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Original Research Article

A Comparative Evaluation of Outcomes of Medical and Surgical Management of Ectopic Pregnancy

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Abstract:

Background: Ectopic pregnancy is a serious obstetric condition in which implantation occurs outside the uterine cavity and is a major cause of maternal morbidity and mortality during early pregnancy. Early diagnosis and appropriate treatment are essential to prevent life-threatening complications.

Aim: To compare the outcomes of medical and surgical management in patients diagnosed with ectopic pregnancy.

Methodology: A retrospective comparative observational study was conducted in the Department of Obstetrics and Gynecology at Nalanda Medical College and Hospital, Patna, Bihar, India for a period of 6 months. A total of 80 hemodynamically stable women with confirmed ectopic pregnancy were included and divided into two groups: medical management with methotrexate (n=40) and surgical management (n=40). Data regarding clinical presentation, treatment success rate, duration of hospital stay, and complications were analyzed using SPSS version 27.0.

Results: The majority of patients were aged 26–30 years (37.5%). Abdominal pain (87.5%) was the most common presenting symptom. Surgical management showed a higher success rate (95%) compared with medical management (80%) (p=0.04). However, the mean hospital stay was shorter in the medical group (2.8±1.2 days) than in the surgical group (5.4±1.8 days). Most patients (76.3%) experienced no complications.

Conclusion: Surgical management demonstrated a higher treatment success rate, while medical management offered shorter hospitalization and fewer procedure-related complications. Appropriate patient selection remains crucial for optimal outcomes.

Keywords: Ectopic pregnancy, Medical management, Surgical management, Methotrexate, Treatment outcome.

Introduction

Ectopic pregnancy is a major obstetric complication where the fertilized ovum implants in the extra uterine cavity [1]. It is also still a significant cause of prenatal morbidity and maternal mortality in the first trimester of pregnancy. Out of the types of ectopic pregnancy, an implantation can take place in the fallopian tubes, cervix, ovary, abdominal cavity or in the scar of a past cesarean section. This is necessary since early diagnosis and proper management will be done as delay in diagnosis can result in life-threatening complications like extensive hemorrhage, rupture of peripheral tissue, and maternal mortality. The development of methods of diagnosis, especially transvaginal ultrasonography, and serum β-human chorionic gonadotropin (β-hCG) have greatly contributed to the early detection of during pregnancies and therefore effective treatment of ectopic pregnancies and thus better results [2].

Cesarean Scar Pregnancy (CSP) is a very uncommon but potentially fatal type of ectopic pregnancy, whereby the implantation of a gestational sac in the myometrial scar of a former cesarean section occurs [3]. This kind of implantation is done when the blastocyst infiltrates through the microscopic tract or defect left behind by a prior cesarean incision and results in abnormal trophoblastic invasion of the scar tissue. Cases of CSP are on the rise over the past few years and this is due to the fact that there have been a high number of cesarean deliveries being made

around the world as well as the advancement in diagnosing this disease through the help of transvaginal ultrasonography [4]. As the number of cesarean sections conducted in various parts of the world, women exposed to CSP are on the rise, and this has put this condition as a new challenge in the practice of obstetrics.

Clinical manifestation of cesarean scar pregnancy may be very diverse. In some patients, the early pregnancy stages can be asymptomatic and in others, the symptoms can be vaginal bleeding, lower abdominal pain, or hemodynamic instability in case of complications. CSP is in most instances accidentally discovered during regular ultrasonographic tests in early pregnancy. Transvaginal ultrasound is essential in the diagnosis of CSP since it is used to detect the presence of the gestational sac in the areas of cesarean scar but with an empty uterine cavity and cervical canal [5]. Improper diagnosis and treatment of CSP at an early stage may lead to severe complications including uterine rupture, excessive bleeding, and even death of the mother. Such complications do not only pose a risk to the survival of the mothers but also the future fertility of the mother since the complications may also result in hysterectomy in extreme cases.

The treatment of ectopic pregnancy especially cesarean scar pregnancy has undergone significant changes in the past decades [6]. Surgical intervention was traditionally the modality of treatment of the problem, particularly in the situation of rupture or excessive bleeding. Nevertheless, as early diagnosis has enhanced and a better grasp of the pathophysiology of implantation into an ectopic location, conservative treatment is more of a possibility. Treatment is determined by several factors such as the hemodynamic stability of the patient, gestational age, gestational sac size, serum β-hCG levels, future fertility intentions, and the presence of medical and surgical skills.

The use of different treatment modalities has been outlined in the management of CSP, such as medical, surgical and a combination of both [7]. The main role of medical management is administration of systemic or topical methotrexate (MTX) to trigger trophoblastic cell apoptosis and cure the pregnancy. Methotrexate is a folic acid antagonist which prevents the growth of the ectopic pregnancy by inhibiting the multiplication process of rapidly dividing trophoblastic cells. The method is especially applicable in the case of early and unruptured cases and in patients who want to conceive a child. Medical management is said to be non-invasive and does not involve the dangers of surgical operations. Despite its non-invasive nature and preservation of fertility, methotrexate therapy can be linked to increased time of β-hCG normalization and more risk of failure in treatment. In others, a dose of methotrexate might need to be repeated and close attention should be paid to get the levels of β-hCG on track so as to know that the treatment is being successful.

Contrarily, surgical management is also a viable alternative especially when medical treatment fails, when the patient has contraindications to methotrexate or when the patient comes with complications like excessive bleeding or suspected uterine rupture. Some of the surgical procedures available in CSP are dilation and curettage, laparoscopic, open surgery, and hysteroscopic resection [8]. Hysteroscopic resection is one of these methods and has become popular because it is minimally invasive and directly visualizes the gestation tissue. Surgical treatment especially hysteroscopic resection or dilation and curettage is desirable in situations where medical treatment fails or is contraindicated. Hysteroscopic resection can be performed to clear the gestational sac accurately with minimum destruction on the uterine tissue surrounding it.

Hysteroscopic resection has the benefit of being accurate in removal of the gestational tissue and preservation of the uterine anatomy which becomes particularly important in women who would like to have subsequent pregnancy. The process also enables the visual inspection of the cesarean scar site directly whereby, the surgeon may regulate the bleeding and make sure that all the trophoblastic tissue is removed [9]. Nonetheless, surgical management can also be associated with some risks notwithstanding its benefits. These are the intraoperative bleeding, infection, uterine perforation, and anesthetic complications. Even though hysteroscopic resection is a good option, some cases can be accompanied by significant intraoperative blood loss. Thus, the choice of the most suitable treatment modality should be made with taking into account the clinical condition of the patient and resources.

Recent years have witnessed increasing research interest to assess the effectiveness and safety of medical and surgical treatment methods for ectopic pregnancy which includes cesarean scar pregnancy. Multiple studies have conducted assessments to determine treatment success rates and treatment complications and hospital duration and patient recovery results from different medical interventions. Medical management shows effectiveness for some early cases according to certain studies while other studies find that surgical procedures produce better success rates. The medical field has tested combined treatment methods which start with methotrexate administration and end with surgical removal to achieve better patient outcomes while minimizing treatment-related issues.

The research comparison between medical and surgical treatment methods for managing CSP has produced inconsistent results for both success rates and complication rates and recovery duration. The results show different outcomes because the study

used different patient selection methods and people diagnosed with different gestational ages and followed different treatment procedures and institutional standards. The best management method for CSP remains unknown because of this situation. The treatment comparison between different medical methods requires complete knowledge about their advantages and disadvantages to assist doctors with evidence-based decision-making.

The medical and surgical treatment methods for cesarean scar pregnancy carry potential risks which require researchers to create standardized treatment guidelines for this condition. The most dependable evidence about treatment effectiveness and safety and patient outcomes comes from randomized controlled trials and well-designed comparative studies. The studies will identify the treatment method that achieves the highest success rate while maintaining safety and preserving fertility and supporting patient recovery.

The investigators conducted their research because they wanted to study the rising frequency of cesarean scar pregnancy cases which currently lacks consensus about its best treatment method. This study aims to compare the outcomes of medical management using methotrexate with surgical management via hysteroscopic resection in patients diagnosed with CSP. The study evaluates treatment success rates together with complications and recovery parameters to generate new knowledge which helps doctors choose better treatment options for their patients who have cesarean scar pregnancy.

Methodology

Study Design: The present study was designed as a prospective comparative observational study aimed at evaluating and comparing the clinical outcomes of medical and surgical management in patients diagnosed with ectopic pregnancy. The study assessed treatment success rate, complications, duration of hospital stay, and recovery parameters between the two management approaches. Patients diagnosed with ectopic pregnancy and meeting the eligibility criteria were enrolled and allocated into two groups based on the treatment modality received. The study was conducted following ethical principles and after obtaining informed consent from all participants.

Study Area: The study was conducted in the Department of Obstetrics and Gynecology, Nalanda Medical College and Hospital, Patna, Bihar, India.

Study Duration: The duration of the study was 6 months from April 2025 to September 2025.

Study Participants: A total of women diagnosed with ectopic pregnancy attending the obstetrics and gynecology department during the study period were screened for eligibility. Patients who satisfied the inclusion criteria and provided informed consent were included in the study.

Inclusion Criteria

- Women diagnosed with ectopic pregnancy confirmed by clinical examination, ultrasonography, and/or serum β-hCG levels.
- Hemodynamically stable patients suitable for either medical or surgical management.
- Patients with unruptured ectopic pregnancy detected at an early stage.
- Women aged between 18 and 40 years.
- Patients willing to participate in the study and provide informed consent.

Exclusion Criteria

- Hemodynamically unstable patients requiring immediate emergency surgery.
- Patients with ruptured ectopic pregnancy presenting with severe intra-abdominal bleeding.
- Patients with contraindications to methotrexate therapy (such as liver disease, renal disease, or blood dyscrasias).
- Patients with heterotopic pregnancy.
- Women who declined to participate or were unwilling for follow-up.

Sample Size

The total sample size was 80 patients diagnosed with ectopic pregnancy. The participants were divided into two groups:

- **Group A (Medical Management)** – 40 patients
- **Group B (Surgical Management)** – 40 patients

Procedure: All patients presenting with symptoms suggestive of ectopic pregnancy, such as abdominal pain, amenorrhea, or vaginal bleeding, underwent detailed clinical evaluation including history taking, physical examination, and relevant laboratory investigations. Diagnosis of ectopic pregnancy was confirmed using transvaginal ultrasonography along with serum β-hCG estimation. Once the diagnosis was established and eligibility criteria were satisfied, patients were categorized into two management groups depending on the treatment approach advised by the treating clinician.

Patients in the medical management group received methotrexate therapy according to standard treatment protocols. A single intramuscular dose of methotrexate (50 mg/m² body surface area) was administered. Serum β-hCG levels were measured on day 4 and day 7 after the injection to assess treatment response. If the decline in β-hCG levels between day 4 and day 7 was less than 15%, an additional dose of methotrexate was considered. Patients were monitored clinically and followed weekly with β-hCG measurements and ultrasonography until complete resolution of the ectopic pregnancy.

Patients in the surgical management group underwent operative treatment, which included procedures such as laparoscopic or open salpingectomy or salpingostomy depending on the clinical condition and intraoperative findings. The procedure was performed under appropriate anesthesia, and intraoperative parameters such as blood loss and operative findings were documented. Postoperative monitoring included vital signs assessment, hemoglobin levels, and observation for complications.

Outcome measures assessed in both groups included treatment success rate, time taken for normalization of β-hCG levels, duration of hospital stay, and occurrence of complications such as hemorrhage, infection, or need for additional interventions. All patients were followed until clinical recovery and normalization of biochemical parameters.

Statistical Analysis: The collected data were entered into a Microsoft Excel spreadsheet and analyzed using Statistical Package for Social Sciences (SPSS) version 27.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between the medical and surgical management groups were performed using appropriate statistical tests such as the student's t-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. A p-value less than 0.05 was considered statistically significant.

Result

Table 1 shows the distribution of patients according to age group in both medical and surgical management groups of ectopic pregnancy. Out of the total 80 patients included in the study, 40 patients were managed medically and 40 were managed surgically. The majority of patients belonged to the 26–30 years age group, comprising 30 patients (37.50%), with 14 in the medical management group and 16 in the surgical management group. This was followed by the 31–35 years age group with 19 patients (23.70%), including 9 patients under medical management and 10 under surgical management. The 18–25 years age group accounted for 18 patients (22.50%), of which 10 received medical treatment and 8 underwent surgical management. The least number of patients were observed in the 36–40 years age group, with 13 patients (16.30%), including 7 in the medical group and 6 in the surgical group. Overall, the data indicate that most patients with ectopic pregnancy in this study were in the 26–30 years age group.

Table 1: Distribution of Patients According to Age Group

Age Group (Years)	Medical Management (n=40)	Surgical Management (n=40)	Total (n=80)	Percentage (%)
18–25	10	8	18	22.50%
26–30	14	16	30	37.50%
31–35	9	10	19	23.70%
36–40	7	6	13	16.30%
Total	**40**	**40**	**80**	**100%**

Table 2 shows the clinical presentation of ectopic pregnancy among the study participants in both the medical and surgical management groups. The most common symptom observed was abdominal pain, reported in 34 patients in the medical group and 36 patients in the surgical group, accounting for a total of 70 cases (87.50%). This was followed by amenorrhea, which was present in 30 patients in the medical group and 32 patients in the surgical group, with an overall frequency of 62 cases (77.50%). Vaginal bleeding was the third most common clinical feature, observed in 22 patients in the medical group and 25 patients in the surgical group, contributing to 47 cases (58.70%). The least common symptom reported was dizziness or syncope, which was seen in 6 patients managed medically and 12 patients who underwent surgical management, totaling 18 cases (22.50%). Overall, abdominal pain and amenorrhea were the predominant presenting symptoms of ectopic pregnancy in the study population.

Table 2: Clinical Presentation of Ectopic Pregnancy

Clinical Symptoms	Medical Group (n=40)	Surgical Group (n=40)	Total (n=80)	Percentage (%)
Abdominal pain	34	36	70	87.50%
Amenorrhea	30	32	62	77.50%
Vaginal bleeding	22	25	47	58.70%
Dizziness/Syncope	6	12	18	22.50%

Table 3 shows the comparison of treatment success rates between medical management and surgical management groups. In the medical management group (n=40), successful treatment was observed in

32 patients (80%), while 8 patients (20%) experienced treatment failure or required additional intervention. In contrast, the surgical management group (n=40) demonstrated a higher success rate, with 38 patients (95%) achieving successful treatment and only 2 patients (5%) requiring further intervention. The difference in treatment success between the two groups was found to be statistically significant, as indicated by the p-value of 0.04. These findings suggest that surgical management had a higher treatment success rate compared to medical management in the study population.

Table 3: Comparison of Treatment Success Rate			
Treatment Outcome	**Medical Management (n=40)**	**Surgical Management (n=40)**	**p-value**
Successful treatment	32 (80%)	38 (95%)	0.04
Treatment failure / Need for additional intervention	8 (20%)	2 (5%)	

Table 4 shows the comparison of duration of hospital stay between the medical group and the surgical group. In the medical group (n=40), the majority of patients, 28 (70%), had a hospital stay of 1–3 days, while 10 (25%) stayed for 4–6 days and only 2 (5%) stayed for more than 6 days. In contrast, in the surgical group (n=40), only 12 (30%) patients had a hospital stay of 1–3 days, whereas 18 (45%) patients stayed for 4–6 days and 10 (25%) patients required hospitalization for more than 6 days. The mean duration of hospital stay was significantly lower in the medical group (2.8 ± 1.2 days) compared to the surgical group (5.4 ± 1.8 days). The difference between the two groups was statistically highly significant ($p < 0.001$), indicating that patients managed medically had a shorter hospital stay than those who underwent surgical management.

Table 4: Comparison of Hospital Stay			
Duration of Hospital Stay	**Medical Group (n=40)**	**Surgical Group (n=40)**	**Mean ± SD**
1–3 days	28	12	$p < 0.001$
4–6 days	10	18	
>6 days	2	10	
Mean duration (days)	**2.8 ± 1.2**	**5.4 ± 1.8**	

Table 5 presents the complications observed among patients in both the medical and surgical management groups of ectopic pregnancy. The majority of patients experienced no complications, accounting for 61 cases (76.30%), with 33 patients in the medical group and 28 in the surgical group. Among the complications reported, abdominal pain was observed in 7 patients (8.70%), including 4 in the medical group and 3 in the surgical group. Infection occurred in 5 patients (6.30%), with a higher number in the surgical group (4 cases) compared to the medical group (1 case). Hemorrhage was noted only in the surgical group (3 cases; 3.70%), while need for blood transfusion was also reported exclusively in the surgical group (2 cases; 2.50%). In contrast, treatment failure was seen only in the medical group (2 cases; 2.50%). Overall, complications were relatively low in both groups, though surgical management showed slightly higher procedure-related complications, whereas treatment failure occurred only with medical management.

Table 5: Complications Observed in Both Groups				
Complications	**Medical Group (n=40)**	**Surgical Group (n=40)**	**Total**	**Percentage (%)**
No complications	33	28	61	76.30%
Abdominal pain	4	3	7	8.70%
Infection	1	4	5	6.30%
Hemorrhage	0	3	3	3.70%
Need for blood transfusion	0	2	2	2.50%
Treatment failure	2	0	2	2.50%

Discussion

The study assessed how medical and surgical treatments for ectopic pregnancy produced different results based on patients' demographic data and clinical symptoms and treatment outcomes and hospital stay length and medical complications. The study results show that both treatment methods lead to successful results but surgical treatment achieved better success rates while medical treatment required shorter hospital stays and resulted in fewer complications. The current study results match findings from earlier research which examined the

effectiveness of conservative and surgical methods to treat ectopic pregnancy.

The study found that 37.50% of patients belong to the 26-30 years age group while 23.70% belong to the 31-35 years age group and 22.50% belong to the 18-25 years age group. The data shows that ectopic pregnancy occurs most frequently in women who reach their highest reproductive capacity. The distribution of ages in this study matches the age distribution patterns found in previous research. Bouyer et al. (2003) [10] found that women aged 25 to 30 years displayed the highest rate of ectopic pregnancy which accounted for almost 35 percent of all recorded cases. Similarly, Shaw et al. (2010) [11] found that about 40 percent of women diagnosed with ectopic pregnancy belonged to the 25 to 30 years age group. The study results demonstrate that reproductive-age women face the greatest risk of ectopic pregnancy because they have higher fertility rates combined with increased sexual activity and exposure to pelvic inflammatory disease and previous pelvic surgery.

The clinical presentation observed in this study also corresponds closely with the classical symptomatology reported in the literature. The present study found that abdominal pain occurred as the most common symptom when it affected 87.50% of patients and amenorrhea affected 77.50% of patients and vaginal bleeding affected 58.70% of patients. The pattern shows the typical three symptoms which people with ectopic pregnancy show. Kirk et al. (2014) [12] recorded that 90% of ectopic pregnancy patients experienced abdominal pain while 75% of patients showed amenorrhea and 55% of patients displayed vaginal bleeding. Similarly, Crochet et al., (2013) [13] found that abdominal pain was present in around 85% of patients with ectopic pregnancy, confirming that it remains the most consistent presenting complaint. The similarity between these findings and those of the present study suggests that the clinical profile of ectopic pregnancy remains relatively consistent across different populations and clinical settings.

The researchers of this study tried to determine which treatment method to use because they wanted to find out which method produced better treatment results. The current study showed that medical treatment methods achieved an 80% success rate while surgical methods reached a higher success rate of 95%. The results of this research study match the results of previous research studies which investigated the effectiveness of methotrexate treatment and surgical treatment. The group led by Lipscomb et al. (1998) [14] reported that single-dose methotrexate treatment for ectopic pregnancy achieved an 82% success rate. The researchers Menon et al. (2007) [15] discovered that medical treatment success rates between 70% and 85% depended on initial β-hCG levels and patient selection. The success rates of surgical management reached higher levels through the use of laparoscopic salpingectomy and salpingostomy. The research conducted by Mol et al. (2008) [16] showed that surgical treatment achieved success rates above 95%, which matched the 95% success rate found in this study. The surgery achieves better success because it removes ectopic gestational tissue completely, which leads to permanent resolution and the elimination of trophoblastic tissue.

The present study found that patients undergoing two different treatment approaches experienced different lengths of hospital stays. Patients who received medical treatment had shorter hospital stays which averaged 2.8 days with a standard deviation of 1.2 days while patients who underwent surgical treatment had longer hospital stays which averaged 5.4 days with a standard deviation of 1.8 days. Previous research has produced identical results to these findings. Van Mello et al. (2012) [17] discovered that patients who received methotrexate treatment spent less time in the hospital and recovered more quickly than patients who underwent surgical procedures. Some studies have demonstrated that laparoscopic surgery enables patients to return home earlier because the procedure uses less invasive methods. Mol et al. (2008) found that patients with uncomplicated conditions who received laparoscopic treatment would spend approximately 2 to 3 days in the hospital. The surgical group in this study spent more time in the hospital because they required monitoring after surgery and needed to recover from anesthesia and deal with the surgical wound care process.

The present study found that both groups had low complication rates because 76.30% of patients remained free from complications. The surgical group showed higher rates of procedure-related complications which included infection and hemorrhage while the medical management group experienced treatment failure. The current findings confirm the results of past research studies. Lipscomb et al. (2000) showed that methotrexate therapy required less invasive treatment yet it still posed a treatment failure risk that would need surgical intervention in 10 to 20 percent of patients. Menon et al. (2007) showed that medical treatment failed in about 15 to 20 percent of cases especially in patients who had higher β-hCG levels or larger ectopic masses. Surgical management brings several operative risks which include bleeding and infection plus the requirement for blood transfusions. Kirk et al. (2014) reported that about 5 to 10 percent of cases developed surgical complications which mostly occurred in patients who had ruptured ectopic pregnancies.

The present study results show high agreement with past research which demonstrates that surgical treatment offers better success rates than medical treatment, although medical treatment requires less

invasive procedures and results in shorter hospital stays. The choice of treatment should therefore be individualized based on clinical stability, size of the ectopic pregnancy, serum β-hCG levels, and patient preference. Early diagnosis together with correct patient selection stands as the most important factor for achieving successful results in ectopic pregnancy treatment.

Conclusion

The present study demonstrated that both medical and surgical management are effective treatment options for ectopic pregnancy when appropriately selected based on the patient's clinical condition. The findings revealed that surgical management showed a higher treatment success rate compared to medical management, indicating its effectiveness as a definitive treatment approach. However, medical management with methotrexate was associated with a shorter duration of hospital stay and fewer procedure-related complications, making it a less invasive alternative for carefully selected, hemodynamically stable patients. Most patients presented with classical symptoms such as abdominal pain, amenorrhea, and vaginal bleeding, emphasizing the importance of early clinical suspicion and prompt diagnosis. Overall, the choice of treatment should be individualized, considering factors such as patient stability, β-hCG levels, fertility preservation, and available clinical expertise to ensure optimal maternal outcomes.

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