

Chromopertubation – Presentation of a Modification of the Standard Technique

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Abstract. *Background and Aim:* In this article, we describe an easy and cost-efficient technique to improve the applicability of blue dye for chromopertubation using a pediatric transurethral catheter. *Materials and Methods:* We evaluated our technique at a University Hospital with 21 patients aged between 19 and 39 years with primary and secondary infertility, undergoing laparoscopic chromopertubation of the fallopian tubes using a transurethral Foley catheter. *Results:* Our results show an easy and quick performance and distribution of a cost-efficient method. *Conclusion:* Using a transurethral catheter is a time-efficient, easy-to-handle, cheap and effective method for chromopertubation.

Infertility is defined as the failure to conceive after one year of regular unprotected sexual intercourse. It affects 10% to 15% of all couples (5). There are different reasons for infertility, which can be due to the female as well as the male partner. Common reasons for female infertility include ovulation problems, tubal blockage, age-related factors and uterine problems. The main cause of male infertility is low semen quality. Focusing on tubal blockage, there are several methods which can be employed to check tubal patency, such as hystero salpingo contrast sonography and radiographic hystero salpingography, with similar efficacy (2, 6). Another technique is trans-vaginal hydro-laparoscopy in combination with mini-hysteroscopy and chromopertubation (18). If hystero-salpingo contrast sonography is performed by an experienced gynecologist, it serves as a valuable first-line screening test (13) for the more invasive procedures of laparoscopy and dye-chromopertubation, as well as hysteroscopy. If detailed

diagnostic information is required in women without clinical or sonographic evidence of pelvic pathology, the surgical technique of fertiloscopy is another, rarely used option (10, 19). Chromopertubation is a method traditionally used to check for tubal patency (7), but there are several techniques to perform it. In particular, it is important to be able to insert the blue dye easily and efficiently into the uterus, only then can the test be accomplished quickly and reliably. However, this is, for several reasons, rarely achieved. Using the standard metal cannula often leads to leakage of the dye. Another problem is that the dye can cause adverse events such as an anaphylactic reaction (14). In Germany, the most common catheter implemented is the Schultz catheter, consisting of a metal with a plastic cone which is placed over the cervix and which is therefore quite rigid to apply. Although the most common problem in the use of uterine catheters is leakage of the dye (9), the economic issue that the catheter systems used in hysterosalpingography are expensive also ought to be considered (3). With this report, it is our aim to introduce an easy method for performing chromopertubation compared with other catheter systems by using a Foley catheter for infants with a tip balloon enabling an approach which is more cost-efficient and allows a quick operation mode.

Patients and Methods

The method was introduced at the Department of Obstetrics and Gynecology of the University Medical Centre Mannheim, Germany. We used Norta® Foley catheters 30 cm in length and 6-8 Charrière-thick, distributed by BSN medical GmbH, Hamburg, Germany. Between April 2011 and January 2012, 21 patients aged between 19 and 39 years with primary or secondary infertility underwent chromopertubation by laparoscopy. Different sizes of Foley catheters were used depending on the cervical dilatation. Diluted toluidine blue dye (20-50 ml) was injected intra-operatively into the uterus. All data were collected retrospectively for all patients who underwent the procedure. All operations were performed in a standardized way in the first half of the menstrual cycle. A detailed medical history and physical examination was obtained for all patients. During surgery, each patient received single-shot prophylactic antibiotics.

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Figure 1. Transurethral catheter.



Figure 3. The blocked catheter in the uterus.



Figure 2. Inserting the catheter into the uterus.

Table I. Patient characteristics.

	Mean±Std. deviation (Range)
Age (years)	31.9±5.4 (19-39)
Weight (kg)	70.1±16.87 (55-111)
Height (cm)	165.1±6.4 (155-176)
BMI (kg/m ²)	25.7±6.1 (20-38)
Gravity	0.4±0.8 (0-3)
Parity	0.15±0.4 (0-1)
Sterility	
Primary sterility	15/21 (71.4%)
Secondary sterility	6/21 (28.6%)
Patency of fallopian tube	
Bilateral	11 (52.3%)
Unilateral	7 (33.3%)
No patency	3 (14.3%)

Operative procedure. Chromopertubation was performed under general anesthesia in the lithotomy position. After disinfection and emptying of the bladder, a small Foley catheter was inserted through the cervix into the lower uterine segment (Figures 1-3) (infant-catheter, 6-8 Charrière). The infant catheter consists of a mandrin, which simplifies the insertion into the uterus while fixing the portio with bullet forceps. The catheter was blocked with a balloon with saline infusion. Laparoscopy was performed after the pneumoperitoneum had been created using a verres needle. One 10 mm port was inserted through the umbilicus for a 10 mm laparoscope 0°. If necessary, one or two 5-mm ports were inserted laterally to the visualized inferior epigastric vessels. The patient was placed in the Trendelenburg position to inspect the inner genital organs. When the fallopian tubes were identified, 20 to 50 ml of diluted toluidine blue dye was injected through the catheter. Tubal

patency was assessed by observing the discharge of the dye through the fallopian tubes.

Data analysis. The descriptive statistics were calculated with Prism 5.0 software (GraphPad Software Inc., San Diego, CA, USA).

Results

The insertion of the Foley catheter was accomplished in all patients without any problems. No reflux of dye into the vagina was observed. The patient characteristics are shown in Table I. 15 patients suffered from primary sterility (71.4%), six of secondary sterility (28.6%). Bilateral fallopian patency was seen in 11 cases (52%), unilateral patency in seven (33%) and no

Table II. *Details of operation time.*

Duration of operation, min (range)	60.0±39.9 (10-156)
Duration of operation for patients with chromopertubation only, min (range)	20.4±13.4 (10-41)

patency was found in three patients (14%). Six different gynecologists performed the interventions. Operating time ranged from 10 to 156 minutes, depending on additional procedures (details of operation time are shown in Table II). In five of the patients, chromopertubation was the only procedure performed. In the other patients, additional procedures were necessary, including extirpation of ovarian cysts, conization of the cervix, myoma resection, ablation of endometriosis, salpingotomy in hydrosalpinx, resection of a uterine septum *via* hysteroscopy, puncture of a hydatid, diagnostic hysteroscopy and curettage. In eight out of the 21 patients (38.1%) there were no adhesions, in the other patients, adhesiolysis had to be performed to allow for the visualization of the fallopian tubes. Intraoperative complications included one case with a lesion of the intestinal serosa after extended adhesiolysis and one case of major bleeding during the resection of a 140 g myoma, yet conversion to laparotomy was not necessary.

Discussion

Chromopertubation, in which catheters are used to apply the dye, is a well-established procedure in the diagnostic workup for sterility. However, the procedure needs to be easy to perform and not too expensive. Cervical stenosis may obstruct the cervix. Several methods were suggested to widen the passage for catheter placement. The easiest and most obvious way is to try to widen the cervical channel gently by using Hegar sticks. Allison *et al.* (1) used the Seldinger technique with a 0.0038-inch guide wire and a 5 FR taped dilator. In extreme cases the use of a 22-gauge spinal needle, which is inserted into the endocervical canal while directing the needle toward the presumed location of the endometrial cavity, is needed (11). Others use chorionic villus sampling catheters with their malleable stylet to help open the stenotic os and introduce the catheter into the uterine cavity. Once this has been accomplished to satisfaction, the stylet is removed, leaving the catheter in place. Saline can be infused through the indwelling flexible catheter, enabling the filling of the uterine cavity (12). In our study there was no case of cervical stenosis. As the catheters were quite thin (6-8 CH) and they include a guide wire, it was easy to pass the cervical os. There was no need to dilate the cervix. Especially metal catheters, but also synthetic plastic catheters with balloon systems can perforate the uterus. Catheter systems as the RUMI system[®] uterine manipulator (CooperSurgical, Inc., Trumbull, CT, USA) are useful devices for uterine mobilization, handling and

chromopertubation during laparoscopic surgery. But there are reports of over inflation of the tip balloon causing uterine rupture resulting in massive hematoma (20). However, these cases are isolated reports and such occurrences are rare. The tip balloon of the Foley catheters we used and the catheter itself are supple and smooth, and both are flexible and unlikely to injure the uterus. In our study, there was no case of perforation or lesion of the uterus or cervix. In Germany, the most commonly used adapter is the Schultz adapter. Although it closes the cervix nearly completely through its conic cap, reflux of the dye into the vagina can still occur. Especially if the cervical canal is wide, it can be difficult to obtain sufficient intra-uterine pressure for perturbation (4). Many of the other methods employed also have leakage problems. In particular, there are reports of using a thin catheter and pressing on the cervix with the vaginal speculum to prevent reflux into the vagina (9). To reduce the reflux problem, most studies use catheters with a balloon. Lindheim *et al.* analyzed hysterosalpingographies and suggested that patients with an incompetent cervix or with an enlarged uterus are best examined with balloon systems or an 8-French pediatric Foley catheter (8). In the case of a wide cervical channel, it is advised to maintain steady forward pressure on the catheter to support the catheter balloon position in the endometrial cavity during saline administration (1). If the cervical channel is not too patulous, the catheter balloon tip may be inflated to aid in uterine traction, or to limit efflux or spontaneous expulsion of the catheter (15). In our study, we used Foley catheters with a tip balloon. We did not observe any case of leakage through the cervical channel. There was no need for traction or pressure application. The balloon seemed to seal the inner cervical os in a satisfactory way, avoiding reflux into the vagina. Probably one of the most important aspects in the implementation of catheters is the time used for positioning. The material the catheter is made of may contribute to this aspect. Sholkoff found that a catheter made of polyvinylchloride is sturdier and more malleable than other hysterosalpingographic catheters made of polyethylene or rubber (16). Tur-Kaspa *et al.* compared a hysterosalpingo-graphy balloon catheter (Bard Reproduction Systems, Galway, Ireland) with a traditional metal cannula in a prospective, randomized blinded study and showed that with the balloon catheter, hysterosalpingography was performed significantly faster, the amount of fluid used was significantly less, and it was easier to use compared with the metal cannula (17). The study of Dessole *et al.* (3) evaluated six types of catheters used for hysterosalpingography, examining 610

patients. In this study, the Foley catheter was rated as cheapest but more difficult to use, as it requires a greater time for insertion and positioning. However in this study, the Foley cath used was the thickest of all tested catheters at 8-CH (the other catheters were 6-CH-thick or smaller), hence it lacked an inflexible guide for insertion, which our catheters had. The Foley catheter is similar to the pediatric Foley catheter we used in our study. In Dessoles *et al.*'s study, the only catheter without a balloon required significantly more fluid to fill the uterus because of the high backflow into the vagina, which demonstrates, that the existence of a balloon seals the cervix and prevents the reflux of dye. Dessole *et al.* concluded that the choice of the catheter must be targeted to achieve a good balance between tolerability for the patient, efficacy, low cost, and the personal preference of the user (3). Seeking a safe, fast and easy method for laparoscopic chromopertubation, we found that a pediatric Foley catheter with a guide wire seems to fulfil these requirements. We believe that this method is beneficial for laparoscopic techniques. The results of this study have lead to the use of Foley catheters as the standard equipment for chromopertubation in our Department. However, studies with larger number of cases need to be performed to confirm our results. Besides describing the new technique, we were able to show that chromopertubation can be accomplished safely and easily by using pediatric Foley catheters.

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