Nerve Sparing Radical Hysterectomy: Feasibility and Effect on Bladder Function

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ABSTRACT

Objective: To examine the feasibility and effect of autonomic nerve preservation on postoperative bladder function.

Material and Methods: A prospective controlled clinical study of twenty four patients with invasive carcinoma of the cervix, stage I and IIa. Patients were divided into two groups, 12 patients each. The first group underwent type III radical hysterectomy without nerve sparing (control group) while the other 12 patients underwent the nerve sparing technique. Patients were compared as regards to the operative time, time needed before the catheter was removed, urodynamic findings, the need for postoperative catheterization for urinary retention and the duration of postoperative stay. Results were expressed in the form of mean and standard deviation, independent t test was used to compare means with the statistical significance set at p < 0.05.

Results: Out of the 12 patients of the study group, the procedure was successful in 10. The nerve sparing group showed a significant reduction in the postoperative catheterization time. 6 patients in the control group required catheterization for retention following removal of the catheter, compared to 3 patients in the study group. The closing urethral pressure, maximum bladder capacity and peak flow rate were all significantly higher in the study group.

Conclusion: The nerve sparing technique appears to be a feasible alternative to the classic technique of radical hysterectomy and is associated with better postoperative bladder function.

Key Words: Cancer cervix - Radical hysterectomy.

INTRODUCTION

The Latzko-Okabayashi procedure for radical hysterectomy has been, in theory and radicality, one of the best operative procedures for carcinoma of the cervix uteri; however due to extensive dissection of the parametrium and the cervical ligaments, a certain degree of bladder dysfunction follows the procedure [13].

A number of patterns of urinary bladder dysfunction have been described, including, hypotonic, or hypertonic vesical dysfunction, loss of bladder sensation, urgency, stress incontinence and vesicoureteral reflux [14].

Several surgical techniques have been constructed in an attempt to preserve the autonomic nerve supply of the pelvis without compromising the radicality of the procedure in order to preserve bladder function [6].

By using the middle rectal artery as a landmark to separate the vascular from the neural part of the cardinal ligament, the aim of this study was to examine the feasibility and effect of autonomic nerve preservation on postoperative bladder function [4].

MATERIAL AND METHODS

The study population consisted of 32 patients with invasive carcinoma of the cervix attending the National Cancer Institute at Cairo University and Minea Oncology Center during the period from January 2001 to August 2002. All patients had clinical stage I-II a disease. None of the patients had previous radiotherapy.

After complete general or local examination, chest X ray and CT abdominopelvic scan to exclude distant metastasis, the patients were all examined under anesthesia to determine the extent of parametrial and pelvic spread, a tissue biopsy was taken and cystoscopy was performed.
to exclude bladder invasion. All patients were evaluated by urodynamic study preoperatively.

Exclusion criteria included cases with clinically stage II b-IV, surgically unfit patients due to general cause, patients with urinary tract infection or preoperative bladder dysfunction as detected clinically or on urodynamic evaluation. (8 patients out of 32 were excluded).

The patients were then divided into two groups, 12 patients each. The first group underwent type III radical hysterectomy without nerve sparing (control group) while the other 12 patients underwent the nerve sparing technique as described by Possover [6].

Type III hysterectomy was modified by preserving the pelvic splanchnic nerve during transection of the cardinal ligament: During pelvic lymphadenectomy, lymph nodes along the common, external and int. iliac vessels were dissected and removed, opening the lumbosacral and paravesical space. The obturator nerve, sciatic nerve and the lumbosacral trunk were exposed. The pararectal space was opened between the ureter medially and the internal iliac vessels laterally. Special attention was paid to preserve laterally the hypogastric fascia to avoid injury of the pelvic splanchine nerve. The cardinal ligament was completely freed of all lymphatic tissue by blunt dissection and all vessels of the vascular pedicle were identified.

The neural part of the cardinal ligament was freed of fat and lymphatic tissue anteriorly (“preneural lymph nodes”). The vascular part of the cardinal ligament was divided as lateral as possible at the pelvic sidewall without including the middle rectal vessels.

The pelvic splanchnic nerves were completely preserved and the operation was then completed as usual.

Patients were retained with a transurethral Folly’s catheter for 6 days postoperative, after which bladder training was started and stopped when residual urine was less than 50 ml. Urodynamic studies were then repeated.

The patients were compared as regarding the operative time needed before the catheter was removed, urodynamic findings, the need for postoperative catheterization for urinary retention and the during of postoperative stay.

Results were expressed in the form mean and standard deviation; independent \( t \) test was used to compare means with statistical significance set at \( p < 0.05 \).

**RESULTS**

Out of the 12 patients who were scheduled to undergo the nerve sparing technique (study group), the procedure was successful in 10 of these patients and failed in 2 patients in whom accurate identification of the landmarks separating the vascular from the neural portions of the cardinal ligament was not possible, these two patients were however analyzed in their originally assigned groups when performing the statistical analysis.

There was no significant difference regarding the operative time and post operative stay between both groups, however the sparing group showed a significant reduction in the postoperative catheterization time.

6 patients in the control group required intermittent cauterization for retention following removal of the catheter, compared to 3 patients in the study group, one of these patients had a failed nerve sparing technique due to surgical non feasibility.

As regards to the post operative urodynamic findings, the closing urethral pressure, maximum bladder capacity and peak flow rate were all significantly higher in the study group.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Nerve sparing group</th>
<th>Control group</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative time (min)</td>
<td>213.5 (SD 53.8)</td>
<td>193 (SD 44.8)</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Post operative (days)</td>
<td>10 (SD 2.9)</td>
<td>12 (SD 3.7)</td>
<td>&gt; 0.05</td>
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<tr>
<td>Duration of catheterization</td>
<td>13.5 (SD 3.8)</td>
<td>20.1 (SD 2.9)</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Parameter</th>
<th>Nerve sparing group</th>
<th>Control group</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urethral closing pressure</td>
<td>68.1</td>
<td>37.1</td>
<td>&lt; 0.05</td>
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<td>Bladder capacity</td>
<td>395.8</td>
<td>140.5</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Peak flow rate</td>
<td>23.9</td>
<td>12.5</td>
<td>&lt; 0.05</td>
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Fig. (1): Diagram of the pelvic autonomic nerves in radical hysterectomy: transversal section through the pelvis showing the bladder, uterine cervix and rectum within the pelvic connective tissues. Autonomic nerves are in yellow. The dotted line represents the sacrouterine resection line.

Fig. (2): Diagram of the pelvic autonomic nerves in radical hysterectomy. Frontal section through the uterus and parametrium. UA = uterine artery; UV = uterine vein; SN = splanchnic nerves; HN = hypogastric nerve. The dotted line represents the parametrial resection line.

Fig. (3): Para sympathetic motor nerve crossing from lateral to medial with the middle rectal vessels as landmark during dissection.

Fig. (4): Urodynamic curves for a patient with nerve sparing technique with normal urethral closing pressure, average bladder capacity and normal peak flow rate.

Fig. (5): Urodynamic curves for a patient of the control group with decreased urethral closing pressure, peak flow rate, increased residual urine and decreased bladder capacity.
DISCUSSION

The surgical treatment of invasive carcinoma of the cervix is primarily limited to those patients in whom the disease is confined to the cervix or vaginal fornix (stage Ia, stage Ib, or stage IIa disease) and who are at good surgical risks [8, 10].

An extensive abdominal hysterectomy effectively denervates the bladder and upper urethra. Sasaki and coworkers have suggested that the posterior part of the cardinal ligament (pars nervosa) contains the major part of the parasympathetic nerve supply to the bladder & urethra and that its removal is responsible for postoperative bladder dysfunction [3,9]. The more extensive the dissection, the greater the degree of interference with their function. The incidence of significant bladder dysfunction may be as high as 50% [7].

Accordingly removal of only the anterior cardinal ligament (pars vasculosa) with preservation of the caudal neural portion has been postulated in several studies in order to preserve bladder innervation and function without compromising the necessary extensive dissection and tissue removal around the central disease, thus sparing many patients the loss of urethrovaginal function [9].

This approach was not widely adopted by oncologic & gynecologic surgeons, presumably because of a concern that this same cardinal ligament tissue also carries lymph channels draining the cervix and should be removed in a complete central dissection [12].

However in more recent studies, such as that of Possover, it has been shown that autonomic preservation may be feasible without compromising the radicality of the operation [6].

The main aim of this study was to investigate the surgical feasibility of the technique of nerve sparing taking the middle rectal vessels as a landmark to limit the dissection only to the vascular part of the cardinal ligament and to investigate its effect on postoperative bladder function.

As regards to the operative time, there was a slight increase in the operative time with the nerve sparing technique owing to the extra time taken to dissect the vascular landmarks (213 min compared to 193 Min), also the postoperative stay was similar for both groups, 10 days for the non sparing group Vs 12 days for non sparing (p > 0.05).

Studies have demonstrated that bladder may initially be hypertonic, with decreased bladder capacity, increased resting pressure and increased residual urine volume. Many patients have difficulty in initiating micturition and loss of sensation of bladder fullness [2].

In this study post operative bladder drainage was continued for at least 6 days following which bladder training was started and was stopped when the residual volume of urine was less than 50 ml. The mean time to the return of normal bladder function was significantly less in the sparing group; 13.5 days compared to 20.12 days in the non sparing group (p < 0.05), these findings are in agreement with previous studies such as that of Wu 1991, who found that the time for return to normal urinary function was 18.25±1.93 days for the study group and 24.05±1.68 days for the control group [11]. Similar findings were also found by Possover et al., 2000 (11.2 days versus 21.4 days for the control group) [6].

Two patients who had undergone a successful nerve sparing technique required catheterization for retention following removal of the catheter compared to 5 patients in the nerve non sparing technique, this may be due to damage of the sympathetic supply which may also be important for normal bladder function as perviously suggested by Sasaki [9]. A number of urodynamic disorders have been described with injury to the nerve supply of the urinary bladder [1,5]. In this study it was found that there was a significantly lower mean closing urethral pressure in the control group (37 compared to 68), similarly the maximum bladder capacity and peak flow rate were significantly lower in the control group.

In conclusion the nerve sparing technique appears to be a feasible alternative to the classic technique of radical hysterectomy and is associated with better postoperative bladder function.

REFERENCES


