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Original article

Non-closure of peritoneum after abdominal hysterectomy for uterine carcinoma does not increase late intestinal radiation morbidity

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ABSTRACT

Background/Aim: To evaluate whether non-closure of the visceral peritoneum after total abdominal hysterectomy (TAH) and bilateral salpingo-oophorectomy (BSO) in patients with uterine corpus carcinoma influences the volume of the small intestine within the irradiated volume during adjuvant radiotherapy or late radiation intestinal toxicity.

Materials and methods: A total of 152 patients after TAH + BSO with adjuvant pelvic radiotherapy were studied. The state of peritonealization was retrospectively evaluated based on surgical protocols. The volume of irradiated bowels was calculated by CT-based delineation in a radiotherapy planning system. The influence of visceral peritonealization upon the volume of the small intestine within the irradiated volume and consequent late morbidity was analyzed.

Results: Visceral peritonealization was not performed in 70 (46%) of 152 studied patients. The state of peritonealization did not affect the volume of the irradiated small intestine ($p = 0.14$). Mean volume of bowels irradiated in patients with peritonealization was 488 cm³ (range 200–840 cm³, median 469 cm³); mean volume of bowels irradiated in patients without peritonealization was 456 cm³ (range 254–869 cm³, median 428 cm³). We did not prove any significant difference between both arms. Nor did we observe any influence of non-peritonealization upon late intestinal morbidity ($p = 0.34$).

Conclusion: Non-closure of the visceral peritoneum after hysterectomy for uterine corpus carcinoma does not increase the volume of the small intestine within the irradiated volume, with no consequent intestinal morbidity enhancement.

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1. Background

Until the last decade of the twentieth century, visceral peritonealization after hysterectomy was a standard of care all

over the world. A closure of the visceral peritoneum has always been thought to be necessary to avoid postoperative ascending infections or adhesion formation with the risk of a consequent ileus. Several studies argued against this procedure at the turn of the millennium.^{1–5,7}

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Prospective randomized trials of hundreds of patients revealed that peritoneal closure at abdominal hysterectomy provides no immediate postoperative benefits while unnecessarily lengthening surgical time and anesthesia exposure and increasing blood loss.^{1,2} Omission of peritoneal closure seems to be safe, as fever, infection, hemorrhage or revision are similar to peritonealization.^{3,4,5} On the contrary, a significantly lower number of postoperative irregular pyelograms was reported in cases without peritoneal closure after radical hysterectomy.⁶ Moreover, resumption of bowel function may take place significantly earlier in patients with open peritoneum,³ without a superior risk of subsequent ileus.^{4,5} Study of pelvic and periaortic peritonealization in radical ovarian cancer surgery has showed that leaving the pelvic and periaortic peritoneum open significantly decreases the adhesion formation.⁷ As a long-term sequelae, peritoneal non-closure after hysterectomy can cause an increase in peritoneal pelvic fluid, however, its clinical impact is supposedly insignificant.⁸

Referenced studies have suggested that the traditional practice of visceral peritoneal closure should be abolished at abdominal hysterectomy. Therefore, at present, a majority of gynecologists omit peritonealization in all patients undergoing hysterectomy for any reason. Unfortunately, some patients after total abdominal hysterectomy (TAH) and bilateral salpingo-oophorectomy (BSO) for uterine carcinoma require adjuvant pelvic radiotherapy. With regard to anatomical alterations, bowels usually fill up the empty space in the pelvis after radical hysterectomy. If the non-closure of visceral peritoneum increased the volume of the small intestine within the pelvis in these patients, a larger volume of the irradiated small intestine would consecutively lead to increased intestinal toxicity. There has been no study evaluating the influence of peritoneal non-closure upon the volume of the small intestine in the pelvis up to the present day.

The purpose of this study is to evaluate the influence of non-closure of the visceral peritoneum after TAH and BSO in patients with uterine carcinoma receiving adjuvant radiotherapy upon the volume of the small intestine within the irradiated volume and upon the risk of late radiation intestinal morbidity enhancement.

2. Materials and methods

2.1. Patients

A total of 235 Caucasian patients with uterine carcinoma had adjuvant pelvic radiotherapy between the January 2004 and December 2009 at the Department of Oncology and Radiotherapy, University Hospital in Hradec Králové. All patients underwent TAH with BSO. In 82 patients closure of the peritoneum was performed after hysterectomy, while visceral peritonealization was omitted in 70 patients. The state of peritonealization in other 83 patients was not clearly provable from the documentation; these patients were excluded from the study, thus 152 patients were left for statistical evaluation.

In 66 of the studied patients (43%), systematic pelvic lymphadenectomy was performed; median number of lymph nodes resected in these patients was 10 (range 1–36; mean

Table 1 – Patient and treatment characteristics.

Age	MEAN: 64 years (± 8.3 years)
FIGO stage (FIGO 1988)	FIGO IB: 33 (22%) patients FIGO IC: 64 (42%) patients FIGO IIA: 12 (8%) patients FIGO IIB: 24 (16%) patients FIGO IIIA: 12 (8%) patients FIGO IIIC: 7 (4%) patients
Histology	ENDOMETRIOID: 133 (88%) patients ADENOAKANTOMA: 11 (7%) patients CARCINOSARCOMA: 5 (3%) patients PAPILLARY SEROUS: 2 (1%) patients CLEAR CELL: 1 (1%) patient
Tumor grade	GRADE 1: 26 (17%) patients GRADE 2: 101 (66%) patients GRADE 3: 25 (17%) patients
Site of surgery	GYNECOL. CENTRE: 80 (53) patients DISTRICT HOSPITAL: 72 (47%) patients
Radiotherapy dose	50 Gy/25 FRACTIONS: 115 (76%) patients 45 Gy/25 FRACTIONS: 37 (24%) patients
Radiotherapy technique	CONVENTIONAL: 117 (77%) patients 3D-CONFORMAL: 31 (20%) patients IMRT: 4 (3%) patients
Values are given as a number (%); or mean \pm standard deviation. FIGO, International Federation of Gynecology and Obstetrics; IMRT, intensity modulated radiotherapy.	

11). Detailed patient and treatment characteristics are listed in [Tables 1 and 2](#).

2.2. Small intestine delineation

Following TAH with BSO, adjuvant pelvic radiotherapy was performed in all studied patients. In all patients, the radiation therapy was performed by a linear accelerator with photons of 6–18 MV energy. Majority of patients were treated by a conventional 4-field “box” technique; the other patients were treated by a 3D-conformal radiotherapy (3D-CRT) using 4-field individually shaped with a multi-leaf collimator (since 2007) or 7-field intensity modulated radiotherapy (IMRT; since 2009). All patients were treated in a supine position with standard leg-immobilization. No protocol for bowel preparation was used before planning.

Radiotherapy treatment planning was based on transversal CT scans of the whole pelvis; thickness of CT slices was mostly 10 mm (in 141 patients) or 5 mm (in 11 patients). Planning treatment volume consisted of the proximal vaginal stump; parametria; presacral, internal, external, and common iliac lymph nodes with cranial border of radiotherapy fields at L4/L5 spondylous discus in all patients; with 10 mm safety margins in all directions.

The contours of the small intestine were delineated within the whole irradiated volume, as defined by the ICRU 50 (International Commission on Radiation Units) recommendation, by the contouring function of the Eclipse radiotherapy treatment planning system (Eclipse; Varian Medical Systems Inc., Palo Alto, USA). Precise contours of the small intestine were performed in all transversal CT slices; every bowel loop was delineated separately omitting visceral adipose tissue; the

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