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# SECOND-LOOK LAPAROSCOPY IN FAILED LAPAROSCOPIC OVARIAN DRILLING

Thesis

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By

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# INTRODUCTION

Between the 1930s and the early 1960s surgical treatment of polycystic ovary syndrome (PCOS) was the only treatment available. The original procedure was the wedge resection, which required a laparotomy and removal of up to 75% of each ovary, and often resulted in extensive pelvic adhesions *(Donesky and Adashi, 1995).*

The modern-day minimal-access alternative to gonadotropin therapy for clomifene-resistant PCOS is laparoscopic ovarian surgery.Laparoscopic ovarian surgery has therefore, replaced ovarian wedge resection as the surgical treatment for clomifene resistance in women with PCOS *(Strowitzki, 2005).*

It is free of the risks of multiple pregnancy and ovarian hyperstimulation and does not require intensive ultrasound monitoring. In addition, laparoscopic ovarian surgery is a useful therapy for anovulatory women with PCOS who need a laparoscopic assessment of their pelvis or who live too far away from the hospital to be able to attend for the intensive monitoring required in gonadotropin therapy. The management of anovulatory infertility in PCOS has traditionally involved the use of clomifene

citrate and then gonadotropin therapy or laparoscopic ovarian surgery in clomifene-resistant patients *(Parsanezhad et al., 2004)*.

The principles of therapy are to optimize health before commencing therapy (e.g. weight loss for those who are overweight), and then to induce regular unifollicular ovulation whilst minimizing the risks of ovarian hyperstimulation syndrome (OHSS) and multiple pregnancy. Weight loss improves the endocrine profile, the likelihood of ovulation and a healthy pregnancy, and the response to every type of ovulation-induction therapy *(Api et al., 2005)*.

# AIM OF THE WORK

This work aims to evaluate ovarian adhesions after LOD, in order to help in choice of the ideal way in the management of PCOs patients.

# Polycystic ovary syndrome

In 1935, Stein and Leventhal provided the first description of PCOS noting varying degrees of enlarged ovaries, obesity, hirsutism, and chronic anovulation in obese women seeking treatment for infertility. They suggested surgery (wedge resection of the ovaries) for management of the condition, resulting in restoration of ovulation in the majority of cases *(Azziz et al., 2009)*.

## Historical background

The first notion related to PCOS dates back to 1721 when Antonio Vallisineri described the anatomical features of this condition. Chereau in 1845 clearly described gross sclerocystic changes of the ovary and linked them with dysfunctional uterine bleeding. Early in the 20th century, Stein and Leventhal were the first to define the association of polycystic ovaries with amenorrhoea, hirsutism and obesity. The diagnosis of PCOS was based on the clinical and histological features. In the 1970s, after the development of immunoassays of androgens and gonadotropins, the diagnosis of PCOS was based more on biochemical features. In the late 1970s, improvement in ultrasound technology provided a non-

invasive technique for assessment of ovarian morphology. In 1981, Swanson and co-workers were the first to describe the ultrasound findings associated with PCOS. Ultimately, the advent of the high-resolution transvaginal ultrasonography allowed a more precise means of assessment of the internal morphological features of the polycystic ovaries, and has gained an increasing importance in the diagnosis of PCOS. Until recently, in Europe, the diagnosis of PCOS was primarily based on ovarian ultrasound morphology. In North America, the diagnosis was based on the 1991 National Institute of Health criteria, which emphasised on chronic anovulation and hyperandrogenism. In 2003, new diagnostic criteria were established during the Rotterdam ESRE/ASRM consensus workshop. The various stages of the historical evolution of the diagnosis of PCOS are summarised in (Table 1) *(Saad Amer, 2009)*.

Before 1930, there was no mention in the literature of any treatment for infertility associated with PCOS. In 1930, Stein and Leventhal were the first to carry out ovarian wedge resection (OWR), which was later adopted as the standard method of induction of ovulation in PCOS women. For many years, OWR remained the only available treatment for infertile

women with PCOS. In the 1960s, with the introduction of medical ovulation induction (clomiphene citrate (CC) and gonadotropins), OWR was largely abandoned due to its associated morbidity. Instead, CC became the standard treatment in anovulatory PCOS. In the late 1960s, with the development of operative laparoscopy, there was a renewed interest in the surgical treatment of PCOS carried out laparoscopically. Several operative techniques were introduced for ovulation induction in CC-resistant PCOS, including ovarian biopsy, ovarian diathermy and ovarian laser treatment **(Table 2)** ***(Saad Amer, 2009)***.

**Table (1):** Summary of histological evolution of the diagnosis of PCOS *(Saad Amer, 2009)*.

| Date | Main development |
|---|---|
| 1721 | Antonio vallisineri described the anatomical features |
| 1845 | Chereau linked anatomical features with dysfunctional uterine bleeding |
| 1920s | Stein & Leventhal linked anatomical features with amenorrhoea, hirsutism and obesity |
| 1930s | Diagnosis based on clinical and histological features |
| Early 1970s | Biochemical diagnosis (radioimmunoassay) |
| Late 1970s | Transabdominal ultrasound diagnosis (features described by Swanson) |
| 1990s | Transvaginal ultrasound diagnosis (old European criteria) |
| 1991 | NIH criteria (old North American criteria) |
| 2003 | Rotterdam criteria (new European & American criteria) |

**Table (2):** Summary of histological evolution of the ovulation induction in women with anovulatory infertility associated with PCOS *(Saad A K Amer; 2009).*

| Date | Main development |
|---|---|
| Before 1930 | No treatment for infertility |
| 1930 | Bilateral ovarian wedge resection |
| 1961 | Clomiphene citrate |
| 1962 | Human menopausl gonadotropin |
| 1967 | Laparoscopic ovarian biopsies |
| 1978 | Laparoscopic ovarian drilling (diathermy) |
| 1988 | Laparoscopic ovarian drilling (laser) |

## Definitions

Stein and Leventhal provided the first description of PCOS noting varying degrees of enlarged ovaries, obesity, hirsutism, and chronic anovulation *(Stein and Leventhal 1935)*.

With the ability to measure hormone concentrations, the diagnostic criteria were revised to include inappropriate gonadotropin secretion and hyperandrogenemia *(Raj et al., 1978)*. Development of ultrasonography shifted attention to ovarian morphology *(Adams et al., 1986)*. However, with recognition of the role of insulin resistance/hyperinsulinemia in PCOS, the development of methods to measure insulin sensitivity in vivo, and awareness of the higher risk of these patients for abnormalities of carbohydrate metabolism, and possibly cardiovascular complications, focused attention on the metabolic abnormalities of the disorder.

Previously, two definitions of PCOS were in widespread use (Table 3). The first arose from the proceedings of an expert conference sponsored in part by the National Institute of Child Health and Human Disease (NICHD) of the NIH on April 16–18, 1990.

During the meeting all participants were surveyed regarding their perception of what features formed part of PCOS, and Drs. Zawadzki and Dunaif summarized these findings in the meeting proceedings *(Zawadski and Dunaif, 1992)*. They concluded that the major criteria for PCOS "should include (in order of importance):

i) Hyperandrogenism and/or hyperandrogenemia.
ii) Menstrual dysfunction.
iii) Exclusion of other known disorders.

This survey identified PCOS as an androgen excess disorder of exclusion, with an ovarian etiology and/or consequences.

Another expert conference was convened in Rotterdam, The Netherlands, May 1–3, 2003 sponsored in part by the European Society for Human Reproduction and Embryology and the American Society for Reproductive Medicine.

The meeting proceedings recommended that PCOS be defined when at least two of the following three features were present:

[i] Oligo and/or anovulation.
[ii] Clinical and/or biochemical signs of hyperandrogenism.
[iii] Polycystic ovaries.

These criteria also recognize that other androgen excess or related disorders should be excluded before assigning the diagnosis of PCOS. *(The Rotterdam ESHRE/ASRM-sponsored PCOS consensus workshop group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS); 2004)*.

Whether these definitions are consistent with currently available data, and whether they are overly narrow or unjustifiably broad, will be explored in the following sections.

However, what is clear is that the impact of using a broader definition (e.g., Rotterdam 2003) compared with more restrictive criteria (e.g., NIH 1990) can lead to a significant increase in the population considered to be affected *(Broekmans et al., 2006)*.

Whether this expansion in the number of affected individuals more accurately reflects the true prevalence of the disorder or whether it is a gross overestimation remains to be determined, and was of concern to the AE-PCOS Society and its appointed Task Force. (Azziz et al., 2009).

### Oligo- or anovulation:

Ovulation occurs less than once every 35 days *(Azziz et al., 2009)*.

### Hyperandrogenism:

Clinical signs include hirsutism, acne, alopecia (male-pattern balding) and frank virilization. Biochemical indicators include raised concentrations of total testosterone and androstendione, and an elevated free androgen index that entails the measurement of total testosterone and sex hormone binding globulin (SHBG). However, the measurement of these biochemical markers for hyperandrogenism has proved markedly inconsistent due to problems with various assays *(Azziz et al., 2009)*.

### Polycystic ovaries:

The presence of 12 or more follicles in either ovary measuring 2–9 mm in diameter and/or increased ovarian volume (>10 mL). Clearly, according to the Rotterdam diagnostic criteria, the majority of women with PCOS can be diagnosed without the need for laboratory examinations. The Rotterdam definition of polycystic ovaries cannot be used in women tacking oral contraceptive pills, as they modify ovarian

morphology. Although, increased stromal volume is a common feature of PCO, it was not included in the definition for lack of simple means of quantification and because ovarian volume has been shown to be a good surrogate *(Azziz et al., 2009)*.

**Table (3):** All possible phenotypes based on the presence of oligo-anovulation, hyperandrogenemia, hirsutism, and polycystic ovary syndrome (PCOS) *(Azziz et al., 2009)*.

| | Potential phenotypes | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** | **L** | **M** | **N** | **O** | **P** |
| Hyperandrogenemia | + | + | + | + | - | - | + | - | + | - | + | - | - | - | + | - |
| Hirsutism | + | + | - | - | + | + | + | + | - | - | + | - | - | + | - | - |
| Oligo-anovulation | + | + | + | + | + | + | - | - | - | + | - | - | + | - | - | - |
| Polycystic ovaries | + | - | + | - | + | - | + | + | + | + | - | + | - | - | - | - |
| NIH criteria | √ | √ | √ | √ | √ | √ | | | | | | | | | | |
| Rotterdam 2003 criteria | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | |
| AE-PCOS 2006 criteria | √ | √ | √ | √ | √ | √ | √ | √ | √ | | | | | | | |

## Prevalence

PCOS is the most common female endocrinopathy, affecting 5–10% of women in their reproductive years. Although polycystic ovaries can be found in approximately 20% of the female population, they are not necessarily associated with the typical symptoms, which may be expressed at some time during the fertile life span when provoked by, for example, weight gain or insulin resistance. PCOS is associated with 75% of all anovulatory disorders causing infertility, with 90% of women with oligomenorrhoea, more than 90% with hirsutism and more than 80% with persistent acne *(Adam et al., 1986; Humborg et al., 1996)*.