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An Update of Anatomical References in Total Laparoscopic Radical Hysterectomy: From Surgical Anatomy to Anatomical Surgery

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ABSTRACT **Study Objective:** To evaluate laparoscopic dissection methodology for exposing the anatomical references necessary to achieve total laparoscopic radical hysterectomy.

Design: Retrospective single-center study. Video records of total laparoscopic radical hysterectomy were reviewed. The classic works of surgical anatomy and the most recent works on pelvic anatomy were used to elaborate anatomical references. (Canadian Task Force classification II-1).

Setting: Son Llátzer General Hospital of Palma de Mallorca, Spain.

Interventions: Videorecords of 40 consecutive total laparoscopic radical hysterectomy for cervical cancer were reviewed.

Measurements and Main Results: The surgical maneuvers of total laparoscopic radical hysterectomy necessary for identification of the anatomical references are described.

Conclusions: Abdominal radical hysterectomy entails a series of surgical maneuvers with potential risk of bleeding and/or damage to pelvic structures. Many of these risks can be prevented, because the laparoscope enables precise surgical maneuvers in zones of difficult abdominal access. It is necessary to renew the classic concepts of surgical anatomy to adapt them to the operative mechanics of laparoscopy, which are closer to the characteristics of microsurgery than abdominal surgery. Journal of Minimally Invasive Gynecology (2008) 15, 4–10 © 2008 AAGL. All rights reserved.

Keywords: Radical hysterectomy; Cervical cancer; Laparoscopy; Pelvic anatomy

In 1911, Ernst Wertheim introduced the concept of radical hysterectomy with the publication *Die Ewieterte Abdominale Operation bei Carcinoma Colli Uteri,* based on his work with 500 cases of cervical cancer [1]. Later, Latzko and Schiffmann [2], Okabayashi [3], and Meigs [4] introduced the main modifications of the original technique, and Piver [5] defined the levels of radicality of the intervention. All of them shared the same surgical approach, consisting of the development of the paravesical and pararectal spaces and exposure of the uterine reticulum in the anterior (vesicouterine ligament), medial (parametrium), and posterior (uterosacral ligament) portions, followed by radical resection of each of these elements separately. These contributions formed the basis for conventional abdominal radical hysterectomy practiced worldwide in the last 5 decades. They continue to be the "gold standard" for surgical treatment of cervical cancer.

The development of laparoscopic technology, incorporating better optical systems together with the capability to record easily all interventions for later analysis, has enabled the establishment of a system of feedback learning. This system is facilitating unprecedented advances in operative methodology in all fields of surgery. As a result, laparoscopic surgeons had to deepen their knowledge of anatomy beyond the classic references of conventional surgical anatomy. The progressive acquisition of this knowledge has made it possible to perform more precise surgical maneuvers, minimizing damage related to dissection and resection. However, it has also meant new points of anatomical reference need to be found.

In recent years, revised publications or papers about pelvic anatomy have sought to integrate classic concepts

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with new advances in knowledge of the anatomy, physiology, and organization of the pelvic structures and organs. Laparoscopy has become an essential tool in the integration and understanding of these new anatomical concepts, and through this has allowed us to move from a classic concept of surgical anatomy to a newer concept of anatomical surgery. The objective of this study was an attempt to establish a methodology for laparoscopic dissection that exposes the anatomical references necessary to realize total laparoscopic radical hysterectomy.

Materials and Methods

This was a retrospective study based on our surgical experience of the last 3 years. The video records corresponding to 40 consecutive total laparoscopic radical hysterectomy procedures performed in Son Llátzer Hospital (Palma Mallorca, Spain) were reviewed, with special attention to the dissection and exposure of the pelvic anatomical structures. All the cases corresponded to radical Piver III/IV hysterectomies performed in cervical uterine cancer in International Federation of Gynecology and Obstetrics stages IB1, IB2, and IIA. Clinical and pathologic characteristics of patients, surgical complications, and oncologic outcome will be reported in another paper.

The anatomical references were elaborated using the classic works of Wertheim [1], Latzko and Schiffmann [2], Meigs [3], and Okabayashi [4] and the most recent works on pelvic anatomy by Yabuki et al [6–8] and Fujii et al [9], which are based on open surgery with image magnification and/or cadaver dissection.

Results

In the following sections, we describe in chronological order the surgical maneuvers of total radical laparoscopic hysterectomy necessary for identification of the spaces and anatomical references referred to in the previously cited works.

Pelvic Lymphadenectomy

Pelvic lymphadenectomy is initiated at the level of the aortic bifurcation. At the height of the sacral promontory, a fibrous bundle can be identified that corresponds to the superior hypogastric plexus (sympathetic system), which bifurcates into 2 branches (hypogastric nerves), each flowing in the caudal direction adjacent to the lateral wall of the rectum. The lymphadenectomy is extended to the entrance of the external iliac artery in the inguinal canal. At this level, the origin of the inferior epigastric artery can be identified. The following conventional structures are then exposed: the psoas muscle; the genitofemoral nerve; the bifurcation of the common iliac artery; the external iliac vein and artery; the superior vesical artery; and the obturator vein, artery, and nerve. The dissection can be extended

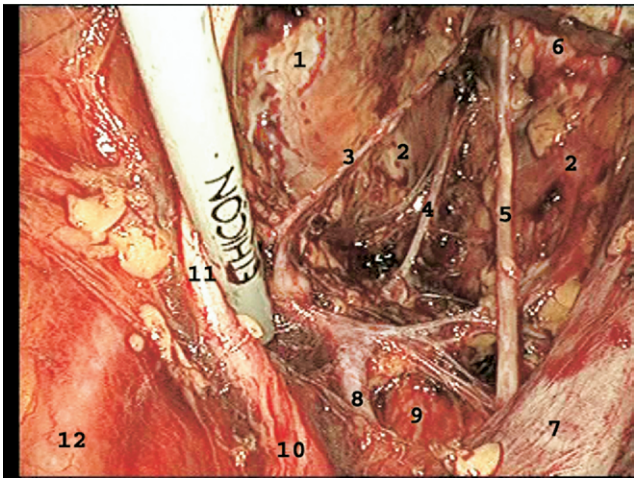

Fig. 1. Pelvic wall (right side): 1. levator ani muscle (endopelvic fascia); 2. internal obturator muscle; 3. obturator artery; 4. obturator vein; 5. obturator nerve; 6. circumflex vein; 7. external iliac vein; 8. hypogastric vein; 9. sciatic nerve; 10. internal iliac artery; 11. superior vesical artery; 12. ureter.

toward the pelvic wall, under the external iliac vein, resecting the adipose tissue surrounding the parietal veins and sciatic nerve (Fig. 1). Although this degree of dissection is not contemplated in conventional abdominal surgery, we have to consider that the limits of the pelvic lymphadenectomy are arbitrary with respect to the anatomical continuity of the pelvic lymphatic drainage. Therefore, the extent of the lymphadenectomy will be determined by the oncologic characteristics of the case.

The Paravesical Space

Development of the paravesical space is initiated with localization of the superior vesical artery (also called the obliterated umbilical artery), which is separated toward the uterus, exposing a virtual space whose external limit is marked by the external iliac vessels. The dissection is continued through the areolar tissue that fills the virtual space of the paravesical space until the internal obturator muscle is reached and the endopelvic fascia is seen at the bottom. It is now possible to localize as a reference the tendinous arc that forms a more fibrous thickening of the endopelvic fascia and extends from the posterior face of the pubis to the sciatic spine. The endopelvic fascia is a fibrous support structure for the pelvic organs covering the musculature of the levator ani muscle. At this level, the endopelvic fascia extends from the tendinous arc and fuses with the vaginal fascia. The development of the paravesical space enables exposure of the anterior face of the parametrium, which comprises connective and adipose tissue partially covered by a fibrous lamina neither very visible nor always present. The vesicohypogastric fascia (*lamina ligamenti umbilicalis lateralis*) extends from the superior vesical artery to the lateral edge of the bladder and vesicouterine ligament. (Fig. 2). In the Piver III level of radicality, this fascia should be sectioned to preserve the superior vesical artery.