Original Article

Tubal Sterilization during Cesarean Section at a Training Hospital in Turkey: A Clinical and Demographic Analysis

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Abstract

Background: The total fertility rate is 2.1 children per women in Turkey. The population is expected to increase to 84 million by 2023. Maternal (19/100,000 live births), infant, and child mortality rates (20/100,000 live births) are still higher than desired levels in Turkey. We investigated factors affecting the choice of tubal sterilization (TS) after cesarean sections (CSs) and determined intraoperative and short-term postoperative maternal effects of this procedure. **Materials and Methods:** We compared 1,849 CSs for demographic characteristics and clinical parameters including obstetric outcomes between two patient groups who underwent CSs with or without TS. Intraoperative and short-term postoperative maternal effects of TS in these patients were also evaluated. **Results:** Twenty-one percent of women underwent both CSs and TS. A significantly higher ratio of TS was found in women with low education levels who had obstetric risk/systemic disease in their present pregnancy. Apart from a hemoglobin deficit and slightly higher duration of hospital stay, TS did not influence postoperative wound infection or heavy bleeding pattern that requires reoperation. **Conclusion:** These findings conclude that in developing countries TS can safely be applicable as a contraceptive method without additional cost at time of CSs and should be considered as an option for those women who desire or would benefit from it.

Keywords: *Cesarean section, demographic factors, family planning, tubal sterilization*

Date of Acceptance:
23-Jul-2018

Introduction

Unwanted/unintended pregnancies and associated health risks such as increased pregnancy complications, preterm births, etc., represent a global challenge. Maternal mortality and morbidity risks are four- and five-folds higher in pregnant women over age 35 and 40 years, respectively.[1,2] Tubal sterilization (TS) is widely used to prevent unwanted pregnancies.[3,4] With currently available techniques including tubal ligation, laparoscopic methods, mini/conventional laparotomy, culdoscopy, culdotomy, and hysteroscopic (TS), more TSs can be offered to desiring clients. Performing TS during a cesarean section (CS) procedure is feasible when fallopian tubes are readily accessible and offers a reliable, effective, and low-cost option.[4,5]

The rate of CS deliveries has gradually been increasing in both developed and developing countries. Compared with the planned pregnancies, unwanted/unintended pregnancies are probably contributors to this increase in numbers of CSs due to higher risk of pregnancy complications.[6,7] According to income status, the rate of CS has been documented as 6%, 9%, 32%, and 28% for those countries with low, moderate-low, high-moderate, and high incomes, respectively (World Health Statistics, 2014). Offering life-lasting and financial advantages, TS can, thus, be performed

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Access this article online

Quick Response Code:

Website: www.njcponline.com

DOI: 10.4103/njcp.njcp_391_16

How to cite this article: Arlier S. Tubal sterilization during cesarean section at a training hospital in Turkey: A clinical and demographic analysis. Niger J Clin Pract 2018;21:1508-13.

during CSs to provide permanent contraception and prevent later complications.

The current study compared the demographic, obstetrical, and clinical features of patients undergoing CSs with or without TS and determined the intraoperative and short-term postoperative maternal effects in patients undergoing these procedures.

Materials and Methods

All patients (N = 1,849) undergoing CS between January 1, 2014 and December 31, 2014 at the Adana Numune Education and Research Hospital were included in the current cross-sectional study after obtaining approval from the Adana Numune Education and Research Hospital Ethical Committee. Detailed information regarding the benefits and potential complications of alternative contraception methods and TS was provided. Written and oral informed consent was obtained from all patients and their partners. We analyzed the impact of demographic data, clinical and obstetrical findings, educational status, total operation (CS) time, and intrapartum and short-term postpartum maternal complications on TS in patients undergoing cesarean delivery.

The patient population was divided into two groups; (1) CSs with TS and (2) CSs without TS. The patients were further classified as emergency CSs (due to severe complications such as fetal distress or placenta previa) or elective CSs (patients in whom preoperative tests and anesthesia consultations were completed had been given appointments for CSs as a result of previous CSs, placenta previa, etc.). Prior to surgery, antibiotic prophylaxis and thromboprophylaxis were administered to all patients destined to receive surgical treatment. Pregnant women over 35 years of age and those who had five or more pregnancies were considered grand multiparous.

CSs were performed by well-trained physicians and in-training ob-gyn residents using the same technique. Entrance to the abdomen was achieved with a Pfannenstiel abdominal incision. A standard, low transverse segment uterine incision was performed. A subumbilical median incision and uterine vertical incision were performed in cases of placenta previa and/or accreta. TS was performed with the Pomeroy technique by using a 3-0 vicryl rapide from the avascular area while being mindful the ovarian blood supply.[8] The duration of the CSs was defined as the time between initiating the skin incision and completing the last suture upon skin closure.

Hemoglobin deficit was calculated by subtracting the hemoglobin value at the eighth postoperative hour from the preoperative hemoglobin value. Data regarding hemoglobin levels were evaluated before and 8 hours after the CSs births. An anticoagulated blood sample was analyzed by an automated hematology analyzer system (CELL-DYN 3700SL, Abbott Laboratories, Santa Clara, CA, USA).

The results were analyzed using SPSS software, version 21.0 (SPSS Inc., Chicago, IL, USA). A two-tailed P value <0.01 was considered statistically significant for all comparisons. Normal continuous variables were described as mean ± standard deviation, and abnormal continuous variables were described as median. Chi-square and Fisher's exact tests were used to compare categorical variables. Comparisons between groups were applied using the student's t-test or One-way analysis of variance (if more than two groups were analyzed) for parametrically distributed data, whereas the Mann–Whitney U-test or Kruskal–Wallis test were used for nonparametrically distributed data.

Results

In 2014, among 3,503 deliveries performed at our hospital, 1,849 (52.8%) were cesarean deliveries while 1,654 (47.2%) were vaginal deliveries, which included 50 twin births, 2 triplet births, and 47 stillborn. The mean age of these 1,849 patients was 29.9 ± 6.1 years (range, 17–45 years; 1,452 were less than 35 years of age and 397 were at least 35 years or older). The mean age of the patients undergoing TS was 36.9 years. The mean number of CSs per patient was 1.4 ± 1.2 (range = 1–8). The mean number of previous CSs in the current study was 1.1 in the non-TS group and 2.4 in the TS group (P < 0.001). The mean of the parity of patients was 3.01 ± 1.6 (range = 1–13). The mean number of pregnancies in our study was 2.57 in the non-TS group and 4.65 in the TS group (P < 0.001). The mean of the duration of hospital stay was 2.4 ± 1.1 days (range = 1–15 days), mean patient body mass index (BMI) was 29.2 ± 4.7 (range = 19.1–53.3), and mean hemoglobin deficit was 1.16 ± 0.87 g/dL (range = 1.7–7.0 g/dL). TS was coperformed in 391 (21.1%) women delivered by CSs. The percentage of TSs was three-fold higher in women ages 35 and older versus women under age 35 years [45.3% (180/397) vs. 14.5% (211/1452), respectively, P < 0.001]. The mean operation time was significantly longer in CSs cases with TS compared with those without TS (mean ± SD 42.4 ± 9.4 min vs. 39.6 ± 9.9 min, respectively, P < 0.001). The distribution of demographic and obstetric data details is given in Table 1.

More than 54.4% of the patients had at least a primary school education. The distribution of education status

Table 1: Demographic and obstetric data of the patients

	Mean±SD		*P*
	No tubal sterilization (*n*=1,458)	Tubal sterilization (*n*=391)	
Age (years)	27.55±5.78	34.12±4.31	<0.001
≥2 cesarean sections	1.14±1.01	2.38±1.54	<0.001
Parity	2.57±1.38	4.65±1.59	<0.001
BMI	28.97±4.30	30.38±5.91	<0.001
Total operating time (min)	39.57±9.98	42.38±9.47	<0.001
Hospital stay (days)	2.35±0.85	2.69±1.98	<0.001
Hemoglobin deficit (g/dL)	1.11±0.84	1.35±0.92	<0.001

Data are presented as mean±SD. SD=Standard deviation; BMI=Body mass index

Table 2: Distribution of patients according to educational status

Educational status	Tubal sterilization		
	No, *n* (%)	Yes, *n* (%)	Total, *n* (%)
Illiterate	302 (16.3)	124 (6.7)	426 (23.0)
Primary school	457 (24.7)	123 (6.7)	580 (31.4)
High school	394 (21.3)	98 (5.3)	492 (26.6)
University	219 (11.8)	35 (1.9)	254 (13.7)
Graduate	86 (4.7)	11 (0.6)	97 (5.2)
Total	1.458 (78.9)	391 (21.1)	1.849 (100)

Data are presented as *n* (%)

Table 3: Distribution of patients according to systemic and obstetric diseases

Systemic and obstetric diseases	Tubal sterilization		
	No, *n* (%)	Yes, *n* (%)	Total, *n* (%)
None	1036 (56.0)	240 (13.0)	1276 (69.0)
Preeclampsia	219 (11.8)	50 (2.7)	269 (14.5)
Eclampsia	17 (0.9)	3 (0.2)	20 (1.1)
Gestational diabetes mellitus	56 (3.0)	63 (3.4)	119 (6.4)
Chronic hypertension	59 (3.2)	24 (1.3)	83 (4.5)
Heart diseases	18 (1.0)	0	18 (1.0)
Others systemic disease	45 (2.4)	11 (0.6)	56 (3.0)
Hellp syndrome	8 (0.4)	0	8 (0.4)
Total	1.458 (78.9)	391 (21.1)	1.849 (100)

Data are presented as *n* (%)

Table 4: Distribution of patients according to placental adherence abnormality

Placental adherence abnormality	Tubal sterilization		
	No, *n* (%)	Yes, *n* (%)	Total, *n* (%)
None	1381 (74.7)	351 (19.0)	1732 (93.7)
Placenta previa marginalise	17 (0.9)	0 (0)	17 (0.9)
Placenta previa totalis	25 (1.3)	22 (1.2)	47 (2.5)
Placenta accreta	0	6 (0.3)	6 (0.3)
Placenta increta	5 (0.3)	6 (0.3)	11 (0.6)
Abruption placenta	30 (1.6)	6 (0.3)	36 (1.9)
Total	1.458 (78.9)	391 (21.1)	1.849 (100)

Data are presented as *n* (%)

of patients is summarized in Table 2. The mean number of pregnancies was 3.4 ± 1.9 in 426 nonliterate patients, 3.2 ± 1.5 in 580 primary school graduates, 2.7 ± 1.4 in 492 high school graduates, 2.6 ± 1.5 in 254 undergraduates, and 2.4 ± 1.3 in 97 postgraduates. Moreover, the patient distribution according to the occurrence of systemic and obstetric diseases is shown in Table 3. No total uterine rupture occurred in any of our patients. Among the patients who refused to undergo TS during their CSs, incomplete uterine dehiscence, likely to cause uterine rupture during current or subsequent pregnancies, was found in 96 cases (6.6%). On the other hand, of 391 patients undergoing TS, incomplete uterine dehiscence was found in 77 (19.7%) during the CSs. Of 117 patients with placental abnormalities, TS was performed on 40 [Table 4] and hysterectomies in 29 patients. Furthermore, TS was performed on 16 of 29 patients who had urinary bladder injuries and on all 9 patients who had intestinal injury during their CSs.

The number of grand multiparous patients was 297 (16.1%). Of these patients, TS was performed on 172 (57.9%). The procedure was not performed on any patients (n = 8) who underwent repeat surgery due to intra-abdominal bleeding. Postoperative wound infection developed in 90 patients, 46 of whom received TS (11.8% in CSs with TS vs. 3% in CSs without TS, $P < 0.001$). TS was performed on 39 of 96 patients who developed atony; 17 others underwent hysterectomies. Furthermore, significantly lower TS was found in emergency vs. elective CSs groups (16.9% vs. 25.7%, $P < 0.001$). The mean hemoglobin deficit was 1.11 ± 0.84 mg/dL in the non-TS group and 1.35 ± 0.92 mg/dL in the TS group ($P < 0.001$). The mean duration of hospital stay was 2.35 ± 0.85 days in the non-TS group and 2.69 ± 1.98 days in the TS group ($P < 0.001$).

Discussion

TS is an effective and reliable contraceptive method associated with a low incidence of complications that is appropriate for use in grand multiparous women who either have or are at risk for developing various systemic diseases and for other women who simply

want permanent contraception or have various medical reasons that make TS an appropriate option. However, despite these advantages TS is not widely used in developing countries.[9] Moreover, the frequency of TS procedure differs according to religious and cultural beliefs, socioeconomic status, obstetric risk, and the presence or absence of systemic diseases.[10] Although the rate of postpartum TS in the United States and in other developed countries has slightly decreased in recent years, the rate still remains at approximately 10% compared with all other contraception methods.[11,12] In United States, the procedure is frequently preferred among African American, and Hispanic patients with low education, who lack health insurance, are of low socioeconomic status and experience high fertility rates.[13-15] In the current study, the rate of TS was 21.1% in the cesarean group and the rate of postpartum TS among all births was 11.2%. By comparison, studies have reported higher rates (47.4% and 58.8%) of TS during CSs;[4,5] another study[16] reported an 11% rate, which is consistent with ours. The current study showed that repeat CSs were responsible for 55.5% of TS cases. The mean patient age of 34.3 years in the previously referenced report[4] is similar to that in the current study. However, Mutihir *et al.*[17] reported a slightly younger mean age 32.1 year. Additionally, in the TS group of the previously referenced study both the numbers of pregnancies and previous CSs was higher than in the recent study.[16]

Our observation indicating significantly lower TS in emergency versus elective CSs groups probably reflects the inability to consult the family during emergency CSs because of other coexisting medical priorities. According to the findings by Swende *et al.*,[4] the rate of TS in patients undergoing emergency CSs was 78.4%, higher than that of our finding, whereas in a separate study, TS was performed in association with CS in only 5.6% of cases.[18]

A previous study shows that the hemoglobin deficit was not significantly affected by performing TS,[19] whereas in this study, the hemoglobin deficit of TS group was found higher than that of non-TS group. Similarly, in this patient population, the risk of postoperative wound infection was found significantly higher in the TS group than the non-TS group. These were surprising findings. The explanation for these unexpected differences may lie in patient demographic distributions, which include significantly longer duration of hospital stay as well as advanced age in in the TS group versus the non-TS group.

TS procedure is a common permanent contraception method in women 35 years and older. In a study of patients undergoing TS in Africa, 51.7% of pregnant women were 35 years old and older;[3] this rate was 21.5% in our study. Hence, the age of women utilizing TS in Turkey is younger than in Nigeria, but older than in Europe. Consistent with prior observations,[20] this study demonstrates increased use of TS together with elevated increased parity and age. A study from Iran reported a rate of TS in patients over 35 years as 14.9%.[21] An earlier study in Nigeria showed that the majority of patients were grand multiparous.[3] Accordingly, the significant difference in BMI between groups may be related to advanced age and weight gain related to the occurrence of multiple births in the TS group.

It is important to recognize that women and their partner education status might be a major factor to influence for choosing of TS method for patients who desire no further childbearing. Patients undergoing TS were divided into two groups according to education status, that is, high school graduates or higher 40.4% and non-high school graduates 59.6%.[16] Contrary to our results, this study found that the rate of preference of TS increases with rising education status.

Complementing published results,[22] we found that TS was preferred at a high rate among women experiencing such systemic diseases as diabetes mellitus and chronic hypertension. It has been reported that the rate of contraception by TS that performed on diabetes mellitus patients is 4.8% between the ages 25 and 34 years and 13.5% between the ages 35 and 44 years.[22] However, in this study, the rate of TS in pregnant women with diabetes mellitus among all age groups was higher (28.9%); the rate was 19.6% in patients with valvular heart disease and no TS preference in any of the chronic hypertension patients (n = 18).

A comparison of patients with placental adherence abnormalities in their current pregnancy to patients without abnormalities revealed that the rates of TS differed significantly (34.1% and 20.2%, respectively, $P < 0.001$). Thus, patients with a placental adherence abnormality in their current pregnancy preferred TS as a permanent contraception method during CSs. TS was not performed on any of the eight patients who were reoperated on because of intra-abdominal bleeding and as expected TS did not increase the risk of intra-abdominal bleeding in our study. Of 96 patients in whom atony developed, tubal ligation was performed on 39 and hysterectomy on 17 patients.

Rulin *et al.*[23] evaluated the long-term effects of TS on menstrual indices and pelvic pain. Five hundred women undergoing TS were interviewed before TS,

6–10 months after surgery, and 3–4.5 years later; 436 nonsterilized women were interviewed in parallel. No long-term differences were found between sterilized and nonsterilized women in terms of menstrual cycles, bleeding between periods, prolonged or heavy blood flow, dysmenorrhea, or noncyclic pelvic pain. An increase in severe dysmenorrhea, which emerged as an irritating but nonsignificant trend at 6–10 months, subsided over the next 3–4.5 years.

Several factors contribute to the high rate of CS, which now exceeds the world wide optimal rate of 15% of all deliveries recommended by the World Health Organization (WHO).[24] Specifically, among all births in Turkey in 2016, the primary and total CS rates were 26.9% and 54.2%, respectively.[25] The latter matches the total CS rate of 52.8% of our current study. Contributing factors to the increase in CS rates include several medical and nonmedical reasons in patients, both pain and fear associated with labor;[26] as well as among physicians, the growing perception that CS has become considered to be a more reliable operation due to recent technological improvements in conditions related to surgery and anesthesia, and the fact that a CS require less time to complete than vaginal deliveries as well as various economical, organizational, social, and cultural factors that have contributed to the growing trend in CS rates.[27-30] However, it should be considered that CSs are increased short- and long-term risks of maternal–fetal complications.[31,32]

A limitation of this study was its short follow-up duration and its coverage to only one hospital.

Conclusion

The current results show that performing TS during CSs is a reliable method, particularly in developing countries and among populations who have difficulty obtaining continuous health care, patients with low income and/or insufficient education levels; grand multiparous women, as well as in situations where pregnancy would cause complications due to systemic diseases and obstetric challenges, suggesting TS to be offered as a permanent contraception method for these pregnant women.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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