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Menstrual pattern following tubal sterilization

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Summary

Background:

We sought to investigate the effects of tubal sterilization over menstrual parameters and determine the timing of the detected influences.

Material/Methods:

We questioned 97 voluntary patients among 301 women who had been subjected to tubal sterilization in our clinic between 1996-2006. Patients were asked via questionnaire about menstrual parameters concerning the 5 years before and after the surgery, which focused on each year separately. Statistical analyses were carried out by considering the preoperative data of patients as controls and postoperative data as the study group.

Results:

Some kind of pattern change was detected in 7.6% of all patients. Hemorrhage with chunky clots of blood incidence decreased significantly by the second postoperative year (31.9%, 21.6%; $P<.05$). We had a significant decrease in dysmenorrhea postoperatively in the third, fourth, and fifth years (38.1%, 21.6%, 16.4%, 13.4%; $P<.05$). While the premenstrual syndrome was 45.3% before surgery, it was 30.9% and 24.7% postoperatively in the fourth and fifth years ($P<.05$).

Conclusions:

Hemorrhage and dysmenorrhea were most frequently seen after tubal sterilization. The statistically significant drop in the mean weekly coital frequency during postoperative period indicates a need for further studies, which might evaluate the reasons behind this reduction.

key words:

sterilization • tubal • statistics • numerical data • tubal ligation • menstrual pattern

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BACKGROUND

Tubal sterilization is one of the most commonly preferred contraceptive methods owing to its highly effective nature [1–3]. It is applied particularly to patients over 30 year of age. In USA, approximately 600 000 tubal sterilizations occur in 1 year, and 42% of those are performed on women aged 30–44 [4,5]. This procedure was first applied as laparotomy and minilaparotomy; whereas today, it is most commonly carried out following caesarean section via laparotomy and laparoscopy [6]. The pregnancy rate in the literature among women who have undergone tubal sterilization has been reported to be generally <1%, where it is recognized as an effective method but one that can lead to complications and alterations in the quality of life. While the description and criteria for *postligation syndrome* have not been clearly stated, they comprise a menstrual pattern with changes, and emotional and systemic complaints including alterations in the sexual life [7–14].

Menstrual pattern changes in women who have been subjected to tubal sterilization have been the subject of many studies. This is because the procedure has been performed among different numbers of women, living in different geographies, without common standards, the reports and results show different findings.

The fallopian tubes are obstructed by performing various surgical techniques. Theoretically, the reason behind menstrual pattern changes is a reduction in blood flow in mesosalpinx owing to the close localization of the utero-ovarian vasculature and resulting ischemic tissue damage. As a result of venous drainage, ovarian circulation and follicular development are affected, leading to disruption in estrogen and progesterone production. Studies that imply disruption of ovarian functions in women subjected to a hysterectomy might support this theory. However, Cevrioglu and associates studied 36 women, via transvaginal color Doppler ultrasonography, given tubal sterilization during a 6-month follow-up, and found no changes in uterine or ovarian blood flow. They found no alterations in the initial hormonal profile [15]. Uzel and associates found reduced E₂ production 24 hours after ligation in 49 tubal sterilized patients aged 20–41 [5].

In this study, we sought to investigate the effects of tubal sterilization on the menstrual pattern and quality of life of women, and determine the onset of those alterations.

MATERIAL AND METHODS

We reviewed files of 301 patients who underwent tubal sterilization by the Pomeroy method or laparoscopic unipolar electrocoagulation technique in our clinic between 1996 and 2006. Patients with endometriosis, dense adhesions, multiple leiomyomas, and large solid adnexal masses (like dermoid cysts) were excluded. One hundred and thirty-seven patients (45.5%) were contacted via phone. The patients were informed of the study's protocol, and 97 of them (70.8%) consented to take part. Refusals were personal. All phone calls were performed by 1 female physician to achieve the highest possible patient compliance. The study was approved by the Ethics Committee and Institutional Review Board of Uluda University Faculty of Medicine.

Table 1. Causes underlying the demand for tubal sterilization.

Causes	n	%
Completion of the family	42	43.3
Systemic diseases	16	16.5
Physician's advice	8	8.3
Advanced age	5	5.2
Need for a definitive solution	6	6.2
Inability to use IUD	13	13.4
Poor obstetric history	7	7.2

IUD – Intrauterine device.

The questionnaire included 41 questions on demographic data, menstrual parameters, and medical history. The following parameters were recorded separately for each year for all the patients for a period of 10 years, starting 5 years before the surgery to 5 years after surgery. They included cycle pattern, menstrual bleeding length, menstrual bleeding volume, intermenstrual bleeding, hemorrhage (with chunky clots of blood), dysmenorrhea, dyspareunia, chronic pelvic pain, and premenstrual syndrome characteristics.

Statistical analysis

Statistical analysis was done by taking the preoperative values as the reference group and the postoperative results as the study group. The influence of surgery on the menstrual parameters was compared between the 2 groups. The chi-square method was used to analyze the data. Obtained values were evaluated by taking the demographic parameters of the patients into consideration in light of the literature reports.

RESULTS

The mean age of 97 patients enrolled in our study was 35.1 years (range, 26–47 years). While the mean gravidity of the patients was 3.9 (range, 2–8), mean parity was 2.6. The average number of children living with our patients during the time of ligation was 2.4.

Tubal sterilization had been applied simultaneously with the caesarean operation in 59 patients, 30 patients had been operated on electively. Of 30 elective patients, 3 had been operated on in the postpartum period. Laparoscopic tubal sterilization had been done to 6 patients under elective conditions (during postpartum period in 2 patients). Eight patients had undergone tubal sterilization during gynecologic operations such as myomectomy or benign ovarian/paraovarian cyst excision. Also, tubal sterilization was performed on 16 patients with systemic diseases (like advanced cardiac or pulmonary disorder) where the health of the mother would have been affected. The causes for tubal sterilization are in Table 1.

Distribution of contraceptive methods used before tubal sterilization is shown in Figure 1. None of the patients who were treated with tubal sterilization demanded reanastomosis and pregnancy in the following years. Pregnancy was

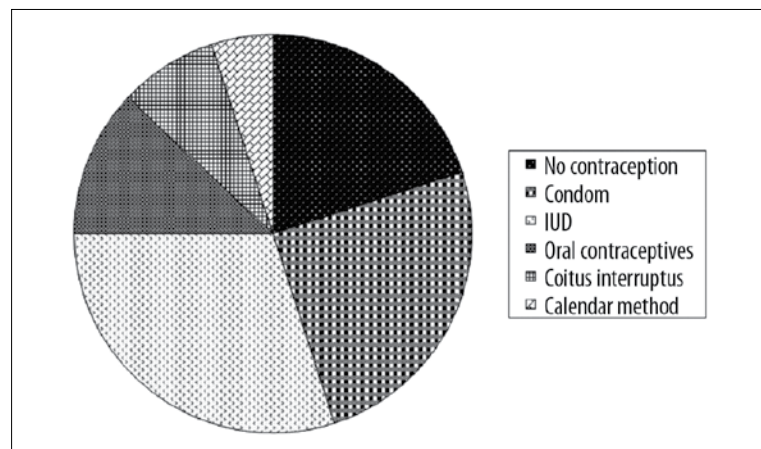


Figure 1. Contraceptive methods applied to women prior to TS.

Table 2. Symptoms and results that show a significant change following the sterilization.

Symptoms	Before sterilization		Postoperative			
	n/(%)	1 st year n/(%)	2 nd year n/(%)	3 rd year n/(%)	4 th year n/(%)	5 th year n/(%)
Haemorrhagia (with chunky clots of blood)	31 (31.9%)	19 (19.5%)	20 (20.6%)	17 (17.5%)	14 (14.4%)	13 (13.4%)
Dysmenorrhea	37 (38.1%)	29* (29.8%)	26 (26.8%)	21 (21.6%)	16 (16.4%)	13 (13.4%)
Premenstrual syndrome	53 (54.6%)	44 (45.3%)	44 (45.3%)	44 (45.3%)	30 (30.9%)	24 (24.7%)

* One patient reported having a menopause in the following year; ** when compared with the preoperative period for the bold values, the result was $P < .05$.

Table 3. Systemic complaints following tubal sterilization.

	Depression n/(%)	Mastalgia n/(%)	Urogenital n/(%)	CVS* n/(%)	DSW** n/(%)
Yes	41 (42.3%)	28 (28.8%)	38 (39.2%)	26 (26.8%)	25 (25.7%)
No	56 (57.7%)	69 (71.2%)	59 (60.8%)	71 (73.2%)	72 (74.3%)

* CVS – Cardiovascular system; ** DSW (Diminishing sense of womanhood): Only 6/25 patients (24%) did not report depression, whereas 19 patients defined depression at the same period.

observed in 1 patient (0.0103%), and a repeat tubal sterilization was applied. (The second request of this patient was not included in our study).

In total, 59 patients (64%) reported experiencing normal cycles after the procedure, whereas 16 of the remaining 38 patients reported various changes in cycle pattern following the operation.

Preoperatively, among 5 women who used to have regular cycles and 11 women who presented with a certain cycle irregularity, 2 exhibited menorrhagia 2 years after surgery, 1 patient showed polymenorrhea 3 years after surgery, and 2 patients displayed hypomenorrhea 3 years after surgery.

All patients with cycle irregularities before the operation reported regular cycles after 1 year, whereas 1 of 3 patients who

had noted oligomenorrhagic cycles reported normalization. None of the patients with preoperative metrorrhagia reported a change in this condition after the procedure. Twenty-two patients did not provide exact information on their menstrual regularity status before or after the procedure.

There was no difference between groups regarding spotting, dyspareunia, and chronic pelvic pain, whereas significant differences were determined between preoperative and postoperative values concerning haemorrhagia (with chunky clots of blood), dysmenorrhea, and premenstrual syndrome (Table 2). While the incidence of haemorrhagia (with chunky clots of blood) was 31.9% during the preoperative period (31/97), the highest incidence postoperatively was found to be 20.6% (20/97) ($P < .05$). Dysmenorrhea was found in 38.1% of patients preoperatively; no significant difference was found postoperatively for the first 2 years. The

incidence at postoperatively in the third, fourth, and fifth years was 21.6%, 16.4%, and 13.4%, ($P < .05$). Premenstrual syndrome was 54.6% before the procedure, and it was 30.9% and 24.7% in fourth and fifth years postoperatively ($P < .05$).

Table 3 shows the relation between tubal sterilization procedure and postoperative systemic complaints (along with changes in menstrual patterns). In place of analyzing each year separately, total numbers for the whole 5-year period are given.

DISCUSSION

Many studies have been done on *posttubal ligation syndrome* comprising the clinical and physiologic changes taking place after the tubal ligation, along with analyses concerning many parameters in hormonal, histologic, and physical aspects [10,12,16,17]. The influence of the procedure over ovarian blood flow is considered as the main underlying cause for the predicted secondary/adverse effects [7,18].

While there are articles that advocate that after tubal sterilization, women should experience a reduction in their quality of lives and might need an additional procedure, there are studies that propose contrary views. Hillis and associates found an elevated risk for hysterectomy in 5 years, independent of the age and the procedure used, among women who had undergone tubal sterilization compared with the women whose spouses had a vasectomy (2% vs 8%) [19].

A study conducted by Tayloe evaluated the status of 144 women 2 years after laparoscopic tubal ligation procedure and revealed 15 patients who required 17 surgical interventions in total along with 8 hysterectomy procedures; that corresponds to a rate of 8/144 in 2 years, which was found to be higher than the predicted value [20]. Shy and associates performed tubal sterilization on 7252 patients, aged 20–49 years, between 1968 and 1983, and compared the results with 5283 women without tubal sterilization whose spouses had undergone vasectomy. They determined a need for hospitalization in 282 cases due to menstrual changes, and found the hospitalization rate after tubal sterilization 2.4 times greater than that of the other group. While the 20- to 24-year-old age group with tubal sterilization showed a 6.1-fold greater need for hospitalization, the same rate for women with vasectomized spouses was 2.4 [7]. In light of these studies, one may believe that risk of hospitalization and hysterectomy among women who have undergone tubal sterilization might show an increase compared with the normal population.

Disruption of ovarian function and its influence over menstrual pattern causing patients to become symptomatic after surgery may be the reason behind elevated hospitalization rates. As earlier studies on that subject generally measure the effect of the procedure on the patient's quality of life, recent investigations concentrate on theories about the causes of postligation syndrome along with exhibition and measurement of those assumptions.

Duran and associates studied the effects of tubal ligation on 24 rats, via removing uterine horns and ovaries for histopathologic analyses, 6 weeks after the ligation procedure, and comparing the results with rats who were subjected to only laparotomy by a blinded pathologist. As a result, they did not find any significant difference between the groups, regarding

the number of tertiary follicles and corpus luteum (which led them to report that tubal ligation is a procedure without any histologic influence over the ovaries) [1]. Although the study lasted only 6 weeks, because a similar study cannot be conducted on humans, we concluded that tubal ligation does not have a significant influence on ovarian histology.

Uzel and Cepicky and associates enrolled 1555 women, with a parity of 2–6, who were between the ages of 24 and 35, from 24 countries and 45 centers in their study, and monitored the patients for 3 cycles before and after tubal sterilization [5]. While 8% of their patients had irregular cycles that became regular, in 5% of the patients, regular cycles turned into irregular ones. As 26% of the patients showed an increase in menstrual bleeding length, 22% of the patients demonstrated a drop in menstrual bleeding. The negative effect of sterilization over steroidogenesis was shown in 112 patients, and those patients exhibited urogenital, cardiologic, and psychosocial problems. A reduction in total estrogen excretion was determined in 59 patients aged 20 to 41 years, and in another 41 patients 24 hours after ligation; osteoporosis occurred after 3 years. Although the number of cases can be considered adequate, the fact that the patients were monitored for 3 cycles perioperatively, while most of the premenstrual pattern changes are known to take place in the late period, could be mentioned as a shortcoming of their study.

In the present study, as 60.8% of the patients (59/97) were determined to have cycles that were not been affected by the procedure, 5 patients who described their cycles as regular before the study, experienced irregularities, the earliest of which showed up after the second postoperative year, whereas 5 of the patients who noted themselves as having irregular cycles exhibited regular cycle patterns beginning from the first postoperative year. In the current study, we planned to monitor our patients for 5 years, and found significant changes regarding hemorrhage (with chunky clots of blood) after the second postoperative year, while determining a reduction in dysmenorrhea complaint after the third postoperative year.

Another study by the same authors, which focused comparing 1107 sterilized cases and 530 control patients, showed no difference regarding the menstrual pattern and menstrual intensity, whereas a tubal sterilization group demonstrated a significant rate of dysmenorrhea, which was a finding contrary to our study. The same study noted that restoration of the fertility could be possible by various studies in 80% of cases [5].

Tubal sterilization procedure can be carried out by applying Irwing, Pomeroy, Uchida, or Parkland methods, and by using unipolar, bipolar cauterization, or various clips. Wilcox and associates followed-up 5070 patients for 5 years, and determined that sterilization could differ. The spring-clip method showed menstrual pain in 33% of patients and determined it to induce more hemorrhage and pain. They observed the longest period in unipolar electrocoagulation cases, whereas they found the shortest period among women who had been subjected to spring clip. Moreover, as the age at the time of sterilization was higher, the pain was lower and the cycles were more regular. The investigators noted the hemorrhage pattern and pain were the parameters that were influenced most from the sterilization, while mentioning that tissue destruction was ineffective [22].

DeStefano and associates performed unipolar electrocoagulation on 2456 patients and found no sign of remarkable change in menstrual pattern owing to tubal sterilization, while further reporting considering all menstrual parameters, approximately 50% of patients were asymptomatic preoperatively, demonstrating reductions in their symptoms following the ligation after the second year [23].

Yazici and associates compared preoperative and postoperative values for FSH, E2 ovarian volume, number of antral follicles, and ovarian arterial blood flow rates of 19 patients who had been subjected to sterilization through laparoscopic, bipolar, coagulation at the end of the first year. They determined no sign of bipolar sterilization's effect on ovarian function and vascular resistance [24]. In the current study, while the Pomeroy method has been applied to 97 patients, the absence of a report concerning clip or electrocauterization might be a shortcoming of the study.

In the studies, there are a variety of different results. Theories concerning changes in ovarian function and menstrual patterns definitely cannot be attributed to the tubal sterilization procedure alone.

CONCLUSIONS

We found hemorrhage (with chunky clots of blood) and dysmenorrhea to be the most-affected parameters, and we observed a decrease in the incidence of those problems as the postoperative period grew longer. Other parameters, and the menstrual pattern, did not seem to be influenced significantly by the tubal sterilization procedure, and tubal sterilization does not present an additional risk for menstrual abnormalities. Although the operative method and the procedures may vary, we believe that after this intervention, a variety of influences might occur in the late period and therefore, monitoring patients only in the early period would not be adequate. This indicates that future studies concentrated on this subject should monitor patients for long periods.

Contrary to our expectations and the related literature, determination of a statistically significant drop in the mean weekly coital frequency during the postoperative period, suggests a need for studies that would evaluate factors leading to this finding.

REFERENCES:

- Owings MF, Kozak LJ: Ambulatory and inpatient procedures in the United States, 1996. *Vital Health Stat*, 1998; (139): 1-119
- Piccinino LJ, Mosher WD: Trends in contraceptive use in the United States: 1982-1995. *Fam Plann Perspect*, 1998; 30(1): 4-10, 46
- Mosher WD, Pratt WF: Use of contraception and family planning services in the United States, 1988. *Am J Public Health*, 1990; 80(9): 1132-33
- Abma JC, Chandra A, Mosher WD et al: Fertility, family planning, and women's health: new data from the 1995 National Survey of Family Growth. *Vital Health Stat*, 1997; (19): 1-114
- Uzel R, Cepický P: Is tubal sterilization harmful to the health of women? *Cesk Gynkol*, 1990; 55(5): 385-89
- Mosher WD: Contraceptive practice in the United States, 1982-1988. *Fam Plann Perspect*, 1990; 22(5): 198-205. Erratum in: *Fam Plann Perspect*, 1991; 23(3): 107
- Shy KK, Stergachis A, Grothaus LG et al: Tubal sterilization and risk of subsequent hospital admission for menstrual disorders. *Am J Obstet Gynecol*, 1992; 166(6 Pt 1): 1698-705; discussion 1705-6
- Taner CE, Hakverdi AU, Erden AC, Satici O: Menstrual disorders and pelvic pain after sterilization. *Adv Contracept*, 1995; 11(4): 309-15
- Goldhaber MK, Armstrong MA, Golditch IM et al: Long-term risk of hysterectomy among 80,007 sterilized and comparison women at Kaiser Permanente, 1971-1987. *Am J Epidemiol*, 1993; 138(7): 508-21
- Gentile GP, Kaufman SC, Helbig DW: Is there any evidence for a post-tubal sterilization syndrome? *Fertil Steril*, 1998; 69(2): 179-86
- Cattanach J: Oestrogen deficiency after tubal ligation. *Lancet*, 1985; 1(8433): 847-49
- Cattanach JF, Milne BJ: Post-tubal sterilization problems correlated with ovarian steroidogenesis. *Contraception*, 1988; 38(5): 541-50
- Donnez J, Wauters M, Thomas K: Luteal function after tubal sterilization. *Obstet Gynecol*, 1981; 57(1): 65-68
- Sumiala S, Pirhonen J, Tuominen J, Mäenpää J: Increased uterine and ovarian vascular resistance following Filshie clip sterilization: preliminary findings obtained with color Doppler ultrasonography. *J Clin Ultrasound*, 1995; 23(9): 511-16
- Cevrioglu AS, Degirmenci B, Acar M et al: Examination of changes caused by tubal sterilization in ovarian hormone secretion and uterine and ovarian artery blood flow rates. *Contraception*, 2004; 70(6): 467-73
- Rulin MC, Davidson AR, Philliber SG et al: Long-term effect of tubal sterilization on menstrual indices and pelvic pain. *Obstet Gynecol*, 1993; 82(1): 118-21
- Peterson HB, Jeng G, Folger SG et al: U.S. Collaborative Review of Sterilization Working Group: The risk of menstrual abnormalities after tubal sterilization. U.S. Collaborative Review of Sterilization Working Group. *N Engl J Med*, 2000; 343(23): 1681-87
- Fagundes ML, Mendes MC, Patta MC et al: Hormonal assessment of women submitted to tubal ligation. *Contraception*, 2005; 71(4): 309-14
- Hillis SD, Marchbanks PA, Tylor LR, Peterson HB: Higher hysterectomy risk for sterilized than nonsterilized women: findings from the U.S. Collaborative Review of Sterilization. The U.S. Collaborative Review of Sterilization Working Group. *Obstet Gynecol*, 1998; 91(2): 241-46
- Tayloe J: Laparoscopic sterilization in a community hospital with a two-year follow-up. *N C Med J*, 1980; 41(9): 581-82
- Duran B, Demirkoprulu N, Guvenal T et al: Histopathological changes in ovary and endometrium after tubal ligation: a rat model. *Acta Obstet Gynecol Scand*, 2003; 82(3): 220-24
- Wilcox LS, Martinez-Schnell B, Peterson HB et al: Menstrual function after tubal sterilization. *Am J Epidemiol*, 1992; 135(12): 1368-81
- DeStefano F, Huezo CM, Peterson HB et al: Menstrual changes after tubal sterilization. *Obstet Gynecol*, 1983; 62(6): 673-81
- Yazici G, Arslan M, Pata O et al: Ovarian function and vascular resistance after tubal sterilization. *J Reprod Med*, 2004; 49(5): 379-83