

Three classes of pelvic and aortic lymphadenectomy in patients with cervical cancer

Klasyfikacja (3 klasy) limfadenektomii miedniczej i aortalnej u pacjentek z rakiem szyjki macicy

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Abstract

Currently, the extent of pelvic and aortic lymphadenectomy is currently described by numerous and ambiguous terms. The aim of this study is to present a classification of pelvic and aortic lymphadenectomy in cervical cancer patients.

On the base of the data from the literature, pelvic and aortic lymphadenectomies have been assigned to three different classes, depending on surgical technique, the extent of the lymphadenectomy and the specificity of the removed lymph node groups. Class I equals removal of selected lymph nodes; Class II: removal of lymph nodes situated ventrally and laterally to large extraperitoneal vessels and the obturator nerve and of lymph nodes situated ventrally and laterally to the aorta and vena cava; Class III: total removal of lymphatic tissue around the iliac vessels and from the obturator fossa dorsally to the obturator nerve and from the presacral region and lymphatic tissue around the aorta and vena cava.

The presented classification allows for a unequivocal assessment of pelvic and aortic lymphadenectomy.

Key words: **uterine cervical cancer / lymphadenectomy / classification /**

Streszczenie

Zakres limfadenektomii miedniczej i aortalnej jest obecnie oceniany przez niejednoznaczne terminy.

Celem pracy jest przedstawienie klasyfikacji limfadenektomii miedniczej i aortalnej u pacjentek z rakiem szyjki macicy. W oparciu o dane z literatury, limfadenektomia miedniczna i aortalna są zaliczane do trzech klas w zależności od techniki chirurgicznej, zakresu limfadenektomii i usuwanych grup węzłów chłonnych. Klasa I jest określana jako usunięcie wybranych węzłów chłonnych; klasa II jako usunięcie węzłów chłonnych znajdujących się po stronie brzusznej i bocznej w stosunku do dużych naczyń zaotrzewnowych miednicy mniejszej, nerwów zasłonowych i bocznie do aorty i żyły głównej dolnej; klasa III jako całkowite usunięcie tkanki limfatycznej wokół naczyń biodrowych biodrowych, dołów zasłonowych w tym także grzbietowo od nerwów zasłonowych, z okolicy przedkrzyżowej oraz tkanki limfatycznej wokół aorty i żyły głównej dolnej.

Przedstawiona klasyfikacja pozwala na jednoznaczne określenie limfadenektomii miedniczej i aortalnej.

Słowa kluczowe: **rak szyjki macicy / limfadenektomia / klasyfikacja**

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INTRODUCTION

Radical hysterectomy and pelvic/aortic lymphadenectomy are two procedures that are applicable in the treatment of cervical cancer.

In their classical paper from 1974, Piver et al. [1] introduced the now widely accepted classification of radical hysterectomy. The authors advocated classification for the following reasons: the term radical hysterectomy connoted many different operations; the existing terminology was not suitable for recording and communicating the extent of the procedure; the results of subsequent radiotherapy were difficult to evaluate without more precisely defining the applied technique, and evaluating both the results and complications of radical hysterectomy was confusing. Additionally, the authors hoped that their classification would help to provide a better understanding of the need to tailor the extent of a radical hysterectomy to the individual patient.

The reasons that led Piver et al. [1] to introduce the classification of radical hysterectomy are similar to those leading us to present this classification of pelvic and aortic lymphadenectomy. They are as follows: the term pelvic and aortic lymphadenectomy connotes many different operations; the existing terminology is not suitable for recording and communicating different procedures; the subsequent therapeutic results are difficult to evaluate without more precisely defining the applied lymphadenectomy technique and extent, and finally, evaluating both the number of harvested nodes and the complications involved in lymphadenectomy is confusing. There is data to support the need to tailor the extent of lymphadenectomy [2, 3].

On the one hand, the application of limited lymphadenectomy can not only reduce morbidity, blood loss, and operating time, but can also conserve the immunological system of the uninvolved nodes [4]. Additionally, the sensitivity of limited pelvic lymphadenectomy is high and reaches 92.5% [5]. On the other hand, some authors advise a more extensive lymphadenectomy because it minimizes the number of false negative procedures. They advocate "wide node dissection" since the presence of metastases is one of the most important determinants for adjuvant therapy [6, 7].

Moreover, they speculate that after limited lymphadenectomy several metastatic nodes may be left in situ, rendering the therapeutic role of lymphadenectomy unreliable [2]. "Wide lymphadenectomy" permits a more precise description of the number of nodes involved. Furthermore, the number of positive nodes was found to be more indicative of survival rate than the existence of nodal metastasis [8,9]. Survival rates in patients with just one positive pelvic node achieve the levels of those without nodal metastases [8].

Generally, lymphadenectomy is extremely important in the treatment of cervical cancer because it allows for the identification and removal of microscopically involved nodes [10] and the tailoring of radiotherapy [6]; moreover, patients who have had involved nodes completely removed gain a survival advantage [2]. Additionally, lymphadenectomy is by far the most sensitive and specific of all the modalities for identifying lymph node metastases [10]. Nevertheless, differences in surgical technique and lack of clear nomenclature can diminish the

potential prognostic, diagnostic, and therapeutic roles of lymphadenectomy [2].

The primary goal of this study is to present the classification of pelvic and aortic lymphadenectomy.

CURRENT DESCRIPTION OF PELVIC AND AORTIC LYMPHADENECTOMY TYPE

For this study, we thoroughly analyzed major publications concerning the extent of pelvic and aortic lymphadenectomies. We found that authors use different descriptions, such as descriptions of the region, technique and extent, or the completeness of the procedure, in attempting to define the type of lymphadenectomy performed.

The region, extent, and surgical techniques

While the terms pelvic and aortic seem to clearly identify the region of the lymphadenectomy, there are some discrepancies having to do with the extent of aortic lymphadenectomy. Sakuragi et al. [5] advocate removal of aortic lymph nodes at the level of the right and left renal vessels, Scambia et al. [4] at the level of the inferior mesenteric artery, Benedetti Panici et al. [2] at the level of the inferior mesenteric artery (left) and the level of ovarian vein entry to vena cava (right), and finally, Cosin et al. [10] recommend removal at the level of 3-4cm above the aortic bifurcation. According to Havrilesky et al. [11], aortic lymphadenectomy is performed at the discretion of the operating surgeon and its extent varies from sampling to complete removal. Additionally, some authors divide aortic lymphadenectomy into "inferior" and "superior" [5, 12], and pelvic lymphadenectomy into "upper" and "lower" [4].

There are also differences in the terms which these authors use to describe the technique and extent of lymphadenectomy. In some reports, the widely applied term "systematic" [2, 5] is used for lymphadenectomy with the removal of all groups of pelvic nodes. However, in other reports [13], the term is used for the removal of the nodes called the primary nodal group (superficial obturator, external iliac, and interiliac). Furthermore, some authors add the adjectives: "thorough" [5] and "wide" [2] to the term "systematic", without explaining what they mean. In one report [13], the term "systematic" is replaced by "radical" while in many other reports [10-12, 14, 15] "complete" is used instead.

The terms "selective" or "limited" lymphadenectomy mean that the "systematic" level of dissection was not reached; however, these terms mean different things to different authors. Scambia et al. [4] suggest that during limited pelvic lymphadenectomy the lower pelvic lymph nodes (obturator and external iliac) should be removed while Benedetti Panici et al. [16] recommend that during limited lymphadenectomy the superficial obturator, interiliac, external, and common iliac lymph nodes be dissected.

Cursory sampling, synonymous with sentinel node dissection with the use of blue dye or radioactive-labeled albumin or both, is a precisely described procedure [17]. Lymph node sampling may also be labeled random biopsy or removal of enlarged lymph nodes only [10].

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Tabela I. Three Classes of Pelvic Lymphadenectomy.

Pelvic Lymphadenectomy			
Class	Description of surgical technique, extent of lymphadenectomy, specification of removed lymphatics	Subclass	Description of sampling
I	Removal of selected lymph node(s)	a	Random excision or removal which does not fulfill criteria of class II
		b	Removal of enlarged lymph nodes only
		c	Cursory sampling
II	<i>Technique:</i> removal of lymph nodes situated ventrally and laterally to large extraperitoneal vessels and obturator nerve <i>Extent:</i> up to the level of aortic bifurcation <i>Lymph node groups:</i> iliac (common, external, internal), superficial obturator		
III	<i>Technique:</i> total removal of lymphatic tissue around iliac vessels and from obturator fossa dorsally to obturator nerve and from presacral region <i>Extent:</i> up to the level of aortic bifurcation <i>Lymph nodes groups:</i> iliac (common, external, internal), superficial and deep obturator and presacral		

Tabela II. Three Classes of Aortic Lymphadenectomy.

Aortic Lymphadenectomy			
Class	Description of surgical technique, extent of lymphadenectomy, specification of removed lymphatics	Subclass	Description of sampling
I	Removal of selected lymph node(s)	a	Random excision or removal which does not fulfill the criteria of class II
		b	Removal of enlarged lymph nodes only
		c	Cursory sampling
II	<i>Technique:</i> removal of lymph nodes situated ventrally and laterally to aorta and vena cava <i>Extent:</i> up to the level of inferior mesenteric artery <i>Lymph node groups:</i> paracaval, precaval, cavaoartic, preaortal and left paraortic		
III	<i>Technique:</i> total removal of lymphatic tissue around aorta and vena cava <i>Extent:</i> above the level of inferior mesenteric artery <i>Lymph node groups:</i> paracaval, precaval, cavaoartic, preaortal and left paraortic, retrocaval, retroaortic and deep cavaoortal		

The number of removed lymph nodes as a parameter of lymphadenectomy completeness

Another parameter used to describe the type of lymphadenectomy is its completeness. [18] In their search for a reasonable parameter of completeness, Nijman et al. introduced limits of 5 or 10 percentile (5 or 6 lymph nodes removed from each side, respectively) as the criteria for “complete, adequate” or “incomplete, inadequate” pelvic lymphadenectomy. Unfortunately, their classification is useful only postoperatively and is in no way a guide in planning the type of lymphadenectomy. Because of individual variability in the number of lymph nodes, it is difficult to imagine a pre-operative guideline to remove at least 6 pelvic lymph nodes from each side. Thus the number of harvested lymph nodes only to some extent reflects the completeness of the applied lymphadenectomy technique. Finally, it is worth noting that many authors have used the terms pelvic or aortic lymphadenectomy without any description [7, 19, 20].

PELVIC AND AORTIC LYMPHADENECTOMY CLASSIFICATION

The type of pelvic and aortic lymphadenectomy is currently assessed with the use of many ambiguous descriptions. Beneath the principles and nomenclature of new numerical classification will be presented.

Principles of pelvic and aortic lymphadenectomy classification

The classification presented is based on the description of the region (pelvic and aortic), surgical technique, and extent of lymphadenectomy with the specification of removed lymphatics. Three techniques of lymph node dissection are shown in Figure 1.

Tabela III. Nomenclature of Pelvic and Aortic Lymphadenectomy Classification.

	Region	Class Subclass	Number of removed and involved nodes [†]
Lymphadenectomy	P pelvic	I a	(X, Y)
		b	X - number of removed nodes
		c	Y - number of involved nodes
A aortic	II		
		III	

^{*} Only in class I.

[†] Only in reporting after completion of surgery and pathological examination.

The conditions that must be fulfilled in the three classes of pelvic and aortic lymphadenectomy are presented in Table I and Table II.

The nomenclature of pelvic and aortic classification

Nomenclature based on the classification presented is summarized in Table III.

Examples of the nomenclature of lymphadenectomy are presented below. Lymphadenectomy P class II means that the removal of pelvic nodes situated ventrally and laterally to the large iliac vessels and the obturator nerve is either planned or was performed. Lymphadenectomy P class Ic (2,0) reports that during the random or cursory sampling removal of two sentinel nodes, both uninvolved nodes were dissected. Lymphadenectomy P class Ib (2,2) indicates that two enlarged pelvic nodes were removed and that both appeared to be involved. Lymphadenectomy P class III and lymphadenectomy A class Ia reports the total removal of lymphatic tissue from around the iliac vessels, the obturator nerve, and from the presacral region with the subsequent random excision of aortic node(s).

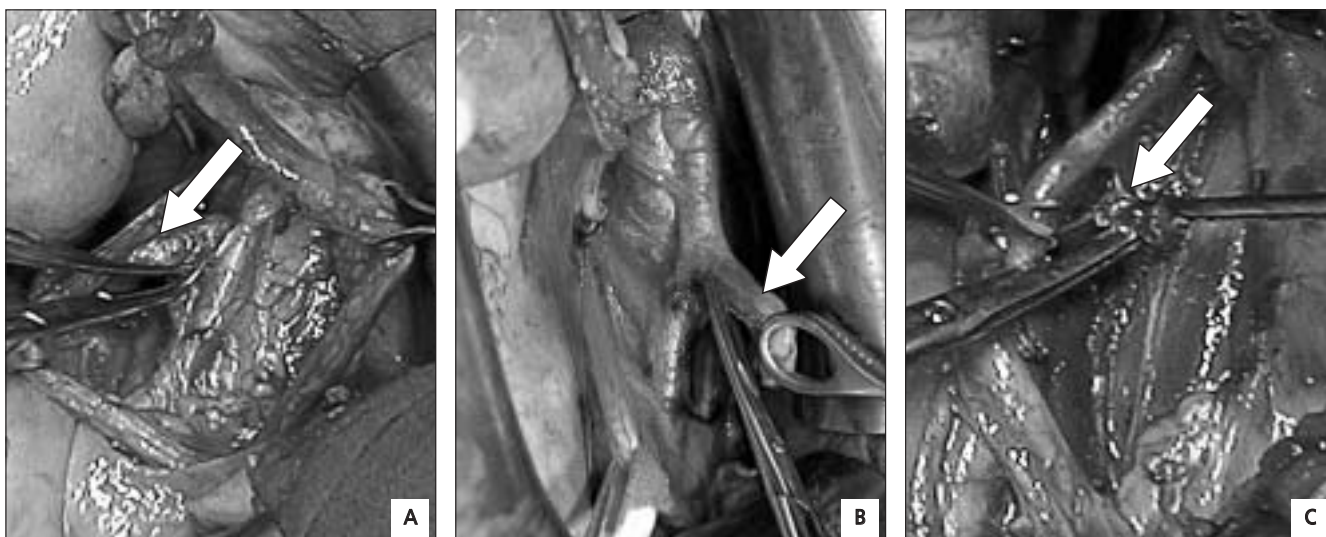


Figure 1. Three techniques of lymph node dissection. **A:** removal of selected lymph node(s) – sampling. **B:** removal of lymphatic tissue from the ventral aspect of the vessel. **C:** removal of lymphatic tissue around the vessel with its skeletonisation. Arrows indicate removed lymphatics.

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COMPARISON OF PELVIC AND AORTIC LYMPHADENECTOMY CLASSIFICATION WITH CURRENTLY USED DESCRIPTORS

The classification presented is, to our knowledge, the first attempt to classify pelvic and aortic lymphadenectomies. The classification outlines both the surgical technique and the extent of lymph node dissection that must be achieved in accordance with each class. The extent of the lymphadenectomy is assessed by two parameters: the lymph nodes that have to be or were removed and the extent of removal. The names of the lymph node groups were adopted from the very broad and detailed nomenclature of Benedetti Panici et al. [16].

Our decision regarding which groups of lymph nodes to remove in each class was based on numerous reports. The extent and technique of class III pelvic and aortic lymphadenectomy were derived from the Benedetti Panici et al. report [16]. The removal of lymph nodes localized dorsally to vessels (retrocaval and retroaortal in the aortic region and deep iliac and deep obturator in the pelvic region) were included in their systematic lymphadenectomy. In class II, only lymph nodes situated ventrally and laterally to the large pelvic vessels and the obturator nerve in pelvic region and located ventrally and laterally to the aorta and vena cava in aortic region were removed. According to some authors [2, 4, 5], the lymph node groups harvested during this type of lymphadenectomy are representative and sufficient to evaluate nodal status. In class Ia, random node or nodes are dissected. In this class there are also lymphadenectomies which do not fulfill the criteria of class II, including the lymphadenectomy of primary nodal groups which, according to Benedetti Panici et al. [13], also constitute a representative sampling. According to Cosin et al. [10], there are some cases in which removal of all nodes is impossible because of the dense adherence to or invasion of vascular and nervous structures. Lymphadenectomies with such limitations are also classified as class Ia. In class Ib and Ic the enlarged lymph nodes or indicated nodes are removed from the pelvic or aortic region accordingly.

In the literature the extent of the performed lymphadenectomy was assessed by the number of harvested nodes [16, 18]. In presented classification postoperatively assessed number of removed and involved nodes is also reported.

PERSPECTIVES

The presented numerical classification of lymphadenectomy, similar to the numerical classification of radical hysterectomy, will allow for both randomized prospective studies and for the comparison of the effectiveness of different lymphadenectomy classes as suggested by Sakuragi et al. [5]. It would be possible, based on the results from such studies, to establish recommendations for lymphadenectomy classes in cervical cancer, as well as more precise descriptions of nodal status. The standardization of lymphadenectomy procedures would improve communication between surgical and oncological teams and promote the teaching of the techniques of different classes of lymphadenectomy, as well as provide the necessary information for sufficient reimbursement by insurance companies for different procedures. The introduction of this classification will promote the tailoring of lymphadenectomy

in cervical cancer and other genital malignancies. Furthermore, individual postoperative information about harvested nodes and the number of nodes involved when incorporated into this classification will provide better insight into the completeness of lymphadenectomy and offer a more reliable assessment of nodal status. In presenting this classification, we do not pretend to have resolved all the problems of pelvic and aortic lymphadenectomy identification and nomenclature, but hope that it will serve as a basis for further modifications in this area.

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