Ectopic pregnancy and laparoscopy

M. Saranovic[1], M. Vasiljevic[2], M. Prorocic[2], N. Djukic Macut[1], T. Filipovic[1]

[1]University of Pristina, Department of Anatomy, Kosovska Mitrovica
[2]University of Belgrade, Clinic of Gynecology and Obstetrics "Narodni Front", Belgrade (Serbia)

Summary

Purpose: The aim of this study was to compare the success of surgical procedures performed by laparoscopy and laparotomy in the treatment of tubal ectopic pregnancy. *Materials and Methods:* In this prospective study, there were 57 women who were operated due to tubal ectopic pregnancy. Laparoscopic surgery was performed in 36 women (study group). Conventional abdominal surgical treatment was performed in 21 women (control group). *Results*: Among 36 women from study group, a laparoscopic linear salpingotomy was performed in 69.44% cases, salpingectomy in 13.88% cases, and milking of tube in 16.66% cases. In the control group, linear salpingotomy was performed in 57.14% cases, salpingectomy in 28.57% cases, and milking of tube in 14.28% cases. Patent ipsilateral fallopian tube at three months after surgery was 66.66% in the study group and 52.38% in the control group. The intrauterine pregnancy rate was 19.44% in the study group and 19.05% in the control group. *Conclusion:* The percentage of tubal patency and intrauterine pregnancies after laparoscopical surgical treatment was not higher than after conventional surgical treatment by laparotomy.

Key words: Ectopic pregnancy; Laparoscopy; Laparotomy; Surgery.

Introduction

The frequency of ectopic pregnancy has increased to a large extent over the past 20 years, both in developing as well as in developed countries. The incidence of ectopic pregnancy in the United States is 0.64%, and in the United Kingdom it is 1.11% [1, 2]. In order to preserve the fertile capability of women, the prime importance is to diagnose ectopic pregnancy as soon as possible. Ectopic pregnancy can be treated either medically or surgically. Surgical treatments may be radical or conservative and they may be performed by laparoscopy or laparotomy [3]. The possibilities of the conservative laparoscopic surgical treatment are great, if the ectopic pregnancy is discovered in intact stage. Laparoscopy is cost-effective and is the preferred surgical approach [4]. The reproductive potential of women after ectopic pregnancy is significantly decreased. One previous ectopic pregnancy increases the possibility of its recurrence by 10% [5]. The use of transvaginal ultrasound, the determination of serum beta-human chorionic gonadotropin (β-hCG), and progesterone concentrations raises the suspicion of an ectopic pregnancy at the early stage, while laparoscopy enables the precise onset of the final diagnosis, as well as estimation of the severity and operability of the pathological changes in the pelvis. The application of the operative laparoscopic techniques in haemodynamically stable women with ectopic pregnancy, enables the preservation of the fertile capability of any woman. Women with a first-recorded ectopic pregnancy have a significantly lower long-term delivery rate and a manifold increased risk of further ectopic pregnancies [6]. The risk of recurrence of ectopic pregnancy is approximately ten percent among women with one previous ectopic pregnancy and at least 25% among those with two or more previous ectopic pregnancies [5]. The aim of this study was to compare the success of surgical procedures performed by laparoscopy and laparotomy in the treatment of tubal ectopic pregnancy.

Materials and Methods

In this prospective study, the authors analyzed the success rate of the application of few operative laparoscopy techniques in 36 women (study group) treated for tubal ectopic pregnancy compared to the success rate of the conventional abdominal surgical treatment in 21 women (control group) in the Department for Laparoscopic Surgery, Gynecology-Obstetrician Clinic "Narodni Front" in Belgrade. The diagnosis of ectopic pregnancy was based on the anamnesis information, transvaginal color Doppler ultrasound examination, values of serum β-hCG, while the laparoscopy enabled the final diagnosis.

The patients were treated by laparoscopy or laparotomy, based on their haemodynamic status, experience of the surgeon, and the availability of endoscopic equipment. To remove an ectopic pregnancy, the following surgeries were performed on the fallopian tubes: salpingotomy, salpingectomy, and extirpation of tubal pregnancy through the fimbrial end. Laparoscopy operations were performed using a Harmonic scalpel. It works on the basis of breaking hydrogen bonds on the molecular level in human cells using high frequency vibrations (up to 50,000/min). It performs cutting and coagulation on its tip with only a local effect and temperatures not higher then 90°C. Laparoscopic salpingotomy was performed in women who had the desire for future pregnancies, in haemodynamically stable women, no severe adhesions in the tubal wall, in the case of absence of pathology of the contralateral tube, or in cases with size of ectopic pregnancy less than five cm, and where the gestational sac was located in the ampulla, infundibulum or isthmic portion.

During laparoscopic salpingotomy, linear incision on the antimesenteric tubal wall was made at the site of maximum distension, extending from one to two cm. Product of conception was removed from the tube using laparoscopic atraumatic forceps or

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hydrodissection. Laparoscopic salpingectomy was performed in women who had the desire for future pregnancies or in the case of tubal rupture, in a previously reconstructed tube, in the case of recurrent tubal pregnancy in the same fallopian tube, and in the case of tubal pregnancy greater than five cm. It was executed by progressively coagulating and cutting the mesosalpinx, beginning with the fimbrial end to proximal portion. Excised tube was removed intact or in sectioned part or placed in an endobag and removed. Extirpation of tubal pregnancy through the fimbrial end, ie. milking of ipsilateral tube was performed in the case where the product of conception was located on fimbrial end or distal tubal segment. This was accomplished by aspiration or use of gently grasping forceps which removed product of conception. In some cases, tubal abortion had already occurred. Laparotomy was performed through a Pfannenstiel incision and standard surgical techniques. Laparotomy was performed in women with extensive intraperitoneal bleeding with tubal rupture or poor visualization of the pelvis at the time of laparoscopy. Salpinogotomy was performed using monopolar needle. With salpingotomy, the mucosal margins were then closed with interrupted sutures. The seromuscular sutures were placed using delayed absorbable material. Salpingectomy included ligature of the blood vessels in mesosalpinx of affected tube, to secure hemostasis followed by excision of the mesosalpinges, and proximal end of tuba in cornual part by scissors. The success of applied operative technique was assessed by hysterosalpingography performed three months postoperatively and number of pregnancy occurred in the first 12 months postoperatively. In all patients, the authors analyzed age, ultrasound findings, tubal status, type of surgery, operative and postoperative complications, hysterosalpingographic findings performed three months after surgery, and number pregnancy occurring in the first 12 months postoperatively. Statistical analysis were performed using chi-square test and Student's t test.

Results

Out of 57 women with tubal ectopic pregnancy, 36 were treated with laparoscopy and 21 women by laparotomy. There was no conversion to laparotomy in the women treated by laparoscopy in this study. Out of 36 women with tubal ectopic pregnancy from the study group, two (5.55%) women were previously operated due to tubal gravidity. Three (8.33%) women were operated earlier due to a tubal infertility factor. Salpingitis in the anamnesis history was reported in four (11.11%) women. Five (13.88%) women gave birth previously and three (8.33%) women had abortions earlier. There were 21 women in control group. Among them, two (9.52%) women were operated earlier due to tubal gravidity and one (4.76%) due to tubal infertility factor earlier. Salpingitis in the anamnesis was reported in three (14.28%) women. Two (9.52%) women gave birth previously and three (14.28%) women had abortions earlier. The average age of the study group was 32.5 ± 3.9 years and 33.7 ± 2.6 years in the control group. These differences were not statistically significant ($p > 0.05$). The diagnosis of the ectopic pregnancy in study and control group was set from 35 to 56 days after the last menstruation.

The most frequent location of the tubal ectopic pregnancy in both groups was in the distal half of the fallopian tube. The most frequent types of the surgical procedures ectopic pregnancy in both group was linear salpingotomy. Salpingectomy was performed frequently in the control group ($p < 0.05$). Size of tubal pregnancy and surgical time did not differ between the study and control groups ($p > 0.05$). Hospital stay was significantly shorter in the study group ($p < 0.05$). Estimated blood loss was significantly lower in the study group than in the control group ($p < 0.05$). One (2.77%) woman of study group and three (14.28%) women of control group required blood transfusion. There were no serious complications during the laparoscopic operative

Table 1. — *Surgical outcome in the study and control groups.*

Tubal ectopic pregnancy	Study group N	%	Control group N	%
Location of ectopic pregnancy				
Isthmic	3	8.33	2	9.52
Ampullary	28	77.77	16	76.19
Infundibullar	3	8.33	2	9.52
Fimbrial	2	5.55	1	4.76
Type of ectopic pregnancy				
Ruptured tubal pregnancy	3	8.33	5	23.81
Unruptured tubal pregnancy	30	83.33	14	66.66
Abortion	3	8.33	2	9.52
Type of surgery				
Linear salpingotomy	25	69.64	12	57.14
Salpingectomy	5	13.88	6	28.57
Milking of tube	6	16.66	3	14.28
Size of tubal pregnancy (cm)	3.5 ± 1.6		3.7 ± 1.9	
Hemoperitoneum	6	16.66	7	33.33
Blood loss (ml)	55.5 ± 72.5		145.5 ± 125.5	
Patient required blood transfusion	1	2.77	3	14.28
Surgical time (min)	35.20 ± 18.50		43.10 ± 15.30	
Wound infection	0	0	1	4.76
Hospital stay (days)	1.93 ± 0.6		4.18 ± 1.21	
Total	36	100.00	21	100.00

Table 2. — *Hysterosalpingographic findings three months after surgery.*

Findings	Study group N	%	Control group N	%
Unilateral salpingotomy				
Bilateral tubal patency	20	40.00	6	50.00
Patency of ipsilateral tube with contralateral tubal occlusion	9	36.00	3	25.00
Occlusion of ipsilateral tube with contralateral tubal patency	6	24.00	3	25.00
Total	25	100.00	12	100.00
Unilateral salpingectomy				
Patency of contralateral tube	4	80.00	4	66.66
Occlusion of contralateral tube	1	20,00	2	33.33
Total	5	100.00	6	100.00
Milking of ipsilateral tube				
Bilateral tubal patency	4	66.66	2	66.66
Patency of ipsilateral tube with contralateral tubal occlusion	1	16.66	0	0
Occlusion of ipsilateral tube with contralateral tubal patency	1	16.66	1	33.33
Total	6	100.00	3	100.00
Patency of ipsilateral tube	24/36 (66.66%)		11/21 (52.38%)	
Occlusion of ipsilateral tube	8/36 (22.22%)		4/21 (19.05%)	

Table 3. — *Pregnancy rate in the study* unconjugated estriol (uE3) *and control groups.*

Pregnancy	Study group N	Study group %	Control group N	Control group %
IUP	7	19.44	4	19.05
EP	2	5.55	1	4.76
Total	9/36	25.00	5/21	23.81
IUP in women with patent ipsilateral tube	5	20.83	2	18.18
EP in women with patent ipsilateral tube	1	4.16	1	9.09
Total	6/24	25.00	3/11	27.27

IUP: intrauterine pregnancy; EP: ectopic pregnancy.

procedures, or in the postoperative period due to the residual trophoblast. All patients from study group were discharged between the first and third postoperative day. One (4.76%) woman from control group had a wound infection in the postoperative period, after the third postoperative day. On analysis of the pathological changes of ectopic trophoblastic tissue, it was found that 37 (64.91%) out of 57 specimens were degenerated products of conception and 20 (35.08%) specimens of trophoblastic tissue included hemorrhage. These results are shown in Table 1.

Hysterosalpingography was performed at three months after surgery. In the study group, 24 (66.66%) out of 36 women had a patent ipsilateral fallopian tube. In the control group, 11 (52.38%) out of 21 women had a patent ipsilateral fallopian tube. The difference was not statistically significant ($p > 0.05$). These results are shown in Table 2.

All operated women were scheduled for medical control in the period from 12 months after surgery. Nine (25.0%) out of 36 women from study group became pregnant. In seven (19.44%) women, the pregnancy was intrauterine and in two (5.55%) women it was ectopic. Five (23.81%) out of 21 women from control group became pregnant. In four (19.05%) women the pregnancy was intrauterine and in one (4.76%) woman it was ectopic.The difference was not statistically significant ($p < 0.05$). Six (25.00%) out of 24 women from study group with patent ipsilateral tube became pregnant. In five (20.83%) women, the pregnancy was intrauterine and in one (4.16%) woman it was ectopic. Three (27.27%) out of 11 women from control group with patent ipsilateral tube became pregnant. In two (18.18%) woman the pregnancy was intrauterine and in one (9.09%) woman it was ectopic. The difference was not statistically significant ($p > 0.05$). These results are shown in Table 3.

Discussion

In the last period, the frequency of ectopic pregnancy shows a permanent increase. Ampulla is the most frequent implantation site in the fallopian tube, with approximately 73.3%, then isthmus 12.5%, fimbrial 11.6%, and interstitial 26.1% [7]. In the present study group, the ampullar location of ectopic pregnancy was represented in 28 (77.77%) cases and in 16 (76.19%) cases from the control group. The early onset of the diagnosis enables the application of the conservative laparoscopic or conventional surgical treatment. The conservative surgical treatment often includes linear salpingotomy with the removal of the gestational products. In the present study, salpingotomy was performed in 25 (69.44%) patients from the study group and in 12 (57.14%) patients from the control group. Other authors have performed laparoscopic salpingostomy in 66.5% and in 84.9% patients with ectopic pregnancy [8, 9]. Radical surgical treatment or salpinegectomy was performed in five (13.88%) patients with tubal ectopic pregnancy from the present study group and six (28.57%) patients from the control group. Other authors have performed laparoscopic salpingectomy in 80% of patients with ectopic pregnancy [10]. All patients were offered hysterosalpingography at three months postoperatively. The tubal patency rate of the treated side, ie. ipsilateral tube in the present patients from the study group was 66.66% and 52.38% patients from the control group. Other authors suggest that the tubal patency rate of the treated side was 90% in patients with linear salpingotomy with suturing and 94% without suturing [11]. Tubal patency of the treated tube was demonstrated at hysterosalpingography in 55% that underwent laparoscopic surgery [12]. Tubal patency after laparoscopic salpingotomy and salpingotomy by laparotomy in patients with a small unruptured tubal patency was 73% and 83%, respectively [13]. Nine (25%) women from the study group and five (23.81%) women from the control group became pregnant during 12 months after surgery. The percentage of intrauterine pregnancies in patients with patent ipsilateral tube after laparoscopic surgery was 20.83% in the present study group and 18.18% in the control group. The rate of recurrent ectopic pregnancies in women in the present study group was 5.55%, while in women of the control group it was 4.76%. Other authors suggest that the subsequent spontaneous intrauterine pregnancy rate was 62% after laparoscopic salpingotomy in patients with non-ruptured tubal pregnancy and the ectopic pregnancy rate was 17.3% [14]. Intrauterine pregnancy rates up to 24 months were established as 65.2% in salpingectomy and 60.1% in the salpingostomy groups [15]. The 24-month cumulative rate of intrauterine pregnancy was 67% after laparoscopic salpingectomy and 76% after laparoscopic salpingostomy in the treatment of tubal ectopic pregnancy [16]. The rate subsequent ectopic pregnancy was 15% after laparoscopic salpingostomy and ten percent after laparoscopic salpingectomy [5]. The rates of subsequent intrauterine pregnancy were 74% in the laparoscopy group and 61% in the laparotomy group and the rates subsequent to ectopic pregnancy were four percent in the laparoscopy group and ten percent in the laparotomy group [3]. Subsequent intrauterine pregnancy rates in patients with a small unruptured tubal pregnancy after salpingotomy by laparoscopy and salpingotomy by laparotomy was 57% and 53%, respectively, while the recur-

rent ectopic pregnancy rate was seven and 14 percent, respectively [4]. No serious complications occurred during the surgical procedures or during the postoperative period. One (4.76%) woman from the present control group had a wound infection in the postoperative period.

One of the most common complications of laparoscopic tubal salpingotomy in the treatment of tubal ectopic pregnancy is incomplete removal of products of conception as an persistent ectopic pregnancy requiring additional therapy. In the present study, there were no cases of persistent ectopic pregnancy. One population-based study found that the failure rate of laparoscopic salpingotomy was 6.6% [9]. The literature data state that the percentage of intraoperative laparoscopic complications ranges from zero to eight percent, with the average being two percent and the percentage of postoperative complications ranged from zero to 15%, with the average being nine percent [17]. In the present study, the authors conclude that laparoscopic treatment of tubal ectopic pregnancy is not more successful than conventional surgical treatment by laparotomy. The percentage of tubal patency and intrauterine pregnancies after laparoscopic surgical treatment was not higher than after conventional surgical treatment by laparotomy. Laparoscopy has a shorter duration of surgical time and hospital stay, compared with laparotomy.

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Address reprint requests to:
M. SARANOVIC, M.D.
Balkanska Street, No. 14a / 49
11000 Belgrade (Serbia)
e-mail: milena.saranovic@gmail.com