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# A Novel Laparoscopic Technique for Fixation of the Utero-Ovarian Ligament to the Round Ligament for Prevention of Recurrent Ovarian Torsion: Experience from The Sarem Women's Hospital, Tehran

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**ABSTRACT**

**Introduction:** Ovarian torsion is an important gynecologic surgical emergency caused by complete or partial rotation of the ovary around its supporting ligaments. This rotation may compromise or completely interrupt the blood supply, resulting in ovarian ischemia and, in severe cases, tissue necrosis. Timely diagnosis and appropriate surgical intervention play an important role in preserving ovarian and fallopian tube function. Although detorsion allows preservation of the ovary and fallopian tube in many cases, a previous episode of torsion is considered a predisposing factor for recurrent torsion. Oophoropexy is a surgical procedure used to fix the ovary or its supporting structures in order to reduce the risk of recurrent torsion.

**Objective:** The aim of this article is to introduce the laparoscopic oophoropexy technique used at Sarem Women's Hospital, Tehran, for the prevention of recurrent ovarian torsion and to describe its surgical steps and technical considerations.

**Technique Description:** Following the diagnosis of ovarian torsion, detorsion is performed to restore blood flow to the ovary and fallopian tube, and the ovarian tissue is preserved whenever feasible. In the technique used at Sarem Women's Hospital, Tehran, following detorsion, if the utero-ovarian ligament is excessively long, it is initially shortened or folded using a plication technique and is subsequently fixed to the round ligament. When the length of the utero-ovarian ligament and the ovarian supporting structures are within the normal range, fixation of the utero-ovarian ligament to the round ligament is performed directly. A zero-gauge Vicryl suture is used for fixation, and the needle passage is selected according to the position of the fallopian tube and through the avascular portion of the mesosalpinx to minimize the risk of fallopian tube injury or obstruction. In cases where there is a risk of loss of the contralateral ovary or a potential risk of recurrent torsion, contralateral oophoropexy is also performed.

**Conclusion:** Oophoropexy following detorsion may be considered a surgical approach for preventing recurrent ovarian torsion. The laparoscopic technique introduced at Sarem Women's Hospital, Tehran, involving fixation of the utero-ovarian ligament to the round ligament, with plication of the utero-ovarian ligament, when necessary, provides an approach for stabilizing the ovarian position and reducing its mobility. A detailed description of this technique may improve surgeons' familiarity with an available surgical option for preventing recurrent ovarian torsion.

**Keywords:** Ovarian Torsion; Oophoropexy; Laparoscopy; Detorsion; Utero-ovarian ligament; Plication Procedure; Round ligament.

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## Introduction

Ovarian torsion is an important gynecologic emergency in which the ovary undergoes complete or partial rotation around its supporting ligaments. This rotation may result in compression or reduction of the ovarian blood supply and, in severe cases, complete interruption of blood flow, which, if prolonged, can lead to ovarian ischemia and tissue necrosis [1, 2]. Ovarian torsion can occur in women of all ages, and in many cases, the fallopian tube is simultaneously twisted and involved along with the ovary. Torsion of paratubal, paraovarian, and broad-ligament cysts may also occur in association with adnexal torsion. Therefore, timely diagnosis and prompt surgical intervention are of great importance for preserving the viability and function of the ovary and fallopian tube [3].

The clinical presentation of ovarian torsion typically consists of sudden, severe, unilateral lower abdominal and pelvic pain, which may be intermittent or colicky in nature and is often accompanied by nausea and vomiting. Abdominal tenderness is also a common finding on physical examination. The presence of an ovarian or fallopian tube cyst or mass, polycystic ovaries, pregnancy, fertility treatments that may increase ovarian size, and a previous history of torsion are among the conditions associated with an increased risk of ovarian torsion [4, 5]. The diagnosis of ovarian torsion is based on a combination of clinical symptoms, physical examination findings, and imaging and laboratory investigations. Intermittent or colicky pain accompanied by nausea and vomiting, abdominal tenderness, and Doppler ultrasonographic assessment of ovarian blood flow may aid in the diagnosis. However, definitive diagnosis is often established intraoperatively. Given the emergency nature of this condition, surgical treatment is essential, and laparoscopy, as a minimally invasive approach, is commonly used for surgical management in these patients [6, 7].

During surgery, the ovary and fallopian tube may appear ischemic or even necrotic and may have friable tissue. The first step is detorsion to restore blood flow to the adnexa. Following detorsion, a change in the color of the adnexa from a bluish, ischemic appearance toward a more normal color can usually be observed, although in many cases the adnexal color may not completely return to normal. If the ovarian tissue is viable and amenable to preservation, without evidence of severe tissue friability or extensive necrosis, efforts are made to preserve the ovary and fallopian tube. When a resectable mass or cyst is present, cystectomy or adnexal mass resection may also be performed [8].

One of the important risk factors for recurrent ovarian torsion is a previous history of torsion. Therefore, following treatment of torsion and restoration of blood flow, consideration of strategies to prevent recurrence is of particular importance. Oophoropexy [2] is a surgical procedure performed to fix the ovary or its supporting structures to adjacent structures, including the pelvic wall, uterus, or ligaments, and may be used to reduce the risk of recurrent torsion [9, 10].

Oophoropexy has been particularly considered in cases of recurrent torsion and in the presence of elongated ligaments or fallopian tubes. Various oophoropexy techniques have been used worldwide. These include fixation of the ovary to the pelvic wall, posterior abdominal wall, posterior aspect of the uterus, or uterosacral ligaments. Another technique, known as the Hot Dog in a Bun technique, combines shortening of the utero-ovarian ligament with fixation of the ligament to the round ligament. Trocar Site Closure has also been described as another oophoropexy technique, particularly for ovarian torsion in pregnant women [11].

At Sarem Women's Hospital, Tehran, a technique similar to the Trocar Site Closure method is used to prevent recurrent ovarian torsion. In this technique, when the utero-ovarian ligament is longer than normal, its length is first reduced by plication or shortening using a suture, after which the utero-ovarian ligament is fixed to the round ligament. When the size and length of the ovaries and supporting ligaments are within the normal range, only fixation of the utero-ovarian ligament to the round ligament is performed. Given the importance of preserving ovarian tissue following torsion and the need to prevent recurrence, describing surgical techniques used for oophoropexy may be valuable for surgical education and the dissemination of operative experience. Accordingly, the aim of the present article is to introduce and describe the laparoscopic technique used at Sarem Women's Hospital, Tehran, for fixation of the utero-ovarian ligament to the round ligament to prevent recurrent ovarian torsion, and to present the technical considerations associated with performing this procedure.

## Technique Description

Following the diagnosis of ovarian torsion, surgical intervention is essential. The first step in surgical management is detorsion of the ovary, during which blood flow to the ovary is restored. In most cases, provided that severe necrosis has not occurred, preservation of the ovary and fallopian tube is feasible. Given that a previous history of ovarian torsion may be associated with an increased risk of recurrent torsion, oophoropexy following detorsion may be considered to prevent recurrence. At Sarem Women's Hospital, Tehran, oophoropexy is performed following detorsion as an approach to prevent recurrent ovarian torsion.

In this technique, the ovary, fallopian tube, and their supporting ligaments are initially assessed. If the utero-ovarian ligament [1] is longer than normal, plication or shortening of the ligament using a suture

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is performed, followed by fixation of the ligament to the round ligament. If the ovaries and supporting ligaments are within the normal range in terms of size and length, only fixation of the utero-ovarian ligament to the round ligament is performed.

The fixation procedure is performed using a zero-gauge Vicryl suture. First, the suture is passed through the round ligament. The fallopian tube is then elevated to prevent tubal obstruction. Subsequently, the needle is passed beneath the fallopian tube through the mesosalpinx, entering the avascular portion of the mesosalpinx. The needle is then passed through the utero-ovarian ligament. The needle is subsequently withdrawn along the reverse path, passing again through the avascular portion of the mesosalpinx and then through the round ligament, after which the suture is tied. When the utero-ovarian ligament is excessively long, it is first corrected by plication, that is, by creating a fold in the ligament or shortening it, before fixation to the round ligament. Thus, in this technique, the decision to perform plication is based on the length of the utero-ovarian ligament. When the ligament is elongated, it is first shortened and subsequently fixed to the round ligament, whereas when the length and size of the supporting ligaments are within the normal range, direct fixation of the utero-ovarian ligament to the round ligament is performed.

During implementation of this technique, careful attention should be paid to the position of the fallopian tube and the selection of the avascular portion of the mesosalpinx. For this purpose, the fallopian tube is elevated so that the needle can be passed beneath the tube through the avascular portion of the mesosalpinx. In this manner, the suture pathway is selected to minimize the risk of tubal obstruction. After the needle is passed again through the avascular portion of the mesosalpinx and the round ligament, the suture is tied, completing the fixation. If there is a potential risk of loss of the contralateral ovary or a risk of recurrent torsion, contralateral oophoropexy is also performed. Therefore, the decision to perform contralateral oophoropexy is based on the clinical condition and the estimated risk of torsion involving the contralateral ovary.

At Sarem Women's Hospital, Tehran, this technique has been used as a method for preventing recurrent ovarian torsion. Based on the experience reported at this center, no recurrence of ovarian torsion has been observed to date following oophoropexy (Figure 1).

**Figure 1.** Steps of the laparoscopic oophoropexy technique involving fixation of the utero-ovarian ligament to the round ligament for the prevention of recurrent ovarian torsion.

## Discussion

Ovarian torsion is a gynecologic surgical emergency in which prompt diagnosis and treatment are essential for preserving ovarian function. As discussed in the preceding sections, initial surgical management consists of detorsion of the adnexa and an attempt to preserve the ovary and fallopian tube when viable tissue is present [12, 13]. Given that a previous history of torsion is considered a predisposing factor for recurrence, prevention of recurrent torsion after restoration of blood flow is also of particular importance. In this context, oophoropexy is used as a method of stabilizing the ovary and reducing its mobility [14].

Oophoropexy has been performed using various techniques, and there is currently no universally accepted standard technique. Described approaches include fixation of the ovary to the pelvic wall or posterior abdominal wall, fixation to the uterus or uterosacral ligaments, plication of the utero-ovarian ligament, and techniques based on fixation to the round ligament [15]. In the present review, three approaches were also described: fixation of the ovary to pelvic and uterine structures, the Hot Dog in a Bun technique, and the Trocar Site Closure technique. Review studies have similarly demonstrated that multiple techniques are available for oophoropexy and that the choice of technique may be based on the patient's history and anatomic characteristics.

One important consideration when selecting an oophoropexy technique is the anatomy of the utero-ovarian ligament and the degree of adnexal mobility. In the technique used at Sarem Women's Hospital, Tehran, when the utero-ovarian ligament is elongated, its length is first reduced by plication or shortening, followed by fixation of the ligament to the round ligament. When the length and size of the ovaries and ligaments are within the normal range, direct fixation of the utero-ovarian ligament to the round ligament is performed. This approach attempts not only to provide

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a fixation point for the adnexa but also to reduce excessive length and mobility of the utero-ovarian ligament.

The relevance of this approach is supported by studies investigating plication of the utero-ovarian ligament. In a study involving patients with recurrent torsion of normal adnexa, plication of the utero-ovarian ligament was used as one of the oophoropexy techniques, and the authors considered the procedure advantageous in terms of surgical feasibility and preservation of normal anatomy. However, recurrence of torsion was observed in one of the patients during follow-up in that study, indicating that none of the available oophoropexy techniques can be considered to provide an absolute guarantee against recurrence.

On the other hand, fixation to the round ligament has also been reported as an approach for preventing recurrent torsion. In a case report, following recurrent torsion despite previous plication of the utero-ovarian ligament, laparoscopic fixation of the adnexa to the round ligament was performed. The authors proposed this technique as a potentially useful option in selected cases; however, torsion recurred in the same patient one year later. This finding highlights the fact that although fixation to the round ligament may reduce adnexal mobility, it cannot completely eliminate the risk of recurrent torsion.

More recent evidence suggests that combining plication of the utero-ovarian ligament with fixation to the round ligament may represent a promising approach for patients with recurrent torsion [16]. In a study involving 10 patients with recurrent torsion of normal adnexa, a combined technique of utero-ovarian ligament plication and fixation to the round ligament was performed, and only one recurrence was reported after a median follow-up of approximately 19 months. However, the authors emphasized the relatively short duration of follow-up and the need for further studies to determine the long-term effectiveness of this technique [17].

An important feature of the technique used at Sarem Women's Hospital is the particular attention given to the suture pathway and its relationship to the fallopian tube. According to the described technique, after the initial suture is passed through the round ligament, the fallopian tube is elevated, and the needle is passed beneath the tube through the avascular portion of the mesosalpinx. The needle is then passed through the utero-ovarian ligament, and the pathway is subsequently reversed so that the suture ultimately passes through the round ligament and is tied. This pathway is designed to minimize the risk of tubal obstruction while taking into consideration the vascular structures of the mesosalpinx.

The use of the round ligament as the site of fixation has also received attention in previous studies from a technical perspective. Published reports have described fixation to the round ligament as a method for reducing adnexal mobility; however, reported experiences indicate that recurrent torsion may still occur even after this type of fixation. Therefore, this technique should be considered a surgical option in selected patients rather than a procedure that guarantees complete prevention of torsion recurrence [18].

Another feature of the present technique is the ability to perform plication according to the length of the utero-ovarian ligament. When the ligament is elongated, it is first folded or shortened and subsequently fixed to the round ligament, whereas direct fixation is performed when the ligament length is within the normal range. This variation in the application of the technique allows the procedure to be adapted to the individual anatomic characteristics of each patient.

There is also no complete consensus regarding the optimal timing of oophoropexy. In some patients, particularly those with recurrent torsion, oophoropexy is performed concurrently with detorsion, whereas in other circumstances, the decision may be made to perform the procedure electively at a later time. Recent literature has also emphasized the need for individualized decision-making based on the patient's history of torsion and anatomic characteristics.

In the technique introduced at Sarem Women's Hospital, Tehran, contralateral oophoropexy is also performed when there is a potential risk of loss of the contralateral ovary or a risk of recurrent torsion. This approach is clinically relevant because, in some patients, the goal of surgery is not limited to treating the current episode but also includes preserving the remaining ovarian function and reducing the likelihood of a similar emergency in the future.

Overall, the technique used at Sarem Women's Hospital, Tehran, can be considered an approach based on reducing adnexal mobility through fixation of the utero-ovarian ligament to the round ligament, with plication added when the utero-ovarian ligament is elongated. An important feature of this technique is the attention given to the passage of the suture through the avascular portion of the mesosalpinx and the effort to minimize the risk of fallopian tube injury or obstruction. Although no recurrence of torsion has been observed to date following oophoropexy in the experience reported by this center, this observation should be interpreted as the experience of a single center. Larger studies with longer follow-up and assessment of fertility outcomes are required to establish the effectiveness of this technique.

Overall, current evidence supports the view that oophoropexy may play a role in reducing the risk of recurrent torsion; however, its effectiveness may depend on the technique used, the patient's anatomic characteristics, and the history of previous torsion, and the optimal fixation method has not yet been definitively established. Therefore, the introduction of surgical techniques and detailed descriptions of their implementation may facilitate the dissemination of

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surgical experience and provide a basis for comparing different approaches in future studies.

## Conclusion

Ovarian torsion is a gynecologic surgical emergency in which timely diagnosis and treatment, particularly detorsion and efforts to preserve the ovary and fallopian tube, are of great importance. Given the possibility of recurrent torsion, particularly in patients with a previous history of torsion, oophoropexy may be considered as one of the surgical approaches for preventing recurrence. The laparoscopic technique used at Sarem Women's Hospital, Tehran, is based on fixation of the utero-ovarian ligament to the round ligament. In this technique, when the utero-ovarian ligament is elongated, plication or shortening of the ligament is first performed, followed by fixation; when the length and size of the ligaments are within the normal range, direct fixation of the utero-ovarian ligament to the round ligament is performed. In addition, the suture pathway is designed to minimize the risk of fallopian tube injury or obstruction by passing through the avascular portion of the mesosalpinx while taking the position of the fallopian tube into consideration.

Given its adaptability to the length of the utero-ovarian ligament and the use of the round ligament as a fixation site, this technique may represent a potential option for preventing recurrent ovarian torsion. In patients at risk of recurrent torsion or loss of the contralateral ovary, contralateral oophoropexy may also be considered as part of this approach. Based on the experience reported at Sarem Women's Hospital, Tehran, no recurrence of ovarian torsion has been observed to date following oophoropexy using this technique. However, given the technical nature of this report and the absence of quantitative data regarding the number of patients and duration of follow-up, definitive assessment of the effectiveness of this technique requires future studies with an adequate sample size, long-term follow-up, and evaluation of clinical and fertility outcomes. Overall, a detailed description of this technique may contribute to the dissemination of the surgical experience of Sarem Women's Hospital, Tehran, in preventing recurrent ovarian torsion and provide a basis for evaluating and comparing this approach with other oophoropexy techniques in future studies.

## Ethical Considerations

In conducting this research, all ethical principles in medical and biological research were observed in accordance with the Declaration of Helsinki, and the rights, dignity, and confidentiality of the participants were protected.

## Conflict of Interests

There was no conflict of interest in this study.

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