



Laparoscopy in gynecologic oncology: A review of literature

Laparoskopija u ginekološkoj onkologiji – pregled literature

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Key words:

genital neoplasms, female; laparoscopy; gynecologic surgical procedures; lymph node excision.

Ključne reči:

polni organi, ženski, neoplazme; hirurgija, laparoscopska; hirurgija, ginekološka, procedure; limfadenektomija.

Introduction

Introducing laparoscopy in gynecology during the 1960s in Europe placed gynecology as pioneer in this less invasive approach in surgery. At that time, gynecological laparoscopy was predominantly used in diagnostics by means of direct visualization of *pelvis minor*. During the 1970s the gynecologists shifted the use of endoscopic technology from diagnostic to surgical purposes such as tubal ligation. From that time, laparoscopy has become a leading technique in diagnostics and surgical treatment of benign lesions in gynecology¹. By using laparoscopy in detection of bladder and prostate carcinoma spreading into the lymph nodes urologists have become the pioneers of the use of laparoscopy in the field of oncology². During the late 1980s, the initiators of endoscopic oncology began with laparoscopic evaluations of the condition and spreading of the malignant disease. The first reports were available at the beginning of 1990s, and with them came the controversial opinions about the usefulness of laparoscopy and minimal invasive surgery in gynecologic oncology. Disagreements were mainly associated with medicolegal aspects of possible consequences resulted from inadequate surgical treatment of malignant diseases.

The trends of laparoscopy use in gynecologic surgery

There has been an increasing trend in the use of minimal invasive techniques for resection and/or staging of malignancies in gynecology during the last ten years. Many studies report the advantages of these procedures, their efficacy, safety and adequacy in surgical treatment of gynecologic malignancies³⁻⁶. A survey conducted in 2004 and 2007 among the members of the Society of Gynecologic Oncologist (SGO) in the USA showed a significant increase in the

use of laparoscopy. Forty-six percent of 850 SGO members responded to the survey. In 2004 survey, laparoscopic surgery was indicated in 84% of cases while in 2007 survey it was increased to 91%. The following laparoscopic procedures were most often indicated⁷: laparoscopically assisted vaginal hysterectomy (LAVH) or total laparoscopic hysterectomy (TLH) and staging of endometrial carcinoma (43%); diagnostics of adnexal masses (39%); prophylactic salpingo-oophorectomy in case of women at high risk for ovarian cancer (11%).

These procedures are accepted as the most convenient for use in endoscopic surgery. The question regarding the conversion from laparoscopy to laparotomy was answered by 90% of the survey participants. In 2004, 25% of them did the conversion, while in 2007 only 3% of conversions were reported by 94% of surveyed SGO members⁷. The mentioned data and numerous papers published in Europe and Asia point to the increasing trend of using laparoscopy in gynecologic oncology (Table 1).

The launch of minimally invasive surgery reduces the operation-induced trauma, provides a faster recovery, shortens the hospitalization and lowers the total costs of treatment. The purpose of using laparoscopy in gynecologic surgery is to confirm therapeutic efficacy compared with standard surgical procedures and to reduce the appearance of side effects. Still open are dilemmas regarding the results of treatment after laparoscopic surgery in oncology and intraoperative complications such as injuries of intestines, larger blood vessels and tumor cells dissemination.

Small incisions suitable for ports and laparoscopic instruments do not make possible the removal of large solid tumors. Tearing the tumor into pieces and its rough excision from pelvis and abdomen may cause spreading and expansion of tumor cells in the abdomen and development of metastases in the area of port incisions. The basic aim of treat-

Table 1

Laparoscopic procedures that are frequently applied in gynecological oncology	
Localization of a malignant tumor	Type of laparoscopic surgery
Cervix uteri carcinoma	Laparoscopically assisted radical vaginal hysterectomy (<i>Schauta-Amreich</i> and <i>Schauta-Stoeckel</i>)
	Laparoscopically assisted radical vaginal trachelectomy
	Laparoscopic radical abdominal hysterectomy
	Laparoscopic lymphadenectomy (pelvic and para-aortic)
	Laparoscopic evaluation of the stage of the disease
Endometrial carcinoma	Laparoscopic evaluation of the stage of the disease
	Laparoscopically assisted vaginal hysterectomy with bilateral adnexectomy
	Laparoscopic hysterectomy with bilateral adnexectomy
	Laparoscopic lymphadenectomy (pelvic and para-aortic)
Ovarian carcinoma	Diagnostic laparoscopy
	Second look surgeries

ment in oncology is the complete removal of malignant tumor and interruption of its spreading, and control and alleviation of disease symptoms. If the aim can be achieved by minimally invasive laparoscopic procedures than their use is justified but not at any price and if they are harmful to patients' health⁸. Nevertheless, laparoscopic surgery in gynecologic oncology has become a standard procedure in the majority of medical institutions in developed countries. Modern medical technology, acquired experience, and better surgical training with modern endoscopy equipment have been the main reasons for that.

The surgeons have agreed that laparoscopic techniques are associated with extremely gradual process of learning, which starts with small and simple procedures and goes up to more complex and comprehensive laparoscopic operations. It should be mentioned that laparoscopic operations in gynecologic oncology could be performed only by surgeons who have already mastered the techniques of classic surgery and are skilled to manage the complications. The learning curve starts with classic surgery procedures in gynecologic oncology and continues with learning the basics of laparoscopic operations and skills under supervision. The next step is to have sufficiently enough training after which come the actual performance of laparoscopic procedures and operations in the treatment of gynecologic oncology patients⁸.

The use of robotics in laparoscopy

Robotic assisted surgery is a new aspect in gynecologic oncology which eliminates the basic ergonomic problem for a surgeon and the most important long learning curve. In addition, it gives a 3-D vision and magnification: the surgeon controls the camera, the image is directly projected, the movements are intuitive, the instruments are articulated and ergonomic, the tremor is eliminated. The first surgical robots were presented during the 1980s. The development of robotic surgery made possible broader applications for surgical indications. ROBODOC was the first surgical robot approved by the United States Food and Drug Administration FDA. The next were Automatic Endoscopic System for Optimal Positioning (AESOP) in 1994 and ZEUS, a second-generation robotic system in 1998⁹. The da Vinci surgical

system is the most sophisticated of the surgical robotic systems. Based upon the first reports made by Advincula and Reynolds on the use of robot for myomectomies, FDA approved the use of the da Vinci in gynecologic procedures in April 2005¹⁰⁻¹³. At the annual SGO meeting in February 2006, Boggess¹⁴ did a live demonstration of radical hysterectomy and reported on 13 previously performed operations. Since then, the use of robotic surgery in gynecologic oncology has constantly been improved in world centers.

Laparoscopy in endometrial carcinoma

Laparoscopic approach in treatment of endometrial carcinoma implies laparoscopic determination of the stage of the disease combined with laparoscopically assisted vaginal (LAVH) or laparoscopic hysterectomy and bilateral adnexectomy. In the initial FIGO stage I of endometrial carcinoma, which is limited only to the uterus, laparoscopically assisted vaginal hysterectomy with bilateral adnexectomy should be applied whenever it is technically possible^{15, 16}. Zullo et al.¹⁷ conducted a randomized study to compare laparoscopy vs laparotomy in patients with early stages of endometrial carcinoma. The authors showed that the safety and efficiency of laparoscopy was the same as in the open approach, pointing out the benefit of laparoscopy in relation to the quality of life during the first 6 months after the surgery. Tozzi et al.¹⁸ reported the first results of the survival of patients with endometrial carcinoma who were operated laparoscopically in comparison to those patients who underwent open surgery. Based on the average follow-up of 44 months of patients with endometrial carcinoma FIGO stage I, they found that a disease-free interval among laparoscopically operated patients was 91% compared to 94% among patients treated with classic surgery. Overall survival was 86% compared to 90% in patients with laparotomy. Malur et al.¹⁹ presented 70 patients with stage I-III of endometrial carcinoma: 37 patients had laparoscopically assisted vaginal hysterectomy and 33 underwent open surgery. Comparative analysis of the removed lymphatic nodes and duration of surgery did not show a statistically significant difference. The recurrence-free interval did not show statistically significant difference between the laparoscopy group (97%) and

the laparotomy group (93%). Similar results were presented in relation to overall survival, 84% in the laparoscopic group, and 91% in the laparotomy group.

Ju et al.²⁰ included 5 prospective and 8 retrospective studies in a meta-analysis. The comparison of the laparoscopic approach to open surgery in endometrial carcinoma did not confirm a statistically significant difference for the overall survival and the recurrence of the disease, while the number of complications was lower in the group with the laparoscopic approach. Furthermore, the analysis of 5 studies dealing with the number of lymphatic nodes in tested groups did not confirm any statistically significant difference. In the study of Janda et al.²¹, the quality of life after total laparoscopic hysterectomy (TLH), $n = 190$, and total abdominal hysterectomy (TAH), $n = 142$, was examined. In the early phase of the recovery period, the improvement of the quality of life was more pronounced in patients with TLH. Better quality of life continued its trend in the TLH group even 6 months after the surgery. Longer duration of the surgery was statistically significant in the TLH group (138 ± 43 min), when compared with the TAH group (109 ± 34 min; $p = 0.001$). Intraoperative complications were similarly present in both of the groups (TAH 8/142, 5.6%, and TLH 14/190, 7.4%; $p = 0.55$). During the postoperative period, two times more adverse events occurred in the TAH group than in the TLH patients (33/142, 23.2%, and 22/190, 11.6%, respectively; $p = 0.004$). Serious postoperative complications were more frequent in the TAH patients (27/142, 19.0%) than in the TLH group (15/190, 7.9%; $p = 0.002$). The advantages of the laparoscopic approach, together with the vaginal hysterectomy imply less percentage of postoperative complications, shorter recovery period at the hospital, even in the group of obese patients²².

Laparoscopy in cervix uteri carcinoma

Vaginal radical hysterectomy as a method of choice in the treatment of cervix uteri carcinoma was the initial idea for performance of the first laparoscopic lymphadenectomy in the treatment of early invasive cervix uteri carcinoma. The greatest advantage of the vaginal operative procedure is the possibility of closure of the cervix at the very beginning of the surgery and the reduction of chances for tumor dissemination. Dargent performed the laparoscopic lymphadenectomy after the Schauta's vaginal radical hysterectomy in 1986 in Lyon, and that was the first step of implementation of laparoscopy in combination with already familiar radical vaginal surgery. Dargent published the first results after the surgeries of 51 patients, where a three-year long survival was registered in 95%. At the beginning, laparoscopy had extraperitoneal approach, but since 1992, Querleu has been promoting a transumbilical transperitoneal laparoscopic dissection of lymphatic nodes²³. After more than 10 years of implementation in surgical practice, the analysis showed that the laparoscopic lymphadenectomy is an equally safe and reliable method as laparotomy, with the great advantage of the minimally invasive approach. Laparoscopic lymphadenectomy can also be performed as a diagnostic procedure in pa-

tients with the early stage of the cervix uteri carcinoma before making the decision on the selection of the therapeutic procedure^{24, 25}. More frequent implementation of laparoscopy created conditions for performance of laparoscopic radical abdominal hysterectomy and laparoscopically assisted radical vaginal trachelectomy (LVRT)²⁶⁻²⁹. In 1994, Daniel Dargent presented the concept of radical vaginal trachelectomy, where the body of uterus, ovaries, and the fallopian tubes were preserved and the vaginal approach radically removed the cervix uteri, the upper third of the vagina and a part of parametrium. This procedure is combined with the laparoscopically assisted lymphadenectomy in an identical way as in the case of laparoscopically assisted radical vaginal hysterectomy²³. These surgeries are reserved only for the early stages of the cervix uteri carcinoma with the aim of preservation of the patient's fertility³⁰. Implementation of laparoscopy in the advanced disease is limited to lymphadenectomy, which is performed in some centers, because it was proved that the patients who had their bulky lymph nodes removed before the therapy had better survival⁸. Introduction of robotic surgery has also widened the indication of laparoscopic robotic surgery implementation in the treatment of cervical carcinoma³¹. Magrina et al.³² presented the comparison of robotic laparoscopic radical hysterectomy with classical laparoscopic approach and laparotomy. The average durations of robotic procedure, laparoscopy and laparotomy were 189.6 min, 220.4 min and 166.8 min, respectively, with loss of blood of 133 mL, 208 mL, and 443.6 mL, respectively. The average number of removed lymphatic nodes was 25.9 in robotic laparoscopy, 25.9 in laparoscopy and 27.7 in laparotomy with hospital stay of 1.7, 2.4 and 3.6 days, respectively. There were no differences in intra- and postoperative complications among the tested groups. During the follow-up of all the three groups in duration of 31.1 months, no disease recurrence was registered³².

Laparoscopy in ovarian carcinoma

There is a general consensus that implementation of laparoscopy as a surgical approach in treatment of benign adnexal masses is entirely justified due to reduced loss of blood, shorter hospital stay, less complications and pain and reduced treatment expenses in comparison to the open approach³³.

The role of laparoscopy in the treatment of ovarian carcinoma remains in the domain of discussion and insufficiently clear directives. In the majority of cases, laparoscopy imposed itself as a method of surgical staging of the disease and deciding on further treatment of ovarian carcinoma.

When compared, the results of laparoscopic surgical staging, in relation to laparotomy, showed reduced loss of blood, shorter hospital stay and less complications with longer operative time. The numbers of lymphatic glands and survival were not significantly statistically different^{34, 35}.

However, there are pending questions related to implementation of laparoscopy, and now even robotic laparoscopy, in cytoreductive surgery of the advanced ovarian carcinoma, which is still diagnosed in about 75% of cases.

Conclusion

Implementation of laparoscopy, *ie* minimally invasive surgery (MIS) in gynecological oncology represents today a significant therapeutic modality of treatment without com-

promising basic oncological principles. Using such a medical technology in oncology patients in Serbia imposes discussion on a new approach in education and organization of centers with adequate equipment where this type of surgery could be implemented with a sufficient number of cases.

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Received on December 23, 2011.

Revised on March 8, 2012.

Accepted on March 9, 2012.