laparoscopic removal of an endometriomas prior to IVF does not improve fertility outcomes, and that the surgery may affect negatively the ovarian response to the administered gonadotropins. This study, which was interesting and reports important findings, was retrospective in nature.

In 2008, Kahyaoglu performed a prospective randomized case control study to evaluate if laparoscopic cystectomy and cauterization of endometriomas greater than 3 cm in size will impact the ovarian reserve and IVF outcome (14). The study concluded that laparoscopic cystectomy and cauterization of endometriomas diminishes ovarian reserve (lower number of follicles in patients who had undergone surgery), and does not improve the pregnancy rate with IVF.

We believe that prospective randomized control studies are needed to evaluate the risks and benefits of removal of endometrioma(s) prior to IVF, controlling is needed for all the other factors that can affect outcome such as patient’s age, baseline ovarian reserve, size of the endometrioma(s), prior IVF failure, and presence or absence of male factor infertility.

3. Conclusion

We firmly believe that laparoscopy still has an important role in the diagnosis and treatment of infertility. The majority of patients with infertility, such as those with male factor and/or anovulation, will not need this procedure but a significant number of other patients, such as those with unexplained infertility and those with tubal factor and endometriosis, can benefit from it. Operative procedures at the time of laparoscopy can enhance conception, naturally or with IUI/IVF, such as lysis of adhesions, ablation of endometriosis, and salpingectomy for hydrosalpinx. The issue of removal of endometriomas, prior to IVF, is still somewhat controversial and individualization of treatment in these cases is recommended. If operative laparoscopy is anticipated in infertile patients, experienced and competent physicians who are knowledgeable in surgical techniques, as well as all aspects of infertility diagnosis and treatment, should perform it.

Not all infertility patients will need IVF. Laparoscopy has its own advantages and disadvantages and so does IVF. Laparoscopy still has a place in the armamentarium of the fertility specialists.

References


Comment by: RonyAbdallah, Isaac Kligman

1. Introduction

More than 30 years after the introduction of in vitro fertilization (IVF) and despite the improved success rates of assisted reproductive technologies (ART), the argument for performing diagnostic and therapeutic laparoscopy as part of the infertility workup still stands (1). Most physicians agree that the use of laparoscopy in women with decreased ovarian reserve or severe male factor infertility offers no advantage since the main treatment will remain IVF. However, even considering these factors the presence of hydrosalpinges is known to be associated with poor pregnancy outcomes after IVF and embryo transfer (2), and the advantages of salpingectomy or proximal tubal occlusion relief have been well documented (3,4). The major controversy remains in patients with endometriosis, tubal adhesions, history of tubal ligation, and uterine fibroids distorting the endometrial lining.
2. Endometriosis

A meta-analysis published in 2002 (5) showed significantly lower pregnancy rates for untreated endometriosis patients (odds ratio, 0.56; 95% confidence interval, 0.44-0.70) when compared to tubal factor infertility patients. On the other hand, the data of the Society of Assisted Reproductive Technology (SART, 2008) show that the live birth rate from fresh non-donor cycles in women with endometriosis (43.5%) was slightly higher as compared to women with tubal factor infertility (40.5%) (6). While this data show a high success rate with ART, they do not report whether patients had laparoscopic fulguration or resection of their endometriosis prior to their ART treatment. Unlike when it is performed for the treatment of pelvic pain, laparoscopic resection of endometriomas and endometriosis in young women desiring future fertility is a very delicate procedure that requires great surgical expertise. The surgeon should be comfortable performing a complete resection of all involved sites, (bladder flap, peritoneum overlying ureter and infundibulopelvic ligament, pelvic and anterior abdominal wall, and bowel serosa), while avoiding any injury to the surrounding areas. To avoid resection of extra ovarian tissues, a fine plane should be developed between the endometriotic cyst wall and the ovarian cortex, and most of the endometrioma should be removed to prevent recurrence. The different surgical skills and approaches (resection and fulguration) in treating endometriomas may explain the conflicting results seen in IVF outcomes. In the absence of large randomized controlled trials performed with the same surgical technique, the debate will likely continue with some retrospective studies showing no advantage (7) and possibly harm (8), while others show clear advantage (9) of endometriosis resective surgery prior to IVF treatment. At The Center of Reproductive Medicine and Infertility (CRMI), Weill Cornell Medical College, we recommend laparoscopic ovarian cystectomy with fulguration of all visual endometrial implants prior to ovarian stimulation only in patients with no prior histologic diagnosis of endometriosis.

3. Tubal factors

Although tubal diseases (post inflammatory adhesions, history of tubal sterilization or hydrosalpinx) are not the main indications for IVF anymore, as a single factor they remain a major diagnosis for IVF treatment (10). According to the SART data of 2008, tubal factors were the third most common identifiable diagnosis for ART treatment (8%, 11264 cycles), after male factors (17%) and diminished ovarian reserve (12%) (6). Most studies showed an increased live birth rate post tubal reconstructive surgery but with an unacceptably high ectopic pregnancy rate of 11% (11) and 23% (12). On the other hand, an earlier study from CRMI Weill Cornell Medical College, showed that more than 70% of women with tubal factor infertility will have a baby within four IVF cycles (13). Therefore, with the high success rate of IVF compared to tubal reconstructive surgery, IVF is recommended especially in the presence of severe tubal adhesions or with a history of tubal ligation. However, laparoscopy and hysteroscopy still play a major role in the diagnosis of tubal factor infertility. The workup usually starts with a Hysterosalpingogram (HSG) which is a very useful screening test to rule out tubal obstruction. However, an abnormal HSG may not necessarily be due to intrinsic tubal obstruction but can be secondary to many reversible factors such as tubal spasm, mucosal debris, cornual polyps, technical difficulties, or extra-tubal adhesions. In these cases, laparoscopic surgery with or without transcervical tubal cannulation can both confirm the diagnosis and provide treatment. Transcervical tubal cannulation involves introducing a catheter through the operative channel of the hysteroscope under direct visualization. When the catheter is seen inside the uterine cavity, it is directed in such a way that the tip is just inside the tubal ostium. At this point, indigo carmine dye is injected while the surgical assistant handling the laparoscope is injecting the dye through the fimbriae intra-peritoneally. If patency cannot be documented, a series of smaller catheters can be introduced through the proximal end of the tube to overcome any possible obstruction. The same procedure is then repeated with the contralateral fallopian tube. Novy et al. reported a 50% false positive diagnosis of proximal tubal obstruction on HSG when it was followed by hysteroscopic cannulation with direct laparoscopy or laparotomy visualization (14). Even when laparoscopic chromo-perturbation was consistent with the finding of proximal tubal obstruction on HSG, selective hysteroscopic cannulation showed 35% tubal patency (15). In the same study, and with no further treatment, the pregnancy rate was 36.4% post surgery (14).

Another advantage of laparoscopy is the ability to release peri-tubal adhesions and excise paratubal cysts. Peri-tubal adhesions in addition to interfering with the normal transport of sperm, egg and embryo in natural conception, increase the risk of ectopic pregnancies following IVF and embryo transfer. Paratubal cysts do not interfere with the ovarian response to gonadotropins stimulation but they can present a diagnostic challenge during transvaginal follicular monitoring.

Finally, it is well known that hydrosalpinges increase miscarriage rates and have a negative impact on implantation and delivery rates, in both fresh (16) and frozen (17) embryo transfer cycles. A randomized controlled trial of 204 women with the diagnosis of uni- or bilateral hydrosalpinges and seeking IVF treatment, showed a significant improvement in implantation, clinical pregnancies and delivery rates in the salpingectomy group as compared to the non-intervention group (18). While the literature reports similar outcomes with either salpingectomy or occlusion of the proximal tubal end, we prefer to completely resect the hydrosalpinges if technically feasible (absence of extensive bowel or omental adhesions). Complete salpingectomy will prevent any potential leaking of tubal fluid into the uterine cavity and will avoid confusion with follicular monitoring during controlled ovarian hyperstimulation. If technically challenging or if the surgical procedure pose a high risk of bowel injury, the application of surgical clips to the proximal end of the fallopian tubes will occlude the proximal end of the tube and prevent the hydrosalpinx fluid from leaking into the uterine cavity.

4. Uterine fibroids

Women with submucosal uterine fibroids are known to have a lower fertility potential (19). It is also widely believed that those with intramural fibroids causing cavity distortion have similar poor pregnancy outcome. A prospective controlled
study of 181 young women who have been trying to conceive for more than one year, showed that myomectomy of submucosal or intramural fibroids with submucosal component significantly improved pregnancy rates (43.3% versus 27.2%, and 40% versus 15%, respectively) (20).

Similarly to naturally conceived pregnancies, most studies in IVF cycles show that submucosal and intramural fibroids with endometrial cavity distortion negatively impact implantation and pregnancy rates (21). Surrey et al. showed that pre-cycle resection of submucosal or intramural myomas with endometrial distortion resulted in IVF outcomes similar to controls (22). In these cases pre-IVF myomectomy is strongly recommended. Earlier studies suggested that intramural fibroids without cavitary distortion have minimal or no effect on IVF outcomes. However, a recent meta-analysis of 19 observational studies (6087 IVF cycles) showed a lower clinical pregnancy rate (RR = 0.85, 95% CI: 0.77–0.94, \( P < 0.002 \)) and live birth rates (RR = 0.79, 95% CI: 0.70–0.88, \( P < 0.0001 \)) following IVF, in patients with non-cavitary distorting intramural fibroids compared to those with normal uteri (23). The question whether myomectomy in these cases is beneficial remains to be answered.

Submucosal and intramural fibroids with more than 50% protrusion into the uterine cavity are best treated with hysteroscopic resection. Large fibroids with mostly an intramural component can be treated by multiple hysteroscopic resection, laparotomy, or laparoscopy. We tend to measure the myometrial thickness between the fibroid and the uterine serosa. If the thickness is more than 1.5 cm, we recommend ultrasound guided hysteroscopic resection. Whenever complete resection cannot be accomplished, (fluid over load, excessive bleeding, etc.), a second attempt is made 2–3 months later. Typically, the fibroid will involute and protrude into the cavity leading to a successful second attempt. Laparotomy and laparoscopic resection are reserved for the cases of multiple large fibroids, or when there is a thin layer of myometrium thickness separating the fibroid from the uterine serosa. Abdominal myomectomy used to be the method of choice for the resection of large fibroids, but with the development of improved techniques and instruments laparoscopic myomectomy gained acceptance as an alternative method. However, the need for advanced surgical skills, prolonged operating time, and the concern of uterine rupture with future pregnancy have prevented laparoscopic myomectomy from gaining wide acceptance. Laparoscopic assisted abdominal myomectomy (LAAM) is a technique that combines the advantage of both methods. A 5 mm umbilical incision is made and the laparoscope introduced. After full inspection of the fibroid uterus, pelvic area, and abdominal area, an ultraminilaparotomy (4 cm) Pfannenstiel incision is made. The abdominal fascia is then incised vertically to gain better access to the abdominal cavity. A medium self-retaining retractor, protractor, can then be introduced and the myomectomy is done with a scalpel through the incision. If the fibroids are larger than the incision, a direct morcellation with the scalpel can be done while paying close attention to the underlying endometrium. The sites of the myomas can then be securely closed manually with multiple running or interrupted sutures. The laparoscope is finally used to confirm hemostasis. A modification of this technique involves laparoscopically creating two openings in the broad ligament and introducing a red rubber catheter and wrapping it around the lower uterine segment prior to the myomectomy in order to decrease the uterine defect and decreased operative time. In addition, it confers the advantage of laparoscopic surgery; mainly lower blood loss, decreased febrile morbidity and paralytic ileus, smaller incision, faster post-operative recovery, return to routine activity and prompt resumption of the IVF treatment. Prospective studies with a minor modification of the above mentioned techniques showed a clear advantage in all the above mentioned outcomes when compared to standard laparotomy (24,25).

5. Conclusion

Despite the high success rate with ART, laparoscopy still plays a major role in the diagnosis and treatment of infertility. In patients with proximal tubal obstruction, a combined laparoscopic and hysteroscopic approach can both confirm the diagnosis and clear the obstruction. While the debate of endometriosis and endometriomas resection prior to IVF continues, we favor surgery for women with no history of histologic diagnosis of endometriosis. Repeated hysteroscopic resection, under ultrasound guidance, of large submucosal or intramural myomas should be considered whenever possible (> 1.5 cm myometrial thickness, between myoma and uterine serosa). LAAM is a novel technique that combines the advantages of both laparotomy and laparoscopy for the treatment of large fibroids. It is very important to keep in mind that in older patients, those with decreased ovarian reserve, and for couples with a severe male factor, IVF should remain the mainstay of their infertility treatment.

References

(9) Wong BC, Gillman NC, Oehninger S, Gibbons WE, Stadtmueller LA. Results of in vitro fertilization in patients with endometri-


(24) Hysterosalpingography (HSG) has been classically used for decades for the evaluation of tuboperitoneal infertility. Hysterosalpingo Contrast Sonography (HyCoSy) is an attractive ultrasonography-based tool for outpatient screening for tubal patency. Besides lack of exposure to X-rays or iodinated contrast media, assessment of tubal patency was as good as conventional HSG (5). A new imaging technique called saline intraperitoneal sonogram (SIPS) has been demonstrated as a safe, quick, and potentially cost-effective method for evaluating pelvic adhesive disease in an outpatient facility in women with unexplained infertility and a normal HSG (6). Dynamic MR-hysterosalpingography with cervical cannulation and intracavitary gadolinium injection has allowed assessment of the uterus, fallopian tubes, and extra-uterine pelvic structures, while avoiding all ionizing radiation (7). Based on symptoms suggestive of previous pelvic inflammatory disease (PID), a history of abnormal vaginal discharge and a previous diagnosis of a lower genital tract infection, the positive predictive value of thorough history taking, was only 56%, 59%, and 35%, respectively, in predicting tuboperitoneal infertility (3,8).

Comment by: Ahmed Nasr

1. Introduction

Around the globe, gynecologists are far from reaching a unanimous agreement about the role of laparoscopy in infertility management. Unanswered remains the all-important question of when to perform laparoscopy, if ever, in the infertility work-up. The currently available evidence generates a great deal of uncertainty, controversy, cynicism and skepticism among practicing gynecologists and infertility specialists.

1.1. Diagnostic Laparoscopy

Pragmatic use of diagnostic laparoscopy for the evaluation of all cases of female infertility is a contentious issue. Ten years ago, almost 90% of all reproductive endocrinologists in the USA routinely performed a laparoscopy in the diagnostic work-up of infertility (1). However, in up to two thirds of women, no definite pathology was witnessed or only minimal and mild endometriosis (2). In the mid-1990’s, the test ‘diagnostic laparoscopy’ failed to be an ideal predictor for infertility (3). Consequently, routinely performing this procedure has been seriously challenged (4). In many IVF clinics worldwide, diagnostic laparoscopy is increasingly bypassed in an endeavor not only to avoid potential complications but also to reduce costs (3). Strong advocates of the procedure highly praise laparoscopy as a gold standard diagnostic tool that can be combined with hysteroscopy and endometrial biopsy as part of day care surgery with the potential of performing both diagnosis and therapy. Counter-agonists, on the other hand, focus on other less invasive diagnostic substitutes as well as disadvantages including the need for general anesthesia, patient’s anxiety and the possibility of adhesion formation (3). With the swing of the pendulum, equipoise is still out of reach.

1.2. Could laparoscopy be reliably replaced by unconventional diagnostic procedures in the evaluation of tuboperitoneal infertility?

Hysterosalpingography (HSG) has been classically used for decades for the evaluation of tuboperitoneal infertility. Hysterosalpingo Contrast Sonography (HyCoSy) is an attractive ultrasonography-based tool for outpatient screening for tubal patency. Besides lack of exposure to X-rays or iodinated contrast media, assessment of tubal patency was as good as conventional HSG (5). A new imaging technique called saline intraperitoneal sonogram (SIPS) has been demonstrated as a safe, quick, and potentially cost-effective method for evaluating pelvic adhesive disease in an outpatient facility in women with unexplained infertility and a normal HSG (6). Dynamic MR-hysterosalpingography with cervical cannulation and intracavitary gadolinium injection has allowed assessment of the uterus, fallopian tubes, and extra-uterine pelvic structures, while avoiding all ionizing radiation (7). Based on symptoms suggestive of previous pelvic inflammatory disease (PID), a history of abnormal vaginal discharge and a previous diagnosis of a lower genital tract infection, the positive predictive value of thorough history taking, was only 56%, 59%, and 35%, respectively, in predicting tuboperitoneal infertility (3,8).

Given the fact that Chlamydia trachomatis is the most important etiologic factor in PID, screening for Chlamydia antibod-
There is a serious lack of evidence regarding routine use of diagnostic laparoscopy before the onset of ovulation induction. Please cite this article in press as: Nasr A, Is there a role of laparoscopy in the diagnosis and treatment of infertility in the 21st century?, Middle East Fertil Soc J (2010), doi:10.1016/j.mefs.2010.07.005. Citations (1).

- The role of laparoscopy in IUI (with normal HSG).
- Prospective randomised allocation study, Tanahatoe et al; 2005.
- Laparoscopy first + up to 6 IUI vs 6 IUI then laparoscopy.
- No difference in abnormalities found (48% vs 56%)
- No difference in ongoing pregnancy rate (44% vs 49%).
- NB: high natural pregnancy rate in both groups (12/77 and 16/77).

- The impact of detection and treatment of pelvic pathology prior to IUI seems negligible.

Diagnostic Laparoscopy.
- Laparoscopic evaluation after failure to achieve pregnancy after ovulation induction with clomiphene citrate.
- Benefit of diagnostic laparoscopy for patients with unexplained infertility and normal HSG findings.
- Retrospective analysis (57 cases), Tsuji et al; 2009.
- 46 patients (80.7%) had pathologic abnormalities.

Hysteroscopy is performed also in the course of investigating the causes of infertility or where there is a risk of miscarriage. As a minimally invasive procedure, hysteroscopy is gaining increasing popularity in diagnosing female disorders. At INVICTA Clinics both diagnostic and surgical hysteroscopy is available. Types of hysterectomy.

Description of the medical procedure:
- laparoscopic surgery performed in order to collect a tissue specimen from the pathological ovarian lesion. Type of anaesthesia: general
- Duration of hospital stay: up to 24 hours after surgery. Diagnostic laparoscopy of fallopian tube patency with contrast (dye).