



Review Article

Laparoscopic Ovarian Transposition Before Pelvic Cancer Treatment: Ovarian Function and Fertility Preservation

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ABSTRACT Survivors of pelvic cancer treatment live with the ramifications of pelvic radiation for many years after their cure. Several options are available to preserve ovarian function and fertility in reproductive age women undergoing pelvic radiation. Laparoscopic ovarian transposition is an under-utilized, yet fairly simple surgical procedure to relocate the ovaries away from the radiation field. Although randomized-controlled trials on the outcomes of ovarian transposition are scarce, there is a growing body of evidence on the risks and benefits of this procedure, in terms of prevention of premature ovarian failure, and potentially preserving fertility. In this review, we summarize the available data on the indications, patient selection and outcomes of ovarian transposition, as well as illustrate the technique of the procedure. *Journal of Minimally Invasive Gynecology* (2017) 24, 28–35 Published by Elsevier Inc. on behalf of AAGL.

Keywords: Laparoscopy; Oophoropexy; Ovarian transposition; Ovariopexy; Pelvic malignancy

The American Cancer Society estimates that more than 15.5 million Americans with a history of cancer are living in the United States, and this number is expected to exceed 20 million over the next decade [1]. Two of the most prevalent cancers in women are uterine (757 000) and colorectal (727 000) cancers [1]. Increasing numbers of cancer survivors are confronted with morbidity secondary to exposure to chemotherapy and radiation treatments. For reproductive-aged women, the reserve of primordial follicles in the ovary is fixed and declines with age at a fairly predictable rate (Fig. 1) [2]. Thus, any injury to the ovaries reduces this pool and accelerates a woman's reproductive aging.

The American Society of Clinical Oncology and the National Comprehensive Cancer Network recommend offering ovarian transposition as an option for optimizing fertility preservation in patients with cancer [3,4].

The authors declare that they have no conflict of interest.

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Preserving ovarian function by sparing the ovaries from the direct deleterious effects of radiation can be accomplished with this procedure, which repositions the ovaries out of the field of radiation. The procedure is indicated for women of reproductive age who are undergoing pelvic or lower abdominal radiation therapy [5]. Recently, less invasive laparoscopic and robotic approaches to ovarian transposition have been successfully performed and described.

Methods

Sources

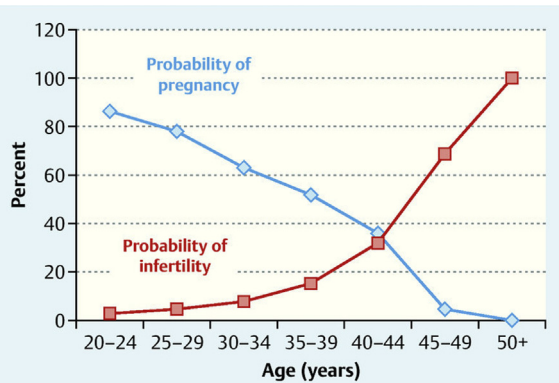
We conducted an electronic search of all research articles published in English without time restriction, using PubMed and Cochrane databases for studies of ovarian transposition. The text words used in the search included “ovarian transposition,” “ovariopexy,” and “oophoropexy.” References from articles were reviewed, and pertinent articles and reviews were used for the discussion.

Study Selection

The authors identified the appropriate articles for review. Of the 79 studies initially identified, 55 were selected after

Fig. 1

The reserve of primordial follicles in the ovary is fixed and declines with age at a fairly predictable rate. Graph obtained from Reference [2]; permission from Thieme.



limiting the review to clinical trials and case reports focusing on ovarian transposition in the context of cancer; 24 articles focusing on endometriosis and adnexal torsion were excluded. Given the rarity of ovarian transposition and the scarcity of data available from large, prospective, randomized trials, selection of studies was not limited by the design or the number of patients in the studies. We report the available data and describe the indications for ovarian transposition, the most commonly reported surgical techniques, the potential complications associated with this procedure, and prognoses and outcomes in the context of ovarian function and fertility preservation for patients who have the procedure done before undergoing pelvic radiation and chemotherapy.

Results

Indications for Ovarian Transposition

Female patients with gynecologic cancers, including cervical cancer, vaginal cancer, uterine cancer, and ovarian dysgerminomas, are candidates for ovarian transposition [6]. Ovarian transposition has also been used in nongynecologic cancers of the pelvis, including osteosarcoma, rhabdomyosarcoma, Hodgkin's lymphoma, anorectal carcinomas, and medulloblastoma before radiation therapy [7–13]. Cases of patients ranging from ages 11 to 40 have been reported in the literature. Women older than 40 years already have decreased ovarian reserve and are at higher risk for ovarian failure even with ovarian transposition [14]. Menopausal women and women at risk of developing ovarian metastases are inappropriate candidates for ovarian transposition. Additionally, women who will be receiving chemotherapeutic agents with a low probability of gonadotoxicity are candidates for the procedure. At gonadotoxic levels, systemic chemotherapy is deleterious to the ovaries, regardless of the anatomic location.

Surgical Techniques

Two surgical techniques for laparoscopic ovarian transposition have been described in the literature: lateral and medial approaches. The uterus can be used as a shield from radiation in certain cancers like Hodgkin's lymphoma. For these patients, medial ovarian transposition has been described [15–18]. However, in a study comparing medial and lateral ovarian transposition in patients receiving pelvic irradiation for Hodgkin's disease, lateral ovarian transposition resulted in better outcomes [19]. Seventeen patients of childbearing age received total lymphoid irradiation, including pelvic and inguinal nodes. Fifteen of 17 patients underwent prophylactic bilateral oophorectomy during staging laparotomy: 10 underwent lateral transposition and 5 had midline fixation. Patients were followed for reproductive and ovarian function by menstrual history and serum hormonal assays for a minimum of 3 years. In 13 patients who remained in complete remission, normal cyclic ovarian activity was found in 7 of 9 patients after lateral transposition (including 1 pregnancy) but only in 1 of 4 cases after medial transposition. The authors concluded that lateral transposition should be preferred if ovarian protection is required before pelvic radiation [19].

Descriptions of the laparoscopic technique and variations using the lateral approach have been reported in the literature [20–22]. A video depicting the technique is also available for viewing [23]. The procedure is performed under general anesthesia with the patient in the Trendelenburg position. Because of the final destination of the transposed ovaries outside of the pelvic cavity, consideration should be given to higher trocar placement that commonly used in pelvic laparoscopy. The location of the midline incision for the optical trocar varies in the literature, with some articles reporting the incision 5 cm above the umbilicus and others reporting the Lee-Huang point, located 3 to 4 cm above the umbilical line at the midpoint between the umbilicus and the xyphoid process (Fig. 2) [21]. A Veress needle is then inserted at the umbilicus for insufflation with carbon dioxide to achieve adequate pneumoperitoneum, and the primary trocar is then inserted at the umbilicus, followed by the optical trocar at a more cephalad location.

Alternatively, open (Hasson) entry at the umbilicus can be performed, followed by the subxiphoid trocar insertion under laparoscopic guidance. The endoscopic camera is introduced through the subxiphoid port. A secondary trocar is placed in the midline at the umbilicus, in lieu of a suprapubic trocar, because of the higher region for operating outside of the pelvis, and 2 secondary trocars are placed in the paramedian lines at the same level of the umbilicus, which is higher than the typical lower quadrant trocar insertion for other gynecologic procedures. If a midline approach is chosen as described above, the surgeon and the assistant will be facing the pelvis during the procedure, with a monitor at the foot of the operating table. Alternatively, 2 ipsilateral ports can be used instead

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