THE ROLE OF LAPAROSCOPY SURGERY IN INFERTILITY

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ABSTRACT

To deal with infertility, a patient probably should have a number of diagnostic tests performed in order to find out the exact cause of the problem. If there is no obvious abnormality, ovulation induction with clomiphene citrate is often one of the first treatment options used. If pregnancy has not been achieved after four ovulatory cycles, laparoscopy has been routinely used to search for anatomical abnormalities. If diagnostic laboratory tests are not conclusive when it comes to determine the root cause of the infertility, laparoscopy is used to evaluate outside condition of the uterus, fallopian tubes, and ovaries. It is often employed when an infertility diagnosis cannot be reached through laboratory tests alone. It checks the presence or absence of adhesions, endometriosis, and other infertility-causing disorders. Laparoscopy is the gold standard for the diagnosis intrapelvic adhesions or tubal disease. Laparoscopy is an outpatient surgery performed in the hospital under general anesthesia by inserting a telescopic device into abdominal cavity through a small incision made in the naval, while surgical instruments are inserted through another little incision made at the top of the pubic bone. If adhesions or endometriosis are found, these can be treated during the same procedure. Laparoscopy usually takes less than an hour, so that most of patients may leave the hospital within three to four hours after surgery.

Keywords: laparoscopy, infertility, tube patency, endometriosis, PCOS

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INTRODUCTION

Due to availability of assisted reproductive technologies, the need for reproductive surgery in infertile women has declined over the past decades. However, reproductive surgery still has a place in the management of infertile women. For example, young women with a history of pelvic inflammatory disease might have pelvic adhesions or blocked Fallopian tubes that impair their fertility; and they will benefit from early surgical intervention. On the other hand, women over the age of 35 with a long history of infertility or those who require a laparotomy for correction of their disorders are better treated with in-vitro fertilization (Al-Sunaidi & Tulandi 2007). Even in the endometriosis cases that have failed in the IVF program, the laparoscopy surgery still has its place for making women conceived. In this study, Littman evaluated 29 cases that have failed in several IVF program and performed laparoscopy treatment on the women. Three patients had a known history endometriosis before IVF treatment whereas the remaining 26 had no previous laparoscopy. Twenty two out of 29 (76%) of the patients who had laparoscopic treatment of endometriosis conceived. From those who conceived successfully, there were stage I disease 4/4 (100%) patients and 5/6 (83%) stage II disease patients. Five of 6 (83%) of patients of stage III disease conceived and 8/13 (62%) of those with stage IV disease conceived (Littman 2005). The use of laparoscopic surgery in infertility can be divided into two main categories, i.e. diagnostic and operative, that will be discussed in this paper.

DIAGNOSTIC LAPAROSCOPY

In Graha Amerta Fertility Clinic of Dr. Soetomo Teaching Hospital, a retrospective observation has shown that between March 2004 and March 2006, there have been 322 cases of diagnostic laparoscopy. Based on the infertility duration characteristics, it is revealed that there were 178 cases (55.3%) for the infertility duration of 5 years or less and 144 cases (44.7%) for infertility duration of over 5 years. Hoger’s results have been reported by Preeti Kanal and Sanjaya of Department of Obstetrics & Gynecology, MLB Medical
In the era of assisted reproductive technology, there have been normal (el-Yahia, 1994). However, the distribution of patients who have been married for more than 5 years shows that the patient’s awareness/understanding towards early infertility management and diagnosis is still low (Darmosoekarto 2006), because the earlier the diagnostic laparoscopy is performed, the earlier the information on the abnormality and prediction of successful management can be gained (Fatum 2002).

In young cases and no history of pelvic pathology, diagnostic laparoscopy should be performed only after complete investigation of infertility such as semen analysis, heterosalpingography and assessment of ovulation is conducted. An interesting finding is reported by el-Yahia, who has performed diagnostic laparoscopy evaluation to 130 women whose basic infertility survey revealed no abnormalities. He reported by el-Yahia, who has performed diagnostic laparoscopy should be performed only after complete investigation of infertility such as semen analysis, heterosalpingography and assessment of ovulation is conducted. An interesting finding is reported by el-Yahia, who has performed diagnostic laparoscopy evaluation to 130 women whose basic infertility survey revealed no abnormalities. He reported that 75 (57.7%) women were proven to have pelvic disease, i.e. 27.7% pelvic endometriosis, 20.8% pelvic adhesion and 6.2% pelvic inflammatory disease. He concluded that diagnostic laparoscopy should be performed on all women to search for tubal or pelvic causes of infertility when all other examinations have been normal (el-Yahia, 1994).

In the era of assisted reproductive technology, laparoscopy is not a routine test anymore (Al Sunaidi & Tulandi 2007). Laparoscopy is not usually performed in patients who are indicated for IVF or ICSI, since assessment of the tubes and the other intraabdominal pathology is of less concern except for the presence of hydosalpinges which can be diagnosed by ultrasonography (Srandell et al. 1999). However, laparoscopy is indicated in young women with a history of salpingitis or sexually transmitted disease, previous pelvic surgery, or endometriosis. Abnormal findings can be corrected at the same laparoscopic setting. Evaluations needed in the diagnostic laparoscopy are stated below.

**Evaluation of the Tubes**

Tubal patency is checked during the laparoscopy examination by injecting dilute solution of methylene blue into the uterine cavity through the cervix. Tubal patency is indicated by the passage of the blue dye from the fimbriated end of the tube. The incidence of abnormal laparoscopic finding in infertile females with a normal hysterosalpingogram ranges from 21-68%. (Al-Sunaidi & Tulandi 2007). In our center, Graha Amerta Fertility Clinic of Dr. Soetomo General Hospital, from 322 laparoscopy cases there were 178 (55.1%) cases of patent tube (both tubes patency), while 144 cases (44.9%) are tubal blockage cases with 92 (28.8%) bilateral block and 52 (16.1%) unilateral block (Darmosoekarto 2006). Similar result was also reported by Preeti et al. who found both tubes patency in 57% case, 10% unilateral block cases and 32.5% bilateral block (Kanal & Sharma 2006).

Rice studied 231 cases of hysterosalpyngography with 143 cases (62%) were followed by diagnostic laparoscopy. When the results from hysterosalpingography were compared with the laparoscopy results, 15.9% had false positive tubal patency rate and 14.9% false negative tubal patency rate. From all cases, 76% laparoscopy cases discovered the existence of peritoneal disease. Seventeen percent of hysterosalpingography demonstrated intrauterine pathology. There were two cases of acute pelvic inflammatory disease. No significant laparoscopic complications were noted.

The results suggest that laparoscopy provides a more accurate assessment of tubal and peritoneal factors than hysterosalpingography in the investigation of infertility (Rice 1986). In general, if there is not any patency found in a laparoscopy examination, a confirmation using hysterosalpingography is necessary to eliminate the possibility of tubal spasm. The rationale is because combination of laparoscopy and hysterosalpingography is a more effective method to reveal tubal block. However, recent studies show that hysterosalpingo contrast sonography (HyCoSy) is a cost effective screening test as compared to the diagnostic laparoscopy with hysterosalpingography in the assessment of tubal patency for the investigations of infertility patients (Sinawat S 2005).

**Endometriosis**

In infertile women with no other cause of infertility, endometriosis can be found in 40-50% of cases. Endometriosis can be classified into minimal, mild, moderate and severe endometriosis or into stage I to IV. Its presence, regardless of the stage, decreases fertility. Compared women whose endometriosis was not treated, treatment of stage I or II endometriosis is associated with higher pregnancy rate (Al-Sunaidi & Tulandi 2007).

From the study performed in our center, Graha Amerta Fertility Clinic of Dr. Soetomo General Hospital, it is revealed that from 322 cases of laparoscopy, 180 cases (55.9%) are positive for endometriosis and 142 cases (44.1%) do not show any sign of endometriosis. Unfortunately, the operators did not describe the cases based on the applied standard, which is the Revised Classification of Endometriosis published by the...
American Society for Reproductive Medicine (ASRM), instead the operators described the cases based on the location of the endometriosis with following details: uterine and tube, 10.6% ; Douglas Cavity, 27.3%; ovary, 56.1%; and peritoneum, 6% (Darmosoekarto 2006). The endometriosis can cause oocyte quality disorder in infertile women accompanied by toxic agent accumulation, generally in peritoneal cavity, that often causes tissue adherence around the tube and leads to fertilization disorders. The peritoneal secretion can also be considered as an embryo toxic media in unexplained infertility (Darmosoekarto 2006).

Identification of Adhesion

In the study performed in our center during the period of March 2004 to March 2006, there are 152 cases (47.2%) of adherence with various causes. The pathophysiology for the adhesion is started by the cause of the adhesion that leads to tissue reaction and ended by damaged cell tissue, certain genital organs while healing the fibrotic tissue adhered. Several causes of the adherence are mechanic (chemical/non chemical) and thermal cause, infection, foreign matters, and endometriosis. If the cell response in the tissue ends with adherence in the internal genital area and its surrounding area, it will interfere, mechanically, the fertilization process or makes embryo transportation difficult. When the adhesion or damage is located in the tubal area because of Chlamydia trochomatis, which is suspected to cause damage in tubal cilia, the effect will be the disturbances in the process in the tube and the final results will be ectopic pregnancy (den Hartog & Lyon 2006).

LAPAROSCOPY PROMOTING FERTILITY

There are many types of operative laparoscopy management that can promote fertility, but this paper will only show several of them, such as Adhesiolysis, Treatment of Endometriosis, Ovarian Drilling and surgical management of hydrosalpinx to IVF. This management can be performed directly when the case is found in the diagnostic laparoscopy that makes it a one step-procedure because the laparoscopy is not only used for diagnostic reasons, but also for therapeutic reasons as mentioned above.

Adhesiolysis

In cases of adhesions, there are no studies that have compared fecundity rate after laparoscopic adhesiolysis with no treatment. Only one non-randomized study compared open versus no treatment. In that study, 69 infertile women having preadnexal adhesions were treated by laparotomy and salpingo-ovariolysis and 78 were not treated. The cumulative pregnancy rate at 12 and 24 months follow-up was 32 and 45% in treated group and 11 and 16% in the non-treated group. Both differences in cumulative pregnancy rates between those groups were highly significant (Tulandi 1990; Tanahatoe 2003). This suggests that adhesiolysis might be associated with higher spontaneous pregnancy rates. However, whether laparoscopic adhesiolysis also enhances pregnancy rates after IUI has never been studied. Assuming that the pathophysiological mechanism of peritubal adhesions is based on impaired ovum pick up due to decreased tubal motility, it is likely that laparoscopic adhesiolysis might increase spontaneous pregnancy rates as well as pregnancy rates after IUI (Taanahtoe SJ 2003).

Treatment of Endometriosis

Treatment can be achieved with excision, ablation with electrocautery, laser, or a combination of both. Pregnancy rates are similar. Medical treatment by ovarian suppression with gonadotrophin releasing hormone agonist (GnRHa) will improve the symptoms of endometriosis, but it delays conception for several months. Marcoux studied 341 infertile women of 20 to 39 years of age with minimal or mild endometriosis who were randomized to laparoscopic ablation or expectant management. He found that laparoscopic ablation of minimal and mild endometriosis doubled the cumulative fecundity rate after a follow-up period of 36 weeks, 30.7% in the treatment versus 17.7% in non-treatment group. From these findings, he concluded that Laparoscopic resection or ablation of minimal and mild endometriosis enhances fecundity in infertile women (Marcoux 1997).

A systemic review was undertaken to determine whether coagulation or laser vaporization of endometriosis is associated with an increase in the risk of cyst recurrence compared with excision of the pseudocapsule. In the four comparative trials identified, endometrioma recurrence was reported in 39 of 212 (18.4%) women treated with coagulation or laser vaporization compared with 19 of 295 (6.4%) in those who underwent cystectomy. Coagulation or laser vaporization of endometriosis without excision of the pseudocapsule seems to be associated with a significant increase in risk of cyst recurrence (Paulo 2003). In advanced stage IV endometriosis, severe pelvic adhesions enveloping the whole pelvic organs (frozen pelvic) can be encountered. Instead of subjecting the patients to a laparotomy with a low pregnancy rate, the patients are better treated with in vitro fertilization.
Laparoscopic Treatment of PCOS

A modification of ovarian wedge resection is laparoscopic ovarian drilling (LOD). This is performed by creating multiple holes on the surface of the ovary using either electrocautery or laser. As a result, circulating level of androgen is reduced, followed by restoration of pituitary-ovarian axis restoring ovulation. Ovarian drilling is associated with an ovulation rate of 80% and pregnancy rate at 12, 18, and 24 months of 54-68, 62-73, and 68-82% respectively (Al-Sunaidi & Tulandi 2007).

An alternative treatment is medical treatment with metformin. In a randomized trial, Palomba et al compared ovarian drilling with metformin treatment. Group A underwent diagnostic laparoscopy, whereas group B underwent LOD. At hospital discharge, the patients were treated for 6 months with metformin chloride (group A: 850 mg twice daily) or with multivitamins (group B). The ovulation, pregnancy, abortion, and live-birth rates were evaluated. At the end of the study, the total ovulation rate was not statistically different between both treatment groups (54.8 vs 55.1% in group A and B, respectively), whereas the pregnancy (18.6 vs 13.4%), the abortion (15.4 vs 29.0%), and the live-birth (82.1 vs 64.5 %) rates were significantly (P < 0.05) different between the two groups (Palomba 2004).

According to Bayram et al., diagnostic laparoscopy could be omitted in the management of infertile women with PCOS without suspected peritoneal disease. Furthermore, he suggests that, at the moment, LOD should be performed only in oligoovulatory PCOS women with associated gynecological disease (uterine leiomyomas, endometriosis, pelvic adhesions, etc.) (Palomba 2004).

Surgical management of Hydosalpinx to IVF

Hydosalpinx is associated with lower implantation and fecundibility rates. This may be attributed to an alteration in endometrial receptivity or a direct embryo toxic effect. Furthermore, hydosalpinx may be unintentionally punctured at the time of egg retrieval or it may disturb the access to the ovary if it too big. In a meta-analysis, it has been demonstrated that there was a reduction by half in the probability of achieving a pregnancy in the presence of hydosalpinx and an almost doubled rate of spontaneous abortion. In an animal study, the hydosalpinx fluid was shown to contain toxin that are potentially teratogenic (Darwish 2005). Removal of the hydosalpinx (salpingectomy) significantly improved the pregnancy and live birth rates (36.6% versus 23.9% without salpingectomy and 28.6% versus 16.3%, respectively). Patients who benefit most from salpingectomy are those with hydosalpines visible on ultrasound (live birth rate 40% versus 17% without salpingectomy). Moreover, salpingectomy of bilaterally visible hydosalpinges increased the delivery rate 3.5-fold (live birth rate 55% versus 15.8%) (Al-Sunaidi 2005).

Instead of salpingectomy, young women with hydosalpinx can be offered salpingostomy. It eliminates fluid leakage into the uterine cavity and it allows spontaneous conception. (Darwish 2005). Another alternative is occluding the isthmic portion of the tube in the same manner as tubal sterilization. Ultrasound-guided aspiration of the hydosalpinges fluid has also been advocated, but rapid built up of the fluid can occur. A simpler and yet effective approach is the administration of antibiotics to women with hydosalpinx undergoing IVF (Al-Sunaidi & Tulandi 2007).

CONCLUSION

Laparoscopic surgery has very important roles in infertility cases, not only for investigation, but also for treatment. The treatment can be done simultaneously with the diagnosis, especially in cases related to endometriosis, PCOS, hyosalpinx management and adhesion release.

REFERENCES


