-five laparoscopic procedures of bilateral pelvic lymphadenectomy for gynecological oncologic procedures (50 half pelvises) were performed. CMOR was located in 15 half pelvises on the right side (60 %), in 7 half pelvises on the left side (28 %), in 3 patients it was evidenced bilaterally. CMOR was dissected in 26/50 (52 %) half pelvises. Venous anastomosis was more frequently (46 %) followed by both venous and arterial vessels; in only 8 % (2/26) an arterial communication was observed. 83 % of venous anastomosis were single communications. One isolated arterial anastomosis was evidenced in two patients. In the cases of both arterial and venous anastomosis, one venous and one arterial vessel in 5/6 (83 %) were detected, and one type of anastomosis with one arterial and two venous vessels. Our data suggest that venous CMOR is usually present in higher frequency than the arterial one, followed by the combined type with arterial and venous connections. The isolated venous anastomosis resulted the frequent subtype.

Keywords Obturator artery · Crown of death · Lymphadenectomy

Abbreviations

CMOR	Corona mortis
EIA	External iliac artery
EIV	External iliac vein
OV	Obturator vein
OM	Obturator muscle
ON	Obturator nerve
IEA	Inferior epigastric artery
IEV	Inferior epigastric vein
PB	Pubic branch
BMI	Body mass index

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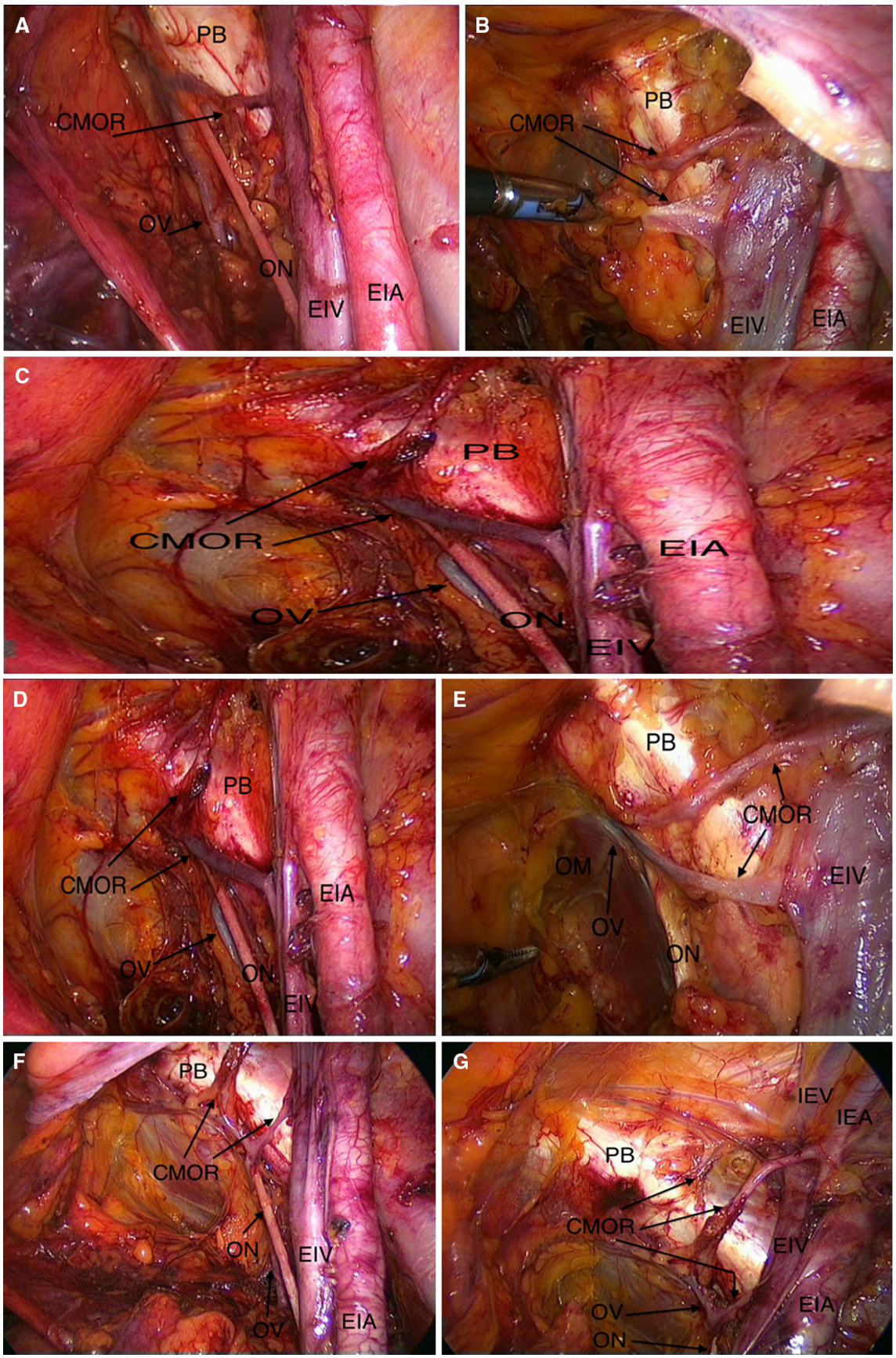
Introduction

The corona mortis (CMOR) is defined as the vascular connections between the obturator and external iliac systems or deep epigastric vessels [1, 2].

The name "corona mortis" or crown of death testifies to the importance of this feature, as high-risk hemorrhage may occur if accidentally cut because it is difficult to achieve subsequent hemostasis [2, 3].The CMOR may be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◀**Fig. 1** **a** Corona mortis with one isolated venous anastomosis. **b** Corona mortis with two venous anastomosis. **c** Corona mortis with different types of venous and arterial anastomosis. **d–f** Corona mortis with different types of venous and arterial anastomosis. **g** Corona mortis with one arterial and two venous vessels

arterial, venous or both, but it is usually regarded as arterial. These anastomotic vessels cross the superior pubic ramus and lacunar ligament near the femoral ring and their unexpected presence could become a matter of great concern to the orthopaedic surgeon, urologist, gynecologist and general surgeon [4]. In anatomical dissections during lymphadenectomies, large vessels were identified behind the superior pubic ramus, whereas in clinical practice these vessels do not seem to be as great a threat as initially perceived [2].

According to our knowledge, there are no in vivo studies about CMOR in literature. We searched both on PubMed and on Medline databases "corona mortis in vivo" and no results were found. We found data collected on cadaver pelvises during anatomical dissections, data about bleeding after pubic trauma and urogynecological procedures or after laparoscopic procedures for hernia repair, but no description about localization of corona mortis in elective procedures, outside emergency treatment was found [1, 5–10]. We evaluated the incidence and anatomical features of the CMOR during systematic pelvic lymphadenectomy for gynecological oncologic procedures, the type of anastomosis, if arterial, venous or both.

Materials and methods

The study was performed collecting data from January 2012 to December 2012 at Gynecological and Obstetric Department of Manzoni and Infermi Hospital, of retroperitoneal dissection of the abdominal wall during 25 surgical procedures of bilateral pelvic lymphadenectomy (50 half pelvises).

Only vessels of relevant size were considered, excluding vessels smaller than 2 mm in diameter. All vascular structures were clearly evidenced as arterial or venous and dissection of CMOR was carefully performed. All surgical procedures were performed by three expert endoscopists. IRB approval and informed consent were obtained from patients. All experiments on human subjects were conducted in accordance with the Declaration of Helsinki.

Laparoscopic technique

In order to expose CMOR, it was necessary to create paravesical space: an incision was made in the broad ligament laterally and parallel to the infundibulopelvic ligament, after section of the round ligament. The superior vesical artery was the first surgical landmark in the pelvic dissection, which was retracted medially. This maneuver enables to create the paravesical space and release the pelvic sidewall, leading to the exposition of the external iliac vessels. Prior to dissection, the major vascular landmarks have to be identified, including the common, external, and internal iliac vessels. The tissues localized on the external iliac vessels were grasped and gently put in traction. The paravesical space, bordered medially by the obliterated hypogastric artery, bladder and vagina and laterally by the pelvic sidewall, was developed using graspers.

The creation of the avascular paravesical space was necessary to identify the obturator nerve and pelvic vessels. The obliterated hypogastric artery and external iliac vein were the mean landmarks to get access to the paravesical space. The spaces laterally to hypogastric artery and medially to the external iliac vein and obturator internus muscle are developed with blunt and sharp dissection. Electrocoagulation should not be necessary as this space is generally avascular [11].

Finally, the node-bearing tissues were dissected between the external iliac vessels and the psoas muscle.

Results

Average BMI of the patients was 26.5 (range 23–30) and their average age was 59.5 years (range 46–68). Average operative time was 300 min (range 240–360) in procedures in which pelvic and lomboaortic lymphadenectomy were performed; it was 240 min (range 200–280 min) in procedures in which only pelvic lymphadenectomy was performed. CMOR was located in 15 half pelvises on the right side (60 %), in 7 half pelvises on the left side (28 %), in 3 patients it was evidenced bilaterally. A vascular communication was dissected in 26/50 (52 %) half pelvises. Venous anastomosis was more frequently (48 %, 12/25) followed by venous and arterial vessels (23 %, 6/26); in only 8 % (2/26) was observed a single arterial communication.

One isolated venous anastomosis was found in 83 % of patients with venous anastomosis (10/12) (Fig. 1a), two or more anastomosis in 2/12 (17 %) (Fig. 1b); one isolated arterial anastomosis was evidenced in two patients. In the cases of both arterial and venous anastomosis, one venous and one arterial vessel in 5/6 (83 %) were detected, (Fig. 1c–f) and one arterial and two venous vessels in 1/6 (17 %) (Fig. 1g).

Discussion

CMOR is referred to as arterial or venous communication by various authors. In addition to venous corona mortis,

some terms like accessory OV, accessory OA, aberrant OA, and anomalous origin of the OA from the EIA are used to refer to the corona mortis by some authors [12].

There is no artery of proportionate size having as variable an origin as that of the OA [11]. The variant obturator arteries crossing the superior pubic branch are those leaving either the external iliac artery or the IEA. In the literature their incidence is highly variable: the origin of the OA from the EIA is reported in 0–25 % of cases, while the origin of the OA from the IEA ranges from 6.6 to 44 % [3]. Interesting anomalies in the origin and course of the principal arteries of the lower limbs received attention by anatomists and surgeons for a long time. Based on previous embryological description, an ontogenetic theory involving individual variations of differentiation of vessels from the rete femorale and rete pelvicum was advanced. The arterial pattern is established after the individual selection of the channels comprising these primitive networks. There are channels that enlarge while the others retract and disappear thereby establishing the final pattern [13]. Rusu et al. [12] performed an interesting study on 40 hemipelvises of cadavers in which it was found that the major type of CMOR anastomosis was the combined type: 16 cases of both arterial and venous connections, followed by 10 pure arterial anastomosis and 6 cases of pure venous anastomosis. In our case, the pure venous type is resulted the major specimen. It must be underlined also the presence of different genders in the previous study.

Our data suggest that venous CMOR is usually present in higher frequency than the arterial one, followed by the combined type. The knowledge of accurate anatomy of retroperitoneal space and CMOR provides a great advantage to decrease the incidence of surgical complications and improve the outcome of surgical procedures.

Conflict of interest None.

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