

Role of Laparoscopic Surgery in the Management of Female Infertility at the Department of Gynecology of Hôpital du Mali

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Abstract

Infertility is a socio-cultural drama in Africa, especially in Mali and remains difficult for couples to overcome. Laparoscopy, also called minimally invasive surgery or keyhole surgery, is an operative technique that permits to explore the pelvis and perform an appropriate therapeutic procedure. The objective of our work was to assess the role of laparoscopic surgery in the treatment of female infertility at Hôpital du Mali. It was a retrospective descriptive study that was conducted over a period of 5 years (January 2013 to December 2018). Any patients followed for infertility and who underwent laparoscopic surgery in the gynecology department over a period of two (2) years were included. The outcome of laparoscopic surgery was evaluated in terms of conception of pregnancy. We had collected 103 infertile patients out of 2984, with a frequency of 3.45%. The mean age of our patients was 30.2 years. Housewives and out-of-school women accounted for 68.93% and 54.37% respectively. Nulligravida represented 41.75%. Regarding infertility, it was primary in 41.75% and secondary in 58.25%, with an average duration of 6.2 years. Systematic chlamydial serology was positive in 62.14% of our patients. Hysterosalpingography (HSG) revealed bilateral tubal obstruction in 53.33% of cases. Laparoscopy found tubal adhesions in 97.80% of cases. Adhesiolysis was the main procedure performed with 84.47% bilateral tubal patency achieved in the methylene blue test. Among our patients who had contracted a pregnancy (22.99%), 85% had carried their pregnancies to term. Tubal damage was the main cause of infertility. Adhesiolysis remains the main laparoscopic procedure for treatment.

Keywords

Laparoscopic Surgery, Infertility, Hôpital du Mali

1. Introduction

Infertility is a global public health issue and affects 8% to 12% of couples [1]. In France, 15% to 20% of couples consult for fertility problems at some point in their life [1]. In Africa, infertility is a social drama and a difficult ordeal for couples to overcome. Its rate varies from 7% to 21% depending on the regions [2]. The first cause of marital disagreement or divorce is considered a fatality, a fate or a curse inflicted on the couple. For the woman, it would represent a divine punishment because most of the time, she is the first to be blamed [2].

Tubal causes are the main etiology of infertility in Africa [2]. According to a study of the World Health Organization (WHO), bilateral tubal occlusion is 3 times more common in Africa than in the rest of the world (49% versus 11%) [1] [2]. The management of infertility in Africa is complex, due to the lack of adequate means of prevention and difficult access to new techniques such as laparoscopy and medically assisted procreation (MAP) [1] [2]. These techniques are slow to become popular in Africa because of their cost [1] [2].

Laparoscopy, also called minimally invasive surgery (MIS) or keyhole surgery, is an operative technique that allows exploration of the pelvis and a suitable therapeutic procedure to be proposed [3].

Tubal involvement is found in 25% to 35% of infertile women and represents 25% of the indications for *in vitro* fertilization followed by embryo transfer according to the national register of *in vitro* fertilization (FIVNAT) which manages the statistics of the assisted medical procreation (AMP) in France [4].

However, laparoscopy is the gold standard for assessing tubal patency. Its objective is twofold: to diagnose and possibly, according to the management strategy, to correct anatomical anomalies [5]. Fimbrioplasty and neosalpingostomy respectively improve and restore the permeability of the distal portion of the tube: fimbrioplasty consists of reconstitution of the pinna as in its natural state from the old tubal ostium and neosalpingostomy allows creating a tubal ostium. Laparoscopy can considerably reduce the length of hospital stay, operative risks and post-operative complications compared to laparotomy [5].

Endoscopic surgery introduced in Mali in 2001, is in our work setting the main method used to treat distal tubal infertility. Although its results are often poor [6] [7], it permits a curative treatment of tubal occlusion and offers to the patient the possibility to expect babies without using assisted medical procreation that is hardly available in Mali.

A study carried out in Mali at the Point G University Hospital by S KEITA had obtained a pregnancy in 32.5% of cases after the laparoscopy [8].

The hospital of Mali, which is a 3rd referral structure, is equipped with a la-

paroscopic surgery column. He started laparoscopy in 2012, just one year after opening. We initiated this study which aimed to study the role of laparoscopic surgery in the management of female infertility.

2. Patients and Method

This was a retrospective descriptive study that was conducted over a period of 5 years (January 2013 to December 2018). Any women with infertility who had visited the gynecology department of Hospital du Mali and who underwent laparoscopic surgery were included. Any woman who consulted for infertility and who did not undergo laparoscopic surgery was excluded.

We had studied several variables:

- sociodemographic aspects: age, marital status and level of education,
- the process of performing laparoscopic surgery,
- preoperative conditions: type and duration of infertility, gynecological history, results (ultrasound and HSG) and infectious assessment,
- intraoperative variables: lesions observed, procedures performed (adhesiolysis, end-to-end tubal recovery, fimbryo-neostomy, drilling, myomectomy and cystectomy),
- post-operative variables (follow-up assessment, lost to follow-up, the interval between surgery and the occurrence of pregnancy, additional treatments),
- the result of laparoscopic surgery (becoming pregnant and progressing of pregnancies).

The patients were followed on at least two (02). Our data was collected on a survey sheet from the patient's records and the operative report registers. They were supplemented by telephone calls from patients and their families. The data is processed and analyzed by using Word, Excel software,

3. Results

We recruited 103 patients out of 2984 treated in the service for infertility, with a hospital frequency of 3.45%. The average age of our patients was 30.2 years \pm 14.53 with extremes from 18 to 48 years. These were housewives (68.93%), out of school (54.37%). Among our patients, nulligravida accounted for 41.75% and primiparous 63.11%. The history of manual intrauterine (MIU) aspiration and pelvic surgery concerned 78.43% and 37.24% of our patients, respectively. The pelvic exam was unremarkable. The average duration of infertility was 6.2 years, with extremes ranging from 2 to 14 years. Infertility was primary (41.75%) and secondary (58.25%) (**Table 1**). Chlamydia serology was positive in 62.14% of patients. Pelvic ultrasound returned to normal in 86.41% of cases. The main abnormalities found out on HSG were: bilateral tubal obstruction (53.33%) (**Figure 1**), and bilateral hydrosalpinx (32.22%) (**Figure 2**). The main lesions found on laparoscopic examination were: tubal adhesions (97.80%), bilateral hydrosalpinx (34.06%) and tubal phimosis (23.08%) (**Table 2**). The main procedures performed were: adhesiolysis (69.23%), neo-salpingostomy (23.08%), fimbrioplasty

and drilling or ovarian drilling (each 15.38%) (**Figure 3**). Bilateral tubal patency was pointed out in 84.47% of patients tested with methylene blue (**Figure 4**). Patients who became pregnant was 22.99% of cases (**Figure 5**). The main laparoscopic procedures leading to these results were: adhesiolysis (55%), ovarian drilling (40%), cystectomy (5%) (**Table 3**). The time to pregnancy conception was 1 to 3 months in 55% of our patients. The pregnancies had progressed to term in 85% of cases. We had recorded 10% of spontaneous abortion cases, and 5% of ectopic pregnancies. The patients lost to follow-up were evaluated at 15.53%. There had been no per- and post-operative complications.

Table 1. Maternal characteristics.

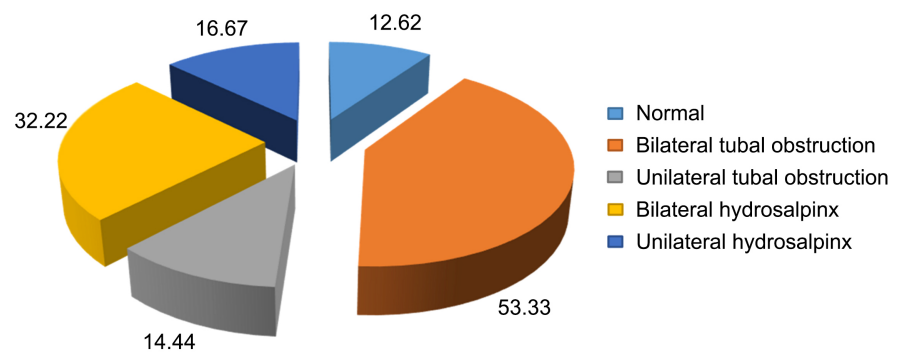
Maternal characteristics	Number	Percentage
Mean age 30.2 years		
Educational level		
No schooling	56	54.37
Primary level	12	11.65
Secondary level	9	8.73
Higher level	26	25.25
Gravida		
Nulligravida	43	41.75
Primigravida	30	29.12
Paucigravida	23	22.33
Multigravida	7	6.80
Parity		
Nulliparous	65	63.11
Primiparous	28	27.18
Pauciparous	10	9.71
Average duration of infertility (in years) 6.2 years		
1 - 5	34	33
6 - 8	44	42.72
9 and over	25	24.28

Table 2. Distribution according to the type of lesion observed on laparoscopy.

Type of lesions	Number	Percentage
Tubal adhesion	89	97.80
Unilateral hydrosalpinx	17	18.68
Bilateral hydrosalpinx	31	34.06
Bilateral ovarian cyst	0	0
Unilateral ovarian cyst	8	8.79
Myomas	01	1.10
Tubal phimosis	21	23.08
Tubal endometriosis	01	1.10
None	12	11.65

Table 3. Distribution according to occurrence of pregnancy depending on surgical procedure performed.

Surgical procedure performed	Occurrence of pregnancy	
	Number	Percentage
Adhesiolysis	11	55%
Cystectomy	1	5%
Drilling (ovarian drilling)	8	40%
Total	20	100%

**Figure 1.** HSG from a 32-year-old patient showing bilateral tubal obstruction: left proximal, and right distal.**Figure 2.** Distribution according to the result of the hysterosalpingography.

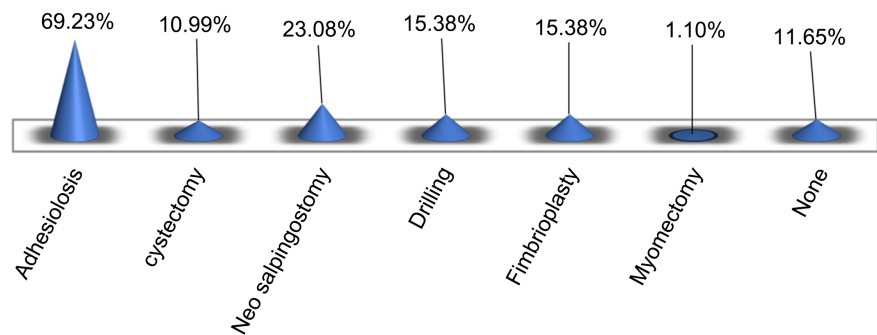


Figure 3. Distribution according to the surgical procedure performed.

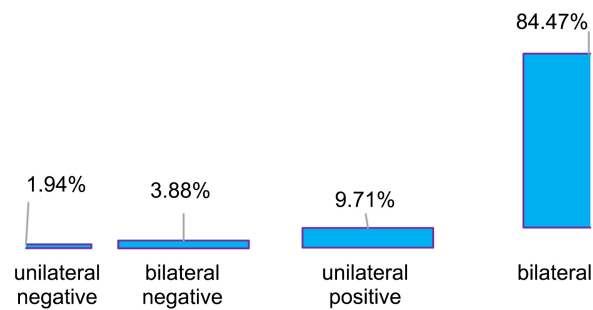


Figure 4. Distribution according to occurrence of pregnancy.

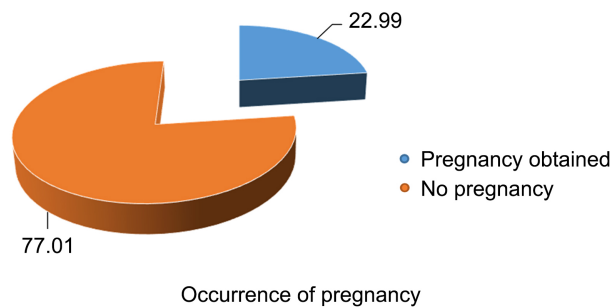


Figure 5. Distribution according to the methylene blue test.

4. Discussion

Age: The mean age of our patients was 30.2 years \pm 14.53. Our data could be compared to those of Kaouther Dimassi *et al.* [9] (34 years) and Khaled Boudhraa *et al.* [10] in Tunisia (33, 3 years). Floriane Silvente-Fernandez *et al.* [11] in France reported an average age of 31 years.

The level of education: Our patients were not educated in 54.37% of cases. This was comparable to the 52% of Kaouther Dimassi *et al.* [9] and 55.5% of Mahamadou Diabaté *et al.* [12].

Gravidity and parity: We found out 41.75% of nulliparous. This rate was close to that of Salma Ait Batahar who reported 40.5% [13]. However, it was lower than that of Kaouther Dimassi 33% [4] and of Floriane Silvente-Fernandez 30.5% [11]. In our study, we found out 63.11% of primipara. This rate was higher than that of Kaouther Dimassi *et al.* (50.5%) [9] and Yaële Dadoun (48.65%)

[14]. These could be accounted for by the total pregnancy rate which is higher in our context (7.2 children per woman).

A history of MIU aspiration was figured out in 78.43% of our patients. Our data were lower than those of other authors such as Salma Ait Batahar (26.93%) [8], Khaled Boudhraa (12%) [10], or Yaële Dadoun (11.1%) [14]. The history of pelvic surgery was about 37.24% of our patients. These data were parallel to those of Khaled Boudhraa [10] and Salma Ait Batahar [13] who reported 35.5% and 34.65% respectively. They were lower than those of Yaël Dadoun [14] (40.6%), Floriane Silvente-Fernandez [11] (43%) and Kaouther Dimassi [9] (50%).

Infectious origin: Chlamydia serology was positive in 62.14% of our patients. Our data were comparable to that of DK Tran (65%) [15], but higher than those of Salma Ait Batahar, (25%) [13], Yaële Dadoun (27%) [14] and Kaouther Dimassi (5.76%) [9]. Chlamydiae trachomatis is the pathogen most implicated in infectious tubal damage [4] [16].

The nature of infertility: It was primary in 41.75% of our patients, and secondary in 58.25%. Our data were parallel with those of Khaled Boudhraa [10] who reported 46% primary infertility and 54% secondary infertility. However, they were different from those of other authors such as Salma AIT BATAHAR [8] who reported (56.25%) and (43.75) respectively for primary and secondary infertility. In the series by Floriane Silvente-Fernandez [11], primary infertility concerned 56% of patients and secondary infertility 44%. Kaouther Dimassi [9] pointed out 32.7% for primary infertility and 67.30% for secondary infertility.

Duration of infertility: The average duration of infertility in our series was 6.2 years, with extremes from 2 years to 14 years. These data were superimposable on those of authors like Khaled Boudhraa *et al.* [10] who have reported an average duration of 5.42 years with extremes from 3 to 13 years. It was also 7.43 years in the series of Salma Ait Batahar [13], with extremes ranging from 2 years to 20 years. Our data were different from those of authors like Kaouther Dimassi [9] who found out an average duration of infertility of 4 years with extremes ranging from 1 year to 16 years. Floriane Silvente-Fernandez [11], in her series had figured out an average duration of 3 years, with extremes from 2 years to 12 years.

Pelvic ultrasound: All of our patients had undergone at least one pelvic exploration on ultrasound and this was normal in 86.41% of cases. This pelvic ultrasound normal rate was higher than that of Kaouther Dimassi [9] and Khaled Boudhraa [10] who reported 60% and 59% respectively.

Hysterosalpingography (HSG): Particularly indicated in infertility, because it specifies the condition of the uterine cavity and tubal patency. It is essential in the exploration of the tubes, as it allows the dynamic tubal study and the localization of the tubal obstacle. All our patients had benefited from this HSG. The main abnormalities found out were: bilateral tubal obstruction (53.33%), bilateral hydrosalpinx (32.22%), unilateral hydrosalpinx (16.67%). Our data differed

from those of Kaouther Dimassi [9], who figured out 13.46% bilateral tubal obstruction, 61.53% bilateral hydrosalpinx, and 15.38% bilateral tubal phimosis. Salma Ait Batahar [13] reported 70.83% of tubal patency, 45.83% of hydrosalpinx, 10.41% of tubal ectasia.

Laparoscopic exploration: The main lesions found out on laparoscopic exploration in our series were: tubal adhesions (97.80%), bilateral hydrosalpinx (34.06%), tubal phimosis (23.08%). They were tubo-ovarian adhesions in 40.05%; tubo-pelvic in 27.08% omentum uterine in 16.05%, tubo-peritoneal 10.01% and very rigid utero-pelvic in 4.61%. Our data were close to those found out by the following authors: Salma Ait Batahar [13] who observed that adhesions were the most common lesions (with 47.91%), followed by hydrosalpinx (45.8%), tubal phimosis (18.75%). In Salma Ait Batahar's series [13], the adhesions were: tubo-peritoneal in 45.8%, tubo-pelvic in 22.9%, tubo-ovarian in 25% of cases, and one case of hepatic adhesions in the context of the Fitz-Hugh and Curtis syndrome. Floriane Silvente Fernandez [11] reported that the main lesions pointed out were also pelvic adhesions (53%), hydrosalpinx (36%), tubal phimosis (22%). In her series, the adhesions were tubo-peritoneal (57%), tubo-pelvic in (34%), tubo-ovarian in (18%) of cases, and hepatic adhesions (5%) in the context of Fitz-Hugh and Curtis syndrome. Kaouther Dimassi [9], figured out 88% of pelvic adhesions associated or not with Fitz Hugh Curtis syndrome, bilateral hydrosalpinx (26.92%), tubal phimosis (1.92%). Khaled Boudhraa's [10] data were different from those of the authors where pelvic adhesions and endometriosis were the main lesions in 27.14% and 17.14% respectively. These adhesions were mainly peri-ovarian and peri-tubal, bilateral in 52.6% of cases and thick and very dense in 55.26% of cases. Endometriosis cases were associated with 71% of the causes of primary infertility in his series.

The nature of the operative processing: The operative procedures can be simple or combined. In our series, the main procedures performed were: adhesiolysis (69.23%), neo-salpingostomy (23.08%), fimbrioplasty and ovarian drilling (15.38) each. Our data were parallel to those of the authors such as: Ngaroua [17] who came across with (81.60%) of adhesiolysis, fimbrioplasty (39.60%), neostomy (34.10%). The data from Salma Ait Batahar [13] were as follows: adhesiolysis (70.8%), fimbrioplasty (47%) neostomy (20.5%). Khaled Boudhraa [10] had performed (27.1%) adhesiolysis, laparoscopic surgery for infertility. Our operative procedures as well as those of Ngaroua [17], Salma Ait Batahar [13], Khaled Boudhraa [12] were different from those of the authors like Kaouther Dimassi [9], who indicated that the main procedures were neosalpingostomy (51.92%), fimbrioplasty (28.84%) and adhesiolysis (26.92%). Floriane Silvente-Fernandez [11], reported 22% of fimbrioplasty, 21% of neosalpingostomy, 18% of salpingectomy, and only 9% of adhesiolysis.

Post-operative tubal patency, especially after neosalpingostomy, was a reflection of the purely technical aspect and also the achievement of one of the objectives of the intervention. In our series, this patency was pointed out in 84.47% of

patients tested with methylene blue. This rate was higher than those of authors such as: Kaouther Dimassi [9] (67%), Ngaroua [17] (42.6%). It was lower than that of Floriane Silvente-Fernandez, 93% [11] and Yaële Dadoun, 89% [14].

The occurrence of pregnancy: In our series, the rate of patients who became pregnant was 22.99%, including: 55% after adhesiolysis, 40% after ovarian drilling, 5% after cystectomy. The time to conception was 1 to 3 months in 55% of our patients. The great majority of pregnancies (85%) progressed to term, 10% were spontaneously aborted, and ectopic pregnancy in 5% of cases. The rate of becoming pregnant in the series of Kaouther Dimassi [9] was 8.69%, or 13% after fimbrioplasty and 4% after neosalpingostomy. Ngaroua [17] reported 20.5% of conceived pregnancies, 64.1% of which progressed to term, 15.4% resulting in spontaneous abortions. Yaële Dadoun [13] reported 62% of conceived pregnancies, of which 56.2% intrauterine and 5.6% of pregnancy. Among the pregnancies, 42% were spontaneous, 4% occurred after intrauterine insemination and 54% after in-vitro fertilization (IVF). Intrauterine pregnancies in his series were spontaneously conceived after neosalpingostomy and fimbrioplasty in 27% and 50%, respectively. In the series of Salma Ait Batahar [13], the pregnancy conception rate was 43.4%, of which 39.13% was intrauterine pregnancy and 4.3% ectopic pregnancy. Almost 30.4% of pregnancies were conceived after tubal plastic surgery. Floriane Silvente-Fernandez [11] reported 43 pregnancies, 37% were spontaneous and 63% obtained after medically assisted procreation

We had lost to follow-up 15.53% of our patients. This rate was 46% in the series by Floriane Silvente-Fernandez [11], 10% in Yaële Dadoun [9], 14.58% in Salma Ait Batahar [13]. We had no intra or postoperative complications. The same observation was made by the authors [9] [11] [13] [14].

The limitations and difficulties encountered during the study were mainly linked:

- The retrospective nature of the collection, of certain missing or incomplete information noted on the collection media.
- Patients lost to follow-up (16 in number) due to non-existent or non-functional telephone contacts.
- The lack of a medically assisted reproduction (IVF) unit.
- Lack of information on the benefit of laparoscopy.

It appears that after our study, laparoscopy is a good means of treatment of female sterility.

We had obtained 22.9% pregnancy and a short duration of hospitalization after the surgery.

5. Conclusion

Tubal lesion is still the main cause of female infertility. Laparoscopic surgery alone or in addition to medically assisted procreation techniques remains the medical alternatives for conceiving pregnancies. However, a rigorous selection of patients who are eligible for this type of treatment remains necessary.

Conflicts of Interest

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

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