

Surgical management of tubal disease and infertility

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Abstract

With the advance in assisted reproductive technology (ART), the role of reproductive surgery as the primary treatment of infertility has been questioned. Tubo-peritoneal factor is common, and accounts for 30–40% of female infertility. The pathology of tubal disease ranges from peritubal adhesion, proximal and/or distal tubal blockage, hydrosalpinx to previous sterilization. In tubo-peritoneal infertility, reproductive surgery remains an important option and is complementary to ART. It should be considered as the first-line treatment if a good result is expected when the pathology is amendable or if untreated will adversely affect the results or increase the risks of ART. The success of reproductive surgery depends on careful patient selection using proper investigative tools, performed in units with expertise following microsurgical principles.

Keywords peritubal adhesion; reproductive surgery; sterilization; tubal disease

Introduction

Tubal and peritoneal factors accounts for 30–40% of female infertility. Some tubo-peritoneal pathologies are amendable to surgery. Nevertheless, with recent advances in assisted reproductive technology (ART) producing pregnancy rate as high as 50%, the role of reproductive surgery as the primary treatment for infertility has been questioned. On the other hand, with careful patient selection using proper investigative tools, performed in units with expertise following the microsurgical principles, the result of therapeutic surgery can be superior to, or at least as good as that of In-vitro fertilization (IVF). More importantly, surgery offers a permanent cure to the underlying pathology. Patients may have repeated attempts to conceive naturally without being subjected to the complications of ovarian hyper-stimulation syndrome and multiple pregnancies from ART. Therefore, reproductive surgery may still be considered a primary treatment on its own or complementary to IVF in the management of female infertility.

The development of operative endoscopy evokes a revolutionary change in reproductive surgery. Laparoscopic surgery are minimally invasive with significantly less post-operative pain, hastened recovery and fewer cardiopulmonary complications compared with traditional laparotomy. The quality of the

laparoscopic image has improved tremendously with fibreoptic technology, improved camera and light system, which together allow better visualization. In addition, the availability of more versatile instruments allows better exposure, easier identification of pelvic anatomy and more precise surgery. The feasibility of laparoscopic suturing also allows more and more cases of reproductive reconstructive surgery to be carried out laparoscopically. Besides, laparoscopic surgery can be done on a day case basis with lower cost and shorter hospitalization.

Apart from being an alternative choice for women with tubo-peritoneal infertility, reproductive surgery may also be a complementary treatment option to ART in case of hydrosalpinges, submucosal fibroids and endometrial polyps. Women should be well informed about the option of therapeutic surgery in case of tubo-peritoneal infertility before formulating the management plan.

Causes of tubal disease

The fallopian tubes are essential for natural fertility. They have an important role in picking up ova and transporting ova, sperms, and the embryos. They are also essential for sperm capacitation and ovum fertilization. However, the fallopian tubes are vulnerable to infection, endometriosis and surgical damage. Tubal blockage can occur at the proximal, middle or distal portions of the tube, or involving both the proximal and distal portions of the tube (bipolar tubal disease). Pelvic inflammatory disease is a major cause of tubal subfertility. When salpingitis involves the luminal endothelium, ciliated cells lining the ampullary and infundibular portions of the lumen of the fallopian tube are destroyed. These ciliated cells, responsible for the transport of the gametes and embryo to their proper location, often do not recover after resolution of the infection. Loss of ciliated cells, post inflammatory fibrosis and pelvic adhesion impair normal function of the fallopian tubes and can cause occlusion of the tubes in more severe cases. Chlamydial trachomatis accounts for around 50% of acute pelvic inflammatory disease in developed countries. Chlamydial salpingitis is usually asymptomatic and has a long incubation period. A prolonged, untreated infection is more likely to cause permanent endothelial damage. Gonorrhoea is another common infection, especially in young women of low socioeconomic groups. It may presents as pelvic inflammatory disease, disseminated disease with systemic manifestations, or it may be totally asymptomatic. Besides, co-infection with chlamydia may occur up to 30–50% of cases. Despite successful antibiotic treatment, the risk of persistent tubal damage leading to infertility in laparoscopically confirmed PID is approximately 8–12%. This risk doubles with each subsequent episode of PID so that infertility affects approximately 24% of patients following two documented episodes of PID, and approximately 54% of patients after three episodes.

Prior abdomino-pelvic surgery, endometriosis, post-pregnancy sepsis, previous sterilization and pelvic inflammatory disease have all been implicated in causing tubal blockage. The causes of tubal infertility are listed in [Table 1](#).

Assessment of the fallopian tubes

There are various methods for assessing the tubal patency. Traditionally, hysterosalpingogram (HSG) and laparoscopy with

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dye are the two widely used methods for assessing the patency of the tubes. The National Institute for Clinical Excellence (NICE) recommends that women who are not known to have comorbidities (such as pelvic inflammatory disease, previous ectopic pregnancy or endometriosis) should be offered HSG because this is a reliable test for ruling out tubal occlusion, and it is less invasive and makes more efficient use of resources. Although HSG is regarded as safe, the procedure exposes women to ionizing radiation and potentially allergic reaction to contrast media. Where appropriate expertise is available, screening for tubal disease using hysterosalpingo-contrast-ultrasound (HyCoSy) may also be considered as an alternative because it has comparable accuracy to that of HSG, but avoids radiation and allows simultaneous assessment of the uterus and ovaries. Laparoscopy with dye is recommended in women who have increased likelihood of pelvic pathology on account of a history of pelvic inflammatory disease, pelvic surgery and significant pelvic symptoms such as severe dysmenorrhoea and dyspareunia.

Fertiloscopy, also known as transvaginal hydrolaparoscopy (THL) is a relatively new approach, which permits direct visualization of the pelvic organs and confirm tubal patency under local anaesthesia or sedation. However, the procedure is not without risk, bowel and rectal injuries following fertiloscopy have been reported.

However, tubal patency does not necessarily equate to normal tubal function. We currently judge the severity of tubal damage mainly by tubal patency and the extent of peritubal adhesion, as determined by the American Fertility Scoring System, rather than by the functional status of the tubal mucosa. Salpingoscopy or falloscopy permits examination of the tubal mucosa, which provides important information on the function of tubes. Falloscopy is a microendoscopy of the fallopian tube from the uterotubal ostium to the fimbriae by a transcervical approach. It allows direct visualisation of the entire fallopian tube lumen. However, it has limited clinical application partly because the procedure is expensive and partly because the quality of image obtained is at best mediocre.

Cause of tubal blockage related to the site of obstruction

Site of obstruction	Causes
Proximal tubal blockage	<ul style="list-style-type: none"> • Mucus, polyps and intramural debris • Pelvic inflammatory disease • Salpingitis isthmica nodosa • Endometriosis • Obliterative fibrosis • Intrauterine adhesion
Midsegment tubal blockage	<ul style="list-style-type: none"> • Post-surgery <ul style="list-style-type: none"> ◦ Previous sterilization ◦ Segmental salpingectomy for ectopic pregnancy • Congenital segmental absence
Distal tubal blockage	<ul style="list-style-type: none"> • Pelvic inflammatory disease • Post-surgical adhesion • Endometriosis

Table 1

The measurement of chlamydial antibodies in serum has been used in the screening of infertile women for tubal disease. High serum titres of chlamydial antibodies are associated with tubal damage resulting from previous pelvic inflammatory disease. However, it cannot locate the site of damage nor assess the extent of tubal disease, so it cannot completely replace laparoscopy in the diagnosis of tubal disease.

The various tests available to assess the tubal patency and function are summarized in [Table 2](#).

Tubal disease and surgery

Peritubal adhesiolysis

Pelvic adhesions are often associated with tubal disease. Peritubal adhesion limits tubal mobility, create a physical barrier for ovum pick-up and gametes transport within the fallopian tube. Periovarian adhesion may inhibit ovulation. The effect of tubal and ovarian adhesions on fertility was investigated by Tulandi et al. (1990), in an early controlled study which evaluated the effect of salpingo-ovariolysis on subsequent fertility. The cumulative pregnancy rate in the group that underwent salpingo-ovariolysis was three times higher than in the non-treated group (32% vs 11% at 12 months and 45% vs 16% at 24 months). This study confirmed that pregnancies can occur spontaneously in women with periaidnexal adhesions and patent tubes, but also established the significant therapeutic value of salpingo-ovariolysis in such cases.

The overall intrauterine pregnancy rates following adhesiolysis vary from 21 to 62%. The therapeutic outcome of adhesiolysis will be affected by the extent of adhesion and the type of adhesion (filmy or dense), the presence of inflammation and the degree of tubal disease. In patient with filmy adhesion, the cumulative pregnancy rate after adhesiolysis was 68% at 24 months (Oelsner et al., 1994). It is obviously better than the cumulative pregnancy rate after five IVF cycles reported by Tan et al. (1992, 51%) and by Guzick et al. (1986, 49%). Therefore, it is no doubt that adhesiolysis is of benefit to women with filmy adhesions. However, the pregnancy rate fell sharply to 19% in women who underwent adhesiolysis for dense adhesion (Oelsner et al., 1994). Thus, women with dense pelvic adhesion may be more suited to have IVF treatment.

Studies have shown a reduced amount of de novo adhesion formation following laparoscopy when compared with laparotomy. There are two possible explanations. Firstly, laparoscopy avoids tissue desiccation which predisposes to inflammation and subsequent adhesion formation. Secondly, laparoscopy eliminates manual tissue handling leading to inadvertent serosal damage which is a pre-requisite for adhesion formation. Laparoscopic lysis of dense adhesions can be occasionally difficult, especially for thicker, vascular, dense adhesions involving the bowel. In such cases, it may be necessary to convert laparoscopy to laparotomy and lysis of adhesion with the use of microsurgical techniques including gentle tissue handling and frequent irrigation to avoid desiccation.

Proximal tubal disease

Proximal tubal blockage occurs in 10%–25% of women with tubal disease. The narrow lumen, its thick muscular wall, along with the physiological constrictor mechanism in the proximal tube makes it prone to blockage. The blockage may be

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