

Tubal ligation and early menopause: a case-control study

Abstract

Background: This study aimed to assess whether bilateral tubal ligation is associated with premature menopause by reviewing the menopausal age of patients with tubal ligation and comparing it to patients with intact adnexa.

Methods: This retrospective study collected data in 2015 from all bilateral tubal ligation cases performed at Hôtel-Dieu de France University Hospital, Lebanon. Data including age of menopause were analyzed and compared to an equal number of menopausal women who did not undergo any tubal ligation or gynecological surgeries and randomly chosen (controls).

Results: 50 cases of menopausal patients with a history of tubal ligation were analyzed and compared to 50 controls. The mean menopausal age in the operated group was 48.86 years versus 49.56 years in the control group ($P=0.342$). No significant difference was found between both groups for all the study variables.

Conclusion: The association of tubal ligation and premature menopause is still questionable although some studies suggest a relationship between tubal ligation and decreased ovarian function.

Keywords: menopause, ovarian function, sterilization, tubal ligation

Volume 9 Issue 2 - 2018

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Received: September 28, 2017 | **Published:** March 19, 2018

Abbreviations: BMI, body mass index; FSH, follicle stimulating hormone; HDF, hôtel-dieu de france

Background

The effect of the use of tubal sterilization as a birth control method on ovarian function, ovarian reserve and menopausal age is questionable. In fact, bilateral salpingectomy or tubal ligation¹ and conservative abdominal hysterectomy² were sometimes related to decrease ovarian function and premature menopause. The decrease of hormonal secretion will cause endocrine disorders manifested by decreased libido, vaginal dryness, mood swings and vasomotor symptoms. The alteration of the ovarian function by sterilization has been hypothesized to be responsible for menstrual abnormalities and hormonal disturbances that characterize the so-called post-tubal ligation syndrome.^{3,4} The logic behind this theory is that the vascularization of the ovaries by either ovarian artery or the utero-ovarian anastomoses as well as the fallopian tube destruction reduce the utero-ovarian arterial blood flow in the mesosalpinx, which leads to ovarian tissue damage.⁴ In 1987, Riedel HH et al.⁵ found that the levels of estrogen and progesterone decrease after fallopian tube sterilization and hysterectomy.⁵ Nonetheless, Kusche M et al.⁶ in 1994 contradicted this finding by stating that no endocrinological parameters in the perimenopause were found, neither did cycle anomalies and ovarian deficiency symptoms in terms of climacteric complaints occur earlier, nor did early onset of menopause occur more often in the operated group.⁶

In this context, the objective of the present study was to compare age at menopause between the women having already undergone tubal ligation and the control group having intact fallopian tubes. Also, we review literature about the long-term safety of tubal ligation.

Methods

Study settings and population

For the purpose of this case-control study, we retrospectively reviewed the medical records of all women (cases) who had previously undergone bilateral tubal ligation between 1970 and 2010 at the department of Obstetrics and Gynecology, Hôtel-Dieu de France (HDF) University Hospital, Beirut, Lebanon.

More than 200 patients were contacted of whom many were found to have changed their phone numbers. Eligible cases had to be menopausal; menopause was defined as having amenorrhea for more than 12 months with or without symptoms related to hormonal depletion. Exclusion criteria were patients who were operated for bilateral ovariectomy or salpingectomy or hysterectomy before their physiological menopause, and patients who got chemotherapy, radiation therapy or any hormonal therapy that could influence their reproductive function and alter their normal evolution towards menopause.

The 50 cases were then compared to 50 randomly chosen menopausal women (controls) from the department of Obstetrics and Gynecology at HDF, who did not get any tubal ligation or gynecological surgeries (intact tubes, ovaries and uterus) but meeting the same eligibility criteria as the cases.

Data collected

Socio-demographic and biological data were collected from the patients' medical records, such as year of birth, age at the time of operation, obstetrical history (gravida and para), age at menopause, weight and height. Body Mass Index (BMI) was calculated.

Statistical analysis

Cases and controls were compared using the Student's t-test with a two-sided significance level of 5%. Data were analyzed using IBM SPSS version 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.).

Ethical considerations

The study was approved by the ethics committee of HDF and data were collected after patients gave their written informed consent. Anonymity and confidentiality of all participants were guaranteed during data collection and analysis.

Results

50 tubal ligation cases were included in this study and compared with 50 menopausal patients with intact pelvic organs. The characteristics of these 100 patients are detailed in (Table 1).

Table 1 Characteristics of the study population (N=100)

	Minimum	Maximum	Mean	Standard deviation
Age (years)	47	77	58.16	6.9
Gravida	0	14	5	2.52
Para	0	10	4.1	2.12
Age at menopause (years)	35	57	49.21	3.66
Weight (Kg)	45	115	71.71	12.67
Height (m)	1.47	1.75	1.64	0.05
BMI (Kg/m ²)	15.94	40.75	26.64	4.22

No significant difference was found between the cases and the controls for any of the study variables (Table 2).

Table 2 Mean value of the characteristics of the two compared groups

	Case group (n=50)	Control group (n=50)	Total (N=100)	P-value*
Age (years)	58.2	58.12	58.16	0.954
Gravida	5.24	4.8	5	0.364
Para	4.36	3.82	4.1	0.204
Age at menopause (years)	48.86	49.56	49.21	0.342
Weight (Kg)	73.36	70.1	71.7	0.194
Height (m)	1.64	1.63	1.64	0.471
BMI (Kg/m ²)	27.14	26.15	26.64	0.242

*Two-sided significance level set at 5%.

Discussion

Tubal ligation may reduce the ovarian blood flow leading thus to the decrease of the total follicular pool, ovarian function and in an early state of hormonal deficiency. Several publications suggest that tubal ligation induces alteration of the endocrine profile of operated women. Goynumer G et al.⁷ found a significant difference between the postoperative 10th-month Day-3 total ovarian volumes and antral follicle counts in the tubal sterilization groups.⁷ Ozyer S et al.⁸ went further and compared an elective tubal ligation by mini-laparotomy and tubal ligation done during a C-section. They found that intra-operative cesarean section tubal sterilization seems to have less effect on the ovarian reserve when compared with planned tubal sterilization by mini-laparotomy (higher levels of anti-mullerian hormone, lower levels of inhibin B and increased number of antral follicles and mean ovarian volumes).⁸ In 2004, Kelekci S et al.⁹ reported an increase of

follicle stimulating hormone (FSH) levels with no decrease in ovarian reserve or ovarian stromal blood supply.⁹ The same findings were described in their two studies in 2005.^{10,11}

In parallel, other publications made opposite conclusions. As such, Dede FS et al.¹² stated that the rate of ovulation was slightly improved after the procedure, and ovarian reserve was not negatively affected.¹² Carmona et al.¹³ found no significant changes of FSH, luteinizing hormone, 17beta-estradiol and inhibin levels, despite that a 45% increase in FSH concentration from baseline to the 60-month control was detected in tubal sterilization *versus* 30% in the control groups of women.¹³ Cevrioglu AS et al.¹⁴ also found no difference in uterine or ovarian artery blood flow rates or ovarian hormone secretion in comparison with baseline values.¹⁴

Finally when comparing age of menopause, Nichols HB et al.¹⁵ found no significant association between tubal ligation and menopausal age,¹⁵ which is compatible with our findings. In our results, there is a lack of data regarding smoking status and presence of endometrioma knowing that these two factors are important for the occurring age of menopause. Pokoradi AJ et al.¹⁶ found that tubal sterilization was associated with younger age at menopause¹⁶ which is consistent with findings of Visvanathan et al.¹⁷

Conclusion

To conclude, the present study found no difference in menopausal age between women who underwent or not tubal ligation. Based on the review of literature, no conclusive statements can be made in this regard due to contradictory results between publications. Larger randomized case-control studies should be performed to enable making stronger conclusions about the long-term effect of tubal ligation as a method for birth control.

Acknowledgements

We would like to thank all women who participated in the study.

Declarations

Ethics approval and consent to participate

Written informed consent was obtained from the patients for the purpose of this study. A copy of the consent is available for review by the Editor-in-Chief of this journal.

Consent for publication

Not applicable.

Availability of data and materials

The patients' data are available upon request and after approval of the authors to preserve the patients' anonymity.

Funding

None.

Authors' contributions

GAT and EA are responsible of the medical and therapeutic management of the patients.

OH, FM, AK and SM collected the data and performed the data entry.

OH analyzed the data.

Dr GAT, OH and SM wrote the manuscript.

All authors approved the manuscript and GAT gave his final approval of the paper to be published.

Conflicts of interest

The authors declare that they have no conflict of interest in publishing the article.

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