Prevention of Complications Following Pelvic Exenteration With the Use of Mammary Implants in the Pelvic Cavity: Technique and Results of 28 Cases

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Background: With the evolution of neo-adjuvant therapy and the introduction of peritonectomy with chemotherapy in surgical practice, pelvic exenteration has taken second place in the treatment of advanced pelvic tumors. This surgery remains the first of choice for the treatment of T4 superior and medium rectal tumors that are not susceptible to neo-adjuvant radiochemotherapy, for uterine tumors and cervical FIGO IV T4, for pelvic recurrence and for T4 bladder tumors. After a pelvic exenteration the pelvic cavity becomes occupied by the intestinal loops, causing an increase in the risk of short and long-term complications such as radiation enteritis in the case of post-operative radiotherapy, occlusions, and enteric fistulas that could be avoided by isolating the small intestine in the pelvic cavity.

Methods: With this aim we positioned a mammary prosthesis (implant) in the cavity of the last 28 cases we treated, and did not observe complications related to the prosthetic implant.

Results: No early or delayed complications, such as occlusions or fistulas, were observed. All the patients treated underwent adjuvant radiotherapy with no evidence of radiation enteritis. Ten patients were recanализed with removal of the implant, ultra-low rectal anastomosis was performed in four cases. Eight patients were not recanialized, six distance due to recurrence and two local recurrence. Nine patients are currently in follow-up, disease free between 1 and 12 months.

Conclusions: We retain the encouraging results observed that the use of mammary implants in the pelvic cavity after pelvic exenteration should be part of the cultural patrimony of the surgeon who approaches this type of major radical surgery.


Key Words: pelvic exenteration; T4 rectal tumors; cervical cancer t4

INTRODUCTION

Pelvic exenteration constitutes radical surgery of the pelvic cavity and is indicated for the treatment of T4 superior and medium rectal tumors [1,2], for uterine tumors and cervical FIGO IV T4, for recurrence following gynecological and rectal surgery, as well as for T4 bladder tumors.

The term pelvic exenteration identifies different interventions that foresee the total or partial demolition of the pelvic organs, including or not the perineal plane and the sphincter.

Pelvic exenteration is classically divided into total and posterior. A total pelvic exenteration foresees the en block removal of the bladder and uterus with rectus and sigma, while a posterior pelvic exenteration spares the bladder. These two types of pelvic exenteration can then extend to the perineal plain (Type A) or leave intact both the perineal plain and the sphincter (Type B) [Figs. 1 and 2].

Patients who undergo pelvic exenteration begin adjuvant chemoradiotherapy postoperatively to target microscopic residual disease or in order to complete the sterilization of the operating field [4]. The main acute toxicity of chemoradiotherapy against rectal cancer is enteritis, with grade 3, diarrhea occurring in about 11–39% of the cases.

The en block resection of the pelvic organs, rectum, uterus, ovaries and bladder produces an ample empty excavation (cavity) that is filled by the intestinal loops and, because of both inflammatory phenomena and in the case of even microscopic residual tumors, they adhere to the perineal plain with possible occlusions and fistulas. The adjuvant radiotherapy in these cases involves the intestinal package positioned in the pelvic cavity and the bladder wall, which in cases of posterior pelvic exenteration, tends to descend downwards into the field of radiation. Radiotherapy causes slight intestinal damage in 5–25% of cases, above all when radiation is given in high doses of 4,000–5,000 cGy.

Already in 1983, Sugarbaker [5] proposed the positioning of silastic mammary implants in the pelvic cavity after abdominal perineal resection or pelvic exenteration in order to prevent radiation damage [6]. Other authors implement other procedures such as the positioning of an omental sling, polypropylene prosthetics, skin expanders and goretex prosthetics [7,8]. In these patients, in addition to a radical treatment of the tumor, the surgeon must prevent complications—such as radiation lesions, enteric fistulas from inflammatory phenomena or from recurrence and occlusions from internal hernias—that may result from the occupation of the pelvic cavity by the intestinal mass. The positioning of a mammary implant in the pelvic cavity still today seems to us a very effective method for the prevention of these postoperative and adjuvant therapeutic complications.

SURGICAL TECHNIQUE

After having performed a total or posterior Type B pelvic exenteration—or a Type A pelvic exenteration with immediate closure of the perineal plane—the volume of the residual cavity is measured in order to quantify the size of the prosthesis to position so that both the

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intestinal loops as well as the posterior bladder wall, when present, are lifted and do not take up the pelvic cavity. The pelvic cavity is filled with sterile physiological solution to the superior margin of the sacral promontory (Figs. 3 and 4), raising the bladder with ring forceps and keeping the intestines mobilized above. The quantity of physiological solution, in cc, necessary to fill the pelvic cavity corresponds to the precise volume of the implant to be used. In female patients, the volume measured must be augmented by 50 cm³, given the greater lateral spaciousness of the cavity, which causes the prosthesis to fall further downwards.

In the first cases we used Round type silicone gel-filled mammary implants, but a CT scan at 30 days demonstrated that this type of implant placed in the lower part of the pelvis in proximity of the perineal plain tended to form creases (Fig. 5). In the latter 20 cases we used anatomical shaped mammary implants, which, rotated by 180°, adapt perfectly to the confirmation of the pelvis of both female and male patients (Figs. 6–8). Before positioning the implants, two crossover Black Drain¹ type drains are placed in the pelvis. After having placed the implants the bladder wall and, when present, the intestines above it are then allowed to drop (Fig. 7).

During recanalization surgery (Type B total or posterior pelvic exenteration) we noticed that the texture of the implant surface prevents the formation of adherences between the intestines and the implant, which becomes covered by a pseudo-capsule instead (Fig. 8).

MATERIALS AND METHODS

Twenty-eight patients underwent mammary implant device positioning from 2004 to 2009. Twenty-five posterior Type B pelvic exenterations, two total Type B exenterations and one re-operation for relapse after total pelvic exenteration were performed. In four cases out of 28, a resection of the bladder was also performed (two partial and two total cystectomy) and in six cases a bilateral ureteral resection. Two termino-terminal anastomosis on double J, three ureteral re-implants, two ileus re-implant in pelvic recurrence after total pelvic exenteration and two Bricker ileal conduit were performed.

The primitive tumor originated:

<table>
<thead>
<tr>
<th>T4 superior rectal tumor</th>
<th>12 cases</th>
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<tr>
<td>Pelvic rectum recurrence</td>
<td>5 cases</td>
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<tr>
<td>Pelvic ovarian recurrence</td>
<td>4 cases</td>
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<tr>
<td>Pelvic endometrius recurrence</td>
<td>1 case</td>
</tr>
<tr>
<td>Pelvic cervix recurrence</td>
<td>4 cases</td>
</tr>
<tr>
<td>Pelvic ovarian recurrence 6 years after total peritonectomy + HIPEC</td>
<td>1 case</td>
</tr>
<tr>
<td>Enterocutaneous fistula after Type A total pelvic exenteration from uterine cervix neoplasm</td>
<td>1 case</td>
</tr>
</tbody>
</table>

Fig. 1. Modified from EMC—total pelvic exenteration (pelvectomy). Type A: en block removal of bladder, uterus, ovaries, sigma rectum and perineal plain. Type B: en block removal of bladder, uterus, ovaries and sigma rectum with conservation of the perineal plain and sphincter.

Fig. 2. Modified from EMC—posterior pelvic exenteration (pelvectomy). Type A: en block removal of uterus, ovaries, sigma rectum and perineal plain. Type B: en block removal of uterus, ovaries and sigma rectum with conservation of the perineal plain sphincter.

Fig. 3. Pelvic cavity following posterior pelvic exenteration.

Fig. 4. Volume of the pelvic cavity.
In five cases the pelvic exenteration was performed with suspicion of microscopic residual tumor in the presacral fascia, delimited with titanium surgical clips to facilitate radiotherapy field.

All patients underwent adjuvant chemoradiotherapy and restadiation. CT scans were performed at 8 weeks along with implant check-up. Only in the last eight patients did we perform post-chemoradio stadiation with 18F-FDG-PET/CT.

In 10 cases (38%), given the absence of local and/or distance recurrence, we performed an intestinal recanalization, in six cases packaging an ultra-low colorectal anastomosis and in four cases a double layered colo-anal anastomosis on the dentate line.

Six patients were not recanalized for recurrence of non-operable extra-regional disease (in two cases metastases of the lungs, in one case multiple bilobar hepatic metastasis and in three cases both lung and hepatic metastases) and two for progression of localized disease and thus underwent second and third line chemotherapy. The last nine cases treated are currently in 1–12 months follow-up from surgery.

RESULTS

No post-operative mortality was observed. No implant is removed for infection. In four patients (15%) post-operative fever was treated with systemic antibiotics based on the antibiogram of the culture exams of the periprotesic liquid. An irrigation of idrovinil pirrolidone iodine was also performed through drains that are positioned one on the right and one on the left, crossed for an effective transcurrent irrigation.

In one patient, jejunum–jejunal anastomosis leakage occurred. On re-operation the mammary implant was removed and repositioned after toilette of the cavity with idrovinil pirrolidone iodine and no further complications related to the implant were observed.

In two patients (7.5%), a periprotesic hemorrhagic effusion occurred and was evacuated through the residual rectal stump without modifying the therapeutic course of the patient. All patients commenced a protocol of radiotherapy associated with adjuvant chemotherapy at 30 days from surgery. Ten patients, disease free after 1 year and who underwent recanalization with removal of the implant,
returned to normal life activity (Karnofski ≥ 90). In two cases (7.5%) of female patients we observed an asymptomatic vaginal stump leakage at recanilization, which was sutured during the recanilization surgery.

**DISCUSSION**

Pelvic exenteration has functional, psychological, and psychosexual implications for patients postoperatively, and indications should therefore be determined with caution.

With the evolution of neo-adjuvant therapy and early diagnosis of pelvic tumors, pelvic exenteration has taken a marginal role in oncological surgery and is performed only in selected cases with precise indications. Pelvic exenteration can be performed in T4 tumors of the high rectum that are not susceptible to neo-adjuvant radiochemotherapy, T4 tumors of the medium-high rectum excluded from neo-adjuvant treatment, or in phases of occlusion or hemorrhaging not susceptible to other procedures such as endoscopic emostasis or positioning of endoprothesis, or after the failure of these procedures.

Tumors of the endometrius and of the uterine neck in the IV stage T4 after neo-adjuvant therapy can be treated with pelvic exenteration, as can T4 tumors of the bladder, which can benefit from a pelvic exenteration in the case of symptomatic infiltration of the adjacent organs.

The introduction of the concept of citoreduction, peritoneectomy and intra-operative chemo-hyperthermia within the surgical practice has diminished the frequency of pelvic exenterations with concomitant pelvic or peritoneal dissemination of disease.

However, though fortunately always less frequent, pelvic exenteration remains, such as in the cases specified above, the only therapeutic possibility for some patients.

The evaluation of the P-Possum score in a patient who is to undergo pelvic exenteration with a Physiology score of 12 (and thus in generally good condition) forsees morbidity of 75.77% and mortality of 5.48%, and so we are dealing with an operation with a high risk of morbidity and mortality. If to this we add long-term morbidity from adjuvant treatment (radiochemotherapy) and thus radiation enteritis, intestinal perforations, fistulas, and post-surgical occlusions from small intestine hernias in the pelvic cavity and fistulas during recovery, the use of this procedure becomes prohibitive.

In our experience, we have found that positioning the implant in the pelvis allows us to avoid all late complications without any increase in morbidity. The presence of an implant in the pelvic cavity allows for: early radiochemotherapy without the risk of radiation enteritis since the intestinal loops are positioned above the sacral promontory; absence of post-operative occlusions since the intestinal loops are separated from the perineal plain and, in the case of recurrence of local disease, the presence of the implant prevents the formation of enterocutaneous fistulas from neoplastic infiltration. In the cases of posterior pelvic exenteration, these same effects occur on the bladder. Radiotherapy can also be performed without contraindications with the presence of implants in the pelvis. In fact, in immediate reconstruction after a mastectomy for advanced breast tumors, patients undergo adjuvant radiotherapy without complications or contraindications, the only augmented risk being the formation of a pseudo-capsule which, in the positioning of implants in the pelvis, would be desirable for a more complete isolation of the small bowel from the pelvic cavity [9,10].

**CONCLUSION**

Early diagnosis and the evolution of neo-adjuvant radiochemotherapy techniques in T3/4 under-peritoneal rectal cancer, in uterine neck and endometrius cancer, neo-adjuvant treatments in inoperable bladder cancer and the introduction of peritoneectomy with HIPEC in peritoneal cancer with pelvic involvement make it so that today pelvic exenteration can find its limited space in advanced tumors of the pelvic cavity. We believe that, in cases in which this surgery must be performed out of necessity or as the only therapeutic garrison, the positioning of a mammary implant in the pelvic cavity could be of great help in the prevention of radiation enteritis during adjuvant radiotherapy as well as in the prevention of enteropelvic fistulas and occlusions caused by small intestine hernia or infiltrations from recurrence.

The use of implants in the pelvis does not modify mortality or morbidity of the pelvic exenteration, but it does diminish re-operation rate and long-term treatment for fistulas, occlusions and enteritis.

The lower number of hospitalizations due to early and late complications justifies the cost of the prosthetic implant. In cases of a complete response where the restoration of the intestinal continuity is possible, the presence of an implant in the pelvis facilitates the localization of the sunken ano-rectum and the absence of adherences diminishes the maneuvers of debridement of the small intestines from the cavity with lack of iatrogenic lesions from lysis of adherence.

We retain that the use of mammary implants in the pelvic cavity after pelvic exenteration should be part of the cultural patrimony of the surgeon who approaches this type of major radical surgery.

**REFERENCES**