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# Diagnostic role of Laparoscopy in Detecting Tuboperitoneal and Pelvic Factors of Female infertility

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## Abstract

Normal fertility has been defined as achieving a pregnancy within 2 years by regular unprotected sexual intercourse. However, many define infertility as the failure to conceive after 1 year of unprotected intercourse. Infertility can be primary, in women who have never conceived, or secondary, in women who have previously conceived. Infertility affects approximately 13% of women and 10% of men. The major causes of female infertility are anovulation, fallopian tube disease, pelvic adhesions, endometriosis, and unexplained infertility. Tubal factor infertility accounts for approximately 25-35% of cases of female infertility. The evaluation of the fallopian tube is necessary to determine the management plan for infertility. Tubal patency can be diagnosed by hysterosalpingography (HSG) or laparoscopy with chromopertubation. Diagnostic laparoscopy has a role in investigation of tubal factor infertility. Tubal disease is responsible for 25% - 35% of female infertility. The most prevalent cause of tubal factor infertility is pelvic inflammatory disease and acute salpingitis. The incidence of tubal damage after one episode of pelvic infection is approximately 12%, 23% after two episodes and 54% after three episodes.

**Keywords:** Laparoscopy; Tuboperitoneal, Pelvic factors; Infertility.

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## 1. Introduction

Infertility is defined as the inability of a couple toconceive with one year regular unprotectedintercourses.1 the prevalence of women diagnosed within fertility is approximately 13% with a range from 7-28%2in worldwide .About 25% of cases of infertility are attributed to malefactors. In female infertility, untreated infection,anovulation and endometriosis are major causes. Tubal disease affects approximately 25% of infertile couples ranging from mild dhesion to complete tubal blockage. Proximal, distal and peritubular damage may be due to infection, previous surgeries or endometriosis [1]. The incidence of tubal damage after one episode of pelvic infection is approximately 12%, 23% after two episodes and 54% after three episodes. 3 Adhesions due to infection, endometriosis or previous surgery can prevent normal tubal movement, ovum pick up and transport of the fertilized egg into the uterus. Tubal pathology impairs function of the fallopian tube [2]. The evaluation of the peritoneal and tubal factors are necessary to determine the management plan of infertility. Laparoscopy and chromopertubation are widely considered the gold standard tests for investigating tubal patency. They also allow direct visualization and assessment for peritubal disease, adhesion and endometriosis [3].

## 2. HSG and HyCoSy

The HSG provides a morphological view of the uterine cavity, the Fallopian tubes and their patency. According to a meta-analysis, HSG has a reasonable specificity (83%) but a low sensitivity (65%) to document patency of the Fallopian tubes (Swart et al., 1995).4 Fecundability is reduced in the presence of bilateral occlusion and/or hydrosalpinx (odds ratio, OR 0.30; 95% confidence interval, CI 0.13–0.71), but not in the presence of one-sided tubal occlusion or hydrosalpinx (OR 0.81; 95% CI 0.47–1.40) (Mol et al., 1997b).5 Furthermore, an HSG performed with oilbased contrast media may have therapeutic value in women with infertility., a higher conception rate has been demonstrated in patients where HSG was performed with oil-based contrast media than those with water-based contrast media (OR 1.89; 95% CI 1.33–2.68), especially in the subgroup of patients with idiopathic infertility [6]. The conception rate was three times higher in infertile women having an HSG performed with oil- soluble contrast medium when compared with a control group without HSG. However, in everyday clinical practice HSG generally performed with water-based media to prevent allergic reactions despite fact that no clear additional benefit has been reported with regard to fecundability after HSG with water-based media.

HSG has no value in the diagnosis of endometriosis [7]. The technique of HSG has several possible adverse effects. Lower abdominal pain and discomfort are commonly experienced by patients undergoing HSG, and can be remembered for years afterwards as one of the most painful outpatient exams in gynaecology. An HSG can induce or exacerbate PID, leading to peritonitis, pelvic abscess and very

exceptionally even to death. Uterine perforation and post-examination hemorrhage are a possibility. Other complications include granuloma formation and vascular intravasation. Hypersensitivity reactions to iodine exist with any of the HSG media, but allergic reactions are rare. Finally, the ionizing radiation used for HSG can be detrimental to an undiagnozed early pregnancy [8]. Unilateral and bilateral tubal occlusion at HSG and laparoscopy were related to treatment independent pregnancy. The adjusted fecundity rate ratios (FRR) of one-sided tubal occlusion at HSG was 0.80, whereas two-sided tubal occlusion had a FRR of 0.49. In the case of laparoscopy, the adjusted FRRs were 0.51 and 0.15, respectively, for one-sided and two sided tubal occlusion [9]. A laparoscopy showing two-sided occlusion after a normal or one-sided occluded HSG was found in 5% of the patients and the treatment-independent conception rate in this case was virtually zero.

A normal laparoscopic examination after two sided occluded HSG was found in 42% of all patients; in these cases fertility prospects were only slightly impaired with a three year cumulative ongoing intrauterine pregnancy rate of 9%. On the other hand, fertility prospects were strongly impaired in cases where laparoscopy showed one-sided and two-sided occlusions after a two-sided occluded HSG; the adjusted FRR were 0.38 and 0.19, respectively [10]. Hysterosalpingo Contrast Sonography (HyCoSy) is an attractive alternative to HSG because the patient is not exposed to X-rays or iodinated contrast media. Fallopian tubal patency is assessed using transvaginal ultrasonography and a galactose micro bubble contrast medium. The concordance rates on the assessment of tubal patency between HyCoSy and HSG are similar, making this ultrasound diagnostic tool an attractive option for outpatient screening for tubal patency. With reference to pregnancy rates, a case controlled clinical study has demonstrated that allocation of patients screened as normal with HyCoSy to treatments rely on an accurate assessment of tubal patency does not change conception rates [11].

**3. Laparoscopy before IUI**

Whether laparoscopy should be performed after or before IUI was studied in a retrospective study, design by Tanahatoe and co-workers (2003).12 In a cohort of 495 patients with normal HSG, laparoscopy was performed before proceeding to IUI treatment due to unexplained, cervical or mild male infertility. The diagnostic laparoscopy changed the intended treatment in 124 of 495 patients (25%). Excluding the presence of minimal and mild endometriosis as pelvic pathology without therapeutic implications, the additional value of diagnostic laparoscopy is limited [13]. A diagnostic laparoscopy was thus performed in the remaining 64 patients. After the laparoscopy, IUI treatment was started. Before and during IUI in the DLSF group, 11 patients dropped out. Of the 31 patients who became pregnant in this group, 9 conceived before or between IUI and 22 conceived due to the IUI treatment. In the second group (IUI first, IUIF), 77 patients were randomized to treatment with IUI during six treatment cycles. The first three IUI cycles were performed without controlled ovarian hyperstimulation (COH) [14]. If pregnancy did not occur after three cycles of IUI in the natural cycle, then the patient could choose between continuing IUI in natural cycle and starting IUI with COH with recombinant FSH with a maximum of another three cycles.

Further treatment in IUIF group discontinued in 54 patients because of pregnancy (n ¼ 38) or due to drop out (n ¼ 16). The remaining 23 patients who did not conceive in the IUIF group all underwent a diagnostic laparoscopy [15]. The main outcome parameters studied were the pregnancy rate per patient and the presence of pelvic pathology with therapeutic implications. The results are presented in. The pregnancy rate per patient was 40–50% and the presence of pelvic pathology with therapeutic implications was high (48–56%) but both outcome variables were similar in both groups studied (Table 4). Indeed, the at random allocation of patients to one of both study groups did not change significantly the ongoing pregnancy rate per patient nor the presence of pelvic pathology which needed further treatment. The respective ORs were 1.2 (95% CI 0.7–2.3) for the ongoing pregnancy rate per patient and 1.4 (95% CI 0.5–3.6) for the presence of pelvic pathology with therapeutic implications [15]. In conclusion, the authors stress the need for further randomized studies to verify these conclusions since it was impossible to determine a possible beneficial effect of laparoscopic surgery on the cycle pregnancy rate or on the CPR since only crude patient pregnancy rate was presented in their study.

They calculated that at least 1000 patients should have been included to show a difference of 10% in cumulative ongoing pregnancy rate (Tanahatoe et al., 2005). 16 they also mention considerably high natural pregnancy rate in both groups [17]. Scientific evidence suggests that minimal and mild endometriosis, treated surgically before starting COH (COH and IUI may increase cycle pregnancy rate and reduce time to pregnancy). Indeed, in a retrospective cohort study, recently showed data suggesting it is useful to treat minimal and mild endometriosis before starting COH and IUI. This study included 107 women treated during 259 cycles with COH and IUI, including patients with endometriosis (n ¼ 58; 137 cycles) and unexplained infertility (n ¼ 49; 122 cycles). All patients with endometriosis had minimal (n ¼ 41; 100 cycles) or mild (n ¼ 17; 37 cycles) disease that had been laparoscopically removed within 7 months before the onset of treatment with COH and IUI. COH was done by using clomiphene citrate (23 cycles) or gonadotrophins (236 cycles) in combination with IUI. The main outcome measures were the clinical pregnancy rate per cycle and the cumulative live birth rate after four cycles of IUI treatment.

COH and IUI shortly after the complete laparoscopic treatment of minimal and mild endometriosis proved to be as effective as COH and IUI in patients with unexplained infertility with respective clinical pregnancy rates per cycle of 21 and 19% in minimal and mild endometriosis and 20% in unexplained infertility. The cumulative live birth rate after four cycles was also similar in patients with minimal endometriosis (70%), mild endometriosis (68%) and unexplained infertility (66%). The authors conclude that surgical treatment prior to the IUI restores the clinical pregnancy rate after the COH and IUI in women with minimal– mild endometriosis to the same level as that in women with unexplained infertility. This is in contrast with previous studies where the cycle pregnancy rate and the CPR seemed to be lower in patients with surgically untreated minimal to mild endometriosis than those with unexplained infertility. Randomized trials are the needed to verify this conclusion, which might have the important implications [17].

**4. Laparoscopy after failed IUI cycles**

To the best of our knowledge, no studies are available on the additive value of laparoscopy after several failed cycles of COH and IUI. Referring to the above RCT, one may be expected to find significant pelvic pathology (endometriosis all stages, peritubal adhesions) in at least 50% of cases. Laparoscopic treatment enhances the chance of spontaneous conception. One may, by extrapolation, expect a higher pregnancy rate after laparoscopic treatment after several failed IUI cycles. In conclusion, the position of operative laparoscopy for endometriosis and peritubal adhesions prior to IUI treatment or after several failed IUI cycles seems a matter of debate. Further, randomized controlled studies are needed to define the position of laparoscopy in IUI [18].

**5. Diagnostic laparoscopy and IVF**

***5.1. Laparoscopy before IVF treatment***

Although laparoscopy is still considered to be the gold standard in the diagnosis of tuboperitoneal infertility, alternative diagnostic methods, for example, HSG and CAT screening have proven their clinical value and cost-effectiveness for the diagnosis of tubal infertility in everyday clinical practice. The value of diagnostic laparoscopy in case of abnormal HSG findings has been highlighted above. Using these diagnostic procedures and recommendations, it could be argued that diagnostic laparoscopy can be avoided in all cases where available evidence indicates that IVF is the most appropriate and successful treatment. However, there is a fair degree of consensus that selected adnexal pathology, such as hydrosalpinx and ovarian endometriotic cysts, still have to be treated by laparoscopic surgery prior to IVF [19]. With respect to endometriosis, unfortunately there are no RCTs or meta-analyses available to answer question of whether surgical treatment of moderate and severe endometriosis enhances pregnancy rates after spontaneous conception or after IVF. It is however generally accepted that in case of infertility, moderate and severe stage endometriosis should be treated by surgery. There seems to be a negative correlation between stage of endometriosis and spontaneous cumulative pregnancy rate after surgical removal of endometriosis based upon evidence of three studies but statistical significance for this statement was only reached in one study.

With respect to endometriosis and ART, recent ESHRE guidelines state that IVF is appropriate treatment especially if tubal function is compromised, if there is also male factor infertility and if other treatments have failed [20].The IVF pregnancy rates are lower in patients with endometriosis than in those with tubal infertility according to a systematic review of 22 non-randomized studies by Barnhart and co-workers (2002).21 These authors conclude that there is an overall 54% reduction in pregnancy rate after IVF in patients with endometriosis and that success is poorer with advancing severity of disease according to r-AFS classification system. In some large databases e.g. SART and HFEA, however, endometriosis does not seem to adversely affect reported pregnancy rates. There are no available randomized trials that have tested hypothesis that surgical treatment of endometriosis prior to IVF results in higher pregnancy rates when compared to expectant management of endometriosis [22]. Ovarian endometriosis cysts need extra attention in the context of ART since them canbedis advantageous for IVF treatment: theymay interfere with COH, create difficulties in aspirating the ovarian follicles during oocyte retrieval, and be held responsible for producing detrimental substances that are toxic to maturing oocytes, thus impeding embryo cleavage and implantation.

Laparoscopic surgery for advanced stage endometriosis can be technically very demanding, time-consuming and high risk with significant postoperative morbidity and long revalidation. The removal of ovarian endometriomas prior to COH may be associated with significant bleeding and destruction of normal adjacent ovarian tissue, thus diminishing the reproductive ovarian function. There are no randomized studies comparing the live birth rates after IVF treatment in women who were surgically treated for endometriotic cysts prior to IVF versus women who were not. In a retrospective case controlled study, Garcia-Velasco et al. (2004)23 demonstrated that the removal of endometriotic cysts prior to IVF did not improve fertility outcome. Especially in the case of asymptomatic small endometriotic cysts (,3 cm), immediate proceeding to IVF may reduce the time to pregnancy, treatment costs and the possible detrimental effects of inappropriate surgery on the ovarian function. However, laparoscopic cystectomy of larger symptomatic endometriotic cysts (.4 cm) improves fertility and reduces recurrence of these cysts when compared to cyst drainage and coagulate [24].

**6. Conclusions**

Diagnosis of peritubal adhesion can be by hysterosalpingography or laparoscopy. Due to high rates of false-positive and false-negative results with hysterosalpingography, laparoscopy is considered the best technique because of its direct view of pelvic abnormality and the possibility of a one-session treatment. At laparoscopy, the findings determine the option of treatment.

**References**

[1] Y. Chen, W. Premasiri, L. Ziegler. (2018). Surface enhanced Raman spectroscopy of Chlamydia trachomatis and Neisseria gonorrhoeae for diagnostics, and extra-cellular metabolomics and biochemical monitoring. Scientific Reports. 8(1): 5163.

[2] M. Khan, J. Jerin, S. Jesmin, T. Chowdhury. (2014). Laparoscopic evaluation of the tuboperitoneal factors in infertility. BIRDEM Medical Journal. 4(1): 9-12.

[3] S.A. Carson, A.N. Kallen. (2021). Diagnosis and management of infertility: a review. Jama. 326(1): 65-76.

[4] P. Swart, B.W. Mol, F. van der Veen, M. van Beurden, W.K. Redekop, P.M. Bossuyt. (1995). The accuracy of hysterosalpingography in the diagnosis of tubal pathology: a meta-analysis. Fertility and sterility. 64(3): 486-491.

[5] B.W. Mol, P. Swart, P.M. Bossuyt, F. Van der Veen. (1997). Is hysterosalpingography an important tool in predicting fertility outcome? Fertility and sterility. 67(4): 663-669.

[6] C.R. Onwuchekwa, V.K. Oriji. (2017). Hysterosalpingographic (HSG) pattern of infertility

in women of reproductive age. Journal of human reproductive sciences. 10(3): 178-184.

[7] J. van Rijswijk, N. van Welie, K. Dreyer, P. Tajik, C.B. Lambalk, P. Hompes, V. Mijatovic, B.W. Mol, M.H. Zafarmand. (2019). Tubal flushing with oil-or water-based contrast medium: can we identify markers that indicate treatment benefit? Human reproduction open. 2019(3): hoz015.

[8] S.S. Minassian, Evaluation of the Infertile Patient (Case 32). In *Obstetrics and Gynecology: A Competency-Based Companion*, Elsevier: 2010; pp 416-425.

[9] K. Dreyer, J. Van Rijswijk, V. Mijatovic, M. Goddijn, H.R. Verhoeve, I.A. Van Rooij, A. Hoek, P. Bourdrez, A.W. Nap, H.G. Rijnsaardt-Lukassen. (2017). Oil-based or water-based contrast for hysterosalpingography in infertile women. New England Journal of Medicine. 376(21): 2043-2052.

[10] H. YOUSSEF, H. NAGIB, H. SHALAN, A.E.-D. MOSBAH. (2021). Hysteroscopic versus Laparoscopic Tubal Occlusion in Hydrosalpinx Prior to ICSI. The Medical Journal of Cairo University. 89(December): 2481-2488.

[11] J.D.K. Ngowa, J.M. Kasia, N.-T. Georges, V. Nkongo, C. Sone, E. Fongang. (2015). Comparison of hysterosalpingograms with laparoscopy in the diagnostic of tubal factor of female infertility at the Yaoundé General Hospital, Cameroon. Pan African Medical Journal. 22(1).

[12] S. Tanahatoe, P.G. Hompes, C.B. Lambalk. (2003). Accuracy of diagnostic laparoscopy in the infertility work-up before intrauterine insemination. Fertility and sterility. 79(2): 361-366.

[13] D. Mavrelos, E. Saridogan. (2015). Treatment of endometriosis in women desiring fertility. The Journal of Obstetrics and Gynecology of India. 65: 11-16.

[14] R. Satwik, M. Kochhar. (2021). Unexplained infertility categorization based on female laparoscopy and total motile sperm count, and its impact on cumulative live-births after one in-vitro fertilization cycle. A retrospective cohort study involving 721 cycles. Reproductive Medicine and Biology. 20(2): 190-198.

[15] G.N. Allahbadia. (2017). Intrauterine insemination: Fundamentals revisited. The Journal of Obstetrics and Gynecology of India. 67(6): 385-392.

[16] S. Tanahatoe, C. Lambalk, P. Hompes. (2005). The role of laparoscopy in intrauterine insemination: a prospective randomized reallocation study. Human Reproduction. 20(11): 3225-3230.

[17] T. Harada, Y.M. Khine, A. Kaponis, T. Nikellis, G. Decavalas, F. Taniguchi. (2016). The impact of adenomyosis on women's fertility. Obstetrical & gynecological survey. 71(9): 557-568.

[18] L. Yu, Y. Sun, Q. Fang. (2022). Efficacy of Laparoscopic Surgery Combined With Leuprorelin in the Treatment of Endometriosis Associated With Infertility and Analysis of Influencing Factors for Recurrence. Frontiers in Surgery. 9: 873698.

[19] W. Arab. (2022). Diagnostic laparoscopy for unexplained subfertility: a comprehensive review. JBRA Assisted Reproduction. 26(1): 145.

[20] A. Quevedo, R. Pasic, A. Connor, P. Chamseddine. (2021). Fertility sparing endometriosis surgery: A review. Gynecology and Obstetrics Clinical Medicine. 1(3): 112-118.

[21] K. Barnhart, R. Dunsmoor-Su, C. Coutifaris. (2002). Effect of endometriosis on in vitro fertilization. Fertility and sterility. 77(6): 1148-1155.

[22] T. Tanbo, P. Fedorcsak. (2017). Endometriosis-associated infertility: aspects of pathophysiological mechanisms and treatment options. Acta obstetricia et gynecologica Scandinavica. 96(6): 659-667.

[23] J.A. Garcia-Velasco, N.G. Mahutte, J. Corona, V. Zúñiga, J. Gilés, A. Arici, A. Pellicer. (2004). Removal of endometriomas before in vitro fertilization does not improve fertility outcomes: a matched, case–control study. Fertility and sterility. 81(5): 1194-1197.

[24] K. Matsuo, C.E. Jung, M.S. Hom, M.R. Gualtieri, S.C. Randazzo, H. Kanao, A.A. Yessaian, L.D. Roman. (2016). Predictive factor of conversion to laparotomy in minimally invasive surgical staging for endometrial cancer. International Journal of Gynecologic Cancer. 26(2).