

# Transvaginal hydrolaparoscopy for diagnosis of tubal infertility

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## Abstract

**OBJECTIVE:** Infertility problem affects more than 70 million couples worldwide, 5–15% of which are couples in their reproductive age. Less and less invasive endoscopic methods like transvaginal hydrolaparoscopy have been developed by technological progress. This method enables not only precise identification, but is now increasingly used for treatment of tubal and peritoneal factor pathology, which cause approximately 35 per cent of female infertility.

**AIM:** Evaluation of transvaginal hydrolaparoscopy (HLTV) usefulness for diagnosis of tubal infertility comparing to standard laparoscopy and hysterosalpingography (HSG).

**RESULTS:** In evaluation of patent fallopian tubes results of HLTV and HSG examinations are coincide in 87%, while obstruction diagnosed in HSG is confirmed only in 37% during HLTV examination. Transvaginal hydrolaparoscopy and HSG have similar sensitivity and specificity in diagnosis of hydrosalpinx, which is up to 100%. In comparison with HLTV hysterosalpingography is less effective in evaluation of peritubal dilatations and adhesions. Both laparoscopic surgery and transvaginal laparoscopy have the same high sensitivity in diagnostics of the fallopian tubes patency and hydrosalpinx, which is up to 100%. In evaluation of peritubal adhesions and dilatations the results are very similar.

**CONCLUSIONS:** 1. HLTV is a highly useful method in evaluation of the fallopian tubes pathologies which is significantly more sensitive than HSG in evaluation of such lesions as peritubal adhesions and obstructed fallopian tubes. 2. HLTV is as effective as laparoscopy in evaluation of patency and lesions of the fallopian tubes. 3. HLTV is a less invasive method, much better tolerated than laparoscopy and more suitable for the group of overweight patients. 4. Final assessment of HTLV technique will be possible following performance of a greater number of studies, where the foregoing conclusions present only initial observations.

## INTRODUCTION

Infertility problem affects more than 70 million couples worldwide, 5–15% of which are couples in their reproductive age (Ombelet *et al.* 2008; Boivin *et al.* 2007). This has become a social problem.

Among all causes of female infertility tubal and peritoneal factor pathology are the causes of approximately 35 % of all cases. Tubal lesions are mainly caused by infections, endometriosis or surgical procedures (Madhuri 2009; Khalaf 2003; Sotrel 2009).

The demand for infertility treatment has grown significantly in recent years. Endoscopic methods have been created and developed by technological progress. This methods enable at the same time diagnosis and treatment of the causes of infertility. Over the years, less invasive methods have become predominant (Marianowski *et al.* 2007; Zimmer *et al.* 2008). After taking into consideration indications and contraindications, in some hospitals laparoscopy is replaced by hydrolaparoscopy (Taylor 2003; Khalaf 2003; Waterlot *et al.* 2003). Transvaginal access and application of hydroflotation during HLTV examination enable not only precise identification, but are now increasingly used for treatment of pathologies such as adhesiolysis, puncture of thickened surface of the ovary in polycystic ovary syndrome (PCOS) or removal of minor endometriosis using minimally invasive surgical techniques (Pellicano *et al.* 2007; Verhoeven *et al.* 2004; Brosens *et al.* 2001). On the other hand, laparoscopy remains the diagnostic technique of choice in patients without the possibility to inject the pouch of Douglas where results of HSG examination have to be verified, or in the case of indications to perform standard laparoscopy.

Aim of the study was evaluation of transvaginal hydrolaparoscopy (HLTV) usefulness for diagnosis of tubal infertility comparing to standard laparoscopy and hysterosalpingography (HSG).

## MATERIALS AND METHODS

The results of hydrolaparoscopy carried out in infertile women were compared with their results of HSG examination. In a trial group of women with unexplained infertility also the results of hydrolaparoscopy and laparoscopy were compared.

Hydrolaparoscopy was performed under general anaesthesia. After disinfection of the vagina a 2.9 mm diameter endoscope with an optical angle of 30° was inserted via the posterior vaginal wall to the pouch of Douglas. The morphology of the ovaries, the fallopian tubes, posterior wall of the uterus, the pelvis minor walls and the recto-uterine pouch was evaluated. By introduction of Foley catheter into the uterus cavity and application of methylene blue it was possible to test patency of the fallopian tubes, evaluate presence of outside tubal lesions, peritubal stenosis, dilatations and adhesions, size and morphology of the ovaries

and presence of endometriosis (if any). HSG was performed under local anaesthesia. After disinfection of the vagina, Schultz device was inserted into the cervical canal. Contrast agent was injected into the uterine cavity. The first X-ray image was taken after application of 4 ml of the contrast agent in order to see the outline of the uterine cavity. The second X-ray image was taken following application of another 5–10 ml to make the patency of fallopian tubes, tubal lesions and peritubal adhesions visible.

Laparoscopy was performed in a standard manner. After creating of the pneumoperitoneum using Veress needle to puncture the peritoneal cavity, a 10 mm diameter endoscope with an optical angle of 30° was placed via the umbilical canal, and then via 1 or 2 side incisions instruments were passed through to the abdominal cavity to perform the maneuvers necessary for the operation. During the laparoscopy a contrast agent – methylene blue was applied through Schulz device that was previously inserted into the cervical canal to evaluate the patency and condition of the fallopian tubes.

28 THL procedures were performed, out of which 22 patients had previously undergone HSG examination. In the case of two fallopian tubes the results of THL were unclear and therefore rejected from the analysis.

In 4 patients who had undergone hydrolaparoscopy also standard laparoscopy was performed, in two patients it was performed due to unclear results of hydrolaparoscopy – suspicion of one-sided fallopian tube obstruction, where massive fallopian tubes obstruction was observed with the tubes pulled-up highly, and in two patients due to diagnosis of additional pathology of the pelvis minor.

In 4 patients laparoscopy had been performed several years ago – in one patient in primary infertility now being diagnosed due to secondary infertility, in second patient – due to suspicion of endometriosis, in two other patients because of suffering from idiopathic infertility for more than 3 years.

Unsuccessful access to the pouch of Douglas occurred in two patients due to adhesions found in this area being a result of previous pelvic inflammatory diseases (in one patient) and surgery of the pelvis minor (in the second patient).

## RESULTS AND DISCUSSION

For many years there has been a discussion on suitability of imaging and contrast tests in diagnosis of infertility causes. In many studies usefulness of HSG was compared with laparoscopy, HyCoSy, hydrolaparoscopy and other procedures as regards evaluation of the fallopian tubes condition. High efficiency of HSG in evaluation of the fallopian tubes patency was discussed (Mol *et al.* 1999; Shibhara *et al.* 2001). According to our observations sensitivity of HSG is high (up to 87%), however its specificity is quite low (up to 37%) comparing to HLTV, what is inevitably connected with false positive results,

**Tab. 1.** Comparison of HLTV with HSG in evaluation of patency of fallopian tubes - 42 fallopian tubes.

HLTV \ HSG	Patency	Non-patency	Total
Patency	20	12	32
Non-patency	3	7	10
Total	23	19	42

**Tab. 2.** Comparison of HLTV with HSG in evaluation of dilatations of fallopian tubes - 2 fallopian tubes.

HLTV \ HSG	Non-dilated	Dilated	Total
Not dilated	28	2	30
Dilated	5	7	12
Total	33	9	42

**Tab. 3.** Comparison of HLTV with HSG in evaluation of hydrosalpinx - 42 fallopian tubes.

HLTV \ HSG	Hydrosalpinx	No hydrosalpinx	Total
Hydrosalpinx	3	1	4
No hydrosalpinx	0	38	38
Total	3	39	42

**Tab. 4.** Comparison of HLTV with HSG in evaluation of all tubal changes - 42 fallopian tubes.

HLTV \ HSG	No changes	changes	Total
No lesions	24	2	26
Lesions	6	10	16
Total	30	12	42

**Tab. 5.** Comparison of HLTV with HSG in evaluation of all peritubal adhesions - 42 fallopian tubes.

HLTV \ HSG	Adhesions	No adhesions	Total
Adhesions	5	11	16
No adhesions	3	23	26
Total	8	34	42

when instead of the fallopian tube occlusion one deals with the fallopian tube spasm. Such results need to be verified, likewise the unclear results, when the image of contrast within the fallopian tube mixes with the image of surplus contrast material leaking to the peritoneal cavity. In many hospitals laparoscopy is applied as a verification procedure (Fujiwara *et al.* 2003; Rózewicki & Niedzielski 1990; Tsankova *et al.* 2000). More rarely

**Tab. 6.** Comparison of HLTV with laparoscopy in evaluation of tubal patency - 16 fallopian tubes.

HLTV \ Laparoscopy	Patency	Non-patency	Total
Patency	8	0	8
Non-patency	0	8	8
Total	8	8	16

**Tab. 7.** Comparison of HLTV with laparoscopy in evaluation of dilatations of fallopian tubes - 16 fallopian tubes.

HLTV \ Laparoscopy	Dilated	Non-Dilated	Total
Dilated	4	2	6
Non-Dilated	0	10	10
Total	4	12	16

**Tab. 8.** Comparison of HLTV with laparoscopy in evaluation of hydrosalpinx - 16 fallopian tubes.

HLTV \ Laparoscopy	Hydrosalpinx	No hydrosalpinx	Total
Hydrosalpinx	2	0	2
No hydrosalpinx	0	14	14
Total	2	14	16

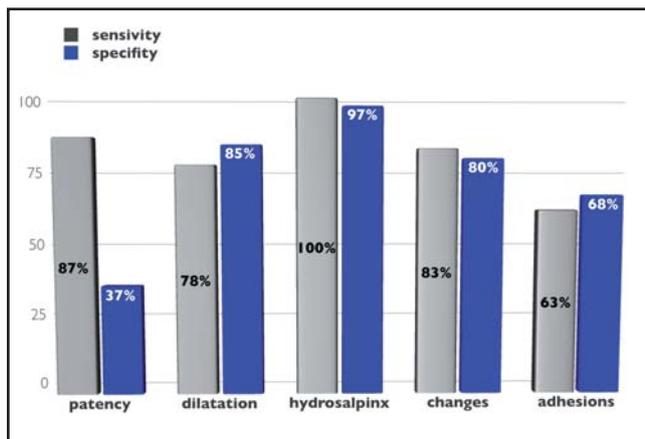
**Tab. 9.** Comparison of HLTV with laparoscopy in evaluation of peritubal adhesions - 16 fallopian tubes.

HLTV \ Laparoscopy	Adhesions	No adhesions	Total
Adhesions	6	2	8
No adhesions	0	8	8
Total	6	10	16

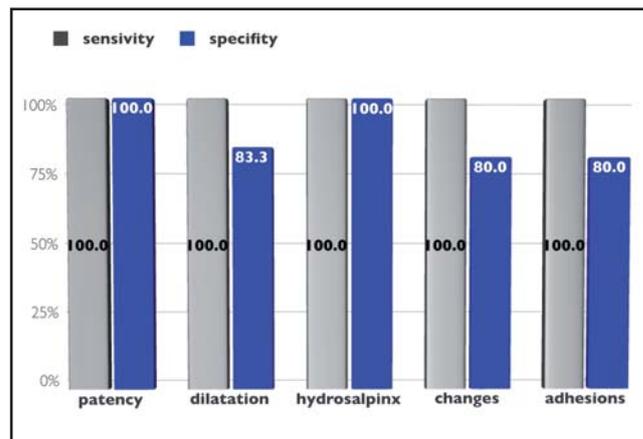
**Tab. 10.** Comparison of HLTV with laparoscopy in evaluation of all tubal changes - 16 fallopian tubes.

HLTV \ Laparoscopy	Changes	No changes	Total
Adhesions	6	2	8
No adhesions	0	8	8
Total	6	10	16

hospitals applied transvaginal hydrolaparoscopy (HLTV) as the procedure for verification, however this method is getting more and more popular (Streda *et al.* 2009; Ahinko-Hakamaa *et al.* 2009; van Tetering *et al.* 2007). Further to our observations both procedures have the same, high sensitivity and specificity (up to 100%) as regards patency and hydrosalpinx evaluation. Basing on our observations HSG is also regarded as



**Fig. 1.** Sensivity and specyfity of hysterosalpingography in evaluation of tubal pathology comparing to transvaginal endoscopy.



**Fig. 2.** Sensivity and specyfity of laparoscopy in evaluation of tubal pathology comparing to transvaginal endoscopy.

highly effective procedure, although is much less useful comparing to HLTV in evaluation of adhesions, other lesions and peritubal obstructions. According to some authors hydrolaparoscopy is even more specific than laparoscopy in evaluation of little adhesions and lesions of the distal part of the fallopian tubes (Daraï *et al.* 2009; Sobkiewicz 2007; Verhoeven & Brosens 2005). However, our observations do not confirm the foregoing. When discussing high efficiency of HLTV in evaluation of the fallopian tubes condition we would like to point out that in our opinion and in the opinion of researches from other hospitals, hydrolaparoscopy meets the requirements of procedure verifying unclear results of HSG in a specified group of women. HLTV is treated by many doctors as a first line procedure in diagnosis of infertility after prior analysis of contradictions (if any) (van Tetering *et al.* 2007; Kowalczyk *et al.* 2006; Verhoeven & Brosens 2005; Hu *et al.* 2005; Gordts *et al.* 2005). Proper qualification of patients allow to avoid complications. In our study in two cases, when we failed to inject the pouch of Douglas, one of the patient had had surgery of the pelvis minor and her adnexa were inaccessible, while the second one had had several infections, that led to adhesions in the peritoneal cavity, what was confirmed by laparoscopy examination. Some doctors perform puncture of the posterior fornix of the vagina assisted by ultrasonography as a way of minimizing the number of complications or failures to inject the pouch (Sobek *et al.* 2007; Sobek *et al.* 2008). In our hospital before HLTV procedure a detailed USG examination of the pouch of Douglas is performed with the aim of evaluating movement of the intestines under pressure of the transvaginal transducer. As more examinations is performed this method seems to be more convincing and friendly, providing the possibility of final verification or full first line examination in the case of infertile overweight women, when there could be some obstacles to perform laparoscopy. Additionally, hydrolaparoscopy does not induce any visible scars within abdominal walls.

## CONCLUSIONS

HLTV is a highly useful method in evaluation of the fallopian tubes pathologies and is significantly more sensitive than HSG in evaluation of such lesions as peritubal dilatations and obstructed fallopian tubes.

HLTV is a more specific method in evaluation of minor peritubal adhesions and dilatations comparing to laparoscopy.

HLTV is less invasive method, much better tolerated than laparoscopy and more suitable for the group of overweight patients.

Final assessment of HLTV technique will be possible following performance of greater number of researches. The foregoing conclusions present initial observations.

HLTV as a minimally invasive and safe method enable a precise evaluation of reproductive organs in infertile women and make minimally invasive treatment possible. Due to the foregoing HLTV may be used as an alternative to laparoscopy for a given group of patients and as a verification method for HSG in evaluation of the fallopian tubes patency.

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