

Experience with Diagnostic Laparoscopy in the Evaluation of Tubal Factor Infertility

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Abstract

Context and Objectives: Tubal factor infertility accounts for a large portion of female factor infertility. Tubal disease is responsible for 25% - 35% of female infertility. The most prevalent cause of tubal factor infertility is pelvic inflammatory disease and acute salpingitis. The incidence of tubal damage after one episode of pelvic infection is approximately 12%, 23% after two episodes and 54% after three episodes. Various modalities for investigating tubal factor infertility exist including: saline Infusion sonography (SIS), Hystero-contrast sonography (HyCoSy), hysterosalpingography (HSG) and laparoscopy with chromopertubation, the latter being the gold standard. The aim of this study was to determine the role of diagnostic laparoscopy in the evaluation of tubal factor in infertile women. **Settings and Design:** A retrospective descriptive study on all diagnostic laparoscopic procedures carried out to evaluate tubal factor infertility in the endoscopic gynecology unit of a tertiary-level hospital from 2010 to 2019. **Methods:** A retrospective descriptive study was conducted in the Department of Obstetrics and Gynaecology of a tertiary-level hospital in Ghana. A total of three hundred and ninety-one (391) records of all diagnostic laparoscopy procedures performed because of infertility in the endoscopic gynecology unit of a tertiary-level hospital between 2010 and 2019 were analyzed. Clients who underwent diagnostic laparoscopy to assess tubal factor infertility in the Obstetrics and Gynaecology Directorate of Komfo Anokye Teaching Hospital (KATH), Kumasi, from 2010 to 2019 were included in the study. Tubal patency was tested by laparoscopy and chromopertubation using methylene blue dye. The clinical characteristics of these women (age, parity, type of infertility), the intra-operative findings and complications were evaluated. Data on age, parity, type of infertility and intra operative findings were extracted using a proforma. Cases in which the bio-data or other clinical and laparoscopic findings were missing were excluded from the study. Ethical approval for the study was obtained

from the Institutional Review Board (IRB) for Research and Development (R & D). A simple percentage method was used for statistical analysis. **Results:** A total of 391 women underwent diagnostic laparoscopy for investigation of tubal factor infertility between 2010 and 2019. The women's mean age was 33.16 years. The youngest patient was 20 years and the oldest was 46 years. 232 (59.3%) patients were in primary infertility group while 159 (40.7%) patients were in secondary infertility group. 265 (66.8%) of the women were in the age group 20 - 35 years. The main laparoscopic findings for tubal factor were: 57.28% with bilateral tubal occlusion, 16.39% with unilateral tubal occlusion and 7.92% with hydrosalpinx. 18.41% had bilateral tubal patency. Other findings were identified during the laparoscopic procedure. For peritoneal abnormalities, 200 (51.15%) had normal findings, 184 (47.06%) had adhesions and 7 (1.79%) had peritoneal endometriosis. For uterine factor, 185 (47.31%) had normal uterus with no fibroids or adenomyosis, 202 (51.67%) had uterine fibroids, 2 (0.51%) had uterine anomaly and 2 (0.51%) had adenomyosis. For ovarian pathology, 13 (3.32%) had simple cyst, 2 (0.51%) had endometrioma, 184 (47.07%) had the ovaries involved in adhesions. 192 (49.10%) of patients had normal looking ovaries. There was no mortality or conversion to open laparotomy in this series. **Conclusions:** Unilateral and bilateral tubal blockade was detected in 73.67% of cases of infertile women. Diagnostic laparoscopy is a safe procedure.

Keywords

Diagnostic Laparoscopy, Primary Infertility, Secondary Infertility, Endometriosis, Chromopertubation

1. Introduction

The development of operative laparoscopy represents one of the most important steps forward in the field of surgery in the past 25 years. Its application has progressed from a diagnostic investigation into an operative surgical discipline [1]. It is employed in managing benign gynaecological conditions such as uterine fibroids [2], endometriosis [3], chronic pelvic pain [4], benign ovarian/adnexal masses [5] and hysterectomy for benign conditions [6].

Diagnostic laparoscopy has a role in investigation of tubal factor infertility. Tubal disease is responsible for 25% - 35% of female infertility [7].

The most prevalent cause of tubal factor infertility is pelvic inflammatory disease and acute salpingitis. The incidence of tubal damage after one episode of pelvic infection is approximately 12%, 23% after two episodes and 54% after three episodes [8] [9].

Tubal damage may involve the proximal, distal, or the entire tube, and may be transient (obstruction), or permanent (occlusion) [10]. Proximal, distal, and peritubal damage can be caused by a number of pathologic processes such as inflammation, endometriosis, and surgical trauma [11]. Peritubal adhesions alter

the normal anatomic relationship between the fimbriae and ovary and interfere or prevent the normal capture and transport of the ovum [12]. Diagnosis of peritubal adhesion can be by hysterosalpingography or laparoscopy. Due to high rates of false-positive and false-negative results with hysterosalpingography [13], laparoscopy is considered the best technique because of its direct view of pelvic abnormality and the possibility of a one-session treatment. At laparoscopy, the findings determine the option of treatment.

The laparoscopic procedure involves creation of an artificial pneumoperitoneum and visualisation of the abdominal cavity by means of an endoscope. Diagnostic laparoscopy is usually a day case procedure, traditionally carried out in an operating theatre under general anesthesia. The procedure is short-lasting: taking between 20 and 30 minutes to complete. The laparoscopic procedure has been extensively employed in the field of gynaecology or some decades even in the developing world [14] [15].

About half a million (400,000) hysterectomies done in the United Kingdom [16] is via laparoscopy, and more than 50% of gynecology residents in Canada are at ease performing a laparoscopic hysterectomy [17]. Across Africa, published articles from Ethiopia and Kenya indicated the usefulness of laparoscopy [18] [19]. In Nigeria, tertiary hospitals had reported on laparoscopy [20]. In the year 2009, 58 cases were reported over a 4-year period from the National Hospital, Abuja with infertility as the commonest reason for the procedure. Across all the centers in the country, tubal factor infertility accounts for about 30% of all the causes of infertility [21].

Although the developed world has made major advancement in laparoscopic surgery, the developing world is faced with the challenges of resources, expertise and cost [22] [23]. In the South east and North western, Nigeria experiences with laparoscopy have been reported illustrating its usefulness in gynecological practice. Prior to this, nearly all gynecological operations were performed by laparotomy. The advent of laparoscopy has reversed this trend; it has brought great innovation to the practice of gynecology worldwide.

Since its introduction in our facility, no study to evaluate the role diagnostic laparoscopy has played in evaluation of infertility has been conducted. This study was to evaluate the role of diagnostic laparoscopy in the evaluation of tubal factor in infertile women.

2. Objective

The aim of the study was to evaluate the role of diagnostic laparoscopy in evaluation of tubal factor in infertile women in the endoscopic gynecology unit of a tertiary-level hospital from 2010 to 2019.

3. Methodology

A retrospective descriptive study was conducted in the Department of Obstetrics and Gynaecology of a tertiary-level hospital in Ghana.

A total of three hundred and ninety-one (391) records of all diagnostic laparoscopy procedures performed because of infertility in the endoscopic gynecology unit of a tertiary-level hospital between 2010 and 2019 were analyzed. Clients who underwent diagnostic laparoscopy to assess tubal factor infertility in the Obstetrics and Gynaecology Directorate of Komfo Anokye Teaching Hospital (KATH), Kumasi, from 2010 to 2019 were included in the study. Tubal patency was tested by laparoscopy and chromopertubation using methylene blue dye. The clinical characteristics of these women (age, parity, type of infertility), the intraoperative findings and complications were evaluated. Data on age, parity, type of infertility and intra-operative findings were extracted using a proforma. The proforma was designed by the authors and data was extracted from the patient theatre records and folders. Cases in which the bio-data or other clinical and laparoscopic findings were missing were excluded from the study. Ethical approval for the study was obtained from The Institutional Review Board (IRB) for Research and Development (R & D). A simple percentage method was used for statistical analysis.

4. Results

A total of 391 women underwent diagnostic laparoscopy for investigation of tubal factor infertility between 2010 and 2019. The women's mean age was 33.16 years. The youngest patient was 20 years and the oldest was 46 years. 232 (59.3%) patients were in primary infertility group (and all were nullipara) while 159 (40.7%) patients were in secondary infertility group. 59.3% were nulliparous. 265 (66.8%) of the women were in the age group 20 - 35 years (**Table 1**).

The main laparoscopic findings are summarized in **Table 2** below. The main laparoscopic findings were: 57.28% with bilateral tubal occlusion, 16.39% with unilateral tubal occlusion and 7.92% with hydrosalpinx. 18.41% had bilateral tubal patency.

Table 1. Types of infertility.

Type of infertility	Frequency	Percentage (%)
Primary	232	59.3
Secondary	159	40.7
Total	391	100

Table 2. Diagnostic laparoscopic findings for infertility.

Laparoscopic findings	Frequency (n)	Percentage (%)
Tubal		
Bilateral patency	72	18.41
Bilateral occlusion	224	57.28
Unilateral occlusion	64	16.39
Hydrosalpinx (unilateral or bilateral)	31	7.92

Continued

Absent	0	0
Total	391	100
Ovarian		
normal	192	49.10
simple cyst	13	3.32
endometrioma	2	0.51
adhesions	181	46.29
Not accessible due to adhesions	3	0.78
Total	391	100
Uterine		
normal	185	47.31
fibroids	202	51.67
anomaly	2	0.51
adenomyosis	2	0.51
Total	391	100
Peritoneal		
normal	200	51.15
endometriosis	7	1.79
adhesions	184	47.06
Total	391	100

Other findings were identified during the laparoscopic procedure.

For peritoneal abnormalities, 200 (51.15%) had normal findings, 184 (47.06%) had adhesions and 7 (1.79%) had peritoneal endometriosis.

For uterine factor, 185 (47.31%) had normal uterus with no fibroids or adenomyosis, 202 (51.67%) had uterine fibroids, 2 (0.51%) had uterine anomaly and 2 (0.51%) had adenomyosis.

For ovarian pathology, 13 (3.32%) had simple cyst, 2 (0.51%) had endometrioma, 184 (47.07%) had the ovaries involved in adhesions. 192 (49.10%) of patients had normal looking ovaries.

There were no complications: mortality, visceral injury, vascular injury or conversion to open laparotomy in this series.

5. Discussion

The women's mean age was 33.16 years. The youngest patient was 20 years and the oldest was 46 years. In this society, women seek childbirth at an early age. Even at an advanced age, some women still will want to explore their changes of conceiving naturally.

Of the 391 patients, 232 (59.3%) patients were in primary infertility group while 159 (40.7%) patients were in secondary infertility group. Findings from

this study indicate that primary infertility was the commonest indication for performing laparoscopy. Similar findings were reported from studies in South-East Nigeria [24] and India [25].

Nulliparity constituted the greater percentage of 59.3%. This finding correlates with studies from South-East Nigeria and Iran where nulliparity constituted the majority among the clients evaluated [26] [27]. This suggests that patients presenting for evaluation usually have fewer children hence the need for infertility evaluation in a culture that places high premium on childbearing.

The majority of women evaluated 265 (66.8%) were in the age group 20 - 35 years with the oldest patient being 46 years. This is consistent with findings from other studies [26] [28].

In our series, bilateral tubal blockage constituted 57.28% of the women. This is similar to the study by Tanaka *et al.*, 2017, where more than 50% of the study participants had bilateral tubal blockage [29].

However, this finding is in sharp contrast to an Indian study by Padmawar *et al.*, in 2016 where the incidence of bilateral tubal blockage was 23.26% [28]. Similarly, a study in Nigeria indicated a bilateral tubal block in 20% of the studied population [26].

In our study population, there was a surprisingly low (7.92%) prevalence of hydrosalpinx. Higher figures of 41.1% have been quoted for hydrosalpinx from a Nigerian study in 2017 [26]. Additionally, tubal blockage and hydrosalpinges are relatively common findings in sub-Saharan Africa and globally due to high prevalence of pelvic infections [30].

18.41% of the women in our series had bilateral tubal patency. Tubal patency though reassuring, does not equate to presence of tubal function.

Endometriosis is a known cause of infertility. Our study showed that endometriosis may not be very common in our study population as it was observed in only 1.79% of the cases. This is lower than figures from the South-east and west of Nigeria; (4.9%) [31] and (20%) [32] respectively, and amongst Asians [33], but all these figures are inconsistent with the global figure of 8% - 10% [34]. During diagnostic laparoscopy, proper assessment of the presence of endometriosis at its various stages using the American Fertility Society (AFS) classification is required.

For uterine factor, our study found 185 (47.31%) had normal uterus (with no fibroids or adenomyosis), 202 (51.67%) had uterine fibroids, 2 (0.51%) had uterine anomaly and 2 (0.51%) had adenomyosis.

A similar finding was obtained from the study by Padmawar A. & Arora G. G., 2016 in India which reported the incidence of uterine fibroids 49.29% [28].

The finding of a greater number (51.67%) of patients having uterine fibroids is not an anomaly as fibroids occur more frequently in the Afro-Caribbean population. Adenomyosis may not be so common in our study population (2%) and was at par with endometriosis prevalence of 1.79%.

Though a simple technique, diagnostic laparoscopy is not immuned to com-

plications. Commonly occurring complications include: damage to other abdominopelvic organs (such as urinary bladder, bowel and blood vessels), hemorrhage, and unintended conversion to open surgery, although the later is uncommon [35] [36] [37]. Like any other surgeries, it can also be complicated by anesthetic problems and postoperative infection [38].

Our series recorded no complication rate. This can be attributable to careful patient selection, ensuring that the procedure was actually indicated, Palmer's point entry in patients with previous midline abdominal incisions, use of safe entry techniques and the experience of the surgeon.

Adequate pre-operative patient assessment and selection are vital ingredients to ensure success during laparoscopy. Certain patient co-morbidities (permanent or a temporary health condition) may preclude the use of laparoscopy. Such conditions may present an absolute or relative contraindication to surgery or might require open surgery instead of laparoscopy because of technical difficulties. Among these conditions are severe heart disease, hemodynamic instability (septic or hypovolemic shock) and severe respiratory diseases, which may worsen through pneumoperitoneum created during laparoscopy. Intracranial hypertension can also be aggravated by the head-down tilt position adopted during laparoscopy. Other conditions that limit the use of laparoscopy include the presence of distended bowels, which can be damaged by the equipment; presence of a large abdominal mass; advanced pregnancy; histories of several previous surgeries, which might distort the anatomy and hinder viewing; and morbid obesity. Multidisciplinary team pre-assessment of these patients with the anaesthetic team will help to ensure better outcomes.

Laparoscopy has significant advantages of low complication rates, shorter duration of operations and shorter hospital stay. It enables diagnosis and efficient planning of definitive treatment for gynaecological conditions. It has therefore become an indispensable and widely used field in gynecology. It is undoubtedly beneficial to ensure regular training updates for surgeons and trainees, careful patient selection and use of safety principles if we want to maintain these safety trends.

6. Limitations

Some of the weaknesses of the study include its retrospective nature. Incomplete documentation of findings resulted in exclusion of cases in which the bio-data or other clinical and laparoscopic findings were missing. This study was conducted at a tertiary hospital hence the findings cannot be generalized. There is a need for a prospective study.

7. Conclusion

Diagnostic laparoscopy plays an important role in the evaluation and treatment of infertility patients. It is safe and beneficial. Therefore, wider application of this modern technology is recommended for our practice.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Abbreviations

- IRB/R & D: The Institutional Review Board for Research and Development
- AFS: American Fertility Society
- SIS: Saline Infusion Sonography
- HyCoSy: Hystero-Contrast Sonography
- HSG: Hysterosalpingography