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Research Article
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Role of diagnostic laparoscopy in infertility

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Background: Use of diagnostic and therapeutic laparoscopy in infertility has been a focus of attention in recent years and demonstrated to be very effective method in evaluating these cases. The main objective of the study was to detect the diagnostic efficacy of laparoscopy in uterine, pelvic and ovarian pathologies. **Methods:** This study was conducted from April 2017 to August2019.This prospective study included 50 infertile women and it was conducted at Vandana nursing home and IVF clinic. After thorough gynecological examination, necessary investigations were made and written consent form was taken from them before laparoscopy. The patients were kept fasting for 24 hours before the laparoscopy and the procedure was performed under general anaesthesia. All the data was collected on pre-designed proforma and the results were tabulated and raw percentages calculated to describe the results. **Results:** Among 50 patients, 36 were of primary infertility cases and 14 were of secondary infertility. In primary infertility maximum number of patients belonged to age group of 21-25 years where as secondary infertility was under the age group 26–30 years and above 31 years of age. Longest duration of infertility in primary was 16 years and that in secondary was 17 years. Out of 50 patients, 7 (14%) had absolutely normal laparoscopic findings. Among the various pathologies observed, tubal pathology contributed the most (44%), followed by ovarian (30%), pelvic (18%) and uterine (16%) pathologies. **Conclusions:** Laparoscopy is safe and cost-effective method and should be considered as prime diagnostic tool for evaluating the etiology of infertility in women and for effective treatment decisions.

Keywords: Infertility, Laparoscopy, Primary and secondary infertility

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Introduction

Infertility is a life crisis. This problem is compounded by the trend towards delayed child bearing age to achieve socio-economic, educational and professional goals as well as the newer diseases which are seen mostly related to the changes in the lifestyle.

Infertility is well-defined as failure to conceive during one year of unprotected frequent intercourse [1]. The problem of infertility was affecting approximately 9-16% of married couples [2]. Leading causes of infertility include tubal disease, ovulatory disorders, uterine or cervical factors, endometriosis and male factor infertility [3,4]. Major instigates according to WHO are pelvic tuberculosis, malnutrition and puerperal infections leading to tubal blockage [5,6].

The traditional method to determine the pelvic cavity was hysterosalpingography but it has now been largely succeeded by hysteroscopy and laparoscopy. Diagnostic laparoscopy was found to be the safe and cost effective in the initial management of young women with infertility, particularly when infertility treatment dropout rates exceed 9% per cycle [7]. It allows direct visualisation of the abdominal and pelvic organs where clinical evaluation and imaging techniques have failed or are equivocal.

Laparoscopy is the GOLD STANDARD for diagnosing the tubo-peritoneal disease, endometriosis and adhesion and because no other imaging technique provides the same degree of sensitivity and specificity. Thus, it is considered as an important tool not only in diagnosis of infertility but also in the treatment of selected cases [8].

In the present study, an effort was made to establish the role of laparoscopy in primary and secondary infertility cases in women and to detect the diagnostic efficacy of laparoscopy in tubal, uterine, pelvic and ovarian pathologies.

Methods

Duration: Two years.

Type of study: Prospective study.

Sample size: Fifty.

Source area: Vandana Nursing Home.

Study design: Prospective study.

Sampling method: 50 women undergoing infertility workup at Vandana Nursing Home.

Data collection:

Inclusion criteria: All women having infertility.

Exclusion criteria: All couples with male infertility.

Data analysis was performed in Microsoft excel statistically.

This prospective study included 50 cases of both primary and secondary infertility in woman. The study was carried out at Vandana nursing home and IVF clinic during the period between April 2017 to August 2019. After thorough gynecological examination and with all necessary investigations (human semen analysis, baseline endocrinal investigations, post coital study, cervical mucus study, ovulation study, post menstrual HSG) patients were admitted a day before surgery.

Written consent form was taken from all the patients. All the patients were kept fasting after 10 pm a day before surgery. Enema was given in morning at 6:00 am. They were advised to void completely before entering the operation room. The diagnostic laparoscopies were performed under general anaesthesia with endotracheal intubation and were maintained on gas, oxygen and halothane.

A bimanual pelvic examination under general anesthesia is done. After measuring uterocervical length Rubins cannula was fixed in position by holding cervix transversely with tenaculum. Cannula was useful for moving internal organ and for patency test as well as for the correction of retroverted uterus.

Pneumoperitoneum was created using carbon dioxide gas (inert, safest, readily absorbable, not supporting combustion) through veress needle inserted through lower border of umbilicus keeping in mind not to choose an area adjacent to previous laparotomy scar for fear of damage to adherent bowel.

The optimal sign for a successful puncture of abdominal skin is a soft listing sound as the needle enters. The gas flow rate was kept at 1 liter/minute and approx. 1-1.5 liter gas was required for diagnostic laparoscopy to maintain pressure of 12 mm Hg inside the peritoneal cavity.

If the needle is attached to carbon dioxide pneumoapparatus, with the machine closed and abdominal wall is elevated a negative pressure

Indicates correct placement of needle. Pneumoperitoneum should be considered adequate when the abdominal wall is uniformly bulging and the liver dullness is obliterated. The trocar cannula is pushed in at 45 degrees with screwing movement after lifting the lower abdominal wall.

The cannula is removed and laparoscope was introduced. The pelvic organs are first inspected by manipulating uterus, tubes, ovaries, pouch of Douglas are visualized for any pathology. Chromopertubation was done to check the patency of tubes by injecting dilute methylene blue through the intrauterine cannula. Any endometriotric implant is ruled out by thorough examination.

Double puncture technique is more reliable to rule out pelvic pathology. After completion of procedure, laparoscope is removed and trocar sleeve is kept open to remove air from abdominal cavity. The trocar is introduced and trocar cannula is removed.

The skin was sutured and sterile dressing was done. After completion of procedure the patients was shifted toward when they are completely out of anaesthesia. They were discharged on the next day. The parameters to be monitored were decided and recorded accordingly.

Results

The present study included 50 patients. Of them, 37 patients were of primary infertility cases and 13 were of secondary infertility. In the present study, majority of patients of primary infertility belonged to the age group of 21-25 years (51.3%) and that of secondary infertility to 26-30 years (46.15%) (Table 1).

The minimum and maximum age of the patients with primary infertility was 20 and 40 years respectively. The minimum and maximum age of the patients with secondary infertility was 23and 35 years respectively.

Table-1: Age group of patients with primary and secondary infertility.

Age in Years	Primary		Secondary		Total	
	No.	%	No.	%	No.	%
18-20	1	2.7	-	-	1	2.0
21-25	19	51.3	5	38.4	24	48.0
26-30	12	32.4	6	46.2	18	36.0
31-35	2	5.4	2	15.4	4	8.0
36-40	3	8.1	-	-	3	6.0
Total	37	100.0	13	100.0	50	100.0

In the present study, majority of patients of primary infertility (67.5%) and that of secondary infertility (69.2%) had duration of infertility of 1-5 years (Table 2). Longest duration of infertility in primary was 16 years and that in secondary was 17 years.

Table-2: Duration of infertility in primary and secondary infertility cases.

Duration of Infertility (Years)	Primary		Secondary		Total	
	No.	%	No.	%	No.	%
1-5	25	67.5	9	69.2	34	68.0
6-10	10	27.0	3	23.1	13	26.0
11-15	1	2.7	-	-	1	2.0
16-20	1	2.7	1	7.6	2	4.0
Total	37	100.0	13	100.0	50	100.0

Causes of infertility shows various factors accounting for infertility in the present study. Out of 50 patients, 7 (14%) had absolutely normal laparoscopic findings. Among the various pathologies observed, tubal pathology contributed the most (44%), followed by ovarian (30%), pelvic (18%) and uterine (16%) pathologies.

In many cases, there were more than one factor. The most important and significant one was considered. However, in spite of thorough laparoscopic evaluation no cause was revealed in 7 cases (14%) and was included under unexplained infertility (Table 3).

Table-3: Causes of infertility at laparoscopy.

Causes of Infertility	Primary (n=37)		Secondary (n = 13)		Total (n=50)	
	No.	%	No.	%	No.	%
Uterine Factors	6	16.2	2	15.3	8	16.0
Tubal Factors	17	45.9	5	38.4	22	44.0
Ovarian Factors	12	32.4	3	22.8	15	30.0
Peritoneal Factors	6	16.2	3	23.0	9	18.0
Unexplained	5	13.5	2	15.3	7	14.0
Total						
Inference	Majority of infertility patients had tubal factors among the causes					

Various pathologies of pelvic organ responsible for infertility in patients: In the present study, uterine factors accounted for 16% of infertility causes; Mullerian anomalies were found in 2 cases of primary infertility, out of which one had unicornuate uterus and another had sub septate uterus.

In the present study, tubal factors were responsible for 45.9% of primary and 38.4% of secondary infertility patients. Overall it accounted for 44% of cases. Out of 4 hydrosalpinx cases, 1 case had

Bilateral and 3 had unilateral hydrosalpinx. 2 cases of bilateral tubal block and1case of unilateral tubal block had associated peritubal adhesions, in addition to 8 cases of isolated peritubal adhesions. Hence a total of 11cases (22%) had peritubal adhesions.

The result of chromopertubation test, which was done in all the 50 cases, delayed spillage was seen in 1case of primary infertility. Chromopertubation test was not perceived in 1 primary infertility case due to dense adhesions. Ovarian factors accounted for 30% of cases of in fertility in the present study.

Of the 3 ovarian cysts, one was dermoidcyst, 1 was chocolate cyst of ovary and the other was simple ovarian cyst. Peritoneal factors accounted for 18% of infertility cases. Pelvic endometriosis was found in a total of 3 cases. As mentioned before, endometriosis in the form of chocolate cyst of ovary was seen in 1case. Therefore, total number of endometriosis cases in the present study, were 4 (8%).

Isolated pelvic adhesions were seen in 3 cases and associated pelvic adhesions (with endometriosis and pelvic infection) were seen in another 3 cases. In addition, as already mentioned, peritubal adhesions were seen in a total of 11cases. Hence, the total number of cases of pelvic adhesions including peritubal, periovarian and omental adhesions were 17 (34%).

Table-4: Demonstrated the various pathologies diagnosed in 50 patients.

Uterine factors- n (%)	Tubal factors-n (%)	Ovarian factors-n (%)
Normal- 42 (84%)	Normal- 18 (36%)	Normal- 35 (70%)
Congenital anomaly-5 (10%)	Abnormal occlusion- 22 (44%)	Bilateral polycystic ovary- 6 (12%)
Fibroid- 3 (6%)		Other pathology (simple ovarian cyst, chocolate cyst)- 3 (6%)

Among uterine factors, in the present study maximum number of patients was observed with normal uterine cavity (84%).

Only fibroids were observed in 3 patients followed by congenital anomalies in 2 patients. And next among the tubal factors, abnormal occlusion was observed in 22 (44%) cases and remaining were observed with normal findings 18 (36%).

Bilateral polycystic ovaries were observed in 6 (12%) cases among ovarian pathologies followed by other pathologies in 3 (6%) cases including ovarian cyst, chocolate cyst, adhesion, or endometriotic implants (Table 4). In present study, typical pelvic adhesions were found in among 17 (34%) patients and about 1patients had Koch's abdomen.

Discussion

Infertility is a worldwide problem affecting 8-12 percent couple (50-80 million) during their reproductive lives [9]. The WHO estimates the overall prevalence of primary infertility in India to be between 3.9-16.8 % [10].

The female factors contribute most (i.e. 40-55%) in the etiologies of infertility followed by male factors (30-40%), both partners (10%) and unexplained (10%) [11].

Diagnostic laparoscopy is considered as an essential and valuable step of the infertility evaluation. It allows the surgeon to visualize tubal patency and integrity, endometriosis and pelvic adhesions [12].

Laparoscopy is an important complementary tool to HSG in determining the extent and subsequent therapy for tubal disease.

Table 5: Types of infertility.

Type	Study conducted				
	Duignanet al [13]	Templeton and Keer [14]	Sharma R et al [15]	Nakade KD et al [16]	Present study
Primary	77%	74.9%	66.2%	69.4%	74%
Secondary	23%	25.1%	32.8%	30.6%	26%

In the present study, incidence of primary infertility was 74% and that of secondary infertility was 26%, which correlates with the studies conducted by Duignanet al (77% and 23%) [13], Templeton and Kerr (74.9% and 25.1%) [14], Sharma et al (67.2% and 32.8%) [15] and Nakade KE et al [16] (69.4% and 30.6%) for primary and secondary infertility respectively (Table 5).

Table 6: Age distribution of patients.

Age group (Year)	Study conducted					
	Sharma R et al [15]		Sortey KD et al [17]		Present study	
	Prim	Sec	Prim	Sec	Prim	Sec
21-25	62.2%	-	41.5%	-	51.3%	-
26-30	-	47.2%	-	43.5%	-	46.15%

In the present study, majority of patients of primary infertility belonged to the age group of 21-25 years (51.3%) and that of secondary infertility to the age

Group of 26-30 years (46.15%).

The present study correlates with that of Sharma R et al [15] and Sortey KD et al [17] as shown in Importance of age factor lies in the fact that increase in age (>34 years) is associated with decline in fertility (Table 6).

Table 7: Duration of infertility.

Duration (Years)	Dor et al [18]				Present study			
	Prim		Sec		Prim		Sec	
	No. of Cases	%	No. of Cases	%	No. of Cases	%	No. of Cases	%
1-5	262	83.2	154	78.1	25	67.5	9	69.2

In the present study, majority of patients of primary infertility (67.5%) and that of secondary infertility (69.2%) had duration of infertility of 1-5 years study conducted by Dor et al [18] also correlated with the present study (Table 7).

Thus, majority of the infertile couple start worrying about their inability to conceive within 5 years of marriage and decide to get themselves investigated.

Table 8: Uterine factors in infertility.

Factor	Study conducted			
	Nakade KD et al [16] (%)	Sortey KD et al [17] (%)	Chakraborti et al [19] (%)	Present study (%)
Uterine factor	12	11	14	16

In the present study, uterine factors were responsible for infertility in 16% cases. In studies conducted by Nakade KD et al [16], Sortey KD et al [17] and Chakraborti et al [19], uterine factors were responsible for 12.0%, 11.0% and 14.0% respectively.

Hence the results of present study are comparable to the above-mentioned studies (Table 8).

Table 9: Tubal factors in infertility.

Factor	Study conducted			
	Chakraborti et al [19] (%)	Bhide AG et al [20] (%)	Kumari C. et al [21] (%)	Present study (%)
Bilateral tubal block	17.7	12.6	20.5	12.0
Unilateral tubal block	5.0	10.2	8.9	6.0
Peritubal adhesions	-	-	7.6	16.0
Hydrosalpinx	9.2	-	-	8.0
Tubo-ovarian mass	7.2	14.0	-	4.0
Total	39.0	42.9	37.8	44.0

Various tubal factors contributing to infertility. It also shows various studies conducted by Chakraborti et al [19], Bhide AG et al [20] and Kumari C et al [21] on tubal factors.

In the present study, tubal factors were responsible for 44% of infertility cases, which correlates with other studies. Similarly, the finding so fall other tubal parameters correlate with other studies (Table 9).

Table 10: Results of Chromopertubatin test.

Chromopertubation	Study conducted			
	Sharma R et al [15]		Present study	
	No. of cases	%	No. of cases	%
Negative	40	17.7	6	12
Bilateral positive	125	55.5	37	74
Unilateral positive	8	3.5	5	10
Delayed spillage	14	6.2	1	2
Not perceived	38	16.8	1	2
Total	225	100	50	100

Chromopertubation test in the present study compared with that of Sharma R et al [15]. In both the studies, both tubes were patent in majority of patients (Table 10).

However, there were minor differences with the results of other parameters.

Table 11: Ovarian factors in infertility.

Factor	Study conducted				
	Rohinee Merchant et al [22] (%)	Gowri BV et al [23] (%)	Bhide AG et al [20] (%)	Chakraborti et al [19] (%)	Present study (%)
PCOD	19.7	5.8	3.9	11.4	6
Ovarian cyst	-	-	5.3	810	6
Streak	-	-	0.8	-	2
Total	28.7	10.6	9.7	-	30

Table 12: Peritoneal factors.

Factor	Study conducted					
	Sharma et al [15] (%)	Chakraborti et al [19] (%)	Peterson et al [24] (%)	Hutchins et al [25] (%)	Bhide AG et al [20] (%)	Present Study (%)
Endometriosis	6.6	4.6	-	-	-	6
Pelvic Tuberculosis	10.6	8.3	-	-	-	2
Pelvic Adhesions	-	-	20	27.7	-	17
Total	-	-	-	-	10.9	18

As ovarian factors contribute to 30% of infertility cases in the present study. This correlates with

Rohinee Merchant et al study [22] (28.7%) but how ever study conducted by Bhide AG et al [20] and Gowri BV et al [23] showed 9.7% and 10.6% respectively.

In the current study, endometriosis was found in 6% cases and was comparable to studies conducted >by Sharma et al (6.6%) [15] and Chakraborty et al (4.6%) [19].

Genital tuberculosis was found in 2% of cases in the present study which was less than that in Sharma et al (10.6%) [15] and Chakraborthy et al (8.3%) [19] studies.

However, pelvic adhesions were found in 17% of cases in the current study and was comparable to studies conducted by Peterson et al (20%) [24] and Hutchin's et al (27.7%) [25]. Overall, peritoneal factors were found in 18% cases in the current study which was a little more than that found in Bhide AG et al (10.9%) study [20].

The incidence of unexplained in fertility in the present study (14%), which is comparable to various other studies, the various etiological factors contributing to in fertility in the present study as compared to Bhide AG study [20] (Table 13).

In both studies, tubal factors contributed to majority of the patients. However, the ovarian factors were more and unexplained infertility less in the present study as compared to Bhide AG [20] study.

Other factors were comparable in both studies. Overall pelvic pathology in the present study of 50 cases was found to be 86.0%, which was comparable to other studies (Table 12).

Table 13: Comparison of causes of infertility.

Factors	Studies	
	Bhide AG et al [20] (%)	Present study (%)
Uterine factors	20.0	16.0
Tubal Factors	42.93	44.0
Ovarian Factors	9.7	30.0
Peritoneal Factors	10.96	18
Unexplained	27.8	14

Conclusion

Diagnostic laparoscopy helps in identifying the hidden etiology of infertility so that a therapeutic intervention can be initiated, by avoiding unnecessary empiric medical treatment for ovulation induction. In some patients, diagnostic laparoscopy alters treatment plans, including earlier utilization of Assisted reproductive technology. Thus, diagnostic laparoscopy can be safely used earlier in the evaluation of infertile females. Laparoscopy is the gold standard for diagnosing tubal and peritoneal disease, endometriosis, adhesions and other pelvic pathology, because no other imaging technique provides the same degree of sensitivity and specificity.

What the study adds to the existing knowledge?

The present study inferred that Laparoscopy is safe and cost-effective method and should be considered as prime diagnostic tool for evaluating the etiology, and for effective treatment decisions for infertility women.

Author's Contribution

Dr. Abhishek Kumar: Study design, concept

Dr. Snehlata: Manuscript preparation

Dr. Manjula Srivastava: Data analysis

Dr. R S Vandana: Patient selection.

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