REVIEW ARTICLE

Temporary Ovarian Suspension: An Overview

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ABSTRACT

Objective: To assess the efficacy of temporary ovarian suspension following laparoscopic surgery for severe pelvic endometriosis in the prevention of postoperative ovarian adhesions and its correlation with the pregnancy outcome.

Study design: Prospective double-blind randomized controlled trial.

Materials and methods: The study was conducted in the Department of Obstetrics and Gynaecology, Vardhman Laparoscopy Centre from January 1, 2011 to September 30, 2017 on 100 endometriotic patients.

Results: On ultrasonographic follow-up, the study group showed significantly lesser incidence of readhesions compared with control group (20% vs 65%). Of these, 28 conceived (56%); 4 delivered, 22 pregnancy continues (85%), and 2 woman had an ectopic pregnancy. Five patients had a second-look laparoscopy out of which in 4 cases (80%), we found no evidence of recurrent adhesions. Only 1 patient had minimal adhesions.

Conclusion: The study suggests that temporary ovarian suspension could be an effective and feasible surgical technique, which might actually help reduce postoperative adhesion.

Keywords: Adhesions, Endometriosis, Temporary ovarian suspension.

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INTRODUCTION

Endometriosis, a common benign condition, characterized by the growth of endometrium-like tissue in ectopic sites outside the uterus is a significant cause of morbidity in women of the reproductive age.¹ Symptoms of endometriosis include dysmenorrhea, dyspareunia, chronic pelvic pain, and subfertility. The most widely accepted staging system for endometriosis, the Revised American Society for Reproductive Medicine (ARSM) classification, uses surgical scoring to grade the disease as absent (0), minimal (1–5), mild (6–15), moderate (16–40), or severe (>40).²

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Laparoscopic surgical excision of the disease is frequently carried out for the treatment of severe endometriosis, as this approach facilitates complete excision of endometriotic lesions with minimal trauma to pelvic tissues.³ Yet, postoperative pelvic adhesion formation after laparoscopic endometriosis surgery has been reported in the range of 50 to 100%.^{5–8} The most common site of postoperative adhesion formation is the ovary.⁴ Formation of severe postoperative adhesions can compromise the successful outcome of surgery for endometriosis by causing chronic pelvic pain, dyspareunia, infertility, intestinal obstruction, and complications noted at repeat surgery.⁵

Adhesions may produce disruption of the normal anatomy, thus altering the normal tubal performance. Thus, follicular growth, pick-up of the oocyte after ovulation, and spermatozoa or embryo transport may be impaired.⁶

The extremely high incidence of postoperative adhesions in endometriosis patients with consequent unsatisfactory surgical outcome and suboptimal fertility rates demands us to come up with modified surgical techniques in order to reduce potential adhesion formation. Intraperitoneal administration of antiadhesive solutions (e.g., icodextrin, hyaluronic acid), drugs (e.g., steroids, heparin), and adhesion barriers like Interceed, Intergel at the time of surgery has been advocated as a way of reducing the incidence of postoperative adhesions but none have proved efficacious till date.

Ovarian Suspension

Ovarian suspension is a simple procedure which was originally used to facilitate ovarian retraction during surgery for severe pelvic endometriosis.⁷ Following the division of adhesions, ovarian cystectomy, and/or the excision or coagulation of endometriosis, pelvic pain may continue because of re-formation of adhesions between the posterior surface of the ovary and the ovarian fossa. Temporary ovarian suspension is a simple technique of suspending the ovary, away from the ovarian fossa, by attachment to the anterior abdominal wall. This allows separation of the raw area on the ovary and the ovarian fossa until surface epithelialization has occurred. The suture is removed after 3 weeks, allowing the ovary to fall back to its anatomical position.

Objective

The study aimed to assess the effect of temporary ovarian suspension following laparoscopic surgery for severe pelvic

endometriosis on the incidence of postoperative ovarian adhesions and its correlation with pregnancy outcome.

MATERIALS AND METHODS

This is a tertiary referral unit for women with severe pelvic endometriosis from a wide area of North India.

Inclusion Criteria

- Age—20 to 39 years
- Infertility—Both primary and secondary
- Confirmed diagnosis of endometriosis on laparoscopic and histological criteria.
- No other infertility factors. Male factor was normal.
- Stage of disease determined by revised American Fertility Society classification of ASRM.
- Requiring extensive dissection of pelvic side wall/rectovaginal space with uterine and ovarian preservation.

Exclusion Criteria

Exclusion criteria were: unwillingness to provide written consent, inability to tolerate a transvaginal ultrasound scan, unsuccessful surgeries, masses occupying the Douglas pouch; previous surgery for endometriosis or additional concomitant surgical procedure planned during the laparoscopic procedure; current pregnancy, including ectopic pregnancy, additional infertility factors, and active pelvic or abdominal infection.

Informed consent was obtained from each woman.

The suitability for randomization was determined at the time of surgery from January 2011 to September 2017. A total of 100 patients with severe endometriosis on laparoscopy were randomized into two groups of 50 each.

1. Treatment group—Bilateral ovaries suspended to anterior abdominal wall.
2. Control group—Ovaries left free in pelvis.

Intervention

Complete surgical excision of all recognizable endometriotic lesion was performed and endometriotic cyst wall enucleated (Figs 1 and 2). In the treatment group, bilateral ovarian suspension was performed by a one-stitch technique to anterior abdomen wall next to ipsilateral round ligament using an ethilon no 1 suture for 21 days. Care was taken to leave approximately 2 to 3 cm between the ovary and anterior abdominal wall in order to avoid adhesion formation between them.

Only the surgical team was aware of the patients' treatment allocation. Patients' randomization number was recorded in the patients' operative notes. At the end of study, the randomization was unblinded for analysis and details of suspension were added to each patient's record.

Patients were discharged from the hospital 24 hours after the procedure. Routine follow-up visit was at 1 week for the removal of operative stitches and then at 3 weeks, when suspension was removed. Routine physical examination was performed and enquiries regarding daily activities, bowel, bladder, and sexual function were made at each visit.

All patients were re-evaluated 60 to 90 days after surgery with transvaginal sonography to assess the readhesion formation. Ovarian adhesions were diagnosed in women with evidence of restricted ovarian mobility on targeted palpation using transvaginal ultrasound probe.

Patients were advised to try for pregnancy and not to delay attempting conception. For each patient, age, body mass index, parity, duration of infertility, history of abdominal surgery, or surgery for endometriosis was assessed. Follow-up and management were individualized according to patient's age, duration of marriage, semen parameters, and tubal factors.

Supposing a young patient presents with healthy tubes, less than 5 years of infertility, and normal semen parameters, then she was managed with ovulation induction and/or intrauterine insemination. On the contrary, for a

Fig. 1: Endometrioma at the start of surgery

Fig. 2: Endometriotic cyst lining being dissected

Fig. 3: Ethilon 1-0 suture on straight needle

Fig. 4: Needle passed from posterior surface to anterior surface of ovary

patient with advanced age, diseased tubes and abnormal semen parameters, *in vitro* fertilization was the preferred modality of treatment.

Patient management was upgraded over time from ovulation induction to IUI to *in vitro* fertilization, depending on the patient response. After 6 months, we refer the patient for assisted reproductive technology.

Pregnancy rates and time to pregnancy in both the groups were compared.

Outcome Measures

Primary outcome is the prevalence of ovarian adhesion on ultrasound after surgery. The presence of ovarian adhesions was assessed by a combination of gentle pressure with the vaginal probe and abdominal pressure with the examiner's free hand as in a bimanual examination. Restricted ovarian mobility was considered indicative of the presence of ovarian adhesions and when the ovary could not be separated from the peritoneum of the lateral pelvic wall and/or pouch of Douglas, by the ultrasound probe.

Secondary outcome are the presence, intensity, and site of postoperative pain.

DETAILED OPERATIVE TECHNIQUE OF TEMPORARY OVARIAN SUSPENSION

Temporary ovarian suspension to the anterior abdominal wall was performed as the last step in the surgical procedure.

The anterior abdominal wall is transilluminated with the laparoscope to demonstrate any major blood vessels, especially the inferior epigastric vessels. Nonabsorbable number 1-0 Ethilon on a straight needle is used for suturing. The needle is passed into the abdominal cavity at the level of the lower ancillary ports, i.e., 2.5 cm above and medial to the anterior superior iliac spine; it picks up the ovary and comes out of the abdominal wall at the same site (Figs 3 to 5). The needle is passed through the posterior

Fig. 5: Suture passage back through anterior abdominal wall adjacent to the entry point and ovary pulled away from raw ovarian fossa

surface which is in approximation to the pouch of Douglas, brought out successively through the anterior surface and then out of the anterior abdominal wall. The suture exits through the anterior abdominal wall at a point adjacent to the entry site.

The pneumoperitoneum is then deflated and the suture is tied on the anterior abdominal wall to separate the ovary approximately 1.5 to 2 cm from the ovarian fossa, with appropriate adjustment of the tension to allow easier removal of the suture and reduce patient discomfort. The stitch is covered with a transparent dressing which is left in position until the day of removal of the stitch.

This will ensure that the suspended ovary is lifted as far away from the pelvis as possible.

No complication like infection, ovarian torsion, bowel symptom, port site infection post, and severe operative pain have been encountered so far.

Second-look surgery was performed only in a small number of patients, since systematic laparoscopic

second-look may be frequently refuted by patients. In this study, we used an office-based surgical procedure performed under local anesthesia that should increase the compliance of patients in undergoing follow-up second look.

RESULTS

This study indicates that temporary ovarian suspension is a simple and safe technique which may be effective in preventing periovarian adhesions after operative laparoscopy for advanced endometriosis resulting in favorable pregnancy outcomes in the long term.

On ultrasonographic follow-up, the study group showed significantly lesser incidence of readhesions compared with the control group (20% *vs* 65%). Patients who had additional infertility factors and/or were of advanced reproductive age were excluded from the study. A total of 28 patients conceived (56%): 4 delivered, in 22 pregnancy continues (85%), and two woman had an ectopic pregnancy. Among patients who failed to conceive spontaneously, five had a second-look laparoscopy. In four patients we found no evidence of recurrent adhesions. Only one patient had minimal adhesions.

We have seen conception rates of 55 to 60% in grade IV endometriosis cases when temporary ovarian suspension was used as the final step to prevent readhesions.

DISCUSSION

Ovarian adhesions after surgery for pelvic endometriosis are a common problem which compromise surgical outcome due to its associated morbidity. Numerous adhesion prevention surgical strategies, mostly based on microsurgical principles, have been attempted over the years including minimal tissue trauma, meticulous hemostasis, copious irrigation, and the use of low reactive sutures.

Suspending the ovaries postoperatively aims to prevent contact between the ovaries and the regions of excised peritoneum while the regions of excised peritoneum heal. In theory, ovarian adhesions are now less likely to form and later as the sutures suspending the ovaries are cut, the ovaries would have assumed their anatomical position in pelvis.⁸

Numerous studies have proven over time that peritoneal healing takes 5 to 8 days to occur,⁹⁻¹³ and further, blood in the pelvic cavity may be involved in adhesion pathogenesis, which has been shown to take up to 8 days for absorption from the pelvic cavity.^{14,15} Hence, it is logical that any antiadhesion technique should maintain its effect at least for a period of 7 to 8 days.

Hoo et al¹⁶ conducted a study in which 55 participants having severe pelvic endometriosis had only one

of their ovaries suspended at the end of surgery, for 36 to 48 hours. Transvaginal ultrasound scan was used to assess the ovarian mobility after 3 months. The study failed to establish a significant difference ($p = 0.23$) in the prevalence of postoperative ovarian adhesions between the suspended (20/52) and unsuspended (27/52) sides (38.5 *vs* 51.9%).

The suspension time of 36 hours was chosen based on a single rodent study by Harris et al,¹⁷ which found that adhesions only formed if the silastic sheet separating the cecum from the abdominal wall was removed prior to 36 hours. Whether the results of this single rodent study can be extrapolated to human subjects is questionable though.

This short length of ovarian suspension was also partially based on an apparent risk of small bowel strangulation. None of the published studies on temporary ovarian suspension with longer suspension times have ever noted this complication.^{8,18-20}

Assessing adhesion formation via ultrasound rather than second-look laparoscopy may be considered a limiting factor. Ultrasound is cheaper, less time consuming, noninvasive, and has better patient compliance for follow-up. Patients have a greater tendency to refuse second-look laparoscopy owing to its invasive nature making follow-up difficult. However, recent studies assessing the impact of certain interventions on adhesion formation in other contexts have used repeat laparoscopy.²¹

Traditionally, postoperative adhesions could only be assessed by laparoscopy, but recent studies indicate that targeted palpation with ultrasound probe could be used as an alternative method to diagnose adhesion. Guerriero et al²² found that the fixation of the ovary to the uterus evaluated by transvaginal ultrasonography had a good specificity (86%) and high positive predictive value of 81%. More recently, Okaro et al²³ found good correlation between ovarian mobility on transvaginal ultrasound and at laparoscopy (κ 0.81). These positive results were also shared by Holland et al.²⁴ Transvaginal ultrasound has proven to be an indispensable, non-invasive, and inexpensive way of assessing ovarian adhesion.

Seracchioli et al,²⁵ in a study titled "The role of ovarian suspension in endometriosis surgery: a randomized controlled trial" comprising 80 patients with ovarian and posterior deep infiltrating endometriosis, evaluated postsurgical ovarian adhesions using transvaginal ultrasonographic scans.

The study observed a significantly lower rate of ultrasound-detectable ovarian adhesions with the uterus and the bowel in the treatment group respectively (46.7% *vs* 77.3%, $p = 0.003$ and 26.7% *vs* 68.2%, $p < 0.0005$). The control group showed a higher percentage of fixed ovaries

with moderate and severe adhesions than the treatment group (56.8 *vs* 28.9%, $p = 0.003$ and 20.5 *vs* 8.9%, $p = 0.110$). No differences between the two groups were found regarding complications and pelvic pain.

Pergialiotis et al²⁶ published a systematic review of four studies on ovarian suspension which recruited 105 women of fertile age. The rates of absence of adhesions were between 41 and 80%. In their majority, adhesions were mild whenever reported, with the exception of the study of Ouahba et al¹⁹ who found that adhesions of moderate severity had an incidence of 33%. However, the incidence of preoperative and postoperative symptoms was not reported in these studies.

Current evidence suggests that ovarian suspension could be an effective and feasible surgical technique, which might actually help to reduce postoperative adhesions. However, further research is needed in this field, as the number of studies published in this field is relatively small to reach a firm conclusion.

CONCLUSION

Ovarian adhesions are fibrous connections, which develop between the ovaries and the surrounding organs as a result of a prior traumatic surgery in this area. Multiple small observational studies have been conducted in order to investigate the role of temporary ovarian suspension in postoperative ovarian adhesions prophylaxis, which suggest that this simple intervention may significantly reduce the prevalence of postoperative ovarian adhesions. Though a promising technique, yet till date, we have failed to reach a consensus regarding its effectiveness.

To the best of our knowledge, a large prospective study has not been done to evaluate this. Our randomized controlled trial suggests that this simple surgical procedure could be included into the routine surgical treatment of women with severe pelvic endometriosis.

Ovarian suspension seems to be an additional effective surgical procedure associated with an increased ovarian mobility and lesser incidence of postoperative periovarian adhesions. Moreover, it is feasible, safe, simple, and fast. Hence, this novel procedure could be routinely used during laparoscopic surgery for endometriosis.

Temporary ovarian suspension is a theoretically compelling means of reducing ovarian adhesions which seems promising. In order to gain a definitive answer on the effectiveness of temporary ovarian suspension, future studies should assess the impact of ovarian suspension for a minimum of 7 days in order to ensure complete healing before the ovarian sutures are cut, use larger patient numbers, and utilize second-look laparoscopy in order to assess adhesion formation.

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