A COMPARISON OF LAPAROSCOPY AND LAPAROTOMY FOR THE TREATMENT OF ECTOPIC PREGNANCY

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ABSTRACT

A review of studies comparing laparoscopy versus laparotomy for the treatment of ectopic pregnancy. This review compared 8 studies in multiple countries. The consensus favored laparoscopic surgery for hemodynamically stable patients.

INTRODUCTION

Laparoscopy compared to laparotomy for the treatment of ectopic pregnancy. Ectopic pregnancy was first discovered in the 11th century, and until the middle of the 18th century, it was usually fatal. John Bard a surgeon in New York reported the first successful surgical intervention to treat an ectopic pregnancy in 1759[1].

According to Sepilian, the survival rate in the 19th century was dismal, however, in the beginning of the 20th century, improvement in blood transfusion, anesthesia, and antibiotics contributed to the decrease in the maternal mortality. Ectopic pregnancy currently is the leading cause of pregnancy-related deaths in the first trimester. Sepilian stated that ectopic pregnancy is derived from the Greek word "ektopos" meaning out of place, and it refers to the implantation of the fertilized ovum in a location outside of the uterine cavity including the fallopian tubes, cornual or interstitial region of the uterus and fallopian tubes, cervix, ovary, and the abdominal cavity. This abnormally implanted pregnancy grows and draws its blood supply from the site of abnormal implantation, as the gestation enlarges it creates the potential for organ rupture because only the uterine cavity is designed to expand and accommodate fetal development. [1] The arterial blood supply to the mesosalpinx provided by branches of the ovarian artery that derive directly from the aorta as well as the branches from the uterine artery that derive from the internal iliac artery, provides the fallopian tubes with a rich arterial supply that can bleed in the event of a perforated tube, to massive catastrophic hemorrhage and maternal death.

Seeber et al reported in 2006 from a study at the University of Pennsylvania in Obstetrics and Gynecology that the incidence of ectopic pregnancy has increased 6-fold since 1970, and is responsible for approximately 9 percent of all pregnancy related deaths in the United States. The author further reported that a rise in the quantitative Beta sub unit of human chorionic gonadotropin of a maximum of 53% over two days would be required for a viable pregnancy, and a decline of 21 to 35 % in 48 hours would be mandatory for a diagnosis of spontaneous abortion [2].

Seeber stated that the absence of an intrauterine pregnancy above an established cut point of hCG is consistent with an abnormal pregnancy, but does not distinguish a miscarriage from an ectopic pregnancy.

Seeber stated that the symptoms of abdominal pain or pelvic pain and vaginal bleeding are the most common complaints suggestive of ectopic pregnancy, The multiple potential sites of ectopic pregnancies add to the complexity of the diagnosis. Seeber also stated that these symptoms may be erratic and variable , and in some cases, absent. Likewise, such symptoms are non specific, and also have been associated with spontaneous abortion, cervical irritation, or trauma, and infection [2].

Sepelian wrote that the classic triad of amenorrhea, pain, and vaginal bleeding has been strongly associated with the clinical presentation of ectopic pregnancy, however, 50% of patients with ectopic pregnancy present without this triad. They may have symptoms associated with early pregnancy, including nausea, fatigue, lower abdominal pain, painful uterine cramping, recent dyspareunia, and shoulder pain [1].

Due to increased technology, most ectopics are diagnosed prior to rupture. Sepilian reported that approximately 20% of ectopic patients are hemodynamically unstable at initial presentation suggesting a ruptured ectopic gestation. There is a 10-25% chance of a recurrent ectopic pregnancy [1].

Risk factor included progesterone intrauterine device. Increasing maternal age plays important roles in ectopic pregnancy and women age 35-44 have a 3 to 4-fold. Increase of ectopic pregnancy compared to women aged 15-24 [1].

Smoking may alter tubal and uterine motility, and is associated with a risk of 1.6-3.5 times more than non smokers. Other factors associated with an increased risk of ectopic pregnancies include prior abdominal surgery, a ruptured appendix, exposure to diethylstilbesterol and uterine developmental abnormalities. [1]

Most authors list prior tubal infection. Chlamydia may be asymptomatic and untreated as well as other infectious agents associated with an increased risk of salpingitis and potential tubal damage. Sepilian stated that within the last 2 decades, there has been a more conservative surgical approach to unruptured ectopic gestation.Utilizing minimally invasive surgery, Laparoscopy has become the recommended approach in most cases. Laparotomy has been usually reserved for cases where the patients have been hemodynamically unstable, or when the surgeon is inexperienced in laparoscopy [1].

Seeber stated that laparoscopic minimally invasive approach has become the preferred surgical approach, and laparotomy is reserved for hemondynamically unstable patients. Other situations in which the open surgical approach may be preferable include extensive pelvic adhesions where adequate visualization of the ectopic is impossible or extra-tubal, intraabdominal ectopic gestation, where risk of injury to other pelvic structures is high [2]. Bruhart et al reported the first laparoscopic surgery for ectopic pregnancy in 1980 [3].

LAPAROSCOPY VS LAPAROTOMY IN TREATMENT OF ECTOPIC PREGNANCIES

El-Tabbakh reported the results of a trial in Kuwait from March 1999, to October 2001, involving 207 patients to compare laparoscopy vs laparotomy for surgical treatment of ectopic pregnancy [4]. One hundred eighty-four were treated by laparoscopy and 23 by laparotomy of the 207 patients with a diagnosis of ectopic pregnancy based on clinical symptoms, history, physical examination, positive serum Beta hCG, transvaginal ultrasanonoography and ectopic pregnancy conformed at laparoscopy. Following surgery, patients were fallowed with serial quantitative BhCG on days 4 and 7,then weekly until labels less than 20iu/l obtained these treated with laparoscopy had an overall success rate of 98.9% moreover, the patients treated by laparoscopy had significantly lower blood loss. Blood transfusion was required by 13% in the laparoscopically treated group compared to 23% in the laparotomy group [4]. All patients had the ectopic pregnancy confirmed by laparoscopy and the decision to proceed with operative laparoscopy or laparotomy depended on the minimal invasive surgery experience of the surgeon on call. There were no intraoperative complications and the duration of surgery ranged from 66 minutes to 72 minutes for both groups. The Kuwait study led the author to conclude that laparoscopy treatment offered benefits superior to laparotomy with less blood loss, therefore, a reduced need for transfusion. The patients experienced less need for analgesia, and a shortened postoperative hospitalization [4].

In another study of 142 patients in China, Xiang reported the results of a comparison of laparoscopy surgery and laparotomy in the treatment of ectopic pregnancy. Seventy-two patients were treated laparoscopically. In the laparoscopically treated treated group the operative time and postoperative recovery were significantly shortened compared to the laparotomy group. The laparoscopic treatment was well- accepted by the surgeons and the patients [5].

In a study of 105 patients in Prince of Wales Hospital in Hong Kong, Yuen reported in 1997 the results of a review of laparoscopy and laparotomy in the treatment of ectopic pregnancy. Sixty-one were treated by laparoscopy and 44 by laparotomy. Age, parity, gestational age, frequency of prior ectopic pregnancy, and previous laparotomy were similar for the two groups. The laparoscopy group had lower incidence of hemoperitoneum 45.9% vs 75% in the laparotomy group. The duration of hospitalization postoperatively ranged 2-9 days for the laparoscopy group vs 5.1 days for the laparotomy group. They concluded that the advantage of laparoscopy is in combining diagnostic and therapeutic procedures in a single operation, and is a better approach than laparotomy in the surgical treatment of ectopic pregnancy.

Brumsted el al reported on a comparison of laparoscopy and laparotomy for the treatment of ectopic pregnancy at the University of Vermont between 1982 and 1987 involving 101cases. According to the author, a retrospective case-control study was done to compare the difference in outcome in patients with ectopic pregnancy who were managed by laparoscopy or laparotomy. Seventy-six were surgically treated by laparotomy and 25 by laparoscopy [8].

Selection of surgical approach was not based on predetermined guidelines, however, over the find 18 months of the study, all patients were treated by laparoscopy surgery,after the surgeon felt comfortable with the laparoscopic therapy for ectopic pregnancy. The only patients treated by laparotomy were hemodynamically unstable on presentation [8].

The results reported by Brumsted et al at the conclusion of the study demonstrated less operating time for the laparoscopy-treated group. The laparoscopy group also had reduced post operating analgesia requests, shorter hospital stay, and reduced time for convalescence [8].

A study at the University of Istanbul was reported by Akhan to determine the surgeon's choice for laparoscopy versus laparotomy for the treatment of ectopic pregnancy. One hundred thirty-five patients were in the study, Seventy-three patients were treated by laparotomy and 64% of the laparotomy-

treated patients had tubal rupture. Forty-five patients were treated by laparoscopy, Hemodynamic stability and less abdominal free blood affected the surgeon's choice between laparotomy and laparoscopy. [9]

Vermesh et al designed a study to compare prospectively the parameters of morbidity, cost, length of hospital stay, and fertility outcome after linear salpingostomy by laparoscopy vs laparotomy. Entry criteria included stable vital signs, hematocrit greater than 30%, age over 18 years, and desire for future fertility. All patients underwent diagnostic laparoscopy. Sixty patients with unruptured ectopic pregnancies of 5cm or less were randomized equally to laparoscopy treatment or laparotomy. The two groups had similar Beta hCG levels. The estimated blood loss was significantly less in the laparoscopy group. Two patients in the laparoscopy group required laparotomy post operatively. Hystrosalpingogram demonstrated similar patency of the treated fallopian tubes. Eighty-four of the laparoscopy and 89% of the laparotomy patients had patent tubes, Moreover, the pregnancy rates in there groups were 56% and 58% respectively. All pregnancies conceived within 6 months after surgery. [10]

Tahseen stated that ectopic pregnancy is the most common cause of maternal death in early pregnancy. At Thaseen's hospital there was a higher frequency of ectopic pregnancy in the younger age group in East Birminglam Hospital West, U.K. Tahseen further stated in 2003 that there was no consensus in treatment of ectopic pregnancy by salpingostomy or salpingectomy [11].A cost effectiveness study for laparoscopy vs laparotomy for treatment was reported by the section of clinical epidemiology at the Mayo Clinic in 1995 in Lancet.

The Mayo Clinics evaluation was based on results of a clinical trial between 1987 and 1989 at Sahigrenska University Hospital in Goteborg, Sweden. The Mayo study found that laparoscopy produced final outcomes equivalent to those of laparotomy at lower costs [12].Clasen et al conducted a Belgian study with a strict laparoscopic approach. In the studies reviewed, the results favoured a laparoscopic approach Clasen et al presented 293 cases that were treated surgically. Eight laparotomies had to be performed due to uncontrollable hemorrhage and too large pregnancy size. Three laparotomy cases were primary and 5 were converted from laparoscopy [14]There were 14 cases with residual disease that were treated either by methotrexate or a second operative procedure. The overall conception rate was 77.3% and an ectopic recurrency rate of 10.6% [14].The author concluded that a surgical approach by means of operative laparoscopy should remain the gold standard in treating ectopic pregnancy [14].

Ectopic pregnancy is still a very common and possibly increasing problem among healthy young women [15].That 40,100 live births occurred in the same city during the same time that the incidence of ectopic pregnancy was 0.79%, the authors concluded that the country was under reported. There were 3 maternal deaths from ectopic pregnancy with a mortality rate of 0.94%.

The 0.79% ectopic pregnancy rate observed may be an underestimation; nevertheless, this rate is lower than that reported in industrial countries. Delayed diagnosis and subsequent deaths are important findings that should encourage African gynecologists to promote ectopic pregnancy. It is well documented that in developing countries, minimal research has been done in this gynecologic emergency as in the African region [14]. Liskin reviewed ectopic pregnancy incidence from the 1960's until the middle of the 1980's. He reported the incidence rates in African countries to be between 0.5% and 2.3% of live births. Low incidence rates ectopic pregnancies were reported in the middle east and Asia at the same time [15]. The incidence of ectopic pregnancy in Africa may have increased in recent times [15]. In Nigeria the hospital-based incidence of ectopic pregnancy quadrupled between 1977 and 1987[4]. The study demonstrated that in developing countries, there has been an increased incidence of ectopic pregnancy in recent decades [14]. Only 24% of patients received conservative surgical management. This finding was consistent with the results in Benin and in the Ivory Coast [18][19]. This study contrasts the studies comparing Laparoscopic surgery vs Laparotomy. In the African studies, there were three maternal deaths from ectopic pregnancy, but none from the surgical group. The developing countries have few resources readily available to diagnose and treat ectopic pregnancy.

LAPAROSCOPIC MANAGEMENT OF ECTOPIC PREGNANCY

Laparoscopy is one of the major advancement for tubal and uterine disease. Surgical procedures for managing benign adnexal masses include aspiration, fenestration, ovarian cystectomy, unilateral or bilateral salpingo-oophorectomy and laparoscopically-assisted vaginal hysterectomy (LAVH) with or without unilateral or bilateral salpingo-oophorectomy

ECTOPIC PREGNANCY

The risk of ectopic pregnancy is higher in white women. It increases three to four times in women between the age of 35 and 44 compared to those from15 to 24. About 64% of ectopic pregnancies occur in the ampulla where fertilization occurs. The recent increase in incidence of ectopic pregnancy has been attributed to a greater incidence of sexually transmitted disease,

delayed childbearing, previous sexual organ surgical interference and successful clinical detection. Any condition that prevents or retard migration of fertilized ovum to the uterine cavity could predispose a woman to an ectopic gestation.

Ectopic pregnancy usually occurs 99% of cases in the uterine tube. It can be found in

1. The ampulla (64%)
2. The Isthmus (25%)
3. The infundibulum (9%)
4. The intramural junction (2%)
5. Ovarian (0.5%)
6. Cervical (0.4%)
7. Abdominal (0.1%)
8. Intraligamental (0.05%)

Major contributing factors and associated relative risks for ectopic pregnancy are:

1. Current use of intrauterine device 11.5%
2. Use of Clomiphene citrate 10%
3. Prior tubal surgery 5.6%
4. Pelvic inflammatory disease 4.0%
5. Infertility 2.9%
6. Induced abortion 2.5%
7. Adhesions 2.4%
8. Abdominal surgery 2.3%
9. T shaped uterus 2%
10. Myomata 1.7%
11. Progestin only contraceptives 1.6%

If laparoscopy is planned, the location, the size, and the nature of the tubal pregnancy are ascertained. If the bleeding has ceased or can be arrested adequately, rupture tubal pregnancies can be treated successfully endoscopically. Once bleeding is controlled, the products of conception and blood clots are removed. If there is more than 1500 cc hemoperitoneum, laparoscopic approach is contraindicated. Heparinized saline should be used in cases of large haematoma. Large ruptured ectopic require extracorporeal knotting. A 10 mm suction instrument is used to clean the abdominal cavity. Forced irrigation with normal saline should dislodge the clot and trophoblastic tissue from the serosa of the peritoneal organs with minimal injury to these structures.

For unruptured tubal pregnancy the fallopian tubes is identified and mobilized to minimize bleeding, a 5 to 8 ml diluted solution containing 5 Unit vasopressin in 20 ml of saline is injected with a 20 gauge spinal or laparoscopic needle. It should be injected in the mesosalpinx just below the ectopic and over the antemesentric surface of the tubal segment containing gestational product. The needle must not inserted deep within a blood vessel because intravascular injection may precipitate acute arterial hypertension, bradycardia and sometime it may be fatal.

After stabilizing the tube by grasper in one hand and microelectrode in other, a linear incision is made on the antimesenteric surface extending one to two cm over the thinnest portion of tube. The fine needle tip should be used in the cutting mode, and should barely touch the tissue surface. With electrosurgery, thermal damage may spread if large tips are used on large surface areas in contact with tissue. It is important to remain aware of the location of underlying or adjacent structures. If the gynaecologists are not careful there may be a chance of adjacent visceral injury.

The pregnancy usually should protrude through the incision and slowly slips out of tube. It may be teased gently out using hydro dissection or laparoscopic atraumatic forceps. Sometimes forceful irrigation in the tubal opening can dislodge the gestation from implantation. As pregnancy is pulled out or extrudes from the tube, some of the product of conception can adhered to the implantation site by a ligamentous structure containing blood vessels. Using bipolar this structure should be coagulated before removing the tissue. Depending upon the size of the product of conception ectopic is removed usually though a 10 mm trocar sleeve.

Resection of the tubal segment containing the gestation is preferable to salpingostomy for an isthemic pregnancy or a ruptured tube or if haemostasis is difficult to obtain. Segmental tubal resection is performed by the help of bipolar forceps or harmonic scalpel. Automatic stapling or suturing devises can be used for bloodless tubal resection. The mesosalpinx if bleed should also be cauterized by using bipolar forceps, particular attention given to the arcuate anatomizing branches of the ovarian and uterine arteries. Total salpingectomy is performed by progressively coagulating and cutting the mesosalpinx, beginning with the proximal portion to fimbrial end. It is separated from the uterus using bipolar coagulation and scissors. The isolated segment containing the tubal pregnancy is removed intact or in sectioned part, through the 10 mm trocar sleeve. The product of conception can be placed in a plastic bag and removed. Multifire

stappeling devices for salpingectomy require a 10 mm trocar. If the tissue is bulky and can not be accommodated through cannula, endobag can be used for retrieval of tissue.

Adhesion or other pathologic processes such as endometriosis can be treated simultaneously during removal of ectopic pregnancy without significantly prolonging the operation. In one week the beta hcg should return to baseline i.e. undetectable or very low.

If the pregnancy is interstitial it may be associated with traumatic rupture, hemorrhagic shock and there is two fold increase in maternal mortality over other tubal pregnancies. Delayed diagnosis and increased vascularity of this are make laparoscopic procedure difficult. 2 to 4% of ectopic are interstitial. The anatomy of this ectopic accommodates the growing gestation accounting for its late recognition. The traditional management is better in these case i.e. Salpingectomy with or without corneal resection and in some difficult cases hysterectomy may be necessary. Interstitial pregnancy can be suspected at the time of laparoscopy when large and asymmetrical uterus is seen.

Most patients are discharged within 48 hours. There is a higher fertility rate/intra-uterine pregnancy rate in subsequent pregnancies with laparoscopic techniques.

Laparoscopic surgery is a good option for rupture ectopic and ruptured ectopic does not necessarily warrant a laparotomy. If the patient is hemodynamically stable and initial laparoscopic examination indicates a moderate blood loss, it may be possible to control bleeding laparoscopically and perform any indicated procedures. If the patient is in stage II or stage III shock who has a large hemoperitoneum, laparotomy is the better choice. Managing ruptured ectopic pregnancies involves examining the pelvis, localizing the ectopic, aspirating blood and clots, localizing and controlling the bleeding points, and performing either salpingectomy or in rare situations, an oophorectomy is performed concurrently.

Controlling bleeding is the most critical part of the procedure, and several methods can be attempted sequentially to achieve haemostasis:

1. Identification of the bleeding point followed by careful bipolar electro desiccation,
2. Injection of vasopressin over the mesosalpinx,
3. Electro desiccation of the mesosalpinx,

4. If bleeding does not stop by these means the partial or complete salpingectomy, depending on the portion of tube involved and the patient's desire for fertility.

After successfully managing the ectopic pregnancy laparoscopically, the patient can be discharged second day. The patient should come again for a serum ft-hCG one week postoperatively to ascertain resolution of the ectopic gestation. The ft-hCG level should be either undetectable or very low after one week of surgery. If it is above 20 mIU/mL, a repeat blood test is ordered one to 2 weeks later when the ft-hCG should be undetectable.

RESULTS

The results total 1,363 ectopic pregnancy. The only mortalities were 3 in the African study. These 3 patients were moribund or deceased on presentation. The overwhelming number in Africa favored laparotomy and this is likely influenced by medical resources available. Clasen's study in Belgium included 285 ectopic pregnancy patients treated by laparoscopy of the 1,363. Seven hundred and six

were treated by laparoscopy and 634 by laparotomy. Closen's study was one of the most recent indicating a physician preference for laparotomy due to lack of resources.

Table 1:

ECTOPIC PREGNANCY	PATIENTS	LAPAROSCOPY	LAPAROTOMY	FATALITIES
Leke	320	4	313	3
Clasen	293	285	8	
Brumsted	101	25	76	
El-Tabbakh	207	184	23	
Xiang	142	72	70	
Yuen	105	61	44	
Akhan	135	45	73	
Vermesh	60	30	30	
	1363	**706**	**634**	**3**

DISCUSSION

Yuen's study included 105 patients in Hong Kong, there were no differences in age, parity, gestational age, and pregnancy of previous laparotomy between the groups had a diagnostic laparoscopy prior to laparotomy. The laparoscopy group had a lower incidence of hemoperitoneum (45.9% vs75%), Yuen's study was performed in Hong Kong. Yuen stated that operative laparoscopy has the advantage of combining diagnostic and therapeutic procedures in a single operation in a better approach than laparotomy for the management of tuber pregnancy [7].

Xiang's study was conducted in Shanghai. Seventy two of ectopic pregnancy patients were treated laparoscopically. The author concluded that while it was more expensive than laparotomy. The operating time and post operative hospitalization were shortened.

In the laparoscopy studies, the authors stressed reduced blood loss, shortened hospital stay, and reduced need for postoperative analgesia as recurrent positive findings throughout the various studies.

Seeber commented on the laparoscopic treatment of slpingostomy versus salpingectomy.Seeber noted that if salpingostomy has not resulted in improvement of subsequent pregnancy rate over salpingectomy, that she would have recommended salpingostomy for all ectopic pregnancy patients. However, she states that the data to support this contention are not clear cut [2]. The approximate 50% subsequent pregnancy rate has been noted with either method [3]. The rate of recurrent ectopic pregnancy appeared higher in the salpingostomy(15% to 10%)[2]. The decision to perform salpingostomy is opposed to salpingectomy is often made intra operatively. In case of severe damage or tubal rapture, Seeber suggested that tubal conservation is not indicated [2]. Moreover, if tubal bleeding occurs that requires extensive coagulation, then salpingectomy may be indicated due to tubal damage. The success of in vitro fertilization has been beneficial for those patients who have salpingectomy [2]. The formation of shadisation postoperatively has been more extensive with laparotomy. Seeber noted that ectopic pregnancy occurs most frequently as a result of fallopian tube pathology; therefore, there is a risk of recurrence in both the affected and contralateral tube. Women who undergone salpingectomy will have a risk of subsequent ectopic pregnancy in the remaining tube [2].

As the surgeons gain more experience and training with laparoscopic surgery for ectopic pregnancy, it has become the preferred choice when equipment and resources were available.

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