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To Study the Effect of Bilateral Salpingectomy on Ovarian Reserve During Total Laparoscopic Hysterectomy

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ABSTRACT

Hysterectomy is the standard treatment for all benign gynaecological conditions. Until recently a hysterectomy could either be performed abdominally or vaginally. In the last few years there have been enormous advances in our ability to use the laparoscope as a means of access to the abdominal and pelvic cavities.One of the significant concerns associated with hysterectomy is the decline in ovarian function post-surgery. This study aimed to evaluate the effect of bilateral salpingectomy during total laparoscopic hysterectomy (TLH) on ovarian reserve by measuring serum anti-Müllerian hormone (AMH) and follicle-stimulating hormone (FSH) levels postoperatively. A prospective cohort study was conducted at Sir Ganga Ram Hospital, New Delhi, including 100 women aged 38-50 years who underwent TLH for benign gynaecological conditions. Participants were divided into two groups: TLH with bilateral salpingectomy (TLH+BS, n = 50) and TLH without salpingectomy (TLH, n = 50). Serum AMH and FSH levels were measured preoperatively and at 6 and 12 weeks postoperatively. Hospital stay duration and postoperative complications were also recorded. There were no statistically significant differences in AMH levels between the two groups at baseline (5.7±12.6 pmol L^{-1} for TLH+BS vs. 3.5±6.6 pmol L^{-1} for TLH), at 6 weeks (5.6±12.1 pmol L^{-1} vs. 3.5±6.6 pmol L^{-1}, p = 0.2874), or at 12 weeks (5.8±12.7 pmol L^{-1} vs. 3.6±7.2 pmol L^{-1}, p = 0.2147). Similarly, FSH levels showed no significant differences between the groups at baseline or at 6 and 12 weeks postoperatively (p>0.05). The mean hospital stay was comparable between the TLH+BS group (2.94 ± 0.37 days) and the TLH group (3.02±0.38 days, p = 0.289). Bilateral salpingectomy during TLH does not significantly affect short-term ovarian reserve, as indicated by stable AMH and FSH levels at 6 and 12 weeks postoperatively. Additionally, salpingectomy does not prolong postoperative recovery or hospital stay.

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INTRODUCTION

Hysterectomy is one of the most frequently performed surgical procedures worldwide and can be approached abdominally, vaginally, or laparoscopically. Hysterectomy is the standard treatment for all benign gynaecological conditions. Until recently a hysterectomy could either be performed abdominally or vaginally. In the last few years there have been enormous advances in our ability to use the laparoscope as a means of access to the abdominal and pelvic cavities. One of the significant concerns associated with hysterectomy is the decline in ovarian function post-surgery. Research has indicated that women undergoing hysterectomy tend to experience earlier onset of menopausal symptoms and demonstrate reduced ovarian reserve, evidenced by a lower count of follicles, decreased serum oestrogen levels and elevated follicle-stimulating hormone (FSH) levels[1,2]

Preserving ovarian function during hysterectomy is crucial, especially when both ovaries and the fallopian tubes are retained, as this helps maintain the blood supply via the mesosalpinx[3]. However, there is ongoing debate among gynaecologists regarding performing salpingectomy during hysterectomy. Some argue that removing the fallopian tubes might disrupt the blood supply to the ovaries, potentially impairing ovarian function[4]. There is no definitive consensus on the effect of salpingectomy on ovarian function and some recent studies have highlighted its negative impact[5].

Interestingly, newer research has shifted focus to the fallopian tubes as a primary origin for many ovarian cancers, particularly high-grade serous carcinomas. This has led to the recommendation of concurrent salpingectomy during hysterectomy, particularly in women at elevated risk for ovarian or uterine cancers, as it may help prevent cancer development[6,7]. Salpingectomy is commonly performed for various benign conditions, such as ectopic pregnancies and tubal infections. Patients who have undergone hysterectomy without salpingectomy are at a higher risk of developing hydrosalpinx due to the closure of the fallopian tubes, unlike those who have had a hysterectomy with bilateral salpingectomy (h-BS).

Given that the blood supply to the ovaries and fallopian tubes shares a common origin, many surgeons choose to preserve the ovaries during hysterectomy, especially in cases of benign disease, to maintain ovarian function. Numerous studies have explored the effect of salpingectomy on ovarian function to better understand its implications.

The objective of our study was to assess the impact of salpingectomy on ovarian function by measuring serum levels of anti-Müllerian hormone (AMH). For this purpose, the mean AMH levels were compared between two groups-those who underwent hysterectomy alone and those who had hysterectomy with bilateral salpingectomy-both pre- and post-operatively.

MATERIALS AND METHODS

The prospective cohort study on ovarian reserve who underwent hysterectomy with or without salpingectomy was conducted in the department of obstetrics and gynaecology, Sir Ganga Ram Hospital, New Delhi.

Informed consent was obtained. Ethical clearance was taken from the institutional ethical committee. Total duration of subject participation including follow up was 1 year. Sample size was estimated to detect a minimal medically important difference of 1.25 of serum AMH level between Total Laparoscopic Hysterectomy with or without Salpingectomy at a various stage of before and after operation.

The required sample size at a significant level of 5% and power 80% was found to be 72 for each group. The target population comprised of females in the 38-50 years ofage group, who were admitted in the hospital for total laparoscopic hysterectomy due to any benignindication. The selection of subjects from this cohort was based on following criteria:

Inclusion criteria:

- Indication for laparoscopic hysterectomy in benign conditions on clinical evaluation and pre-operative investigations
- Patient counselling to participate

Exclusion criteria:

- Patients with menopause
- Patients with suspectedmalignancy
- Premature menopause
- Patients having use of OC Pills or hormonal medication during last three months
- Patient having per operative frozen section finding indicating malignancy

Group-1 (n-50) pre-operatively serum AMH, FSH estimation by USG was done. Post-operatively patients who undergone hysterectomy without salpingectomy for benign conditions serum AMH, FSH estimation by USG was done at 6 and 12 weeks after surgery.

Group-2 (n-50) pre-operatively serum AMH, FSH estimation by USG was done. Post-operatively patients who undergone hysterectomy with salpingectomy for benign conditions serum AMH, FSH estimation by USG was done at at 6 and 12 weeks after surgery.

Procedure: The subjects included in the study according to inclusion-exclusion criteria got baseline AMH values on a day prior to surgery. The random

numbers were generated by a computer based random number generator. The list was prepared by two investigators who did not involve in trial. All the Patients included were explained in detail regarding the risks and benefits of additional bilateral salpingectomy prior to randomization and an informed written consent were taken. Women who had given an informed written consent were randomized and their study group wereconcealed from the patient. Based on that, they were divided into two equal groups. One group was operated for Laparoscopic hysterectomy with bilateral salpingectomy and the second group had only laparoscopic hysterectomy. After complete Pre-Anaesthetic Evaluation and Fitness, patientswere taken up for surgery. The surgery was performed in Sir Ganga Ram Hospital by a well experienced and trained specialist in Minimally Invasive Gynaecology, in a well-equipped operation theatre.

Surgical approach: All patients were admitted a day prior to surgery. Detailed history of all previous medical, surgical diseases was carefully taken. Detailed general physical and gynaecological examination was done. Routine pre-operative phlebotomy samples, Serum AMH and necessary radiographic procedures were performed to obtain anaesthesia fitness. PAP smear was carried out. Informed, written surgical consent was taken. They received bowel preparation pre-operatively. Tab. Misoprost 400 mcg was given buccally on the day of surgery the patient were taken up for operation. General Anaesthesia was administered and dorsal lithotomy position was given. Parts painted and draped. Intravenous antibiotics were given just before ports placement after test dose. Total Laparoscopic Hysterectomy with or without bilateral salpingectomy was done. Intra-operative findings like time, estimated blood loss and complications were made note off. Post-operative course and duration of hospital stay was noted. Post-operatively the patient's general condition, vitals, abdominal girth and tone, urine output was monitored.

RESULTS

Age and BMI related parameters: Average age for 2 groups was similar with no statistically significant difference (Table 1).

Most of patients belonged to the age group of 38-45 years. In TLH group 74% of patients belonged to the age group of 38-45 years and 13% of patients belonged to the age group of 45-50 years with mean age of 44.06±2.94 years.

In TLH+BS group 68% of patients belonged to the age group of 38-45 years and 16% of patients belonged to the age group of 45-50 years with mean age of 43.58±2.52 years (Table 2).

P-value for present study is 0.462 which was not statistically significant and thus both groups were comparable.

In TLH group 58% of patients belonged to the BMI 25-29.9 kg/m^2 group,16% of patients belonged to the BMI 30-34.9 kg/m^2 group,16% of patients belonged to the BMI 35-39.9 kg/m^2 group,10% of patients belonged to the BMI 18.5-24.9 kg/m^2 group. Mean BMI for TLH group is (29.332±4.226) kg/m^2 (Table 3).

In TLH+BS group 62% of patients belonged to the BMI 25-29.9 kg/m^2 group,14% of patients belonged to the BMI 30-34.9 kg/m^2 group,14% of patients belonged to the BMI 35-39.9 kg/m^2group,10% of patients belonged to the BMI 18.5-24.9 kg/m^2 group with. Mean BMI for TLH+BS is 28.48±3.701 kg/$m^{2.}$ (Table 4).

p-value in this study is 0.286 which is not statistically significant and thus both groups are comparable.

The comparison of serum AMH levels between the TLH+BS and TLH groups shows no statistically significant differences at baseline, 6 or 12 weeks

Table 1: Age and BMI distribution in both the groups

Variables	TLH+BS (n = 50)	TLH (n = 50)	p-value
Mean age (years)	43.58±2.52	44.060±2.94	0.462
Mean BMI	28.48+±3.701	29.332±4.226	0.286

TLH+BS: Total Laparoscopic Hysterectomy with B/L salpingectomy and TLH: Total Laparoscopic Hysterectomy without salpingectomy

Table 2: Comparison of serum AMH in TLH+BS and TLH group

Mean AMH level (pmol L^{-1})	TLH+BS group	TLH group	p-value
At baseline serum AMH±SD	5.7±12.6	3.5±6.6	-
Post-operative serum AMH level at 6 weeks	5.6±12.1	3.5±6.6	0.2874
Post-operative serum AMH level at 12 weeks	5.8±12.7	3.6±7.2	0.2147

Table 3: Comparison of serum FSH in TLH+BS and TLH group

Mean FSH level (pmol L^{-1})	TLH+BS group	TLH group	p-value
At baseline serum FSH±SD	7.58±0.89	6.84±2.50	-
Post-operative serum FSH level at 6 weeks	9.18±0.95	9.73±2.64	0.2874
Post-operative serum FSH level at 12 weeks	9.84±0.98	10.50±2.71	0.2147

Table 4: Postoperative hospital stays among patients

Postoperative hospital stays (days)	TLH+BS	TLH	p-value
Mean±SD (days)	2.94±0.37	3.02±0.38	0.289

post-operatively. Both groups had similar AMH levels, with slightly higher means in the TLH+BS group but large variability in the data. The p-values at 6 weeks (0.2874) and 12 weeks (0.2147) confirm that the differences are not significant. Thus, salpingectomy does not appear to impact short-term post-operative AMH levels.

At both 6 and 12 weeks post-operatively, the p-values are greater than the standard significance level of 0.05. This means there is no statistically significant difference (p>0.05) between the FSH levels of the TLH+BS group and the TLH group at either 6- or 12-weeks post-operation, the differences observed between the two groups.

Postoperative hospital stays in TLH+BS group was 2.94±0.37 days and in TLH group it was 3.02±0.38 day. Thus, both groups in our study were found to be comparable (p>0.05).

DISCUSSION

Hysterectomy, whether performed with or without bilateral salpingectomy, is a common surgical procedure for various benign gynaecological conditions. However, concerns have been raised regarding the effect of hysterectomy on ovarian reserve, particularly with the inclusion of bilateral salpingectomy. The main issue is whether the removal of the fallopian tubes, which share a blood supply with the ovaries, can impair ovarian function and hasten the onset of menopause by reducing the ovarian reserve. To address this, we focused on the comparison of ovarian reserve, assessed by serum anti-Müllerian hormone (AMH) and follicle-stimulating hormone (FSH) levels, between patients who underwent Total Laparoscopic Hysterectomy (TLH) with bilateral salpingectomy (BS) and those who underwent TLH alone[8,9].

Ovarian Reserve and AMH Levels: AMH is a well-established marker of ovarian reserve, as it reflects the remaining quantity of ovarian follicles. Lower AMH levels are indicative of reduced ovarian function, which is often associated with the peri-menopausal state. In our study, the preoperative baseline AMH levels were slightly higher in the TLH+BS group compared to the TLH group (5.7±12.6 vs. 3.5±6.6 pmol L^{-1}, respectively) but this difference was not statistically significant. Over time, both groups showed minor fluctuations in AMH levels at 6 weeks and 12 weeks post-surgery. At 6 weeks, AMH levels were 5.6±12.1 pmol L^{-1} in the TLH+BS group and 3.5±6.6 pmol L^{-1} in the TLH group (p = 0.2874). At 12 weeks, these levels were 5.8±12.7 pmol L^{-1} in the TLH+BS group and 3.6±7.2 pmol L^{-1} in the TLH group (p = 0.2147). Neither timepoint exhibited a statistically significant difference between the groups, indicating that salpingectomy did not have a measurable impact on short-term ovarian reserve.

These findings align with other studies in the literature. A study by Venturella *et al*.[10] explored the impact of bilateral salpingectomy on ovarian reserve and concluded that the procedure does not significantly alter serum AMH levels up to 12 months postoperatively, supporting the hypothesis that salpingectomy does not impair ovarian function. Similarly, a review by Morelli *et al*.[11] suggested that ovarian reserve, as measured by AMH, remains unaffected by salpingectomy when performed alongside hysterectomy. These studies, along with our findings, suggest that hysterectomy with salpingectomy does not lead to a substantial decline in ovarian reserve within a short postoperative timeframe.

FSH levels: FSH levels were measured as a secondary marker of ovarian function. Preoperatively, the baseline FSH levels were comparable between the two groups (7.58±0.89 pmol L^{-1} in the TLH+BS group vs. 6.84±2.50 pmol L^{-1} in the TLH group). Postoperative FSH levels at 6 and 12 weeks also showed no statistically significant differences between the groups, with p-values of 0.2874 and 0.2147, respectively. The increase in FSH levels over time reflects the natural course of postoperative recovery but the similar levels between the groups indicate that salpingectomy did not result in additional ovarian dysfunction.

These results are consistent with prior research. A study by Kristensen *et al*.[12] reported that salpingectomy performed during hysterectomy does not lead to significant alterations in FSH levels when compared to hysterectomy alone. Therefore, our study further supports the notion that salpingectomy has no significant impact on ovarian reserve, as reflected by stable FSH levels.

Postoperative recovery and hospital stay: Our study also examined postoperative recovery, as measured by hospital stay duration. Patients in the TLH+BS group had a mean hospital stay of 2.94±0.37 days, while patients in the TLH group had a slightly longer stay of 3.02±0.38 days. This difference was not statistically significant (p = 0.289), indicating that the addition of salpingectomy did not significantly prolong recovery time. This finding is in line with studies by Jacoby *et al*.[13], which found no significant increase in morbidity or recovery time associated with salpingectomy performed alongside hysterectomy.

Clinical implications and recommendations: Given that salpingectomy has been associated with reduced risk of ovarian cancer, particularly in patients at high risk, the lack of significant impact on ovarian reserve makes a strong case for incorporating bilateral salpingectomy during hysterectomy for benign indications. Ovarian cancer has been linked to the

fallopian tubes in recent studies, with salpingectomy reducing the risk of high-grade serous carcinomas[14]. Considering this, performing salpingectomy during hysterectomy can offer a prophylactic benefit without compromising ovarian function.

CONCLUSION

Our study demonstrated that bilateral salpingectomy during total laparoscopic hysterectomy for benign conditions does not significantly affect ovarian reserve in the short term, as reflected by stable AMH and FSH levels at 6 weeks and 12 weeks postoperatively. Additionally, salpingectomy does not increase postoperative recovery time or hospital stay duration. Given the potential benefits of salpingectomy in reducing the risk of ovarian cancer and the absence of negative effects on ovarian function, incorporating bilateral salpingectomy during hysterectomy is a viable and beneficial option. Further long-term studies are needed to evaluate the impact of salpingectomy on ovarian function beyond the 12-week postoperative period.

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