

# TRANSVAGINAL HYDROLAPAROSCOPY- NEW METHOD FOR INFERTILE PATIENTS WITH POLYCYSTIC OVARY SYNDROME

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**Abstract:** *Polycystic ovary syndrome is an accumulation of endocrine changes that associates oligo-amenorrhea, obesity, hirsutism, androgen excess and resistance to insulin. Ovarian drilling can be done through classical laparoscopy and by transvaginal hydrolaparoscopy - minimally invasive surgical method. We performed a meta-analysis of eight studies conducted between 2003-2011, which include a total of 350 infertile patients undergo transvaginal hydrolaparoscopy. Reviewed studies have demonstrated a 49.1% rate of pregnancy after getting a transvaginal hydrolaparoscopy similar to pregnancy rate after laparoscopic ovarian drilling- 58.5%. In conclusion, we can say that transvaginal hydrolaparoscopy is a new method of diagnosis and treatment for infertile patients with micro polycystic ovary syndrome.*

**Key words:** *transvaginal hydrolaparoscopy, laparoscopy, polycystic ovary syndrome, ovarian drilling.*

## 1. Introduction

Infertility is defined as the absence of pregnancy after one year of unprotected sexual contact and affects approximately 15% of couples of childbearing ages [2,4]. The main causes of infertility are male factor, ovulatory dysfunction or mechanical factors (most frequently the tube and rarely the uterus). Oligoanovulation is present in PCOS (polycystic ovary syndrome) as well as in ovarian dystrophies. Polycystic ovary syndrome represents an accumulation of endocrine changes that associates oligo-

amenorrhea, obesity, hirsutism, androgen excess and resistance to insulin [2].

Ovary resection was the first method described in the treatment of PCOS, but was abandoned due to the risk of developing pelvic adhesions. This type of intervention has been replaced by induction of ovulation with clomiphene and gonadotropins. Despite its effectiveness, treatment with gonadotropins has its complications, which could lead to the development of ovarian hyper stimulation syndrome or multiple pregnancies. The method is also cost ineffective, time consuming and requires

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intensive monitoring. Laparoscopic surgery, consisting in ovarian drilling may avoid, reduce or facilitate the action of gonadotropins and improve the induction of ovulation [28]. Ovarian drilling can be done through conventional laparoscopy and by transvaginal hydrolaparoscopy - minimally invasive surgical method.

## 2. Objective of the study

The purpose of this study is to analyze the advantages and disadvantages of minimally invasive approach to female genital tract, namely, the transvaginal hydrolaparoscopy, for micro polycystic ovary syndrome treatment and also the rate evaluation of obtaining a pregnancy after transvaginal hydrolaparoscopy.

## 3. Material and method

We performed a systematic review of eight studies conducted between 2003-2011 and we include in this review a total of 350 infertile patients that underwent transvaginal hydrolaparoscopy. The studies were conducted in different countries (Japan, USA, China, Iran, Italy, France, Belgium).

## 3. Results

The reviewed studies demonstrated a 49.1% rate of pregnancy after a transvaginal hydrolaparoscopy similar to pregnancy rate after laparoscopic ovarian drilling (58.5%), resulting in Campo study.

*Overview of the studies that evaluate the pregnancy rate after THL* Table 1

Authors	Year	Patients number with THL	Pregnancy rate after THL
Casa [6]	2003	28	46,4%
Fujiwara [11]	2003	36	55,5%
Moore [26]	2003	97	24%
Elkelani [9]	2005	30	83%
Ghasemzad [12]	2007	30	26,7%
Gordts [19]	2009	33	76%
Poujade [31]	2011	74	63%
Yang [40]	2011	22	18,2%
		<b>n = 350</b>	<b>49,1%</b>

Other recent studies published since 2005 regarding access and complications of transvaginal hydrolaparoscopy are

shown in Table 2. The results confirm the safety of the surgical technique.

*Overview of the studies regarding the complications of THL*

Table 2

Authors	Year	Cases	Access	Abnormality	Complications
Hu [20]	2005	110	95,7%	NR	0
Tanos [35]	2005	78	70-100%	49%	1 bleeding
El- Shalakany [10]	2006	22	95,5%	54%	0
Kowalczyk [24]	2006	56	100%	57,2%	1 bowel injury
Van Tetering [39]	2007	272	96%	56%	2 rectum injuries 2 bleedings 1 suspectes PID
Sobek [34]	2008	562	100%	30,5%	0
Ahinko- Hakamma et al [1]	2009	56	91%	NR	0

Authors	Year	Cases	Access	Abnormality	Complications
Pjevic [29]	2010	400	96%	47,5%	0
Kissler [23]	2011	239	99%	33,5%	0
Yang [40]	2011	51	96%	47,9%	0

#### 4. Discussions

PCOS is a common endocrine disorder, complex and heterogeneous, defined by a spectrum of clinical, hormonal and anatomical factors of variable intensity and combination. PCOS is classically characterized by ovarian dysfunction (oligomenorrhea, anovulatory infertility), androgen excess (hirsutism, acne) and morphological abnormalities ovary (polycystic aspect by ultrasound). An important component of PCOS is the hypersecretion of insulin with varying degrees of insulin resistance. The mechanisms involved can be explained by the presence of antibodies antireceptor of insulin. It has been identified receptors for insulin and IGF1 on the ovary and their stimulation sensitizes ovary stimulation with gonadotrophins, thus increasing the level of androgens. Also, hypersecretion of insulin inhibits the secretion of hepatic SHBG which, especially in obese patients, can lead to an apparent mismatch between circulating testosterone concentration and degree of hirsutism, explained by increasing free testosterone in order to maintain the total level of testosterone in the normal range [21].

It has been shown that obese women with PCOS, compared to healthy women presents vary degree of insulin resistance and compensatory hyperinsulinemia which are known today as common features of the syndrome. Many genes that coordinate secretion and insulin action were explored as candidate genes in the pathogenesis of PCOS (genes and insulin gene, gene insulin receptor, protein substrate of the insulin receptor, Calpain 10 gene or

Peroxisome proliferator-activated receptor - $\gamma$  gene) [14].

The incidence of ovulation is negatively correlated with the ratio waist/ hip, abdominal circumference and visceral fat ultrasound quantification. Thus, it can support a direct influence on the obesity, especially in the distribution of the android type on the inhibition of ovulation in patients with PCOS [30].

Approach treatment for infertility in PCOS can sometimes be difficult. It is known that the first line of treatment would be the administration of anti-estrogenic therapy, but while clomiphene citrate can induce ovulation in more than 80% of the women treated, pregnancy rate obtained after 6 months of therapy is only 40%. PCOS treatment option for patients resistant to clomiphene citrate is the administration of gonadotropins. Treatment with GHRH analogues in this group offers a cumulative pregnancy rate of 70% after 4-6 cycles of therapy, but is associated with an increased risk of developing severe ovarian hyper stimulation syndrome or multiple pregnancies.

Over the time, ovarian resection has been replaced by laparoscopic drilling ovarian as surgical therapy for patients with PCOS resistant to treatment with clomiphene citrate. Advantages of the method include increased ovulation rate and decreased complication rates following treatment with gonadotropins [3].

Since *Gordts and collaborators* introduced the technique of transvaginal hydrolaparoscopy for the investigation of infertile patients, interest to the vaginal approach for exploring the genital tract has increased [15], [16].

*Transvaginal hydrolaparoscopy*

Transvaginal hydrolaparoscopy is today accepted as a feasible technique for investigating and treating infertility and has the capacity to predict the rate of spontaneous ongoing pregnancy comparable to that of achieved by conventional laparoscopy. The technique uses saline as a distension medium and may be carried out in ambulatory system with intravenous sedation or local anesthesia [15]. Exploring the female genital tract should be as easy as hysterosalpingography and as accurate as conventional laparoscopy. Transvaginal laparoscopy offers the most efficient and accurate solution for this problem. The challenge is: to identify a low cost and easily accessible diagnostic procedure with operative possibilities, in order to offer the fastest and minimal invasive lane to pregnancy [5]. Transvaginal hydrolaparoscopy is an alternative method to hysterosalpingography and laparoscopy, that allows direct visualization of the peritoneal cavity in women [27].

*Indications and contraindications* [33]

There are 5 major indications:

1. tubal obstruction and/or peri tubal adhesions suggested by hysterosalpingography
2. serum antibody against C. trachomatis positive
3. diagnosis of early stage of endometriosis
4. unexplained infertility
5. operative transvaginal laparoscopy - ovarian drilling in infertile women with polycystic ovary syndrome.

The contraindications are:

1. Retroflexed uterus
2. History of pelvic surgery
3. Obstruction of the pouch of Douglas by the rectum or prolapsed tumor
4. Acute pelvic inflammatory disease

*Operative technique* [15], [16]

The operative technique is simple, with the patient in the dorsal decubitus position under local anesthesia or intravenous sedation, the transvaginal laparoscopy can be performed using a simple puncture technique of the pouch of Douglas. It used saline solution as distension.

To allow a safe and atraumatic entrance into the pouch of Douglas is needed a trocar system. The needle length can be preset between 10 and 25 mm. Typically the length of the needle is set to 15 mm, and the length of the needle set to 25 mm only in obese patients. A 2.9 mm endoscope with a 30° angle lens and a diagnostic sheath of 3.7 mm is used both for hysteroscopy and transvaginal laparoscopy (TVL). Before use, the needle is passed into the dilating sheath. The unit is then inserted in the outer trocar and fixed with a counterclockwise movement. In case it is indicated, this diagnostic trocar can be exchanged for another trocar with a working channel allowing the insertion of a 5 Fr grasping or biopsy forceps and scissors.

Changing from the diagnostic device to the trocar with the working channel is performed using a guide mandrin. A light source, preferable a xenon light source, is necessary for illumination of the pelvic space. The vaginal speculum has to have two open lateral sides, (Collin speculum), so it can be removed from the vagina soon after the placement of the other trocar sheath. The trocar assembled is placed in the back of the posterior vaginal bag in the midline, about 1.5 cm below the cervix, following the longitudinal vaginal axis.

In this way, it can be performed the puncture of the pouch of Douglas, between utero-sacral ligaments [8], [25].

*Operative transvaginal laparoscopy* [16,17]

The TVL is also very suitable for performing drilling of the ovarian capsule

in patients with polycystic ovary syndrome (PCOS) resistant to medical therapy. One of the major concerns of laparoscopic drilling of the ovaries was the risk of postoperative adhesion formation.

After identification of the ovarian surface, drilling of the ovarian capsule is performed using a bipolar needle with a diameter of 1 mm and a length of 0.8 cm. The needle is placed perpendicular to the ovarian surface and is gently pushed against the ovarian surface. The capsule is perforated using a bipolar cutting current, allowing an easy insertion of the needle. A coagulating current is used for 5 seconds, followed by the removal of the needle. It can be made about 10–15 small holes on each ovarian surface, preferentially on the anterolateral site. When the current is switched on, the continuous flow of Ringer's lactate is stopped, allowing a more accurate performance of the bipolar. The small needle diameter minimizes the defect on the ovarian capsule and, in the absence of carbonization in a watery environment, risks for postoperative adhesion formation will be reduced.

At this moment, laparoscopy procedure is considered to be the "gold standard" technique for the diagnosis of tubal pathology. However, it is an invasive laparoscopic surgery that requires general anesthesia [37]. Transvaginal hydrolaparoscopy was first described by *Gords et al.* in 1998. It is derived from culdoscopy, an rarely used method, especially from when it was demonstrated the superiority of laparoscopy [7]. One of the cardinal reasons for that culdoscopy was abandoned in favor of laparoscopy was that transvaginal access that can lead to rectal perforation and sepsis development. But bowel perforation is a complication of laparoscopy too [16], [17].

THL is a less traumatic and can be performed in outpatient system. Transvaginal access and the systemic use

of hydro flotation represents the advantages of transvaginal laparoscopy. Moreover, inspection under fluid improves the visualization of distal tubal structures. The risks of a general anesthesia are avoided and there is little chance of injury to major vessels [22]. To expose the full ovarian surface several steps are required: Trendelenburg position, distension by CO<sub>2</sub> peritoneum, a second trocar insertion and manipulation of bowel and adnexa.

THL benefits include accurate and atraumatic inspection of the structure of adnexal [32]. *Tanos et al.* [35] have been demonstrated in a study conducted in three Mediterranean countries (Italy, Greece, Cyprus) that transvaginal hydrolaparoscopy is a feasible method of investigation, with accurate results and easy to learn. Post-operative complications and risks are minimal and depends on the experience of the surgeon, and the patient's selection, as showed in Table 2.

Pelvic adhesions represent a postoperative complication in women diagnosed with polycystic ovary syndrome, and laparoscopy can create a vicious circle by leading to infertility. In the formation of peritoneal adhesions, two factors play a crucial role: high susceptibility to trauma of the peritoneal surface and the speed of recoding the mesothelium areas (5-8 days) [36].

*Giampaolino et al.* conducted a randomized trial to University of Naples "Federico II", Department of Obstetrics and Gynecology, between December 2009 and July 2015 on 286 patients diagnosed with PCOS resistant to clomiphene citrate therapy included in the study. The inclusion criteria were age 18-40 years, respectively compliance to the Rotterdam criteria [38] which include oligo- and/or anovulation, clinical signs and/or biochemical hypoandrogenism, micro polycystic ovaries and exclusion of other etiologies such as: congenital adrenal

hyperplasia, androgen-secreting tumors and Cushing's syndrome. 246 of 286 patients included in the study, met the inclusion criteria and were divided into two equal groups, each group being subjected to laparoscopic ovarian drilling surgery, respectively transvaginal hydrolaparoscopy. Of these, 73 patients who underwent laparoscopy developed adhesions compared to 15 patients who underwent hydrolaparoscopy [13].

### 5. Conclusions

Transvaginal laparoscopy is a new method of diagnosis and treatment for infertile patients with polycystic ovary syndrome, a method less traumatic, with risks and complications less than classical laparoscopy, and the rate of obtaining a pregnancy similar for both methods.

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