A review of laparoscopy and laparotomy in the management of tubal pregnancy

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A retrospective review was performed of all women who had undergone operation for a tubal pregnancy at the Prince of Wales Hospital, Hong Kong, from November 1992 to March 1994. One hundred and five patients were included—61 were managed by laparoscopy and 44 by laparotomy. There were no differences in age, parity, gestational age, frequency of previous ectopic pregnancy, or laparotomy between the two groups. Sixty per cent of patients in the laparotomy group had a diagnostic laparoscopy prior to the laparotomy. The laparoscopy group had a lower incidence of haemoperitoneum (45.9% vs 75.0%, P<0.05). There was no difference in the mean operating time. The laparoscopic approach was associated with a significant reduction in: intra-operative blood loss (46.7±76.8 mL vs 213.4±149.3 mL, P<0.001), post-operative analgesia requirement (odds ratio 0.08, 95% CI, 0.02-0.32), post-operative morbidity (odds ratio 0.27, 95% CI, 0.12-0.58), length of hospital stay (2.9±2.2 days vs 5.1±1.2 days, P<0.001) and recuperation period (11.0±9.3 days vs 21.7±8.5 days, P<0.001). Operative laparoscopy has the advantage of combining diagnostic and therapeutic procedures in a single operation, and is a better approach than laparotomy in the management of tubal pregnancy.

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Introduction

Laparoscopy is a widely accepted tool for the definitive diagnosis of tubal pregnancy. The first laparoscopic excision of a tubal pregnancy was reported in 1973,[1] but it was not until 1980 that a paper on the laparoscopic treatment of tubal pregnancy was published.[2] A Medline literature search revealed only a few studies comparing laparoscopy with conventional laparotomy in the management of ectopic pregnancy.[3-7] Although evidence supporting the use of laparoscopy in the management of ectopic pregnancy is only fair,[8] the laparoscopic treatment of tubal pregnancy has been increasingly accepted as an appropriate alternative to laparotomy.

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The purpose of this study is to review and compare the operative morbidity, post-operative course, post-operative hospital stay, and recuperation period in patients with tubal pregnancy managed by operative laparoscopy or by conventional laparotomy.

Subjects and methods

A retrospective review was performed of all women who had undergone operation for a tubal pregnancy at the Prince of Wales Hospital, Hong Kong, from November 1992 to March 1994. The diagnosis of ectopic pregnancy was based on clinical symptoms, physical examination, a positive urine pregnancy test using monoclonal antibody-based immunoassay for human chorionic gonadotrophin (Testpack, Abbott Laboratories Ltd, Hong Kong), and transvaginal ultrasonography. Diagnostic laparoscopy was performed when ectopic pregnancy was suggested by clinical symptoms, but the transvaginal ultrasonogram did not reveal any adnexal mass in the absence of an intrauterine sac. The selection of operative approach was not based on any defined

criteria, but depended on the availability of laparoscopic facilities and the surgical team. Operations were performed by doctors learning each of the respective procedures under supervision.

All operations were conducted under general anaesthesia with endotracheal intubation. Laparotomy was performed using either a Pfannenstiel or a subumbilical midline incision and standard surgical techniques. Laparoscopic surgery was performed using three ports. Following the establishment of pneumoperitoneum, a 10 mm 0° laparoscope was introduced through an 11 mm cannula in a vertical infra-umbilical incision. The procedure was visualized on a videomonitor using a camera (784 3-chip Medical Video Camera, Stryker, USA) attached to the eyepiece of the laparoscope. Two trocars were inserted in the lower abdomen lateral to the inferior epigastric vessels, a 10/11 mm trocar on the left and a 5 mm trocar on the right. The pneumoperitoneum was maintained with a continuous high flow carbon dioxide insufflator (System 3000 Electronic Insufflator, Cabot Medical, USA).

Salpingostomy was performed by making a linear incision on the anti-mesenteric site over the tubal swelling with point needle monopolar diathermy. Salpingectomy was performed by sequential electrodessication and division of the mesosalpinx close to the fallopian tube, starting from the fimbrial end. The products of gestation or affected tube were removed from the peritoneal cavity through the 10/11 mm trocar on the left lower abdomen. Any tubal pregnancies that were too large to go through the trocar were removed using a bag retrieval technique.[9,10] The pelvis was irrigated with copious amounts of normal saline until all blood clots were evacuated. Adhesions in the contralateral fallopian tube were freed, if present. One litre of lactated Ringer's solution was left in the pelvis at the conclusion of the operation to help prevent adhesion formation.[11] In the presence of haemoperitoneum, the amount of blood present was assessed by the difference between the amounts of fluid irrigated and evacuated.

Post-operative management followed the normal practice in the department. Standard analgesia was prescribed to all patients on demand, namely pethidine, 1.5 mg/kg intramuscularly every four hours or Dologesic-32 (proproxyphene napsylate 50 mg and paracetamol 325 mg), one tablet every six hours, given orally. An outpatient follow up appointment was arranged for six to eight weeks after discharge from hospital. The time taken for a patient to recuperate after the operation was obtained prospectively at the time of follow up for the laparoscopy group and retrospectively (by a telephone survey), for the laparotomy group.

Statistical analysis was performed by the χ^2 test, Fisher's exact test, and the Student's t test using the Statistical Package for Social Sciences for Windows, Version 6.1. Data were presented as the mean ± standard deviation or percentage as appropriate. A P value of less than 0.05 was considered significant. Where appropriate, the odds ratio (OR) and the 95% confidence interval (CI) were calculated.

Results

One hundred and five patients' files were reviewed; 61 underwent operative laparoscopy and 44 conventional laparotomy. There were no differences in the mean age, parity, gestational age, frequency of previous ectopic pregnancy, and prior laparotomy (Table 1).

The operative outcome is summarised in Table 2. Twenty-six patients (60%) in the laparotomy group required a diagnostic laparoscopy prior to the laparotomy. Salpingectomy was the main operation performed in both groups. There was no difference in the mean diameter of the intact tubal pregnancy. The incidence of haemoperitoneum (defined as >100 mL of blood in the pelvis) and severe haemoperitoneum (≥1000 mL) were both significantly lower in the

Table 1. Demographic characteristics of the study population

	Laparoscopy	Laparotomy
No.	61	44
Age (y)	29.5 (SD 5.7)	30.4 (SD 5.8)
Nulliparity	27 (44.3%)	12 (27.3%)
Gestational age (wk)	8 (SD 1.8)	8.5 (SD 1.7)
Previous ectopic pregnancy	8 (13.1%)	2 (4.5%)
Previous laparotomy	15 (24.6%)	5 (11.4%)

Table 2. Overall operative outcome

	Laparoscopy (n = 61)	Laparotomy (n = 44)	P value
Prior laparoscopy	na	26 (59.1%)	
Haemoperitoneum	28 (45.9%)	33 (75.0%)	P=0.003
Severe haemoperitoneum	7 (11.5%)	17 (38.7%)	P=0.001
Size of tubal pregnancy (cm)	3.6 (SD 1.2)	3.5 (SD 1.5)	ns
Operation:			ns
Salpingectomy	58 (95.1%)	43 (97.7%)	
Salpingostomy	3 (4.9%)	1 (2.3%)	
Operating time (min)	57.3 (SD 22.7)	54.4 (SD 16.8)	ns
Anaesthetic time (min)	75.8 (SD 20.6)	64.9 (SD 17.9)	P=0.001
Blood loss (mL)	46.7 (SD 76.8)	213.4 (SD 149.3)	P< 0.001
No need for analgesia	35 (57.4%)	4 (9.1%)	P< 0.001
Hospital stay (d)	2.9 (SD 2.2)	5.1 (SD1.2)	P< 0.001
Recuperation period (d)	11.0 (SD 9.3)	21.7 (SD 8.5)	P< 0.001

na not applicable
ns not significant

laparoscopy group (28/61, 45.9% vs 33/44, 75.0%, P=0.003 and 7/61, 11.5% vs 17/44, 38.7%, P=0.001). Two patients (3.3%) in the laparoscopy group were in shock before the operation compared with four (9.1%) in the laparotomy group. The presence of haemoperitoneum did not affect the operative outcome of the groups (Table 3).

Operating time did not differ much between the two groups. Estimated blood loss was significantly lower in the laparoscopy group (46.7±76.8 mL) than in the laparotomy group (213.4±149.3 mL) [P<0.001]; there were no intra-operative complications in either group. There were no conversions from planned laparoscopic surgeries to laparotomies. Post-operative morbidity is summarised in Table 4. The incidence of post-operative febrile morbidity (defined as oral temperature greater than 38°C on two occasions, 24 hours apart) and post-operative urinary tract infection were significantly higher in the laparotomy group (OR 0.24, 95% CI, 0.09-0.61 and OR 0.12, 95% CI, 0.02-0.96, respectively). Three patients in the laparoscopy group developed bruising over the left lower abdominal wound, which resolved spontaneously without treatment, while one patient in the laparotomy group had a wound infection. Only five patients (8.2%) in the laparoscopy group required blood transfusion, whereas 19 (43.2%) in the laparotomy group needed transfusion (P<0.001).

Fifty-seven per cent of patients in the laparoscopy group did not need analgesia compared with only 9% in the laparotomy group (OR 0.08, 95% CI, 0.02-0.32). For those who required analgesia, the need for narcotic injection was also significantly reduced in the laparoscopy group (53.8% vs 90.0%, P<0.001) with an odds ratio of 0.60 (95% CI, 0.41-0.87).

Hospital stay was significantly shorter in the laparoscopy group (2.9±2.2 days vs 5.1±1.2 days, P<0.001). The mean recuperation period was 11.0±9.3 days in the laparoscopy group and 21.7±8.5 days in the laparotomy group (P<0.001). Nearly 53% of patients in the laparoscopy group had returned to normal activity within one week of surgery, whereas none of the laparotomy group had done so.

Discussion

Laparoscopy is commonly employed to confirm the diagnosis of ectopic pregnancy. With advances in video-camera systems and the development of laparoscopic instruments, it is also being used as a therapeutic tool.

In this review, anaesthetic time was significantly longer in the laparoscopy group. This was because of the extra time required to set up the video-camera system and to position the patient properly. There was no significant difference, however, in the operating time. Although laparoscopic surgery is generally considered to take longer than conventional laparotomy, comparative studies of ectopic pregnancy do not support this,[3-7] thus confirming our observation. Operating time is expected to be longer initially when one is learning a

Table 3. Operative outcome with respect to haemoperitoneum

	Laparoscopy (n = 61)	Laparotomy (n = 44)	
Without haemoperitoneum			
No. of patients	33	11	
Operating time (min)	56.2 (SD 23.5)	61.4 (SD 19.0)	ns
Blood loss (mL)	44.6 (SD 56.7)	188.0 (SD 159.8)	P=0.02
Hospital stay (d)	2.7 (SD 1.6)	4.9 (SD 0.9)	P< 0.001
Recuperation time (d)	10.6 (SD 10.1)	19.5 (SD 9.2)	P=0.01
With haemoperitoneum			
No. of patients	28	33	
Operating time (min)	58.6 (SD 22.0)	52.1 (SD 15.7)	ns
Blood loss (mL)	60.6 (SD 101.7)	223.1 (SD 147.1)	P< 0.001
Hospital stay (d)	3.1 (SD 0.8)	5.1 (SD 1.4)	P=0.001
Recuperation time (d)	11.5 (SD 10.3)	22.4 (SD 12.6)	P< 0.001

ns not significant

new procedure, especially when the surgeon, assistants, and nurses are all learning. However, laparoscopic salpingectomy is a simple operation and the learning curve is short. Once the hand-to-eye co-ordination is developed, operating time decreases progressively with experience.

The most time-consuming step in the laparoscopic management of ectopic pregnancy is the evacuation of blood clots from patients with significant haemoperitoneum. The use of a wide bore cannula (10 mm) makes this much easier and faster, as the cannula is less likely to be blocked by the clots. The main problem associated with using a wide bore cannula is that carbon dioxide is also evacuated quickly, therefore deflating the abdomen and impairing the view. Occasionally, the other fallopian tube, omentum, and even bowel may be sucked into the cannula and damage can occur if the operator is not careful. The use of a high flow carbon dioxide insufflator (at least 10 L/min) can compensate and maintain the pneumoperitoneum and an adequate visual field. Once most of the blood clots have been evacuated, a smaller 5 mm suction/irrigation cannula should be used instead.

Significant haemoperitoneum and haemodynamic instability are frequently cited as contraindications for the laparoscopic management of ectopic pregnancy. In a series of 109 patients, Reich et al successfully performed laparoscopic treatment in 16 patients with ruptured tubal pregnancy, which included three patients in shock, with no intra-operative complications.[12] In our series, about 50% of patients in the laparoscopy group had haemoperitoneum; seven had more than one litre of blood in the abdomen and two were in shock. Despite the presence of haemoperitoneum, the rate of bleeding from a tubal pregnancy is usually slow and this may be further reduced by the raised intra-abdominal pressure created by the pneumoperitoneum. In this situation, a good suction/irrigation system, especially with a wide bore cannula, can quickly evacuate the blood in the pelvis, allowing identification of the tubal pregnancy. Once the fallopian tube is picked up with a pair of forceps, the bleeding will virtually stop and the operation can be performed using electrodiathermy

Performing a laparotomy on a patient with significant haemoperitoneum is very messy, as spillage of blood is unavoidable. Operative laparoscopy is devoid of such a problem, as the procedure is performed without opening up the abdomen. Blood is evacuated by the suction cannula in a closed system, minimising contact with the patient's blood and reducing the risk of contamination and cross-infection. On the other hand, needle-prick injury is not an uncommon occurrence during conventional laparotomy,[13] although this is seldom reported. During most laparoscopic procedures, suturing is not required and the operating field is remote from the operator and assistants. The risk of inadvertent needle-prick injury is therefore avoided, further reducing the risk of cross-infection.

Laparoscopy is the main diagnostic tool for ectopic pregnancy. Despite the development of transvaginal ultrasonography, laparoscopy is still frequently

Table 4. Post-operative morbidity in the two groups

	Laparoscopy (n=61)	Laparotomy (n=44)	Odds ratio (95% CI)
Febrile morbidity	5	15	0.24 (0.09-0.61)
Urinary tract infection	1	6	0.12 (0.02-0.96)
Wound complication	3	1	ns
Total	**7**	**19**	0.27 (0.12-0.58)

ns not significant

performed prior to the definitive procedure as 20% of patients with ectopic pregnancy have no detectable abnormalities on ultrasonography.[14,15] On the other hand, the positive predictive value of the presence of a pelvic mass and free fluid in the pouch of Douglas visualised by transvaginal ultrasonography is only 77%.[15] In the present review, diagnostic laparoscopy was performed in 60% of patients prior to the laparotomy. This may be higher than expected as we usually performed diagnostic laparoscopy to avoid unnecessary laparotomy when there was no adnexal mass detected on ultrasonography. Operative laparoscopy therefore has the advantage of combining diagnostic and therapeutic procedures in the one operation.

As this is a retrospective review, there was no random assignment to the surgical approach and selection bias could not be eliminated. This is reflected by the higher rate of haemoperitoneum in the laparotomy group. However, when analysed according to the presence or absence of haemoperitoneum, the outcome variables measured suggest that laparoscopy is still the preferred approach over laparotomy. The experience and skill of the surgeons are confounding factors in any surgical study. As most of the operations in our series were performed by surgeons learning both procedures, this confounding effect should have been reduced. Obviously, a prospective randomised study would be required to minimise the effects of biases in case selection and surgeon experience.

Our observations suggest that the laparoscopic approach to ectopic pregnancy is associated with lower operative morbidity, less post-operative pain, a shorter hospital stay, and earlier recovery. It has the additional benefit of offering a diagnostic evaluation, allowing both diagnostic evaluation and therapeutic treatment to be carried out in one operative procedure. Reproductive outcome following laparoscopic treatment is reported to be similar to that following laparotomy.[16] Operative laparoscopy should therefore replace laparotomy in the management of tubal pregnancy.

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