

# To Evaluate the Efficacy of Laparoscopic versus Open Surgical Management of the Tubal Pregnancy and its Effects on Future Pregnancy

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## Abstract

Ectopic pregnancy is the most common cause of maternal death in early pregnancy and its incidence is rising. Most of the ectopic pregnancies occur in the young age group and subsequent fertility is an important issue. There is no consensus in the literature regarding conservative laparoscopic versus radical treatment of tubal pregnancy in terms of future reproductive performance. There are no randomized controlled trials of sufficient power, and meta-analysis of studies has shown different results with different investigators. But in certain studies laparoscopic surgery has advantages over open surgery and results in higher rates of subsequent intrauterine pregnancies and a lower rate of ectopic pregnancy.

**Background:** In the treatment of tubal ectopic pregnancy (EP), laparoscopic surgery remains the cornerstone of treatment (Cochrane Database 2007). In the absence of randomized data, the question as to whether surgical treatment should be performed either conservatively (salpingostomy) or radically (salpingectomy) in women with desire for future pregnancy is subject to ongoing debate (Mol et al 2008).

Since the first study demonstrated the potential effectiveness of salpingostomy, this treatment has been compared with salpingectomy in numerous nonrandomized studies (Stromme et al 1962, Mol et al 2008). Pooled data showed no beneficial effect of salpingostomy on intrauterine pregnancy (IUP) whereas there is an increased risk of repeat EP (Clausen 1996, Yao et al 1997, Mol et al 2008). Based on these findings, the Royal College of Obstetricians and Gynecologists guideline advises salpingectomy as the preferred standard surgical approach for tubal EP (RCOG 2004). However, there are good reasons to question this advice. Interpretation of the pooled data is troublesome, since many of the original studies failed to report essential details, e.g. time to pregnancy, presence of the desire for future pregnancy, and whether subsequent pregnancies occurred either spontaneously or after fertility treatment, such as *in vitro* fertilization (IVF). Only a few nonrandomized studies have taken these matters into account and came to different conclusions (Silva et al 1993, Job spira et al 1996, Mol et al 1998, Bouyer et al 2000, Bangsgaard et al 2003, Tahseen et al 2003, Mol et al 2008). The IUP rates were higher and the time to an IUP was shorter after salpingostomy compared to salpingectomy. Especially in women with history of bilateral tubal pathology, salpingostomy offered better IUP rates than salpingectomy, albeit at the cost of an increased risk for repeat EP (Silva et al 1993, Job spira et al 1996, Mol et al 1998, Bangsgaard et al 2003, Mol et al 2008). In women without history of tubal pathology, this benefit was less clear and also in these women there was an increased risk of repeat EP (Mol et al 1998, Mol et al 2008). In view of these data, it has been felt that the most effective type of surgery for women with a tubal EP in the presence of contralateral tubal pathology with desire for future pregnancy is salpingostomy. In women without contralateral tubal pathology, the most optimal surgical treatment is currently unknown.

**Keywords:** Ectopic pregnancy, Operative laparoscopy, Laparoscopic, Laparotomy salpingectomy, Surgical treatment, Minimal access surgery, Future pregnancy.

## INTRODUCTION

Lawson Tait, the father of gynecologic surgery reported the first successful operation for ectopic pregnancy in 1883. His main difficulty lay in establishing the diagnosis (Tait RL 1884).

Until little more than a decade ago, little change had occurred in the diagnosis and management of ectopic pregnancy. The clinical use of sensitive pregnancy testing, transvaginal ultrasonography, and diagnostic laparoscopy has had a major impact on the preoperative diagnosis of this condition. The rate of ectopic rupture has declined,

and the option of conservative surgical management of an unruptured fallopian tube is now a viable alternative.

## INCIDENCE AND RISK FACTORS

Ectopic pregnancy is the most common cause of maternal death in early pregnancy (RCOG 1997-1999) and its incidence is on rise. Most of the ectopic pregnancies occur in the young age group, and subsequent fertility is an important issue. Ectopic pregnancy is the one in which the fertilized ovum implants outside the uterine cavity. Its incidence has increased from 0.5 per 100 pregnancies

30 years ago, to the present day of 2 per 100 pregnancies (Hankins et al 1995, Lehner et al 2000). The Center for Disease Control (CDC) reports that the incidence of ectopic pregnancies is 1 in 70 pregnancies (Hill et al 1993).

Further, an increased incidence of sexually transmitted infections, early diagnosis of pelvic inflammatory disease resulting in tubal damage but not complete blockage, complications of infections, including therapeutic abortions, the wide clinical use of reconstructive tubal surgery, exposure to diethylstilbestrol and the conservative surgical treatment of ectopic pregnancy, and the rise in the number of ectopic pregnancies resulting from assisted reproductive technologies (ART) may account for the overall increase (Westrom et al 1991, Chung et al 1992, Majumdar et al 1983, Wolf et al 1980, DeCherney et al 2008). The incidence of tubal pregnancy after oocyte retrieval/embryo transfer may be as high as 4.5%, although this may be due to already existing tubal pathology in these patients and not solely due to ART intervention. The incidence of heterotopic pregnancy is now believed to be about 1:4,000 in the general population and 1 to 3% in *in vitro* fertilization (IVF) pregnancies, much higher than the originally described prevalence of 1:30,000 in the late 1940s (Symonds et al 1998, Seeber et al 2006).

Critical review of the relative contributions of these factors is pertinent. It is widely accepted that when pregnancy occurs in a woman using an IUD, there is an increased likelihood of ectopic pregnancy. Indeed, the ratio of ectopic pregnancy to intrauterine pregnancy has been reported to have increased sevenfold (Lehfold et al 1970, Vesset et al 1974, Mol et al 2008).

## MANAGEMENT

For most tubal ectopic pregnancies (EP), surgery is the treatment of choice. Whether surgical treatment should be performed conservatively (salpingostomy) or radically (salpingectomy), and also laparoscopically or by laparotomy in women wishing to preserve their reproductive capacity, it is subject to debate. Salpingostomy preserves the tube but bears the risks of both persistent trophoblast and repeat ipsilateral tubal EP. Salpingectomy avoids these risks, but leaves only one tube for reproductive capacity (Mol et al 2008).

In first trimester, ectopic pregnancy is the most important cause of maternal mortality and morbidity (Akbar et al 2002). Prior to 1883, no woman ever underwent a deliberate and successful operation for a ruptured ectopic pregnancy when Trait did it for the first time. Surgical treatment may either be an open laparotomy or laparoscopy

depending on the surgeon's skill, equipment availability, and condition of the patient (Braun et al 2005). Over the past few decades, the management of ectopic pregnancy has been revolutionized. This has resulted in the emergence of several nonsurgical options to what had once been thought to be a solely surgically treatable condition. An earlier diagnosis can be made with transvaginal (TVUS) ultrasound and quantitative  $\beta$ -hCG. This increases the chances of success of medical treatment and minimizes the morbidity, mortality, and financial burden created by this health problem (Sawter et al 2001, Braun et al 2005). Nonsurgical management, like treatment with methotrexate has an established role in the treatment of ectopic pregnancy (Grudzinskas et al 1999, RCOG 2004), but little data are available on international scale.

## AIMS AND OBJECTIVES

The aim of the review is to summarize the role of minimal access surgery in the management of tubal pregnancy and its management options, and further its effect on future pregnancy.

## MATERIAL AND METHODS

A literature search was performed using the search engines PubMed, Yahoo, Wikipedia, Google, HighWire press, and SpringerLink. Selected papers were taken for further references. All articles, RCT (randomized controlled trial) following predominantly laparoscopic and open surgical protocol were included for review. The articles, also reviewed on the elements like study of follow-up on subsequent fertility explored in terms of intrauterine pregnancy, recurrence of ectopic pregnancy and sterility or cumulative intrauterine pregnancy rates, were comparable or superior to that of principle series treated by laparotomy whether radical or conservative and using or not using microsurgical techniques. Also, comparison between the therapeutic techniques (laparotomy or laparoscopy) has been made in view of present and future pregnancy outcome.

The techniques evaluated during the review were:

1. Laparoscopic
  - Linear salpingotomy (tubal aspiration)
  - Salpingectomy
  - Fimbrial expression.
2. Laparotomy.

## LAPAROTOMY VERSUS LAPAROSCOPY

A number of early studies documented the appropriateness of laparoscopic treatment of ectopic pregnancies (Shapiro

et al 1973, Bruhat et al 1980, DeCherney et al 1981, 2008). Rates of conception of an intrauterine pregnancy after the procedure were as high as 70% in these cases. Pouly and associates (Pauly et al 1986) reported on 321 women with ectopic pregnancies who underwent conservative laparoscopic treatment. Of the women who did not have a history of infertility or previous ectopic pregnancy, 86% had a subsequent intrauterine pregnancy.

The advantages of laparoscopic removal of an ectopic pregnancy are a shortened operating time, convalescence, and hospital stay. It is imperative, however that proper case selection be exercised (Brumsted et al 1988, DeCherney et al 2008). If laparoscopic therapy is to be warranted, the first criterion is the expertise of the operator in performance of a laparoscopic surgical procedure. Patients must be stable without evidence of a significant hemoperitoneum.

One of the complications of conservative surgery via laparoscopy, persistent ectopic pregnancy, appears to be higher with laparoscopy (5-20% vs 2-11%). This is thought to be associated with the learning curve seen with laparoscopy. Optimally, the ectopic pregnancy should be confined to the ampullary portion of the tube and should be at least 2 cm in size (Lipscomb et al 2005, DeCherney et al 2008).

## DISCUSSION

The incidence of ectopic pregnancy has remained static in recent years, i.e. 11.1/1000 pregnancies (RCOG 2004, Bangesh et al 2004, Wasim et al 2004, Lozean et al 2005). In this study, the rate was found to be 10/1000 deliveries, which is comparable. Ectopic pregnancy affects young women. The mean age was found to be 28 years and majority of them were multigravida. The commonest presenting symptom was abdominal pain (100%). These results are comparable with other studies (Bangesh et al 2004, Wasim et al 2004, Ben et al 2006).

Historically, the treatment of ectopic pregnancy was emergency laparotomy and salpingectomy. Nowadays, laparoscopic treatment is being considered the gold standard in hemodynamically stable patients, particularly where expertise is available. To minimize the morbidity, mortality and financial burden created by this rapidly growing health problem, nonsurgical alternatives are increasingly being investigated (Korhoren et al 1996, Lozean et al 2005).

Minimal access surgery, as an operative choice for management of life-threatening condition like ectopic pregnancy, leads to increased quality of life in terms of shorter hospital stay, speedy postoperative recovery,

reduced need of postoperative analgesia, cosmetically good scar and less psychological trauma to the patients.

Karsten et al (1990) also favored the laparoscopy over the laparotomy. He concluded that endoscopic management of ectopic pregnancy is recommended due to low postoperative morbidity rates and short time of hospitalization, and also positive effect on future pregnancy.

Pauli et al (1991) in their study also commented that in the absence of few rare contraindications, the most satisfactory surgical treatment of extrauterine pregnancy at present was laparoscopy. The authors found in their series of 223 patients desiring subsequent pregnancy that factors significantly affecting the fertility prognosis included the presence of adhesions on the tube, the condition of contralateral tube, and a history of salpingitis. Neither age, parity nor the characteristics of extrauterine pregnancy significantly affected the possibility of pregnancy in future.

In the era of laparoscopic carbon dioxide laser surgery, Langebrekke et al (1993) suggested in his study of 150 women with tubal pregnancy consecutively treated over a two years period by laparoscopic techniques. Sixty-six percent (38/58) of those women who desired pregnancy after conservative laparoscopic treatment achieved an intrauterine pregnancy. The corresponding rate for women who desired pregnancy after salpingectomy was 45% (18/40). The recurrent ectopic pregnancy rates in two groups were 7% (4/58) and 10% (4/40) respectively. This study confirms that tubal pregnancy can be appropriately managed by laparoscopic laser surgery with the advantages of minimal invasive techniques and also the laparoscopic management helps for better fertility outcome in future.

Oelsner et al (1994) studied that the reproductive performance following salpingectomy did not differ significantly whether by laparotomy or laparoscopy. The intrauterine pregnancy rate was 78 and 64% respectively and the repeat ectopic pregnancy rate was 12 and 6% respectively. Salpingectomy via laparoscopy can be performed safely with a low incidence of complications with subsequent reproductive performance comparable to laparotomy.

Akrong et al (1996) in his two years retrospective study reviewed the outcome of laparoscopic management versus laparotomy for the management of ectopic pregnancy. He found that there was no significant difference between the operating times and complications but the laparoscopy group had significantly fewer doses of opiate analgesia ( $P < 0.05$ ), shorter length of stay ( $P < 0.05$ ), and signifi-

cantly higher postectopic intrauterine pregnancy rates ( $P < 0.05$ ) compared with the laparotomy group. Laparoscopic management of ectopic pregnancy is a viable alternative to conventional laparotomy in district general hospitals also.

Lundoff (1997) conducted a randomized, prospective clinical trial to compare the efficacy of laparoscopic treatment versus conventional conservative abdominal surgery for tubal pregnancy, and concluded that patients treated by laparoscopy had a shorter hospital stay and a shorter convalescence than patients from the laparotomy group.

Lo et al (1999) performed a prospective nonrandomized multicenter study to compare laparoscopic surgery and laparotomy in the immediate surgical outcome of tubal ectopic pregnancy (TEP), at nine teaching hospitals in Hong Kong. After exclusion of patients with shock, laparoscopic surgery offered a significantly shorter postoperative hospital stay (mean 2.7 days vs 5.3 days), a slightly lower perioperative complication rate (8.1% vs 13.9%), and more conservative surgery (90.1% of all salpingotomies) than laparotomy. A longer operating time was needed for laparoscopic surgery (1.2 hours vs 1.01 hours), which was not statistically significant.

Saleh et al (2003) in his study suggested that there were significant reductions of total blood loss, number of blood transfusion units, and duration of hospital stay in the laparoscopic group compared to the laparotomy group. The rates of subsequent intrauterine pregnancies were 74% (17/23) in the laparoscopy group and 61%, (19/31) in the laparotomy group, and the rates of subsequent ectopic pregnancies were 4% (1/23) in the laparoscopy group and 10% (3/31) in the laparotomy group concluding that laparoscopic treatment of ectopic pregnancy in hemodynamically stable patients offers major economic benefits superior to laparotomy in terms of less need for blood transfusion, shorter duration of hospital stay and convalescence, and future pregnancy outcome.

Tahseen et al (2003) concluded that laparoscopic surgery has advantages over open surgery and results in higher rates of subsequent intrauterine pregnancies and a lower rate of ectopic pregnancy. Authors also concluded the higher intrauterine pregnancy (IUP) rates after salpingotomy (2-23% higher IUP rates) than after salpingectomy.

Becker et al (2009) raised a concern as the most ectopic pregnancy cases now diagnosed and treated, early future reproductive outcome needs to be evaluated critically. Authors evaluated long-term reproductive outcome after

salpingotomy vs salpingectomy in patients with and without additional fertility reducing factors, and found that the laparoscopic salpingotomy is of particular benefit for patients with additional fertility reducing factors desirous of future pregnancy. Reproductive outcome is excellent in patients without such risk factors irrespective of the surgical approach.

Zhang et al (2010) favored the treatment of ectopic pregnancy with laparoscopic approach. In their study of 226 cases from January 2003 to December 2008, authors concluded that in order to preserve fertility, laparoscopic conservative surgery was a safe and feasible approach in treatment of tubal pregnancy. A word of caution added is that the preoperative serum hCG levels, size of tube gestational sac were significant factors influencing successful laparoscopic surgery.

Cochrane database review suggests different conclusions over different issues like intraoperative bleeding, need for intraoperative blood transfusion, hospital stay, cost, recurrence of the ectopic pregnancy and future pregnancy. Cochrane database (2007) reviewed the various treatment options and commented that the laparoscopic conservative surgery is significantly less successful than the open surgical approach in the elimination of tubal pregnancy due to higher persistent trophoblast rate of laparoscopic surgery. Long term follow-up shows similar tubal patency rates whereas the number of subsequent intrauterine pregnancies is comparable, and the number of repeat ectopic pregnancies lowers, although these differences are not statistically significant. The laparoscopic approach is less costly as a result of significantly less blood loss and analgesic requirement, and a shorter duration of operation time, hospital stay, and convalescence time.

Supporting the Cochrane database (2007), Desroque et al (2010) reviewed 24 papers of randomized control trial (RCT) or observational studies and concluded that there is no difference between laparotomy and laparoscopy as fertility was found.

## CONCLUSION

Critical overview of literature of all possible approach demonstrates that the minimally access surgery is not only safe and effective but also economical than open laparotomy in the treatment of ectopic pregnancy and should consider as the gold standard in treating ectopic pregnancy. Not only in terms of short-term advantages of surgery, but it also had positive effects on the future pregnancy. Though certain studies and Cochrane database, and other recent studies

show no significant difference between the surgical and future pregnancy outcome, but it mentions the need for further properly organized, randomized controlled clinical trials. But from the past literature and ongoing research, a hopeful picture can be drawn about the laparoscopic management of ectopic pregnancy.

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