大韓不妊學會雜誌：第10卷 第1號, 1983
Kor. J. Fertil. Steril., Vol. 10, No. 1, 1983

Menstrual Pattern Changes in Laparoscopic Sterilization Patients Whose Last Pregnancy was Terminated by Therapeutic Abortion

— A Two-Year Follow-Up Study —

Hyun Mo Kwak, M.D.
I-cheng Chi, M.D., Dr.P.H.
Stephen D. Gardner, B.A.
Leonard E. Laufe, M.D.

Women were used as their own controls in the comparison of presterilization and poststerilization menstrual patterns. Five parameters were studied: regularity of cycle length, duration and amount of flow and incidence of dysmenorrhea and intermenstrual bleeding. Three parameters in the electrocoagulation group (regularity of cycle length and duration and amount of flow) and one parameter in the tubal ring group (duration of flow) showed significant changes after sterilization. However, by controlling for the effect of previous contraceptive methods used, no significant menstrual pattern changes following sterilization were discerned in either technique group.

INTRODUCTION

Studies of the long-term sequelae of laparascopic sterilization are infrequent, and the effect of the procedure on menstrual pattern changes is still controversial. Some investigators have asserted that sterilization by laparoscopic electrocoagulation frequently causes menstrual disturbances that lead to a high rate of hysterectomy.[7,8] Others have not been able to detect a significantly increased risk of abnormalities attributable to sterilization that would indicate cause for concern.[2-4,10]

A recent trend has been that more women are undergoing sterilization either immediately or some time after an abortion, but very few studies of menstrual changes in this group have been conducted. In this analysis, data on women whose last pregnancy ended in a first-trimester therapeutic abortion were examined to determine whether laparoscopic sterilization increases the risk of subsequent menstrual disorders.

From the Department of Gynecology and Obstetrics, Yonsei University College of Medicine, Seoul, Korea, and the International Fertility Research Program, Research Triangle Park, North Carolina.

Dr. Kwak is Professor and Chairman, Department of Gynecology and Obstetrics, Yonsei University College of Medicine.

Dr. Chi is Epidemiologist, International Fertility Research Program.

Mr. Gardner is Senior Assistant, International Fertility Research Program.

Dr. Laufe is Medical Director, International Fertility Research Program.

MATERIALS and METHODS

Between 1973 and 1975, a total of 2,501 women were sterilized via laparoscopy at the Severance Hospital, Yonsei University College of Medicine, Seoul, Korea. At the time of sterilization, comprehensive histories were obtained that included the last three menstrual periods and previous contraceptive practice. The patients were followed at six-month intervals for two years, and the history of the last three menstrual periods was obtained at each follow-up visit.

About 10% underwent a therapeutic abortion (D&C or vacuum aspiration) concurrently with sterilization. Another 35% were sterilized within four months of an abortion, and the remaining 55% more than four months after an abortion.

Table I *Sociodemographic Characteristics of Laparoscopic Sterilization Patients, by Tubal Occlusion Technique*

Sociodemographic Characteristics	Electrocoagulation (N = 653)	Tubal ring (N = 650)
Mean age (years)	33.8	34.2
Mean parity	3.2	3.3
Mean education (years)	9.8	9.5
Mean previous induced abortions	3.3	3.4
Urban residence (%)	80.7	80.2
Currently pregnant (%)	9.6	9.6
Contraceptive method used* (%)		
None	18.4	22.8
IUD	12.1	14.9
Orals	32.0	28.6
Conventional†	37.6	33.6

*For patients pregnant at the time of admission, contraceptive methods refer to those used prior to this conception.

†Includes condom, rhythm, diaphragm, jelly and foam tablets.

Women were excluded if they were older than 40, reportedly had systemic diseases or major previous pelvic surgeries or presented abnormal pelvic findings. Of the 1,303 in this analysis, 653 were sterilized by electrocoagulation and 650 by the tubal ring. The proportion seen during each of the followup periods was approximately equal for the two groups.

Women acted as their own controls in the comparison of their presterilization menstrual pattern with those at the six-month and two-year follow-up visits. Matched x^2 tests were employed to determine whether the changes were statistically significant.[6] To ascertain whether one tubal occlusion technique was more likely than the other to be associated with undesirable changes, previous contraceptive practice was controlled for by Cochran's method for strengthening the common x^2 tests.[1] A change or a difference with a p value <0.05 was considered statistically significant.

RESULTS

Table I presents selected characteristics of women in each technique group. The groups were similar, except that slightly more electrocoagulation cases had used oral contraceptives or conventional methods and fewer had used IUDs or no method at all than had the tubal ring cases.

Table II presents menstrual pattern changes before and after sterilization by tubal occlusion techniques. The menstrual cycle length was defined as irregular if the length of any two of the last three cycles differed by more than seven days. In the electrocoagulation group, significantly more patients changed from regular cycles to irregular cycles at the two-year visit (16.9%) than those who changed in the opposite direction (6.7%). There was no statistically significant change in regularity of cycles for the tubal ring group.

The average duration of menstrual flow was

Table II. *Menstrual Pattern Changes after Laparoscopic Sterilization, by Tubal Occlusion Technique*

	Admission to 6-month follow-up				Admission to 2-year follow-up			
	Electrocoagulation (N = 620)		Tubal ring (N = 560)		Electrocoagulation (N = 356)		Tubal ring (N = 383)	
Parameters of menstruation	No	%	No.	%	No.	%	No.	%
Regularity of cycle length								
A A–no change	549	88.5	503+	89.8	272	76.4	313	81.7
B–irregular to regular	32	5.2	27	4.8	24	6.7	28	7.3
C–regular to irregular	39	6.3	30	5.4	60	16.9	42	11.0
Difference* between B and C	NS		NS		$p<0.01$		NS	
Duration of flow								
A–no change	499+	80.5	472+	84.3	264	74.2	310+	80.9
B–decreased	72	11.6	51	9.1	72	20.2	57	14.9
C–increased	49	7.9	37	6.6	20	5.6	16	4.2
Difference* between B and C	$p<0.05$		NS		$p<0.01$		$p<0.01$	
Amount of flow								
A–no change	440	71.0	424+	75.6	230	64.6	269+	70.2
B–decreased	109	17.5	68	12.2	73	20.5	59	15.4
C–increased	71	11.4	68	12.2	53	14.9	55	14.4
Difference* between B and C	$p<0.01$		NS		NS		NS	

*By McNemar's matched x^2 test (see reference 6).
+One patient with no information on menstrual patterns was included as "no change."

considered to have changed if the reported duration at follow-ups differed by more than one day from admission. More patients in each group experienced a decrease in menstrual flow. For the electrocoagulation group, changes were statistically significant at both the six-month and two-year visits. For the tubal ring group, changes were significant at the two-year follow-up.

In the electrocoagluation group, significantly more patients reported a decrease in the amount of menstrual flow at the six-month follow-up visit. In the tubal ring group, the number reporting an increase and decrease was similar for both periods. The incidence of intermenstrual bleeding or dysmenorrhea was rare, and there were no significant changes for either group at the follow-up visits.

At least three possible confounding factors, all related to the time variable, must be considered in an analysis using patients as their own controls; they are aging of the patient, therapeutic abortion performed before or concurrent with sterilization and previous contraceptive method.

To evaluate the effect of aging, patients were divided into two age groups, under and over 35. Their menstrual patterns were then examined on

Table III. *Menstrual Pattern Changes in Patients Undergoing Laparoscopic Sterilization by Electrocoagulation at Least 121 Days after Therapeutic Abortion, by Previous Contraceptive Method*

Parameters of menstruation	*Admission* to 6-month follow-up			Admission to 2-year follow-up		
	IUD (N = 52)	Orals (N = 104)	Others* (N = 127)	IUD (N = 31)	Orals (N = 60)	Others* (N = 69)
Regularity of cycle length						
A–no change	50	91	113	26	42	51
B–irregular to regular	1	3	6	2	1	9
C–regular to irregular	1	10	8	3	17	9
Difference+ between B and C	NS	NS	NS	NS	$p<0.01$	NS
Duration of flow						
A–no change	40	83	103‡	21	48	48
B–decreased	8	8	16	10	8	15
C–increased	4	13	8	0	4	6
Difference+ between B and C	NS	NS	NS	$p<0.01$	NS	NS
Amount of flow						
A–no change	34	78	87	19	36	38
B–decreased	15	11	25	8	11	18
C–increased	3	15	15	4	13	13
Difference+ between B and C	$p<0.01$	NS	NS	NS	NS	NS

§Includes conventional methods (condom, rhythm, diaphragm, jelly and foam tablets) and no method.
+By McNemar's matched x^2 test (see reference 6).
‡One patient with no information on menstrual patterns was included as "nd change."

the assumption that any changes due to aging would be more apparent in the older subgroup and at the longer (two-year) follow-up visit. The tendency toward irregularity of cycle length for the electrocoagulation group and reduction in duration of flow for both groups persisted in both age subgroups, so these changes do not appear to be attributable to the aging effect.

Most patients who were sterilized within 120 days after an abortion would not have had three menstrual periods during this interval, and their presterilization menstrual pattern refers to the last three periods prior to conception of the last pregnancy. Conversely, most patients who were sterilized more than 120 days after an abortion would have had at least three periods during this interval, and their presterilization pattern refers to the last three periods prior to sterilization. Comparisons of menstrual changes between these two subgroups would thus delineate the effect of abortion. Analysis revealed that at the six-month visits, the amount of flow for the electrocoagulation group and the duration of flow for both groups continued to show the same direction of changes (reduction) in both subgroups. The subsequent menstrual changes do not appear to be entirely attributable to abortion performed prior to sterilization.

To determine the possible effect of previous contraception on menstrual changes, patients who terminated their last pregnancy more than 120 days prior to sterilization were studied. In

this group, both the previous contraceptive method and the presterilization menstrual patterns were recorded for the period after abortion and before sterilization. The patients were divided into three subgroups according to the pervious contraceptive method used. In the electrocoagulation group (Table III), significantly more IUD users had a decreased amount of flow at the six-month follow-up and a decreased duration of flow at the two-year one. Conversely, significantly more users of orals changed from a regular cycle length to an irregular one at two years. No significant changes were detected among patients using conventional or no contraceptive methods. In the tubal ring group, a similar effect of contraceptive method was also detectable, although the changes were not statistically significant. Changes in menstrual cycle length, duration and amount appear to be associated primarily with the contraceptive method used before sterilization. Controlling for previous contraception, no significant differences in any of the menstrual parameters were detected between the electrocoagulation and the tubal ring groups.[1]

DISCUSSION

The shortcomings of most previous investigations concerning late complications of female sterilization have been discussed at great length by Rioux.[9] Studies that demonstrated an undesirable effect on subsequent menstrual changes suffered from at least one of the following methodologic limitations: (1) no provision of control groups, (2) patients with medical indications for sterilization pooled with elective procedures or (3) presterilization menstrual histories either unavailable or obtained from the woman at the follow-ups. One of the only two controlled studies used obstetric and gynecologic patients for comparison unmatched for age, parity and time span.[11] The other used as controls women whose husbands were vasectomized[8]; it is doubtful that they were able to recall and report menstrual changes as accurately as the sterilized women.[5]

In the present study, the obvious problem of selecting an adequate control group was circumvented by using the patients as their own controls.

The patients' menstrual histories for the three consecutive cycles were taken and recorded at the time of sterilization and at each follow-up visit by the same nurses in most cases.

The menstrual history after sterilization was obtained at the follow-up visits before the patient was examined by the physician who operated on her, thereby diminishing the possibility of patients' underreporting their undesirable post-sterilization menstrual patterns in an effort to please the surgeons. Furthermore, the tendency in some of the patients, based on our clinical experience, to attribute any deleterious physical changes, including undesirable menstrual patterns after sterilization, to the sterilization procedures may have counterbalanced the possible underreporting. In any event, our data on menstrual pattern changes are validated by the expected directions of changes in the previous IUD and oral pill users after sterilization.

Three menstrual parameters in the electrocoagulation group (regularity of menstrual cycles and duration and amount of flow) and one parameter (duration of flow) in the tubal ring group showed significant changes after sterilization. Of the three menstrual pattern changes, duration and amount of flow tended toward less disruption and can be considered beneficial. These menstrual pattern changes were most likely due to the effect of the previous contraceptive methods used. Among patients using conventional or no contraceptive methods, no statistically significant changes in any of these menstrual patterns were discovered in either group.

Laparoscopic sterilization performed for women whose last pregnancy was terminated by abor-

tion is probably not associated with significant subsequent menstrual disturbances. The fact that at least 70% of the patients at the six-month follow-up and at least 65% at the two-year follow-up did not experience any changes in menstrual patterns also lends support to our findings.

The proportion of patients followed up six months after sterilization is satisfactory (94.9% for electrocoagulation and 86.1% for tubal ring groups), but the two-year follow-up rates are low (54.5% for the former and 58.9% for the latter). The number of patients becomes rather small when classified by previous contraception. Investigations from other centers using a similar protocol might validate these conclusions.

ACKNOWLEDGEMENTS

This work was conducted under the auspices of the International Fertility Research Program and supported in part by the U.S. Agency for International Development.

REFERENCES

1. Cochran WG: *Some methods for strengthening the common x^2 tests. Biometrics 10:417, 1954*
2. Edgerton WD: *Late complications of laparoscopic sterilization. J Reprod Med 21: 41, 1978*
3. Lieberman BA, Belsey E, Gordon AG, et al: *Menstrual patterns after laparoscopic sterilization using a springloaded clip. Br J Obstet Gynaecol 85:376, 1978*
4. McCann MF, Kessel E: *International experience with laparoscopic sterilization: Follow-up of 8500 women. Adv Planned Parenthood 12:199, 1978*
5. McCann MF, Kessel E: *Late effect of female sterilization. Lancet 1:37, 1978*
6. McNemar O: *Note on the sampling error of the difference between correlated proportions or percentages. Psychometrika 12: 153, 1947*
7. Muldoon MJ: *Gynaecological illness after sterilization. Br Med J 1:84, 1972*
8. Neil JR, Noble AD, Hammond GT, et al: *Late complications of sterilization by laparoscopy and tubal ligation. Lancet 2:699, 1975*
9. Rioux J-E: *Late complications of female sterilization: A review of the literature and a proposal for further research. J Reprod Med 19:329, 1977*
10. Rubinstein LM, Lehberz TB, Kleinkopf V: *Laparoscopic tubal sterilization: Long-term postoperative follow-up. Contraception 13: 631, 1976*
11. Williams EJ, Jones HE, Merrill RE: *The subsequent course of patients sterilized by tubal ligation: A consideration of hysterectomy for sterilization. Am J Obstet Gynecol 61:423, 1951*