# HYSTEROSALPINGO-CONTRAST-SONOGRAPHY AND HISTEROSALPINGOGRAPHY WITH X RAY VERSUS LAPAROSCOPY IN TUBAL PATENCY ASSESSMENT

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## Abstract

***Introduction*** *Contrast sonography has been used for a long time. Published studies which researched the use of this method for tubal patency encourage the use of contrast substances.*

***Objective****. The comparison of the results of initial testing of hysterosalpingography (HSG) and hysterosalpingo-contrast sonography (HyCoSy).*

***Material and methods****: A group of 50 patients underwent a diagnostic laparoscopy for tubal obstruction, previously diagnosed with an imagistic method. From this group, 23 had a form of tubal obstruction diagnosed with the help of HyCoSy. In the same period, a total of 27 patients were diagnosed with tubal obstruction with the help of HSG.* ***Results****: Among the 23 patients tested with HyCoSy, in 20 tubal pathology was confirmed by laparoscopy. In patients tested with HSG, 16 out of the 27 had tubal pathology confirmed by laparoscopy. The main false diagnosis was proximal tubal obstruction. After questioning the patients about the pain during the non-surgical testing on tubal patency, we discovered a significant discomfort in patients investigated with HSG (20 out of 27) in comparison to those investigated with HyCoSy (2 out of 23).*

***Conclusions****: The usage of hysterosalpingo-contrast sonography is a quick method which provides conclusive evidence regarding tubal patency and could represent a method of choice in investigating a patient with infertility.*

## Rezumat: Histerosalpingografia cu substană de contrast şi histerosalpingografia cu raze X în comparaţie cu laparoscopia ca metode de evaluare a patenţei tubare

***Introducere*** *Investigaţiile ecografice cu substanţă de contrast se folosesc de mult timp. Studiile publicate încurajează folosirea substanţei de contrast pentru investigarea patenţei tubare.*

***Obiectiv*** *Compararea rezultatelor ale histerosalpingografiei şi ale histerosalpingografiei cu substanţă de contrast.*

***Material şi metode****: Un grup de 50 paciente a fost supus unei laparoscopii diagnostice pentru obstrucţia tubară, după ce au fost diagnosticate în prealabil cu o metodă imagistică. Din acest grup, 23 de paciente au avut o formă de obstrucţie tubară diagnosticată cu histerosalpingografia de contrast. În aceeaşi perioadă, un număr de 27 paciente au fost diagnosticate cu obstructive tubară cu ajutorul histerosalpingografiei.* ***Rezultate*** *Din cele 23 paciente investigate cu ajutorul histerosalpingografiei de contrast, 20 au avut patologii tubare confirmate laparoscopic. În cazul pacientelor investigate cu histerosalpingografie, 16 din cele 27 au avut patologii tubare confirmate laparoscopic. Cel mai frecvent diagnostic fals a fost cel de obstrucţie tubală proximală. După interogarea pacientelor cu privire la durerea suferită în timpul testării non-chirurgicale a patenţei tubare, am descoperit un discomfort considerabil în cazul pacientelor investigate cu ajutorul histerosalpingografiei (20 din 27) spre deosebire de pacientele investigate cu histerosalpingografie de contrast (2 din 23).*

***Concluzii*** *Folosirea histerosalpingografiei cu substanţă de contrast este o metodă rapidă care aduce informaţii valoroase cu privire la patenţa tubară şi care ar putea reprezenta o metodă de elecţie în investigarea pacientelor cu infertilitate.*

**Cuvinte cheie**: patenţă tubară, histerosalpingografie, histerosalpingografie cu substanţă de contrast, laparoscopie

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## Introduction

First generation contrast agents - ECHOVIST® Berlex Canada – suspension of granules of galactose in galactose solution, LEVOVIST® Berlex Canada, Schering AG – suspension with granules 99.9% galactose and 0.1% palmitic acid, seemed promising in the years 1996-2000, for sonohysterosalpingography. The above mentioned substances injected through catheters in the uterine cavity, showed the tubal passage, by the crossing of microbullas in the lumen. The disadvantage of the first generation contrast agents was the very short life time, of dozens of seconds, but also the destruction of the microbubbles by the standard 2D used ultrasound. At the same time with the development of ultrasound equipment, the possibility of using the regulation of the mechanic index of ultrasound generated by the transducer was discovered, and the decreasing of this index led to a more reduced destruction of the contrast substance microbullas. Under these circumstances, the development of a new contrast agent – sulfur hexafluoride, Sonovue, Bracco – that lasts longer at ultrasound led to the quality increase of the ultrasound image. In the beginning, Sonovue was administered by vein, in hepatic, pancreatic, prostatic, thyroid, breast tumors, and also for the ultrasound of the lymph nodes. Since 2009, there were several studies published studies regarding the utilization of sulfur hexafluoride in sonohysterosalpingographies (1,2). The aim of this study is to assess if the tubal obstruction diagnosed through sonohystero-salpingography with Sonovue contrast agent (HyCoSy) or through hysterosalpingography (HSG), is confirmed through laparoscopy.

## Material and method

A group of 50 patients underwent laparoscopical surgery for a previously imagistically diagnosed tubal obstruction, over a period of 2 years, at the Obstetrics and Ginecology Clinic nr 1, Tîrgu Mureş.

Out of these, 23 patients were investigated through HyCoSy and had a form of tubal obstruction (group 1). At the same time, 27 infertile patients were diagnosed with tubal obstruction through HSG (group 2). For both groups the inclusion criteria consisted of tubal obstruction diagnosed through an imagistic method, followed by a laparoscopic intervention, adequate results of the bacteriological exam of the cervical canal and Babeş-Papanicolau test for invasive investigations.

For HyCoSy an ultrasound with custom soft was used, with a vaginal and abdominal 2D/3D transducer, catheters type Cook for intrauterine-sonohysterography, 40 ml of substance prepared from a bottle of Sonovue with physiological saline solution, without previous medication. There was no anesthesia used before the instillation. HyCoSy was performed in a private practice, by a unique gynoecolgist. The used ultrasound was Acuson S 2000- Siemens, with special soft for contrast - Cadence™ contrast pulse sequencing technology, and with vaginal 2D -EC9-4, 9-4 MHz transducers and the maximal angle of the sector of 178 degrees, and 3D/ 4D -EV9F4, respectively. Initially we performed a transvaginal 2 D ultrasound of the uterus and ovaries in every patient pointing out the intrauterine catheter. During the administration of the Sonovue substance, we performed a 2 D ultrasound with the activated contrast soft, with a dual combined image: 2D and contrast, but also with the image only in contrast. At the same time with the instillation of the contrast agent, the 2D vaginal transducer aimed to point out the uterine body, the entire pelvis, and separately every ovary. The 3D/4D transvaginal transducer, was used for acquisition of the volumes centered on the uterine body, which we acquired concomitantly with the instillation of the Sonovue substance. We considered the salpinx permeable of the tubal passage appeared in real time, the downloading around the ovary and the appearance of the contrast agent in the Douglas pouch. In patients where one or both salpinx were not detected, the instillation continued under 'targeted' ultrasound on the involved ovary, with 20 ml of substance.

For HSG, we administered contrast agent, for pointing out utero-tubal passage, obtaining images for the uterine cavity and the tubal lumen plus download around the ovary. These patients were

previously tested for iodine. HSG was performed after administering anti-spastic medication (40 mg of Drotaverine –NO-SPA). The substance used for instillation in the Schultze device for HSG was Iomeron 370, administered with radiological guidance. HSG was performed in the department of radiology from the Emergency County Hospital Mure', by several operators.

For the 50 patients which underwent laparoscopy, tubal permeability was tested with sterile blue methylene substance insufflated with the Schultze device. Several surgical teams were involved in these interventions. There were not any important complications during or after the surgical intervention. All the patients gave their consent for these procedures.

## Results

Out of 70 patients investigated through HyCoSy, 47 had patent Fallopian tubes, with normal caliber, fast loading and easy downloading of the contrast agent around the ovary. In 20 patients out of 23 tested through HyCoSy, tubal pathology was confirmed by laparoscopy. Among the tested patients through HSG, 16 of 27 presented tubal pathology confirmed by laparoscopy. Most frequent false diagnosis of proximal obstruction occurred by possible tubal spasm associated perhaps to the pain. Using a questionnaire for the pain felt by the patient during the non-surgical testing of the tubal permeability, the patients described a significant pain during HSG (20 of 27) in comparison with those investigated through HyCoSy (2 of 23). We did not encounter side effects such as allergies, infections, pelvic inflammatory disease.

Out of the 50 patients identified to have tubal pathology after HSG or HyCoSy, only 36 (72%) presented the same lesions at laparoscopy.

## Discussion

The medical literature describes several papers regarding the instillation of saline with air bubbles in order to explore the uterine cavity and even the tubal permeability (3,4,5,6). The results of salpingosonography were similarly in 69% of the cases with those obtained by radiological hysterosalpingography, and in 82% with those obtained by laparoscopy in a group of 21 patients (5). Several papers proved the advantages of sonohysterosalpingography in comparison with the radiological method (7) or equal results with those of the two methods, used in the documentation of tubal permeability (8). Regarding the positive and negative predictive values on a group of 68 patients, Radič underlined better results after contrast agent – Echovist sonohysterosalpingography in comparison with that through saline with bubbles obtained by shaking (9). Different published papers describe relatively small groups of patients – 52 patients selected with tubal obstruction after sonohysterosaplingography with saline with microbubbles obtained by shaking (1), or 42 patients (2) tested with SonoVue plus ultrasound with contrast soft, after the initial administration of saline with

**Table 1.** The results of the tubal permeability testing through HSG versus laparoscopy

| | Diagnosis through HSG | Diagnosis confirmed through laparoscopy |
|---|---|---|
| Bilateral proximal tubal obstruction | 17 | 8 |
| Unilateral proximal tubal obstruction | 4 | 3 |
| Uni- or bilateral hydrosalpinx | 6 | 5 |
| TOTAL | 27 | 16 ( 59,25% ) |

**Table 2.** The results of the tubal permeability testing through HyCoSy versus laparoscopy

| | Diagnosis through HyCoSy | Diagnosis confirmed through laparoscopy |
|---|---|---|
| Bilateral proximal tubal obstruction | 12 | 10 |
| Unilateral proximal tubal obstruction | 5 | 4 |
| Uni- or bilateral hydrosalpinx | 6 | 6 |
| TOTAL | 23 | 20 (86,95%) |

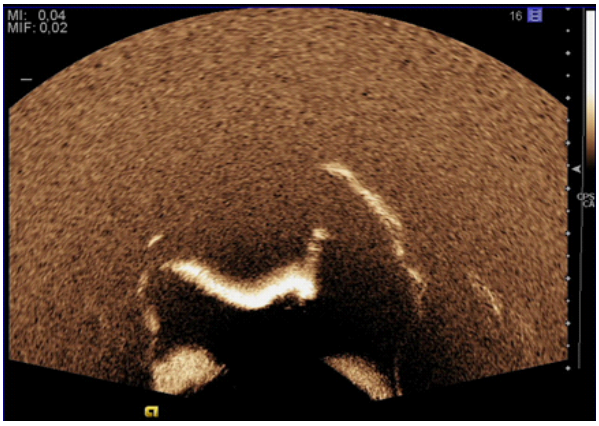


***Fig. 1*** *The passage of the contrast agent from the uterine cavity in both salpinges with normal caliber, with bilateral downloading around the ovaries, in contrast mode HyCoSy*

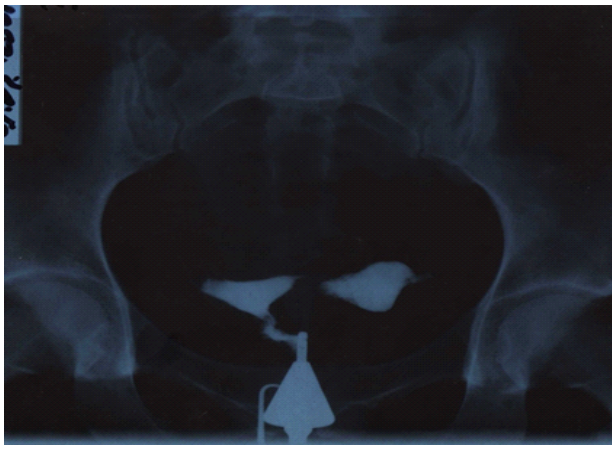

***Fig. 2.*** *HSG with hydrosalpinx*

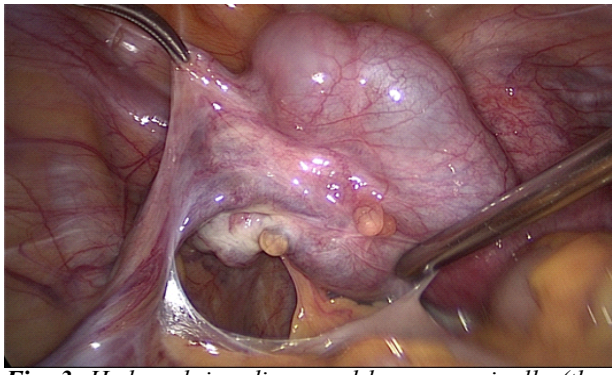

***Fig. 3.*** *Hydrosalpinx diagnosed laparoscopically (the same patient as in the previous image)*

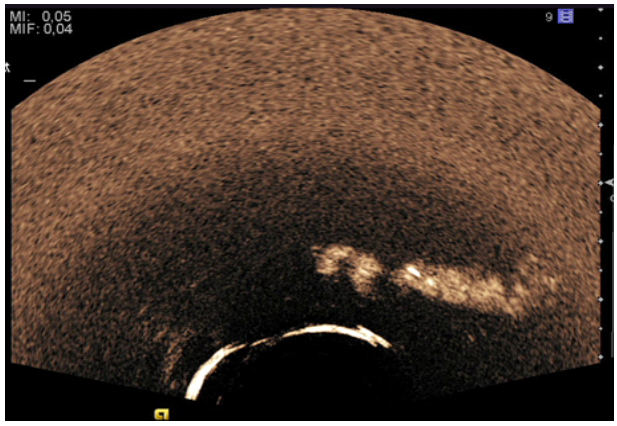


***Fig. 4.*** *Fallopian tube with dilatations, sinuous – contrast mode HyCoSy*

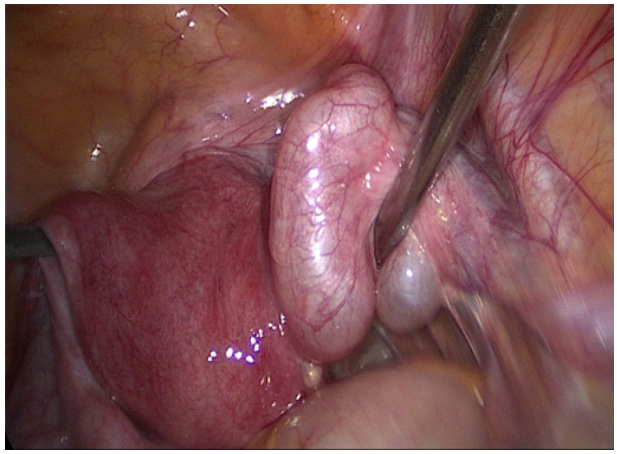

***Fig. 5.*** *Hydrosalpinx diagnosed laparoscopically (the same patient as in the previous image)*

microbubbles. The obtained results through sonohysterosalpingography were verified laparoscopically. Exacoustos et al encountered a correspondence of 93% between tubal occlusion identified through sonohysterosalpingography and laparoscopy by chromotubation, respectively, from 16 patients with tubal pathology (13). Lanzani et al identified 4 patients with bilateral tubal obstruction after sonohysterosaplingography with contrast agent, among which only one presented patent salpinges

**Table 3.** Data from the literature, compared to our study, only in the articles of Exacoustos (1) and Lanzani (2) for HyCoSy was used SonoVue

| | Number of patients | HSG versus laparoscopy | HyCoSy versus laparoscopy |
|---|---|---|---|
| Volpi **(5)** | 21 | 69 % | 82% |
| Volpi **(8)** | 36 | - | 25 (69,4%) |
| Hajishafiha**(13)** | 8 | 0 (0 %) | 6 (75%) |
| Exacoustos **(1)** | 16 | - | 15 (93%) |
| Lanzani **(2)** | 4 | - | 3 (75%) |
| Socolov **(4)** | 91 | 61.9% | 81.39% |
| Our study | 50 | 16 ( 59,25% ) | 20 (86,95%) |

during laparoscopy and chromotubation (14). Generally, in a review of the literature, it seems that the results of HyCoSy are comparable with those of laparoscopy for the tubal permeability testing (10). Our study indicates relatively the same data described by the studies from the literature mentioned above.

A disadvantage suggested by Papaioannou et al regarding sonohysterosalpingography with air bubbles- saline or with albumin substances. Is the lack of a correspondence between the data provided by this investigation and the hysterosalpingography or laparoscopy for the left salpinx. In this review, the left salpinx considered to be obstructed, was frequently a false result according to the others investigations of the tubal permeability (11). The use of the SonoVue agent indicates without doubts the ultrasound image with downloading around the ovary, which theoretically excludes this disadvantage suggested by Papaioannou at al (11), and the pain felt during HyCoSy was rarely encountered similarly to other study (12)

## Conclusions

HyCoSy is a superior method in comparison to HSG, when compare the pain of the patients and the false negative results of the tubal patency. This method can be of first choice for the investigation of infertility, even though the gold standard for testing the tubal permeability remains the laparoscopy.

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