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Titanic Deluxe Hotel, Belek - Antalya



X. TURKISH GERMAN GYNECOLOGY CONGRESS

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L/S ovarian surgery in PCOS

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History

- Surgical approaches with PCOS date back to the 1930s, when bilateral ovarian wedge resection was found to result in restoration of regular menses and pregnancy.

Stein IF, Leventhal ML Am J Obstet Gynecol. 1935; 29:181.

History

- Bilateral ovarian wedge resection...
- Effective in producing ovulatory cycles in previously anovulatory women, but fell out of favor due to;
 - postoperative adhesion formation and,
 - the introduction of ovulation-inducing medications such as clomiphene citrate.

Then comes...

Ovarian Drilling...

Indication

- Clomiphene citrate resistance
- Patients undergoing laparoscopy for tubal patency
- Poor response to any ovulation inducing agents whether CC or Gonadotropins

Literature

The literature now contains reports of over 1000 women in whom partial ovarian resection or ablation was done via a laparoscopic approach in the hope of restoring some ovulatory function.

Success

- Pregnancy has occurred in approximately 55 percent of women undergoing this procedure, a figure that compares favorably with conception rates after three to six cycles of gonadotropin therapy.
- Randomized controlled trials suggest that ovarian diathermy (electrocautery), when compared to gonadotropin therapy, results in similar success rates, but lower multiple gestation rates.

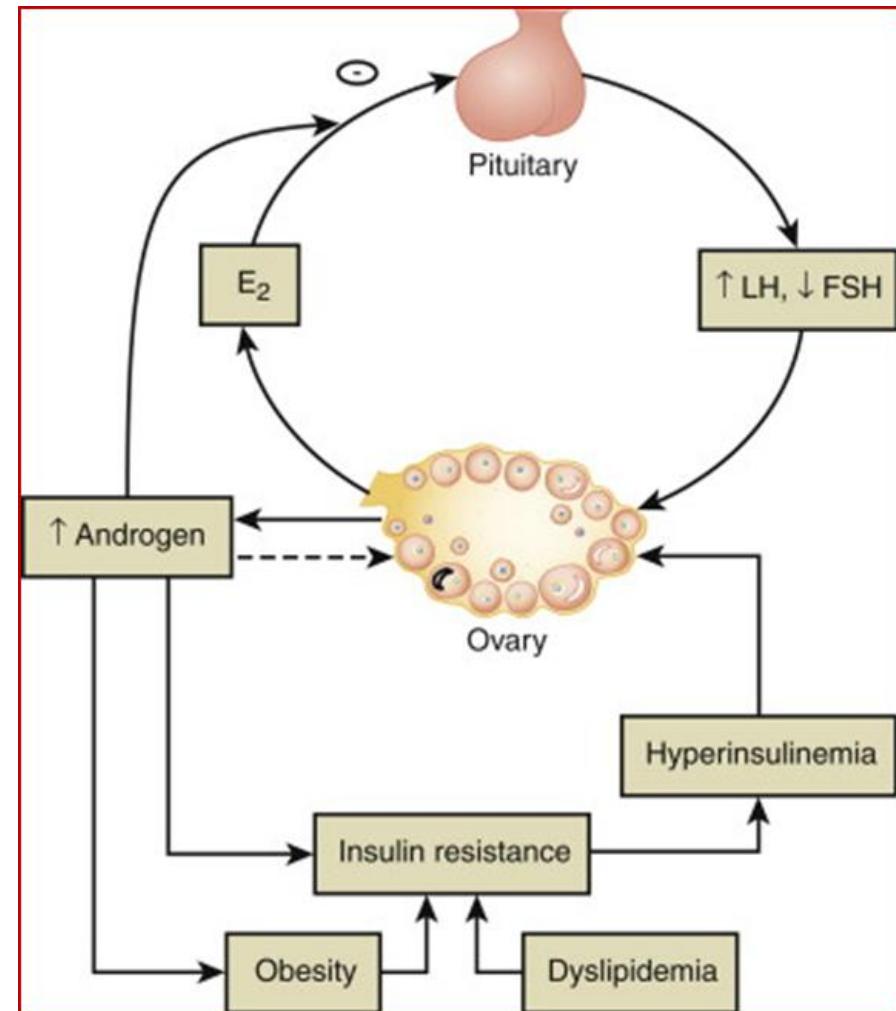
Farquhar C, Lilford RJ, Marjoribanks J, Vandekerckhove P.
Laparoscopic "drilling" by diathermy or laser for ovulation induction in
anovulatory polycystic ovary syndrome.
Cochrane Database Syst Rev. 2005

Endocrinology after L/S

- After LOD, serum androstenedione, LH, testosterone and inhibin
- Serum FSH
- The net effect is normalization of some of the endocrine abnormalities associated with the polycystic ovary syndrome.

Liguori G, Tolino A et al.

Gynecol Endocrinol. 1996;10(4):257



Mechanism

- The mechanism by which controlled partial destruction of the ovary results in follicle development and ovulation is unknown.
- While the hormonal changes probably contribute, it is not clear that they are the sole mechanism for restoration of ovulation.

Mechanism

- The wedge resection technique mainly destroys stromal (androgen-producing) elements; however, other procedures, such as ultrasound-guided transvaginal aspiration of the follicles, appear to produce similar results while having a minimal effect on the stroma .

Mio Y et al. Transvaginal ultrasound-guided follicular aspiration in the management of anovulatory infertility associated with polycystic ovaries. Fertil Steril. 1991

Mechanism

- The most plausible mechanism involves a sudden drop in intraovarian androgens (and perhaps estrogens) that results in increased FSH secretion and an intrafollicular environment...

Table 2 Metabolic Effects in Women with PCOS after LOD

Study	Year	Number of Patients	LH	FSH	Testosterone	Fasting Insulin
Seow et al ²⁸	2007	12	↓	NS	↓	↓
Kato et al ⁴⁹	2007	32	↓	NS	↓	ND
Api et al ⁷¹	2005	45	↓	↑	↓	↓
Kucuk and Kilic-Okman ⁷⁵	2005	22	↓	NS	↓	ND
Malkawi and Qublan ²⁰	2005	63	↓	NS	↓	NS
Wu et al ⁸¹	2004	40	↓	NS	↓	NS
Malkawi et al ⁴¹	2003	97	↓	NS	↓	ND
Amin et al ⁸²	2003	25	↓	↑	↓	ND
Amer et al ⁸³	2003	20	↓	NS	NS	ND
Amer et al ¹⁸	2002	116	↓	NS	↓	ND
Saleh et al ⁷⁰	2001	14	ND	ND	ND	↓
Tulandi et al ⁸⁴	2000	27	ND	ND	ND	NS
Felemban and Tulandi ⁷⁹	2000	112	↓	NS	↓	ND
Lemieux et al ⁶⁹	1999	8	ND	ND	↓	NS
Zullo et al ⁸⁵	2000	62	↓	NS	↓	ND
Taskin et al ⁸⁶	1996	8	↓	↑	↓	ND
Campo et al ¹⁷	1993	23	NS	↑	↓	ND
Tiitinen et al ⁴⁶	1993	10	↓	NS	↓	NS
Sakata et al ⁴⁷	1990	9	↓	↑	↓	ND
Armar et al ²³	1990	21	↓	↑	↓	ND
Tasaka et al ⁸⁷	1990	11	↓	NS	↓	ND
Abdel Gadir et al ⁸⁸	1990	11	↓	↓	↓	NS
Sumioki et al ⁸⁹	1988	7	↓	NS	↓	ND
Greenblatt and Casper ⁶⁰	1987	6	↓	↑	↓	ND
Gjöonnaess and Norman ⁶¹	1987	16	↓	↑	↓	ND
Aakvaag and Gjöonnaess ⁶²	1985	58	↓	↑	↓	ND

ND, no data; NS, no significant changes observed; ↓, significant decrease observed; ↑, significant increase observed.

Techniques

- Wedge resection via L/T
- L/S techniques
 - Multiple punch biopsies, Electrocautery (diathermy), Laser
- Transvaginal
 - Fertiloscopic approach, US guided laser approach

Donesky BW et al. Surgically induced ovulation
in the polycystic ovary syndrome: wedge
resection revisited in the age of laparoscopy.
Fertil Steril. 1995

Techniques

- Each method shares a common goal of creating focal areas of damage in the ovarian cortex and stroma.
- The most extensively studied procedure has been that of electrocautery, which is used to create thermal damage and necrosis of the "excess" ovarian stroma .

Unipolar Needle Electrode

- Most popular method
- Most of the authors prefer the unipolar needle electrode because of the easy set-up and the wide availability of the equipment needed.

Unipolar Needle Electrode

- Unipolar needle electrode that is insulated 1-3 mm in diameter and 4 mm in depth
- 4 – 6 punctures of each ovary can produce substantial thermal damage to the stromal compartment
- Punctures from the end of the ovary nearest the uterus and from the side of the ovary. (...keeps the surface damage away from the fallopian tube as much as possible.)

Laser

- With the development of laparoscopic laser delivery systems, it was inevitable that this modality would also be applied.
- Similar to that of electrocautery, as the ovarian cortex over follicles is vaporized.
- Since lasers focus their energy more precisely than electrocautery, less peripheral thermal damage is inflicted → IN THEORY...

Daniell JF. Polycystic ovaries treated by laparoscopic laser vaporization.
Fertil Steril. 1989

Laser

- Although the literature suggests that laser cauterity is as effective as electrocautery, the laser is becoming less popular in PCOS.
- The reasons seem to center on concerns about the amount of ovarian surface damage and the potential for adhesion formation after laser treatment.

Electrocautery is superior WHY?

- Less cost, easy application
- Achieve higher ovulation and pregnancy rates
- Less surface injury than CO₂ laser therefore less adhesions (Keckstein et al, 1989)
- Effects of electrocautery may last longer than effect of laser (Shaleh and Khalil, 2004)

Cumulative rates 12 months after LOD

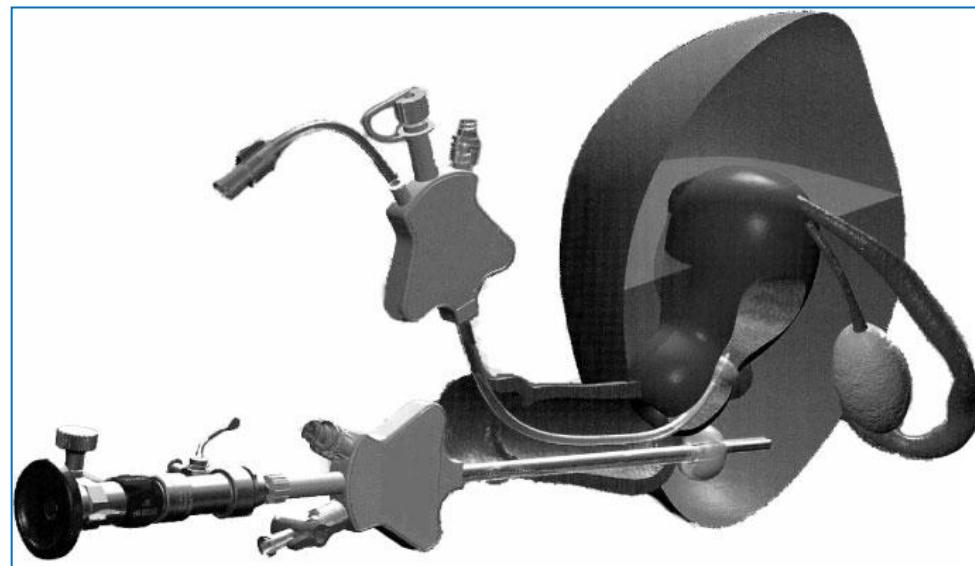
	Spontaneous ovulation	Pregnancy rates
Electrocoagulation	82.7 %	64.8 %
Laser vaporization	77.5 %	54.5 %

Shaleh and Khalil, 2004

Transvaginal Hydrolaparoscopy

- To perform ovarian drilling resulting in an even less invasive procedure...
- Of 15 women who underwent a second-look laparoscopy, 11 women were found to be free of adhesions.

Catenacci M, Goldberg JM.
Transvaginal hydrolaparoscopy.
Semin Reprod Med 2011; 29:95



Schematic diagram of fertiloscopy.
The hysteroscope is placed through the transvaginal introducer and
the pelvis is filled with fluid.
The intrauterine catheter is for chromotubation.

Watrelot A, Dreyfus JM, Cohen M.
Systematic salpingoscopy and microsalpingoscopy during fertiloscopy.
J Am Assoc Gynecol Laparosc 2002;9(4):453–459.

Abstract

Objective and design This was a prospective controlled study to compare the beneficial effects of office microlaparoscopic ovarian drilling (OMLOD) under augmented local anesthesia, as a new modality treatment option, compared to those following ovarian drilling with the conventional traditional 10-mm laparoscope (laparoscopic ovarian drilling, LOD) under general anesthesia.

Methods The study included 60 anovulatory women with polycystic ovary syndrome (PCOS) who underwent OMLOD (study group) and 60 anovulatory PCOS women, in whom conventional LOD using 10-mm laparoscope under general anesthesia was performed (comparison group). Transvaginal ultrasound scan and blood sampling to measure the serum concentrations of LH, FSH, testosterone and androstenedione were performed before and after the procedure. Intraoperative and postoperative pain scores in candidate women were evaluated during the office microlaparoscopic procedure, in addition to the number of candidates who needed extra analgesia.

Results Women undergoing OMLOD showed good intraoperative and postoperative pain scores. The number of patients discharged within 2 h after the office procedure was significantly higher, without the need for postoperative analgesia in most patients. The LH:FSH ratio, mean serum concentrations of LH and testosterone and free androgen index decreased significantly after both OMLOD and LOD.

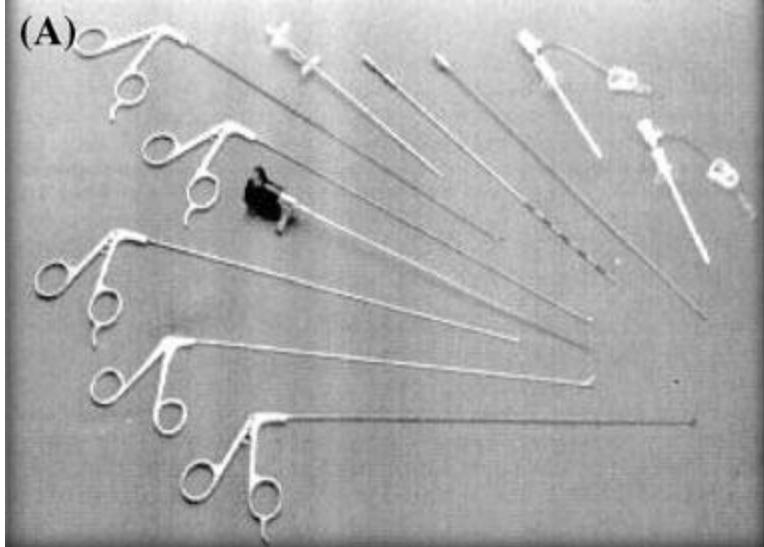
The mean ovarian volume decreased significantly ($P < 0.05$) a year after both OMLOD and LOD. There were no significant differences in those results after both procedures.

Conclusion Intra- and postoperatively augmented local anesthesia allows outpatient bilateral ovarian drilling by microlaparoscopy without general anesthesia. The high pregnancy rate, the simplicity of the method and the faster discharge time offer a new option for patients with PCOS who are resistant to clomiphene citrate. Moreover, ovarian drilling could be performed simultaneously during the routine diagnostic microlaparoscopy and integrated into the fertility workup of these patients.

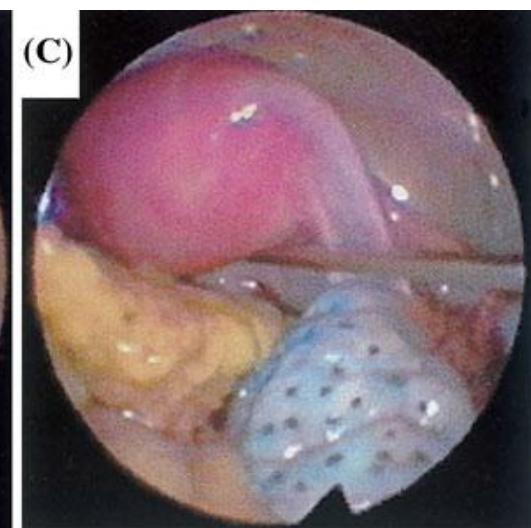
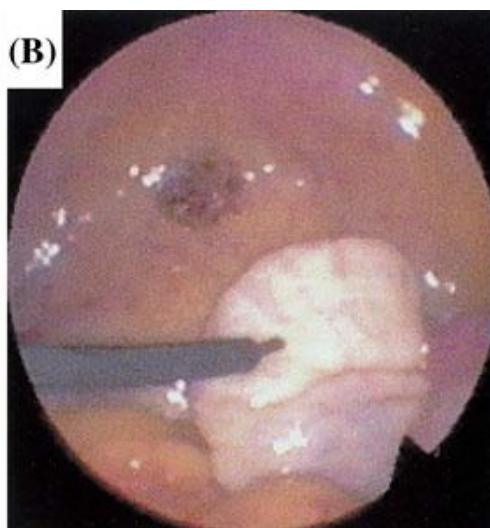
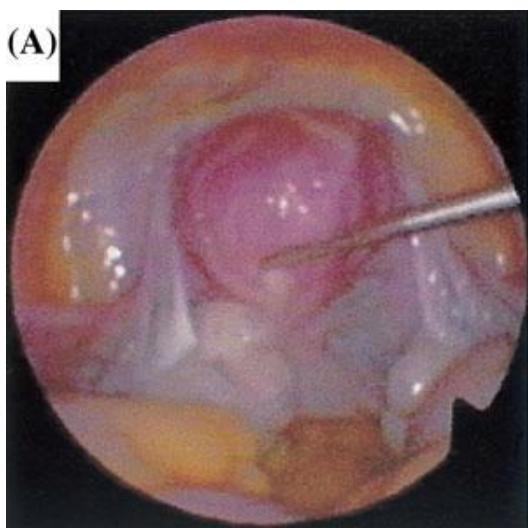
Keywords Endocrine effects · Office microlaparoscopic ovarian drilling · Long-term follow-up · Polycystic ovary syndrome · Polycystic ovaries

Office microlaparoscopic ovarian drilling (OMLOD) versus conventional laparoscopic ovarian drilling (LOD) for women with polycystic ovary syndrome

Imaduldin M. Salah



The microlaparoscopic instruments, and the setup for the office microlaparscopy under augmented local anesthesia



The microlaparoscopic image of the pelvis before the ovarian drilling procedure, which is apparently similar to the 10-mm laparoscopic view; b the microlaparoscopic ovarian drilling and c the microlaparoscopic image after the micro laparoscopic ovarian drilling (OMLOD) procedure

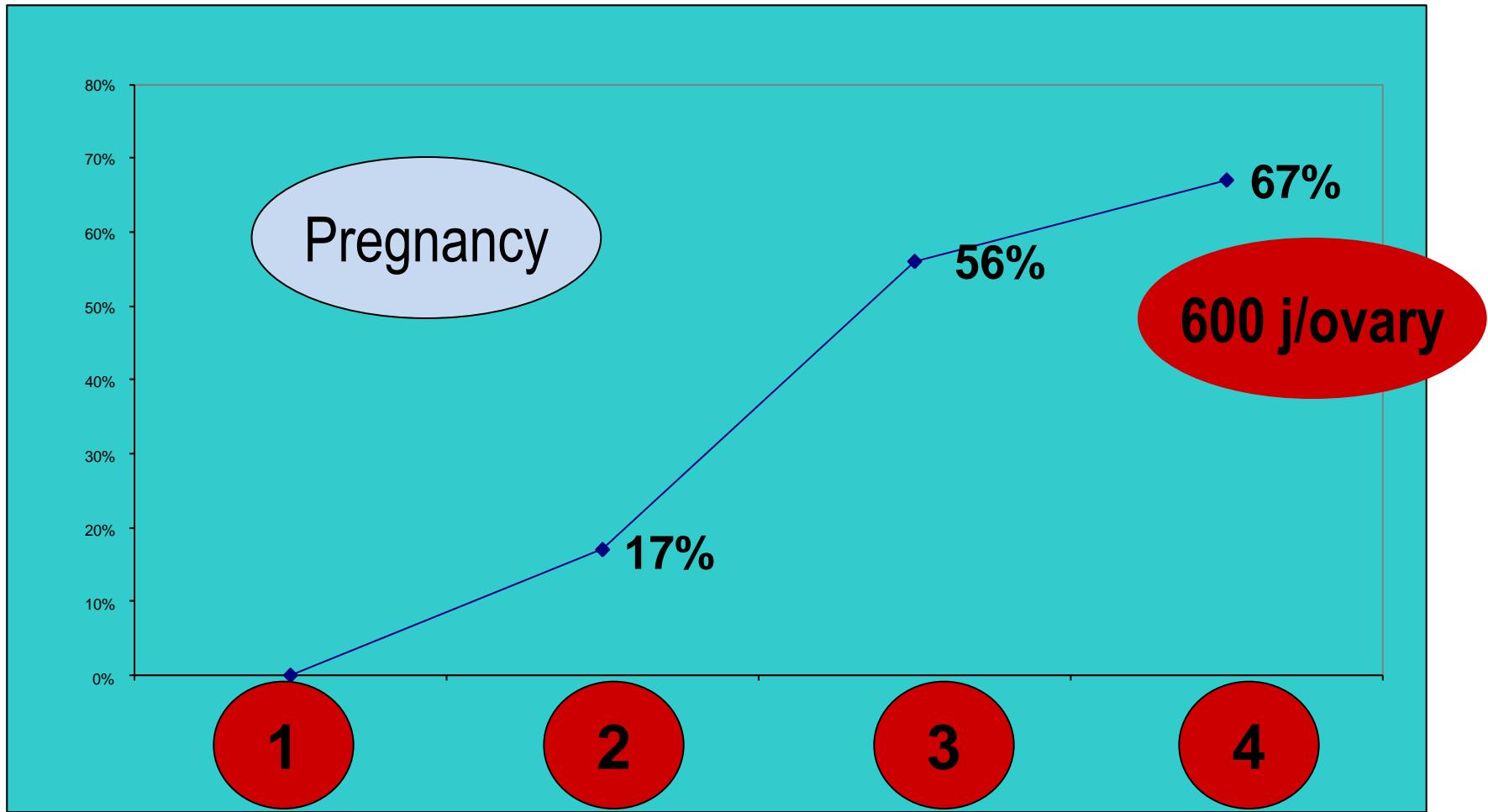
Puncture? Energy?

- The number of punctures is only one of several variables which determines the amount of electrical energy delivered to the ovary...
- The amount of energy (J) used is: power (w) x duration (sec) x No. of punctures
- Dabirashrafi (1989) → $400w \times 5 \text{ sec} \times 8 \text{ hole}$ → 16,000O joule → OVARIAN ATROPHY...

The Sheffield Prospective Dose Finding Study

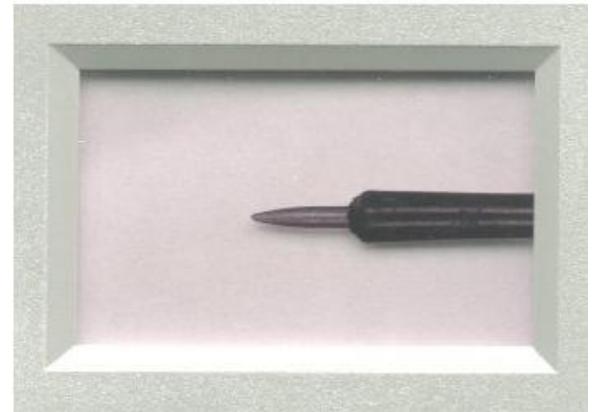
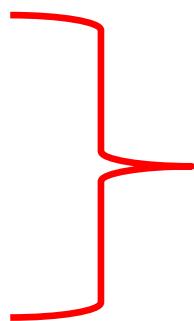
- 30 women divided into ten groups, each group with 3 women
- Dose in each group to be determined by the response of previous group
- Energy utilized for each puncture is standardized (150 J/puncture)

Conception rates after LOD Sheffield Prospective Study



Energy...

- *Rockett of London* diathermy needle
 - needle 8 mm long, 2 mm diameter
 - monopolar coagulation
 - **30 W**
 - **4 holes**
 - **5 seconds**
- 600 joule

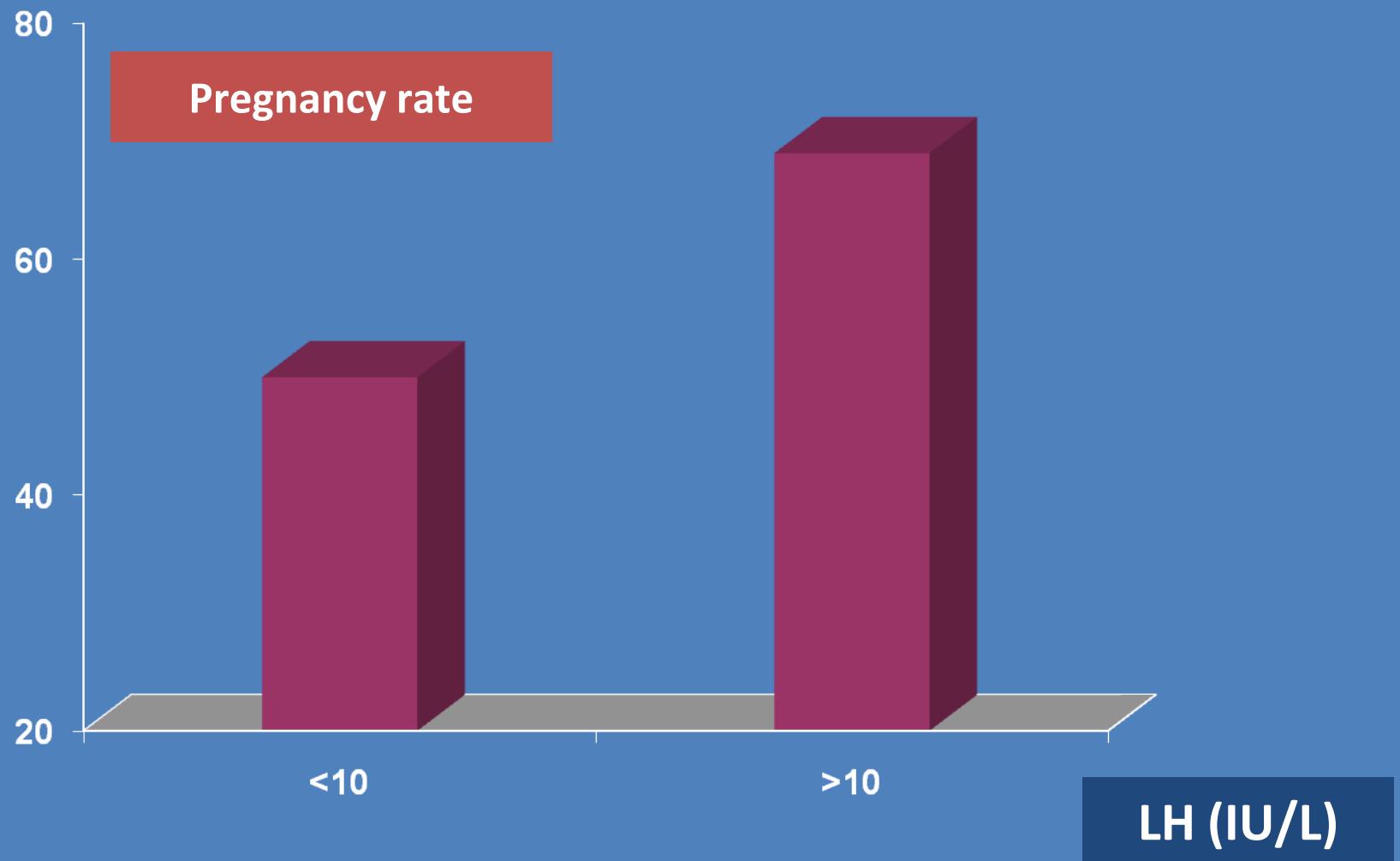


Patient selection

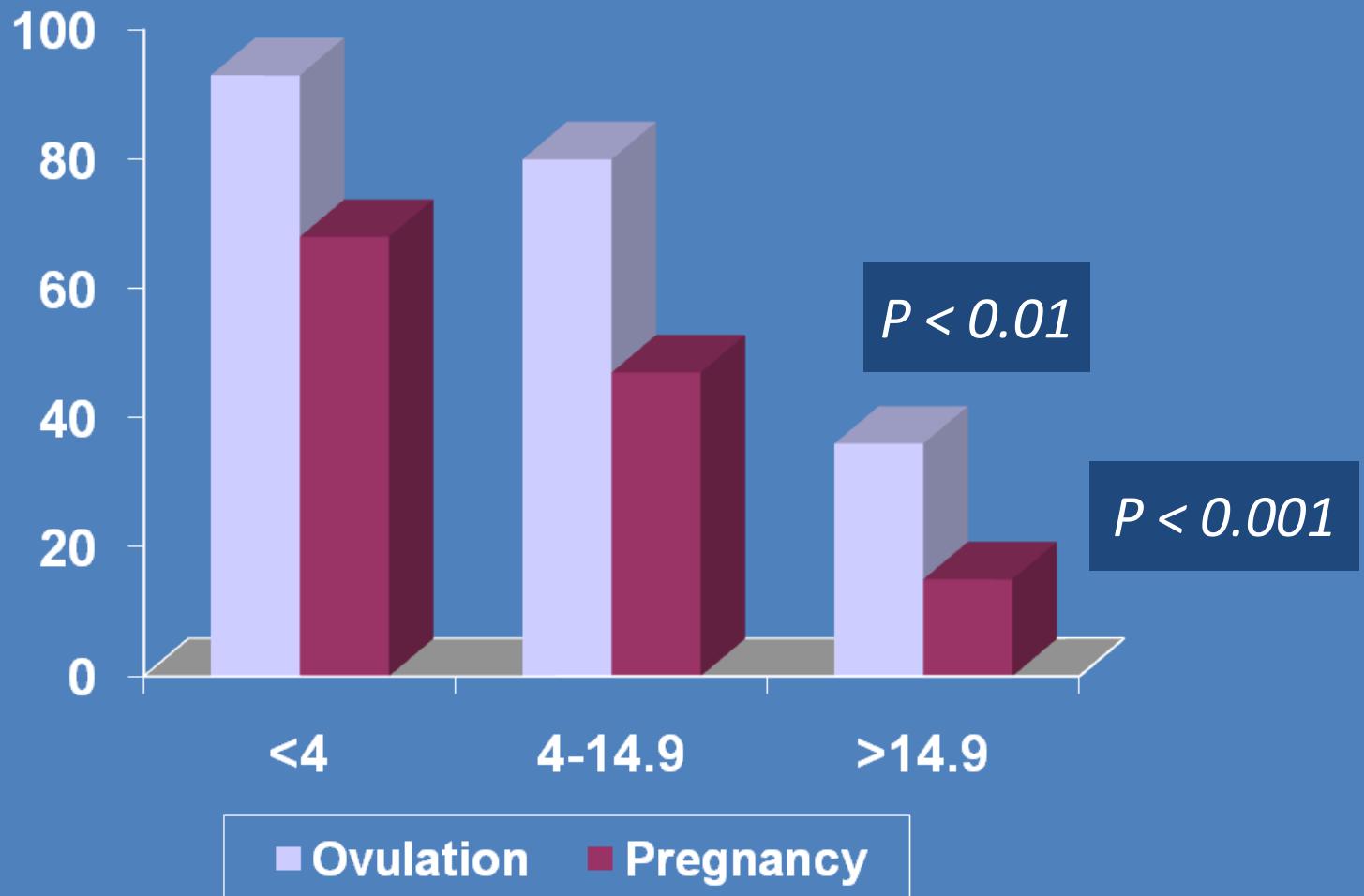
- Retrospective; 200 patients with anovulatory infertility due to PCOS who underwent LOD between 1990 and 2002; Multiple logistic regression analysis ...

Amer SA, Li TC, Ledger WL.
Ovulation induction using laparoscopic ovarian drilling in women with polycystic ovarian syndrome: predictors of success.
Hum Reprod 2004;19:1719-24

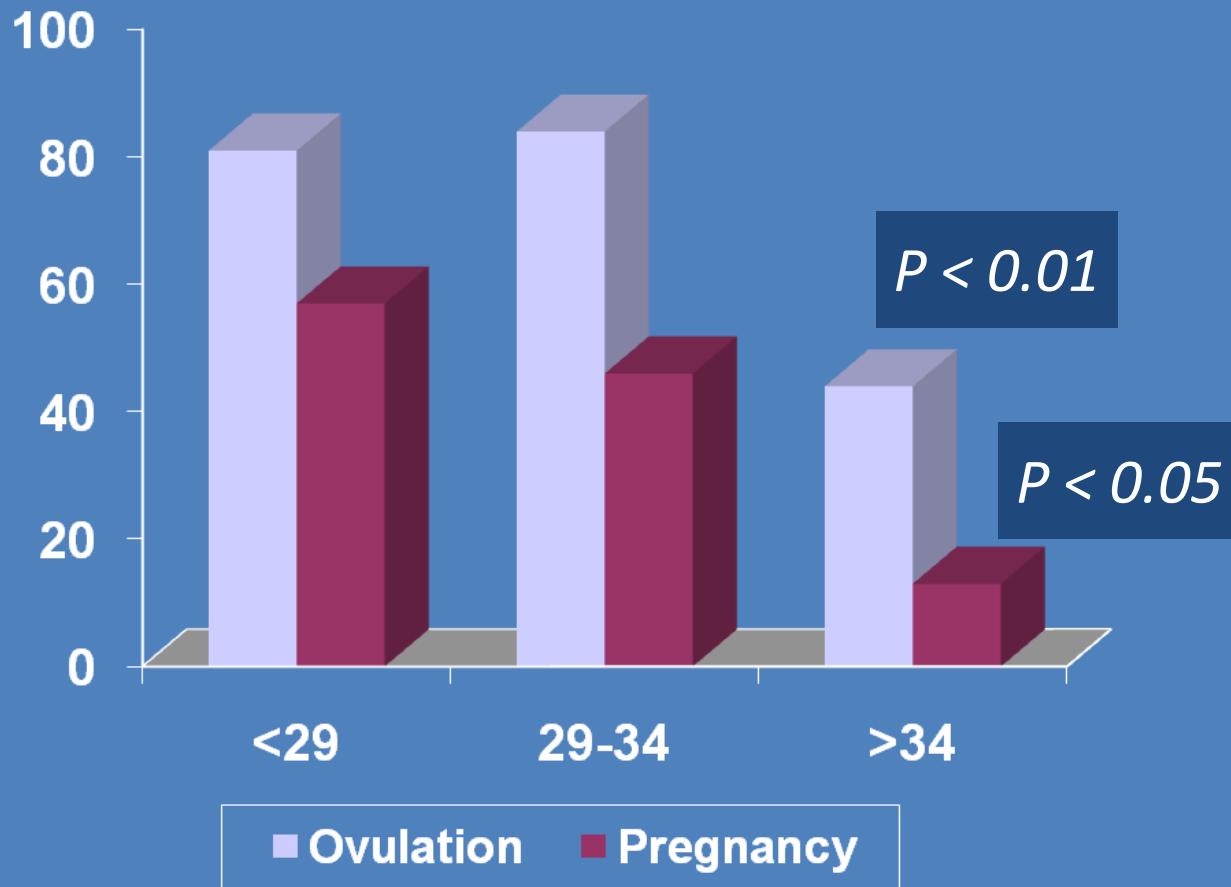
LH and Pregnancy rates in LOD



Free Androgen Index and the outcome of LOD



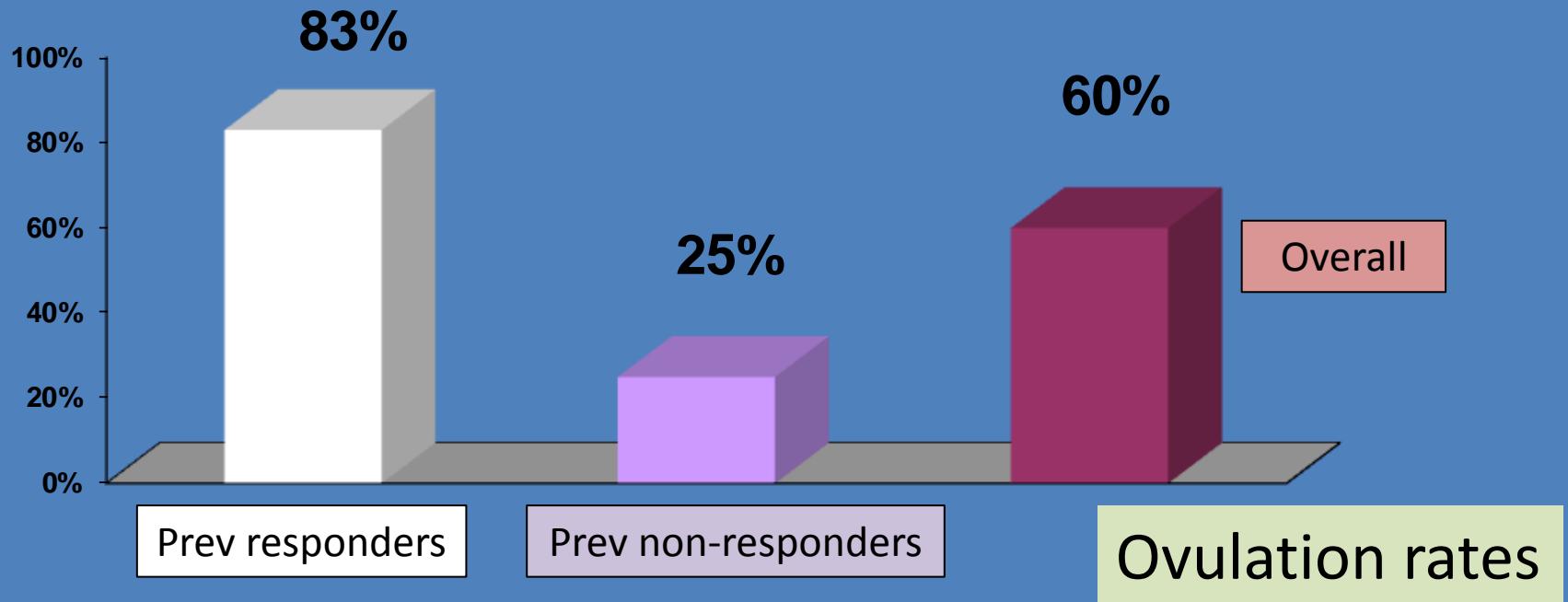
BMI and the outcome of LOD



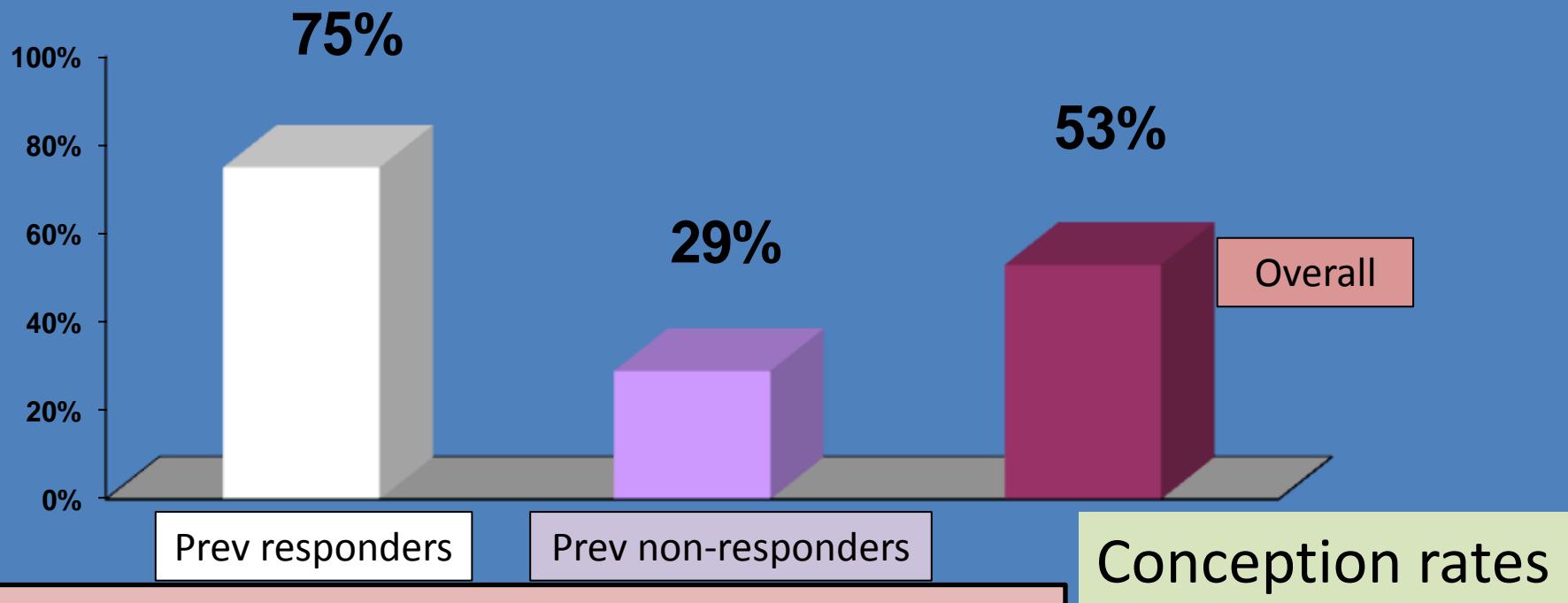
With proper patient selection,
the pregnancy rate after LOD
is up to 80 %

Amer SA, Li TC, Ledger WL.
Ovulation induction using laparoscopic ovarian
drilling in women with polycystic ovarian
syndrome: predictors of success.
Hum Reprod 2004;19:1719-24

Is repeat surgery effective ?



Is repeat surgery effective ?



CONCLUSION(S):

Repeat LOD is highly effective in women who previously responded to the first procedure.

New trends

LOD (n=29)	AMH < 7.7	AMH \geq 7.7	P
Ovulation	95%	60%	0.036
Pregnancy	63%	30%	0.095

First line treatment

	LOD group (n=33)	Clomiphene group (n=32)
Ovulation	64%	76%
Conception after first treatment	27%	44%
Conception after second treatment (at 12m)	53%	63%
Miscarriage	12%	10%
Live Birth	46%	56%

Complications

- Most women who had the procedure were found to have adhesions when a second-look laparoscopy was performed later, although the adhesions did not appear to cause problems relating to conception.

Gürgan T, Kişiçi H, Yarali H, et al.
Evaluation of adhesion formation after
laparoscopic treatment of polycystic ovarian
disease. Fertil Steril 1991; 56:1176

Greenblatt EM, Casper RF. Adhesion
formation after laparoscopic ovarian cautery
for polycystic ovarian syndrome: lack of
correlation with pregnancy rate. Fertil Steril
1993; 60:766

Complications

- There is one report of unilateral ovarian atrophy after laparoscopic ovarian electrocautery.

Dabirashrafi H.
Complications of laparoscopic ovarian cauterization.
Fertil Steril 1989; 52:878

Complications

- An epidemiologic study demonstrated earlier menopause in women who underwent ovarian reductive surgery of any type .
- The women having the earliest menopause (nearly 10 years earlier than in normal women) were those who had undergone bilateral ovarian wedge resection before age 30.

Melica F, Chiodi S, Cristoforoni PM, Ravera GB.
Reductive surgery and ovarian function in the
human--can reductive ovarian surgery in
reproductive age negatively influence fertility and
age at onset of menopause?
Int J Fertil Menopausal Stud 1995; 40:79

But...

- The long-term follow-up study by Dahlgren et al. showed that menopause occurred later in PCOS women who underwent ovarian wedge resection compared with non-PCOS women.

Dahlgren E, Johansson S, Lindstedt G, Knutsson F, Ode'n A,
Janson PO, Mattson LA, Crona N, Lundberg PA.
Women with polycystic ovary syndrome wedge resected in
1956 to 1965: a long-term follow-up focusing on natural
history and circulating hormones.
Fertil Steril 1992;57:505–513.

Complications

- One study reported a decrease in anti-müllerian hormone (AMH) in women who underwent ovarian drilling . While potentially providing a way to assess adequacy of treatment, this finding underscores the fact that these are destructive procedures that result in the loss of oocytes.

Elmashad AI. Impact of laparoscopic ovarian drilling on anti-Müllerian hormone levels and ovarian stromal blood flow using three-dimensional power Doppler in women with anovulatory polycystic ovary syndrome. Fertil Steril 2011; 95:2342

ESHRE/ASRM PCOS Consensus Workshop – 2007

1. LOS can achieve unifollicular ovulation with no risk of OHSS or high-order multiples.
2. Intensive monitoring of follicular development is not required after LOS.
3. LOS is an alternative to gonadotrophin therapy for CC-resistant anovulatory PCOS.
4. The treatment is best suited to those for whom frequent ultrasound monitoring is impractical.
5. LOS is a single treatment using existing equipment.
6. The risks of surgery are minimal and include the risk of laparoscopy, adhesion formation and destruction of normal ovarian tissue. Minimal damage should be caused to the ovaries. Irrigation with an adhesion barrier may be useful, but there is no evidence of efficacy from prospective studies. Surgery should be performed by appropriately trained personnel.
7. LOS should not be offered for non-fertility indications



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Thank you...

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Comparison between laparoscopic ovulation induction and gonadotropin ovulation induction

	Laparoscopy	Gonadotropin Administration
Advantages	<ul style="list-style-type: none">• Pregnancy rates comparable to gonadotropins• No additional procedures required• Minimal monitoring required• One treatment produces multiple ovulatory cycles• Usually produces monovulatory cycles• No increased risk of ovarian hyperstimulation• No expensive medications required	<ul style="list-style-type: none">• High probability of successful ovulation induction• Conception rates comparable to laparoscopy• No known risk of adhesive damage
Disadvantages	<ul style="list-style-type: none">• Initial surgery not entirely risk-free• Adhesions• Ovarian atrophy	<ul style="list-style-type: none">• High cost• Intensive monitoring required• One ovulatory event per cycle• Increased risk of multiple gestations• Increased risk of ovarian hyperstimulation

LOD vs Medical Treatment

- Cochrane Database Syst Rev 2012 Jun 13;(6):CD001122 (review updated 2012 Aug 6)
- systematic review of 25 randomized trials evaluating laparoscopic ovarian drilling (with or without medical induction of ovulation) in 2,481 women with subfertility and clomiphene-resistant polycystic ovary syndrome (PCOS)

Laparoscopic drilling by diathermy or laser for ovulation induction in anovulatory polycystic ovary syndrome (Review)

LOD vs Medical Treatment

- medical treatments in control groups included
 - gonadotropins (8 trials)
 - metformin (2 trials)
 - clomiphene citrate (2 trials)
 - clomiphene citrate plus metformin (3 trials)
 - clomiphene citrate plus tamoxifen (2 trials)
 - clomiphene citrate plus rosiglitazone (1 trial)
 - aromatase inhibitors (2 trials)

LOD vs Medical Treatment

- comparing laparoscopic ovarian drilling to medical treatment
 - no significant differences in
 - live birth rate (odds ratio 0.86, 95% CI 0.74-1, $p = 0.056$) in analysis of 8 trials with 1,034 patients
 - miscarriage rate (odds ratio 1.1, 95% CI 0.74-1.61) in analysis of 15 trials with 1,592 women
 - pregnancy rate (defined as gestational sac seen on ultrasound) per woman randomized (odds ratio 0.94, 95% CI 0.78-1.14) in analysis of 18 trials with 1,930 women
 - drilling associated with lower multiple pregnancy rate per ongoing pregnancy (odds ratio 0.21, 95% CI 0.08-0.58) in analysis of 12 trials with 1,129 patients



ESHRE/ASRM Thessaloniki Consensus on infertility treatment related to PCOS 2007

