Introduction

Although radical hysterectomy is a traditional procedure in gynecologic oncology, with a history of almost 100 years (1), its performance is still poorly standardized. Different terminology and classifications are currently used to describe individual types of the procedure. At the same time one "universal" type of "classical" radical hysterectomy is still used in many institutions, irrespective of the size of the tumor or presence of other prognostic parameters. Even within existing classification systems, description and specification of anatomical landmarks does not allow for precise reproducibility. As a consequence, the extent of the parametria resection may vary substantially between institutions and surgeons, even if the same terminology is used. Simply saying, type X radical hysterectomy may represent very different procedure.

At the same time, an accumulating knowledge in pelvic surgical anatomy helps us to better identify stable anatomical landmarks and precisely describe each type of the procedure. The detailed description and proper understanding of different types of radical hysterectomy is of utmost importance, as the extent of parametria resection determines late morbidity, especially bladder and rectal dysfunctions (2-7). Absence of uniformly accepted terminology and classification is a major limitation for sharing of results, assessment of intra-operative complications and post-operative morbidity, conducting credible multicenter surgical trials, and setting standards for postgraduate education.

Principles of Classification

There are several key principles for classification of radical hysterectomy. 1) The key and sole parameter for differentiation between types of radical hysterectomy is the extent of parametria resection. The resection or removal of other organs or structures (urinary bladder, ureter, rectum, pelvic floor muscle) should not be included in the classification system. Also, the size of the removed vaginal cuff is not a decisive parameter for procedure classification. Vaginal resection is determined by the presence of invasive cancer or high grade precancer lesion (VAIN) in the vagina. Locally advanced tumor growing endocervically, which is referred to more extensive type of parametrectomy, does not require larger extent of vaginal resection, while small tumor referred to extrafascial hysterectomy can be combined with proximal colpectomy due to disperse VAIN III lesions in the vagina. 2) The extent of resection should be precisely defined for all three parts of the parametria (ventral, lateral, dorsal) and in three planes (sagittal, frontal and transverse). Mainly resection margins in vertical (deep parametrial) dimension is determining for long term morbidity due to the damage of autonomic nerves which run in all three parts of the parametria. 3) The extent of the procedure and its classification may be different on each side of the cervix if the tumor growth is asymmetrical. 4) Although the classification system is usually proposed for radical hysterectomy, it is applicable to the radical trachelectomy and the radical parametrectomy (a procedure that usually follows inadequate simple hysterectomy).

For the proper performance, teaching, and reproducibility of each surgical procedure it is crucial to identify stable anatomical landmarks. There are few such structures available in the pelvis, including the urinary bladder, rectum, ureter, large vessels, and nerves. The above structures should be used to define the majority of resection margins.

For an adequate description of the radical hysterectomy performance, following parameters should be specified pre-operatively: a) Procedure on the adnexa (salpingo-oophorectomy; ovarian transposition, etc.); b) Type of lymph node dissection (sentinel node biopsy, pelvic lymphadenectomy and its type, paraaortic lymphadenectomy and its extent); c) Size of the vagina cuff removal; d) Type of the procedure (radical hysterectomy, radical parametrectomy, radical trachelectomy), e) Extent of parametria removal (classification system – type A - D).

Proposed Classification System

The classification system described in this chapter is based on the proposal published by Querleu and Morrow (8) and recent consensual paper, which specified anatomical landmarks for all types of radical hysterectomy in three dimensions (9). Precise description of resection margins in the longitudinal (vertical/deep) plane is the determining factor for late morbidity and long-term quality of life (2-4). This is due to the different requirements for ureteral dissection and, most importantly, damage to the autonomic pelvic nerves deeply in the pelvis (10-12).

Individual types of the procedure in the proposed classification system well corresponds to most common historical types of radical hysterectomy. This may however, due to lack of standardization, be highly dependent on the
existing practice at each institution. So called classical radical hysterectomy may well correspond to type B or type C1 at different parts of the world.

**Type A**

Type A corresponds to the extrafascial hysterectomy, which guarantees full removal of the pericervical tissue (Figure 1) up to the attachment of the vaginal fornices. The ureter does not need to be identified or dissected in the parametrium, thus it does not allow for the resection of the ventral or lateral parametria and it does not include resection of the dorsal parametria. The autonomic nerves remain fully preserved.

**Type B**

Type B corresponds mostly to the modified radical hysterectomy. Identification of autonomic nerves is not required, and the hypogastric plexus remains fully preserved. The ureter must be identified in the parametrium, its course is unroofed, dissected from the cervix and displaced laterally, but not dissected from the lateral or ventral parametria (Figure 2). The resection margin is ventrally and laterally at the ureteral bed. Ventrally, only small initial part of the medial leaf of the ventral parametria can be resected, laterally it allows in the frontal plane for the resection of about 1–1,5 cm of the lateral parametria. The ureteral artery, branching from the uterine artery at its crossing of the ureter, can serve as a helpful lateral landmark. Dorsally type B aims for the resection of 1-2 cm of the dorsal parametria (Figure 3). The resection line corresponds to the amount of removed lateral parametria. Vertically in the sagittal plane, the removal margin on dorsal parametria must not be deeper below the course of the ureter due to the branches of the hypogastric plexus.

**Type C**

The classification system distinguishes between a type C1, which corresponds to the nerve-sparing modification, and type C2, which aims for a complete parametrial resection. There are significantly distinct resection margins between the two types, particularly in the vertical (deep parametrial) dimension, which are determined by the course of the main branches of the inferior hypogastric plexus in C1 type. In type C1 the ureter is unroofed, dissected from the cervix and from the lateral parametria, but only partially from the ventral parametria in the extent of 1–2 cm, while type C2 requires complete dissection of the ureter from the ventral parametria up to the bladder wall.
Laterally, resection margins in a horizontal plane is identical for both types, formed by the medial aspect of the internal iliac vein and artery (Figure 2). In type C1 the deep parametrial resection margin on the lateral parametria is formed by the deep uterine vein (vaginal vein), which is usually a large vein located about 1–2 cm below the uterine artery and vein found during caudal parametrial dissection (Figure 4). Thus the caudal part of the lateral parametria containing the splanchnic nerves is preserved. In type C2 the resection line continues alongside the medial aspect of the internal iliac vessels and pudendal vessels up to the pelvic floor (Figure 4). The pararectal and paravesical spaces are completely unified by dissecting all parametrial (medial) branches of the internal iliac vessels together with the splanchnic nerves in the caudal part. Such deep resection allows for greater mobility of the lateral parametria, facilitating its complete removal.

Ventrally, in type C1 a partial dissection of the ureter from the ventral parametria allows for limited resection in a sagittal plane of 1-2 cm of the ventral parametria (Figure 2). Due to the tangential route of the ureter through the ventral parametria, a bigger portion of the medial leaf of the ventral parametria is exposed and removed in types C1 and B (Figure 5). Even more important is a vertical resection margin on the ventral parametria, which is formed by bladder branches of the hypogastric plexus localized below the course of the ureter (8,9) (Figure 6). In type C2, a complete dissection of the ureter from the ventral parametria is required, which allows for complete resection of the ventral parametria up to the urinary bladder wall, so both medial and lateral leafs of the ventral parametria are resected equally (Figure 2). In a vertical dimension, resection line is formed by the level of the paraocolpium and vaginal resection. Both cranial and caudal (above and below the ureter) parts of the ventral parametria are removed. Bladder branches of the hypogastric plexus are sacrificed; thus, their identification is not required.

Dorsally, type C1 requires separation of two parts of the dorsal parametria: The medial part, which is composed by the recto-uterine and recto-vaginal ligaments, and the lateral laminar structure, which contains the hypogastric plexus, also called the mesoureter (Figure 7). Two different spaces are exposed dorsally – the sacro-uterine space (medial pararectal space) between the rectum and the dorsal parametrium, and the pararectal fossa (pararectal space) between the dorsal parametrium and iliac vessels (Figure 3). Main branches of the hypogastric plexus must be preserved on the lateral part (mesoureter), while the caudal limit on the recto-uterine and recto-vaginal ligaments is formed by the tangential plane of the vaginal cuff resection. Type C2 aims at a complete resection of the dorsal parametria deeply below the rectal...
attachment, so major branches of the hypogastric plexus are sacrificed (Figure 7).

**Type D**

Type D differs from type C2 only in a lateral extent of the lateral parametria resection. Ureteral dissection and resection of both dorsal and ventral parametria is identical to type C2. Laterally, however, it requires ligation and removal of internal iliac artery and vein, together with their branches, including gluteal, internal pudendal and obturator vessels. Lateral resection line is formed by the lumbarvescal nerve plexus, piriformis muscle and obturator internal muscle. This type of radical hysterectomy is rarely performed, mostly for central pelvic recurrences or locally advanced tumors (13).

**References**


