

A PILOT STUDY OF PARRYSCOPE AND HYSTEROSCOPIC FLOW TECHNIQUE FOR TUBAL PATENCY AMONG INFERTILE WOMEN

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ABSTRACT

Background: Infertility affects 17.9 % couples of India. One of the main causes of infertility is tubal block (30-40%). Hysteroscopy along with laparoscopy is regarded as the gold standard in the assessment of uterine cavity and tubal patency. We used two different techniques of hysteroscopy and then compared them with laparoscopic findings. **Purpose of the study:** To study the performance of Parryscope and hysteroscopic flow technique for tubal patency. **Materials and Methods:** Study was conducted at a tertiary care hospital in New Delhi. A total of 30 patients of infertility posted for Diagnostic Hysteroscopy were enrolled in the study. In the Parryscope technique of hysteroscopy, air infused saline was introduced into the uterine cavity and bubbles were seen traversing one or both ostia. In flow technique naturally present substances contrasting with saline was seen that traversed the ostia. **Result:** Diagnostic accuracy of parryscope was found to be 90% and that of flow was 70% for predicting tubal block in the patients of infertility. **Conclusion:** In predicting fallopian tubal occlusion, Parryscope technique was found to be better than the flow method, with higher sensitivity and specificity, i.e. 100.00% and 87.50%. For patients who desire fertility, adding air infused saline to routine hysteroscopy and monitoring whether air bubbles traverse through the tubal ostia or not can yield important information.

INTRODUCTION

Infertility is defined as failure to achieve pregnancy within 12 months of unprotected intercourse or therapeutic donor insemination in women younger than 35 years or within 6 months in women older than 35 years.^[1] Infertility affects approximately 17.9% (as per NFHS 4) of couples in India and represents an important part of clinical practice.^[2] The major causes of infertility includes (1) Tubal pathologies (30-40%), (2) Ovulatory dysfunction (20-40%), (3) Male factors abnormality (30-40%), (4) Uterine pathology (10%) and, (5) unexplained (10%). Among all causes, tubal pathologies are the most common cause of infertility, which alone accounts for 30-40% of cases. Hysteroscopy is regarded as the gold standard for assessing uterine cavity as well as tubal patency in combination with laparoscopic chromoperturbation.^[3] Parryscope technique where tubal patency was assessed using air infused saline in office hysteroscopy. Flow technique is another approach on hysteroscopy where a positive flow is created as defined by observing a naturally present substance contrasting with saline that traversed the ostia.^[4]

MATERIALS AND METHODS

After obtaining ethical clearance from the institutional ethics committee, the study was carried out from September 2022 to February 2024 in a tertiary care hospital. During this period of time 30 patients were enrolled in this study and using block randomisation were divided into two study groups. A detailed history, systemic and gynaecological examination was done in all the subjects and requisite investigations were done.

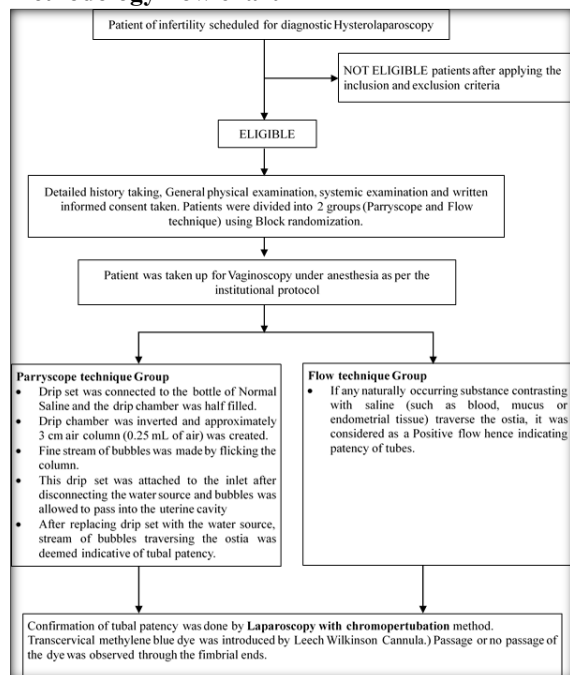
Parryscope technique group- Drip set was connected to the bottle of normal saline and the drip chamber was half filled. This drip chamber was inverted and approximately 3 cm air column (0.25 mL of air) was created. A finer stream of bubbles was made by flicking the air column in the tubing for better bilateral dispersion. The water source was disconnected from the inlet of the hysteroscope and this drip set was attached to the inlet and bubbles were allowed to pass into the uterine cavity. After the bubbles entered the uterus, the drip set was disconnected and the water source was connected again. A stream of bubbles seen inside the uterus traversing one or both the ostia was seen with the help

of hysteroscope and was deemed indicative of tubal patency (Fig. 1). At least ten seconds of intracavitary evaluation was performed prior to bubble entry to allow pressure equilibration if a hydrosalpinx were present. If a single, small (<2 mm) bubble entered the ostia or if bubbles entered only prior to pressure equilibration, this was not considered reflective of patency. If bubbles did not rapidly traverse the ostia, they were observed for 40-60 seconds to differentiate occlusion from transient spasm. If bubbles preferentially migrated to only one side, the patient was rolled on her side to allow for contralateral dispersion.^[5]

Flow technique group - A positive flow is defined as the observation of a naturally present substance contrasting with saline that traversed the ostia. Examples of these include blood, mucus, and displaced endometrial tissue.^[6]

After performing each of the above mentioned methods for assessing tubal patency, confirmatory Laparoscopy was done with chromopertubation. Thorough inspection of the peritoneal cavity was done, along with uterus tubes and ovaries. All the findings were documented, then transcervical methylene blue dye was introduced by Leech Wilkinson Cannula. Passage of the dye was observed through the fimbrial ends. Spillage of the dye from each tube is noted as confirmation of tubal patency.^[3]

Methodology flow chart



RESULTS

Demographic profile of the study subjects is shown in Table 1.

The procedure was done in 15 patients in each group. In the Parryscope group, 7 patients (46.67%) had unilateral tubal block, 1 patient with bilaterally blocked tube (6.66%) and 7 patients with bilaterally patent tubes (46.67%); while in the Flow group, 3 patients with bilaterally patent and bilaterally blocked tubes (20% each) and 9 patients with unilaterally blocked tubes (60%). So, bilateral tubal occlusion was seen in a single case in Parryscope group and 2 patients in Flow group. There were no complications in any of the procedures. The findings were statistically comparable among the two groups with p value of 0.628 as shown in table 2.

On Laparoscopy, in the Parryscope group, 6 tubes (20%) were blocked (with 1 patient having bilateral occlusion and 4 patients having unilateral occlusion) and in the flow group also, 6 tubes (20%) were blocked (with 1 patient having bilateral occlusion and 4 having unilateral occlusion). Statistically, the findings were comparable in the two groups (p=1).

Accuracy for predicting tubal blockage against Laparoscopy as gold standard

Parryscope

Among 24 tubes diagnosed as patent via laparoscopy findings, 21 tubes had similar findings in hysteroscopy findings. Among 6 tubes diagnosed as occluded via laparoscopy findings, all had similar findings in hysteroscopy findings.

A good agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.737 and p value <0.0001. Overall concordance rate was 90.00% and overall discordance rate was 10.00% between Laparoscopy findings and Hysteroscopy findings. (Table 3)

Flow

Among 24 tubes diagnosed as patent via laparoscopy findings, 15 tubes had similar findings in hysteroscopy findings. Among 6 tubes diagnosed as occluded via laparoscopy findings, all had similar findings in hysteroscopy findings. A fair agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.4 and p value 0.006. Overall concordance rate was 70.00% and overall discordance rate was 30.00% between Laparoscopy findings and Hysteroscopy findings.

Table 1: Demographic profile

Socioeconomic Parameters	Parryscope	Flow
Age (years) (mean±SD)	27 ± 3.33	28.3 ± 4.37
Hindu : Muslim	10 : 5	13 : 2
Socioeconomic status (Lower middle)	80%	50%
Duration of infertility (years)	4 ± 1.89	4.15 ± 2.11
Infertility		
Primary	9	10
Secondary	6	5

Table 2: Comparison in terms of hysteroscopy findings between 2 groups (n=30)

Hysteroscopy findings	Parryscope (n=15)	Flow (n=15)	Total	P value	Test performed
Unilateral blocked tubes	7 (46.67%)	9 (60%)	16 (53.3%)	0.628	Fisher's exact test
Bilateral blocked tubes	1 (6.66%)	3 (20%)	4 (13.3%)		
Bilateral tube patent	7 (46.67%)	3 (20%)	10 (33.34%)		
Total	15 (100%)	15 (100%)	30 (100%)		

n=Number of patients

Table 3: Inter-rater kappa agreement between hysteroscopy findings and laparoscopy findings in Parryscope group

Hysteroscopy findings	Laparoscopy findings		Total	P value	Kappa
	Patent (n=24)	Occluded (n=6)			
Patent	21 (70.00%)	0 (0.00%)	21 (70.00%)	<0.0001	0.737
Occluded	3 (10.00%)	6 (20.00%)	9 (30.00%)		
Total	24 (80.00%)	6 (20.00%)	30 (100.00%)		

n=Number of tubes

Table 4: Inter-rater kappa agreement between hysteroscopy findings and laparoscopy findings in Flow group

Hysteroscopy findings	Laparoscopy findings		Total	P value	Kappa
	Patent (n=24)	Occluded (n=6)			
Patent	15 (50.00%)	0 (0.00%)	15 (50.00%)	0.006	0.400
Occluded	9 (30.00%)	6 (20.00%)	15 (50.00%)		
Total	24 (80.00%)	6 (20.00%)	30 (100.00%)		

n=Number of tubes

Table 5: Predictive accuracy of Parryscope technique vs flow technique for tubal blockage after taking Laparoscopy findings as gold standard

Variables	Parryscope	Flow technique
Sensitivity (95% CI)	100.00% (54.07% to 100.00%)	100.00% (54.07% to 100.00%)
Specificity (95% CI)	87.50% (67.64% to 97.34%)	62.50% (40.59% to 81.20%)
AUC (95% CI)	0.94 (0.79 to 0.99)	0.81 (0.63 to 0.93)
Positive Predictive Value (95% CI)	66.67% (29.93% to 92.51%)	40.00% (16.34% to 67.71%)
Negative Predictive Value (95% CI)	100.00% (83.89% to 100.00%)	100.00% (78.20% to 100.00%)
Diagnostic accuracy	90.00%	70.00%

DISCUSSION

In the Parryscope group, among 24 tubes diagnosed as patent via laparoscopy findings, 21 tubes had similar findings in hysteroscopy findings. A good agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.737 and p value <0.0001 and overall concordance rate of 10.00%. Overall, Parryscope technique showed a sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 100.00%, 87.50%, 66.67%, 100.00%, and 0.94, respectively.

In the study by Hager M et al,^[6] the sensitivity, specificity, PPV, and NPV of the Parryscope technique were 90.6%, 100%, 100%, and 96.8%, respectively for predicting Fallopian tube patency. In a study by Parry JP et al,^[5] the sensitivity and specificity of the Parryscope technique was 98.3% and 83.7%, respectively for detecting Fallopian tube patency. In another study by Parry JP et al,^[5] the Parryscope technique had sensitivity and specificity of 96% and 89%, respectively for office tubal patency assessment.

In the Flow group, among 24 patients diagnosed as patent via laparoscopy findings, 15 patients had

similar findings in hysteroscopy findings. A fair agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.4 and p value 0.006 and overall concordance rate of 70.00%. Overall, flow technique showed a sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 100.00%, 62.50%, 40.00%, 100.00%, and 0.81, respectively. In comparison, in the study by Hager M et al,^[6] the sensitivity, specificity, PPV, and NPV of the flow technique were 73.7%, 70.7%, 53.8%, and 85.3%, respectively for predicting Fallopian tube patency. This indicated suboptimal reliability in evaluation of fallopian tubal patency. However, it was mentioned that the evaluation of fallopian tube ostia during hysteroscopy was done by senior surgeons who had considerable expertise in the flow method, these estimates for accuracy may be higher than those seen with typical use or for surgeons new to the technique.

In another previous study by Ott et al,^[7] the sensitivity and specificity of the Flow technique was 85% and 66%, respectively for detecting Fallopian tube patency. Promberger et al,^[8] found that sensitivity and specificity of fallopian tube “flow” were 86.4% and 77.6% for prediction of fallopian tube patency.

The other laparoscopy findings in the study cohort revealed a diverse spectrum of Gynaecological conditions. Among the 15 cases examined in the Parryscope group, 1 patient had ovarian cyst, 1 patient had endometrioma, endometriosis was seen in 1 patient, and adhered uterus in 1 patient. Notably, intraperitoneal adhesions were observed in 5 patients, indicating a relatively common occurrence. Tubo-ovarian masses and hydrosalpinx were not reported in any of the examined cases. These findings collectively contribute valuable information about the prevalence and nature of gynaecological issues within the studied population undergoing laparoscopic evaluation.

While in the Flow group, 2 patients had Tubo-ovarian mass, 1 patient had endometriosis and 1 patient with left tube hydrosalpinx. Notably, no cases of ovarian cysts or adhered uterus were reported. Intraperitoneal adhesions were seen in 1 patient. These findings provide insights into the prevalence and distribution of specific gynaecological issues within the examined population undergoing laparoscopic assessment.

The salient results of the present study were as following

1. In the parryscope group, among 24 tubes diagnosed as patent via laparoscopy findings, 21 tubes had similar findings in hysteroscopy findings. A good agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.737 and p value <0.0001 and overall concordance rate of 100.00%. Overall, flow technique showed a sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 100.00%, 87.50%, 66.67%, 100.00%, and 0.94, respectively.

In the Flow group, among 24 tubes diagnosed as patent via laparoscopy findings, 15 tubes had similar findings in hysteroscopy findings. A fair agreement was seen between laparoscopy findings and hysteroscopy findings with kappa 0.4 and p value 0.006 and overall concordance rate of 70.00%. Overall, flow technique showed a sensitivity, specificity, PPV, NPV, and diagnostic accuracy of 100.00%, 62.50%, 40.00%, 100.00%, and 0.81, respectively.

Therefore on comparing both the groups with the Gold standard the p value for Parryscope group and flow group was <0.001 and 0.006 respectively.

2. Diagnostic accuracy of Parryscope was 90% and that of Flow group was 70% for predicting tubal blockage.
3. The side effects included bloating, nausea, and pain abdomen, exhibited statistically similar frequencies in both groups of parryscope and flow (Bloating: 0 vs. 1, Nausea: 1 vs. 1, Pain abdomen: 2 vs. 1, p=1).

CONCLUSION

To conclude, in predicting fallopian tubal occlusion, Parryscope technique was found to be better than the flow method, with higher sensitivity and specificity, i.e. 100.00% and 87.50%. For patients who desire fertility, adding air infusion to routine hysteroscopy and monitoring whether air bubbles traverse through the tubal ostia or not can yield important information.

Recommendations

We found the diagnostic accuracy of parryscope was 90% and that of flow was 70% therefore we recommend parryscope technique is better in predicting the tubal block in patients of infertility.

Limitations

- The results were limited to one hospital that may not be generalized for all settings.
- Sample size was small, a larger sample size is recommended for more reliable interpretation of results.
- There is a chance of inter and intra observer variability.

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Conflicts of Interest Statement: The authors declare no conflict of interest related to this manuscript.

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