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The 21st century role of Piver type II hysterectomy in FIGO Stage IA, IB cervical cancer: A personal perspective

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Summary

Class II modified radical hysterectomy reported in 1974 by Piver, Rutledge and Smith for cervical cancer is an extended hysterectomy that has less dissection of the ureter from the paracervical tissues, ligation of the uterine vessels just medial to the ureter to ensure preservation of the distal ureteral blood supply, and less radical parametrectomy preserving the lateral parametrium. The authors present a 21st century personal perspective on the use of a type II hysterectomy based on the 1994 FIGO changes in classification of Stage IAI, IA2, IBI and IB2.

Introduction

Invasive cancer of the cervix is the second most common cancer and the major cause of death from gynecologic cancer worldwide, with almost half a million cases diagnosed annually (493,000 new cases and 273,000 deaths) [1]. Current treatment of invasive cervical cancer includes primary surgery or radiation therapy with or without platinum-based chemotherapy.

In 1900 Wertheim [2] of Vienna described radical hysterectomy (RH) for the treatment of invasive cervical cancer. Meigs began to perform pelvic lymphadenectomy with RH and reported his series of 100 cases without an operative mortality in 1946 [3]. With improved blood products and antibiotics during the latter half of the 20th century, RH became the primary treatment for patients with early-stage invasive cervical cancer. In 1974 Piver, Rutledge and Smith defined the extent of radical hysterectomy by establishing five classes of hysterectomy (classes I-V) [4]. The classification of hysterectomy points out the significance of tailoring the radicality of surgery that is appropriate to the individual patient's cervical cancer with the goal of reduction in surgical related complications and improvement in long-term cure rates.

In 1974 type II extended hysterectomy was felt to be suitable for a) microinvasive cancer, as then defined, when there was some question as to the depth of invasion that remained after cervical conization, and b) for small post irradiation recurrences limited to the cervix.

However, since our 1974 report using the original 1971 FIGO classification of Stage IA, FIGO has reclassified 1A in 1985 and subsequently in 1994 adding nuances not present at the time of the original description of type II hysterectomy.

The role of less aggressive surgery in the management of cervical cancer continues to be discussed. For many decades, surgery for early stage cervical cancer patients has focused on aggressiveness and technique in order to maximize survival with less consideration for patients' quality of life. With recent emphasis on quality of life issues in cancer survivors, the ability to tailor the aggressiveness of treatment represents an ultimate goal.

The purpose of this paper is to present a personal perspective on the 21st century role of type II hysterectomy and pelvic lymphadenectomy with special emphasis on the 1994 revised FIGO classification of Stage IAI, IA2, IBI, and IB2.

Methods

Isolation of studies through computerized searches was conducted using PUBMED (www.pubmed.gov). The medical subject headings and text words used were: cervical cancer, radical hysterectomy, type II hysterectomy. The literature over the past 57 years (1951 to present) was reviewed.

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Techniques for hysterectomy

Piver, Rutledge and Smith reported five classes of hysterectomies and defined the extent of radicality of each procedure [4].

Type I (Extrafascial hysterectomy)

This is a simple hysterectomy and the goal of this procedure is to ensure removal of all cervical tissue. Reflection and retraction of the ureters laterally without actual dissection from the ureteral bed allows one to clamp the adjacent paracervical tissue without cutting into the side of the cervical tissue itself.

Type II (Modified radical hysterectomy) (Figures 1 and 2)

This is basically the hysterectomy described by Ernest Wertheim [2]. The purpose of a type II hysterectomy is to remove more paracervical tissues while preserving blood supply to the distal ureters and bladder [4]. The ureters are freed from the paracervical position but are not dissected out of the pubovesical ligament. The uterine artery is ligated where it crosses the ureter thus preserving blood supply to the ureter, and medial half of the cardinal ligaments and proximal uterosacral ligaments are resected. The upper one-third of the vagina is resected. The operation described by Wertheim involved selective removal of the large nodes, rather than systematic pelvic lymphadenectomy. However, currently a pelvic lymphadenectomy is usually performed with type II hysterectomy.

Type III (Radical hysterectomy) (Figures 1 and 2)

The most commonly performed operation for Stage IB cervical cancer is that originally described by Meigs in 1944. Type III hysterectomy removes the central lesion with wide excision of the parametrium and paravaginal tissue along the upper vaginal margin [4]. The uterine artery is ligated at its origin from its superior vesicle or internal iliac artery, allowing removal of the entire width of the cardinal ligaments. Preservation of superior vesical artery is performed to prevent ureteral and bladder fistula formation. Uterosacral ligaments are resected at the sacral attachments. The upper half of the vagina is resected.

Type IV (Extended radical hysterectomy)

The aim of the type IV radical hysterectomy is complete removal of all periureteral tissue, more extensive excision of the paravaginal tissue [4]. This differs from the type III operation in three aspects: a) the ureter is completely dissected from the vesicouterine ligaments, b) the superior vesicle artery is sacrificed, and c) three-fourths of the vagina is excised.

Type V (Partial exenteration)

The indication for the procedure is removal of the central recurrence involving a portion of the distal ureter or bladder [4].

1994 FIGO Stage IA1 cervical cancer

In 1971 FIGO classified Stage IA cervical cancer as those cases of preclinical carcinoma, however, with no designation of the depth of invasion. Subsequently, in 1985 FIGO reclassified microinvasive Stage IA into IA1 described as "minimal microscopically evident stromal invasion" but without defining the depth of invasion and Stage IA2 as microscopic invasion that measured less than 5 mm in depth and less than 7.0 mm in horizontal spread. This definition of allotting all patients with less than 5 mm invasion to Stage IA did not provide the clinicians with evidence-based medicine as to which patients could best be treated by type I hysterectomy with negligible instance of pelvic lymph node metastasis and those with significant risk of lymph node metastasis who would be candidates for extended type II hysterectomy and pelvic lymphadenectomy.

In 1988, one of us (MSP) reviewed ten series of microinvasive cervical cancer cases reported from 1969-1986 [5]. There were 464 patients reported who had less than 3.0 mm invasive cervical cancer and only one or 0.21% had pelvic lymph node metastasis, a percentage too small to be clinically relevant. However, of the 132 women reported with 3.0-5.0 mm of invasive cervical cancer, there were nine or 6.8% with pelvic lymph node metastasis, a percentage that would be clinically relevant.

Ostor and co-authors in 1994 were able to identify 333 women with cervical cancer invading less than 3 mm in depth who underwent lymphadenectomy, five of whom had lymph node metastasis [6]. This less than 1% lymph node metastasis was similar to our 1988 report of 0.21% [5].

Appropriately, in 1994 FIGO again reclassified microinvasive cancer now allocating patients with less than 3.0 mm invasion and less than 7.0 mm horizontal spread to IA1 and those with patients with 3.0-5.0 mm of invasion and less than 7.0 mm horizontal spread to IA2. The depth of invasion is measured from the base of the epithelium, either squamous or glandular, from which it originates to the deepest point of invasion.

Fig. 1a

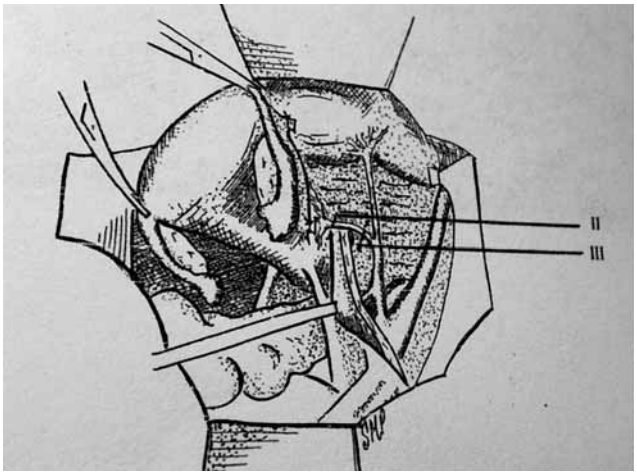
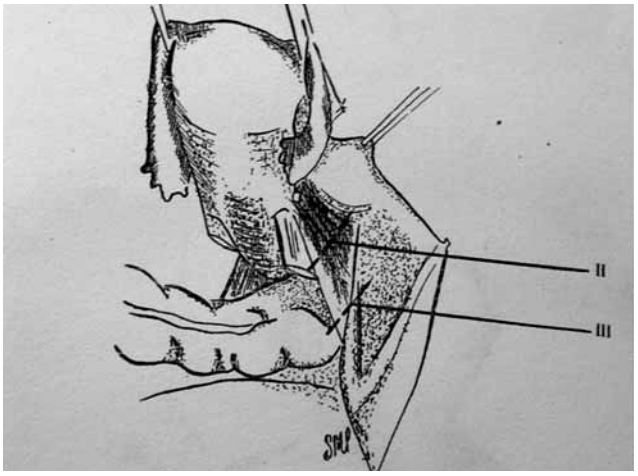


Fig. 1b



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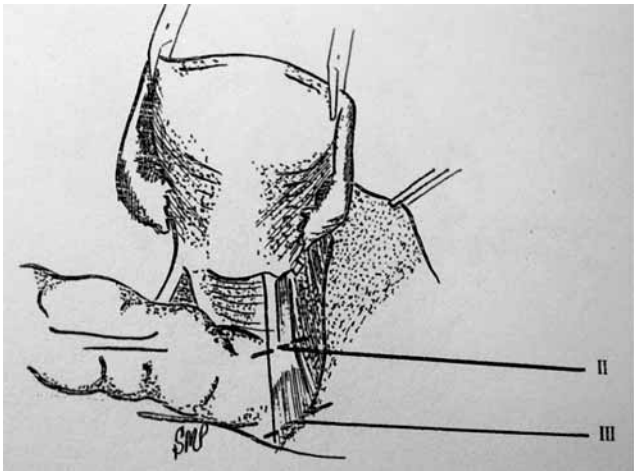


Figure 1. — The identification point of transection of the cardinal ligament, uterine artery and uterosacral ligament in a type II and type III radical hysterectomy. a) Ligation of the uterine artery. b) Transection of the cardinal ligaments. c) Transection of the uterosacral ligaments. (from Piver M.S., Rutledge F., Smith J.P.: "Five classes of extended hysterectomy for women with cervical cancer". Obstet. Gynecol., 1974; reproduced with permission.

Not included in the 1994 FIGO classification of Stage IA1 and IA2 cervical cancer was the presence of tumor cells in lymph or venous space. However, the presence of lymphovascular space invasion (LVSI) clearly presents an important variable to the individual clinician presented with patients with FIGO Stage IA1 or IA2 with LVSI.

In 1986 in an excellent review of the then literature, Benedet and Anderson reported on 49 patients with Stage IA who had invasive cervical cancer equal to or less than 3.0 mm but who had LVSI, four of whom (8.2%) had lymph node metastasis [7]. Moreover, of the 371 reviewed by these authors with equal to or less than 3.0 mm of invasion but without LVSI, only three patients or 0.8% had lymph node metastasis.

Based on the above data, it is not unreasonable to conclude that in the 21st century patients with Stage IA1 without LVSI that a type I hysterectomy without lymphadenectomy or cervical conization in women wanting to preserve fertility is appropriate therapy. Based on the incidence of pelvic lymph node metastasis reported for patients with Stage IA1 but with LVSI, type II hysterectomy with pelvic lymphadenectomy should be considered. A more conservative approach for women wanting to preserve fertility would be cervical conization and retroperitoneal pelvic lymphadenectomy.

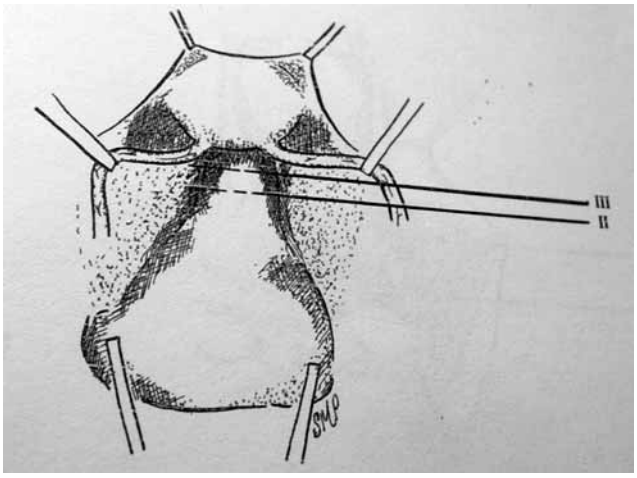
1994 FIGO Stage IA2 cervical cancer

As previously stated, our 1988 review identified a 6.8% incidence of lymph node metastasis in women with 3-5 mm of invasive cervical cancer. Similarly, Ostor and co-authors in 1994 identified 221 patients with 3-5 mm invasion of the cervical stroma who underwent lymphadenectomy with a 6% incidence of lymph node metastasis, nearly identical to the 6.8% reported by one of us (MSP) [6].

In the review by Benedet and Anderson, the authors identified 53 patients with 3-5 mm invasion and LVSI, four of whom or 7.5% had lymph node metastasis. Of importance, this 7.5% incidence of lymph node metastasis was almost identical to the 8.3% of the 180 patients without LVSI [7].

Based on this data, in the 21st century, patients who do not desire to retain fertility, those with Stage IA2 with or without LVSI would be candidates for type II hysterectomy and pelvic lymphadenectomy.

Fig. 2



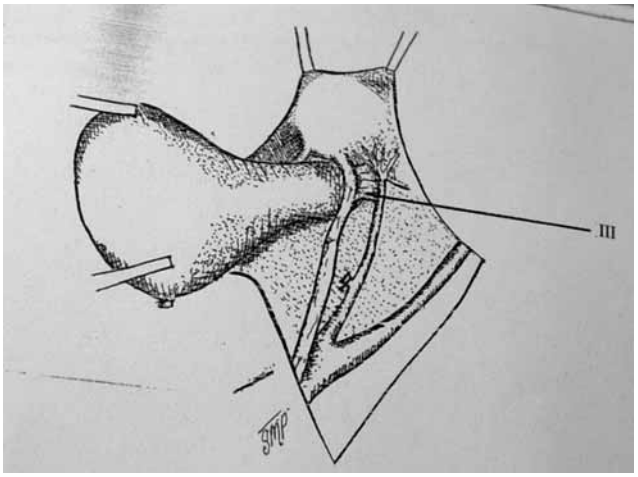


Fig. 3

Figure 2. — Description of the level of vaginal removal in a type II and type III radical hysterectomy (from Piver M.S., Rutledge F., Smith J.P.: "Five classes of extended hysterectomy for women with cervical cancer". Obstet Gynecol., 1974; reproduced with permission).

Figure 3. — Mobilization of the ureters by dissection of anterior vesicouterine ligaments in a type III radical hysterectomy (from Piver M. S., Rutledge F., Smith J. P.: "Five classes of extended hysterectomy for women with cervical cancer". Obstet Gynecol., 1974; reproduced with permission).

1994 FIGO Stage IB1 and IB2 cervical cancer

Prior to the 1994 FIGO classification of cervical cancer, FIGO Stage IB consisted of macroscopic lesions limited to the cervix. In 1975, a year after the publication of the five classes of hysterectomies, one of us (MSP) published a paper titled "Prognostic significance of cervical lesion size and pelvic lymph node metastasis in cervical carcinoma" [8].

Of the 145 women who underwent type II and type III hysterectomy with pelvic lymphadenectomy, those patients with cervical tumors equal to or less than 3 cm in diameter had an overall incidence of lymph node metastasis of 21.2% (Table 2); patients with tumors measuring greater than 3 cm had an incidence of lymph node metastasis of 35.1%. More importantly, those patients with tumors 1 cm or less had a five-year survival of 84.1% and those with tumors measuring 2-3 cm had a five-year survival of 90.1%. However, the five-year survival decreases to 69.9% for tumors measuring 4-5 cm and 60.0% for tumors greater than or equal to 6 cm in maximum diameter.

In 1994, FIGO reclassified Stage IB into IB1 and IB2 in which IB1 are those cervical lesions 4 cm or less in diameter and IB2 are those greater than 4 cm. This new classification is consistent with our 1975 results in which the five year survival is 90.1% for cervical tumors measuring 2-3 cm treated by type II or type III hystectomy but fell to 65.4% for those lesions 4-5 cm and 60.0% for those lesions measuring 6 cm or greater in diameter [8].

In the only randomized prospective trial of type II versus type III hysterectomy, Londoni *et al*. reported on 243 patients with Stage IB1-IIA cervical cancer [9]. Although patients treated by type II or type III hysterectomy had similar recurrence free and overall survival, this conclusion is clouded by the fact that 54% of the type II and 55% of the type III hysterectomy patients received post-hysterectomy radiation therapy lessening our understanding of long-term results of surgery alone.

As was clear from our 1974 report, complications from class II hysterectomies were significantly less as compared to the women who underwent class III hysterectomy. In the randomized trial reported by Londoni and co-authors, patients undergoing class III hysterectomy also had increased morbidity as compared to those treated by class II hysterectomy [9]. However, although it is evident that class II hysterectomy is associated with less morbidity, there are no evidence-based reports that confirm the less extensive parametrial resection of class II as compared to class III hysterectomy results in equal long-term survival, the ultimate goal of the operation.

As clearly stated by Hoffman in 2004 "currently, there is no adequate method to preoperatively identify many of the low-risk (cervical) cancer patients whose risk/benefit ratio weighs against doing a complete parametrectomy" [10].

Based on the above data, there is no 21st century evidence that a class II hysterectomy would be the preferred treatment of choice for FIGO Stage IB1 but rather type III hysterectomy and pelvic lymphadenectomy remains the treatment of choice. Because the long-term outcome for women with FIGO Stage IB2 is significantly worse than for Stage IB1, it appears evident that type II and even a type III hysterectomy are not suitable for these patients, although clearly a type III hysterectomy is performed for Stage IB2 in many centers.

Table 1. — *FIGO Stage IA & IB. International Federation of Gynecology and Obstetrics.*

IA	Invasive carcinoma diagnosed only by microscopy.
IA1	Stromal invasion no greater than 3.0 mm in depth and 7.0 mm or less in horizontal spread.
IA2	Stromal invasion more 3.0 mm and not more than 5.0 mm with a horizontal spread of 7.0 mm or less. The depth of invasion should not be more than 5 mm taken from the base of the epithelium, either cervix or glandular, from which it originates. Venous or lymphatic vascular space involvement does not affect classification.
IB	Clinically visible lesions confined to the cervix or microscopic lesion greater than IA2.
IB1	Lesion 4.0 mm or less in greatest diameter.
IB2	Lesion more than 4.0 cm in greatest diameter.

Table 2. — *Cervical lesion size and lymph node metastasis in Stage IB cervical cancer.*

Size (cm)	Patients	Metastasis	Percentage	
≤ 1	22	4	18.1	
				> 21.1
2-3	72	16	22.1	
4-5	45	16	35.5	
				> 35.2
≥ 6	6	3	50.0	
Totals	145	39	26.9	

From Piver M.S., Chung W.S. *Obstet. & Gynecol.,* 1975, *46*, 507.

Discussion

The purpose of this paper was for one of us (MSP) to take a personal 21st century perspective of the merit of a class II hysterectomy in early-stage cervical cancer since the original classification of five classes of hysterectomy by the late Felix Rutledge and the artist rendition by Susan M. Piver based on the 1994 FIGO reclassification of Stage IA1/2 and IB1/2 cervical cancer.

Purposefully, this paper does not discuss type II versus type III nerve sparing RH [11], fertility sparing type III radical abdominal trachelectomy [12] or robotic-assisted laparoscopic type III radical hysterectomy [13].

It is our opinion based on this review that FIGO Stage IA1 without LVSI is treated by type I hysterectomy without lymphadenectomy but that type II hysterectomy with pelvic lymphadenectomy would be a reasonable choice for Stage IA1 with LVSI. Also, that all Stage IA2 patients with or without LVSI are suitable candidates for type II hysterectomy and pelvic lymphadenectomy.

Finally, until improved imaging allows for possible detection of early parametrial invasion, the type III hysterectomy plus pelvic lymphadenectomy in medically suitable patients is the preferred treatment for IB1. Patients with Stage IB2 may be considered for type III hysterectomy with tailored postoperative radiation [14].

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