

The Surgical Approach for Polycystic Ovarian Syndrome

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Abstract

Polycystic ovarian syndrome (PCOS) affects one in five women in the reproductive age. Young ladies who are not married or not seeking pregnancy have been treated successfully with the combined oral contraceptives. However, once pregnancy is desired, these women are usually faced with sub-fertility due to anovulation. This problem is usually by passed by ovulation induction with or without assisted reproductive technologies. On the other hand, the surgical approach for PCOS patient seems not only logic to free the woman from the causative factor of her infertility which is the polycystic ovaries, but it is also associated with better reproductive outcome when compared to other options.

Keywords: Laparoscopy; 2-Ports; Ovarian; Polycystic; Drilling; Infertility; Reserve; Adhesions; Joules

Abbreviations

PCOS: Polycystic Ovarian Syndrome; LOD: Laparoscopic Ovarian Drilling

Introduction

Stein and Leventhal who first defined polycystic ovarian syndrome (PCOS) reported the first successful wedge resection of the ovaries to treat such condition in 1935 (Figure 1). Despite the ambiguity of the mechanism behind the reversal of the endocrinological dysfunction by this surgery, the concept of ovarian surgery for PCOS continued to evolve since then. Laparoscopic ovarian drilling (LOD) was, then, introduced by Gjonnaess in 1984 as a less invasive alternative, and it is now considered a safe and effective surgical treatment of the chronic anovulation and infertility associated with PCOS. The purpose of this review is to show the evidence behind the above statement with some details of its performance and mechanism of action.

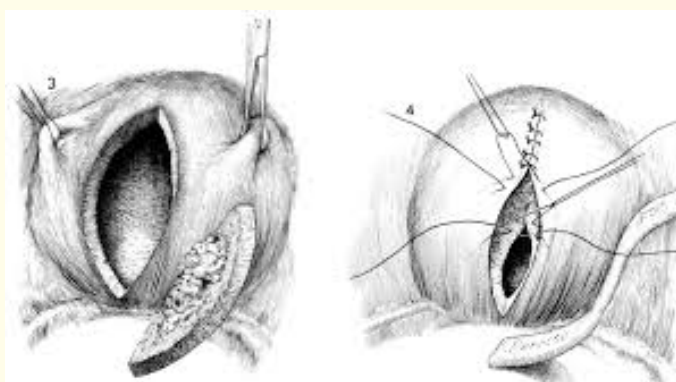


Figure 1: This is how wedge resection used to be done through laparotomy.

Definition

The most popular definition of PCOS is the one introduced by the ESHRE/ASRM-sponsored PCOS Consensus Workshop Group in 2003 and has been known as the Rotterdam Criteria, which requires at least 2 of 3 features for diagnosis: Chronic anovulation, clinical and/or biochemical signs of hyperandrogenism, or polycystic ovaries on ultrasound (Figure 2). Based on this criteria PCOS prevalence can be as high as 19.9% [1].

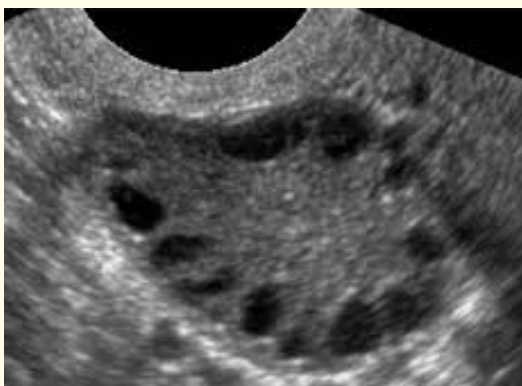


Figure 2: This is the typical appearance of PCO on vaginal ultrasound.

Indication

In the presence of infertility, Laparoscopic ovarian drilling is indicated in clomiphene resistant cases and as an alternate approach to gonadotropin therapy. LOD is associated with high pregnancy rates of around 60 % within 12 months of surgery, and peak pregnancy rate is seen around 6 - 9 months after surgery.

Treatment patients when followed sonographically show spontaneous ovulation or much more improved sensitivity to Clomiphene Citrate and lesser chances of multiple pregnancies. Overall, LOD is simple procedure with lots of benefits for fertility preservation, but it should be judiciously employed with strict selection protocol [2].

How does it work?

The exact mechanism of induction of ovulation by LOD is not understood. This may be attributed to combination of local and central effects [3]. It has been suggested that physical opening of the sub-capsular cysts leads to the removal of androgen-containing follicular fluid from the ovarian environment, thus lowering the androgen content of the ovaries. The total and free testosterone is decreased by 40 - 50% of the preoperative levels. Moreover, there is an improvement in the intraovarian stromal blood flow that may facilitate other postoperative changes such as increased production of insulin-like growth factor-I (IGF-I) which interacts with FSH leading to follicular development.

More precisely, the limited thermal damage of the PCOS ovaries by this surgery causes an immediate reduction in ovarian hormones associated with increased serum levels of pituitary hormones. This is a reflection of restoration of pituitary function induced by a corrected ovarian feedback. Rising FSH levels will result in ovarian follicle growth; and overtime LH levels will decrease as its pulse amplitude decreases.

There are claims that LOD inhibits Inhibin and stimulates the production of Gonadotropin Surge Attenuating Factor (GnSAF) leading to increased FSH and suppression of LH, respectively. More work is needed to confirm such theories.

Regardless of the exact mechanism, it seems that there are corrective endocrine changes occur rapidly after LOD and are sustained for years.

Continuous follicle growth in subsequent cycles after ovarian surgery indicates a favorable environment with less androgen, lower LH levels and reduced follicle excess number leading to menstrual regularity and spontaneous ovulation with higher pregnancy rate.

Doppler studies showed decreased ovarian blood flow velocities postoperatively, which may explain the abolished risk of ovarian hyperstimulation syndrome in women with PCOS after LOD.

How is it done?

2 or 3 ports laparoscopic access using monopolar hook electrode, needle electrode or the harmonic scalpel with a grasper is all what you need to perform this day surgery (Figure 3). The number of punctures is empirically chosen depending on the ovarian size, and its surface area. Ovarian drilling should be perpendicular to the surface and at least 5 mm away from the hilum to avoid bleeding. The number of holes to be drilled depends upon the size of the ovaries and the sonographic appearance which had been noted during the preoperative work-up. In moderately enlarged ovaries, about 10 - 12 holes in each ovary are sufficient but more may be required in voluminous ovaries. The insulated monopolar electrode of 1.5 - 2 mm in diameter with a conical tip is inserted perpendicular to the ovary for about 3 - 4 mm, applying 40 W of coagulating current for about 3-5 seconds [4]. The total thermal dose in joules applied on each ovary is calculated as:

40 Watts X no. of seconds per puncture X no. of punctures.



Figure 3: This is a 3 ports laparoscopy; using a grasper and a monopolar needle electrocoagulation.

A safe and effective thermal dose is in the range of 640 to 1600 joules per ovary; depending on ovarian volume. Large size ovaries require higher thermal dose. Increasing the number of punctures raised concerns about the occurrence of postoperative pelvic adhesions and the effects on ovarian reserve which led to limiting the number of punctures to 4. A prospective comparative study found that the extent of ovarian tissue damage was limited, ranging from 0.4% after 4 to 1% after 8 punctures, using 40 W for 5 seconds.

Unfortunately, restrained approach of ineffective low thermal dose has led recently to drop of the pregnancy rate by 33% in recent publications when compared to original studies performed before 2005; which is my observation from the data collected by S Mitra and coauthors [5]. Hence, I do suggest going back to Gjonnaess original description which stated that ovulation occurred more frequently if ten or more punctures were performed. His results were the best ever, with restoration of ovulation in 92 % of patients and a pregnancy rate of up to 80 %.

2-ports LOD

Over the past 2 decades, the primary author has performed more than 500 LODs, 80% of them were accomplished with 2 ports conventional laparoscopy (unpublished data). These are usually placed at the umbilicus for the 10 mm camera port, and supra-pubic for the 5 mm instrument port. Uterine manipulator or the same uterine canula used for chromopertubation at the same setting is also used to support the ovary with the uterus and keeping it away from the bowels to avoid any thermal injury. Foley catheter is maintained throughout the procedure to avoid bladder injury. While an assistant is holding the camera, the operator’s left hand is holding the uterine manipulator to stabilize the ovary with the uterus and his right hand is performing the drilling on the ovary using the needle or hook monopolar electrode through the 5 mm supra-pubic port. The only complication encountered was that of a case of uterine fundus perforation due to the use of an old rigid curved uterine manipulator that is not in use nowadays. The injury resolved spontaneously with no adverse outcome.

All procedures are concluded by ensuring the presence of appropriate hemostasis and by performing a pelvic lavage to cool the ovarian surface and reduce postoperative adhesions.

Possible Related Complications

1. Theoretically some claimed that the ovaries are being “fried” in this procedure. Realistically, they are not. There is no concrete evidence that LOD causes reduced ovarian reserve.
2. Although post-operative adhesion has been claimed in some reports. However, all these publications were relatively old, while current reported incidence is very low and only few filmy peri-ovarian adhesions were described.

Conclusion

LOD is currently recommended as a successful treatment in women with PCOS. Its advantages are summarized in the following table:

General Post-operative Advantages	<ol style="list-style-type: none"> 1. Normalizes the hormonal environment 2. Resumes regular cycles with spontaneous ovulation 3. Avoids cycle monitoring and frequent visits 4. Improves the outcome of ovulation induction 5. Prevents ovarian hyperstimulation syndrome 6. Evades multiple gestation 7. Offers a high pregnancy rate
When <i>in vitro</i> fertilization is performed after LOD, it has the additional benefit of	<ol style="list-style-type: none"> 1. Better response to gonadotropin stimulation 2. Reduced number of ampoules used 3. Reduced cycle cancelation rate 4. Decreased miscarriage rate

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