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Medical and psychological sequelae of surgical sterilization of women

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THE POSITION of surgical sterilization of women in medical practice has changed in the course of time since its proposal by Shajaa[1] in 1932. In general, the trend has been one of liberalization of the point of view. The legal authorization ranges from prohibition except for instances of medical necessity in some states to a general authorization based upon request and consent of the patient.[2] The legal status of surgical sterilization is dependent upon religious, social, and economic considerations as well as upon the desire to protect both physician and patient against the unforeseen developments of an irreversible action.

When fertility control is considered a prime family objective for social stability and economic advancement and when nonsurgical techniques of contraception prove difficult to use, surgical sterilization of the woman would appear to be a rational alternative. However, it is reasonable to demand information on the medical and psychological sequelae of sterilization of women before the acceptance of this procedure as a justifiable medical action. This paper is concerned with the presentation of such data:

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it was obtained from a systematic follow-up of women, residents of Puerto Rico, who were sterilized on their request and with the consent of their husbands. With few exceptions, the sterilizations were requested to limit the size of family for social and economic reasons rather than medical reasons.

A review of the literature pertaining to tubal ligation[3] indicates that many of the papers are concerned with studies of the outcome of sterilization performed for medical reasons and cover operations undertaken before the advent of modern antibiotics and chemotherapy. Consequently, information reported on death, morbidity, or psychological sequelae may not be relevant to a series of patients in whom the primary consideration for sterilization was social or economic necessity and who were operated upon with benefit of antibiotics or chemotherapeutic agents to minimize infection.

However, to provide a background against which the current study findings can be evaluated, several of the major results reported heretofore are presented. In respect to death ascribed to puerperal sterilization, Prystowsky and Eastman[4] found a risk of 3 per 1,000 among 1,022 patients upon whom Pomeroy's operative technique had been employed. The operations were performed during the period 1936-1950 on women for whom the principal indications were great multiparity only (8 or more viable deliveries); chronic hypertension and/or repeated toxemia; and repeat cesarean section. August,[5] in a study of 606 cases of sterilizations of women over a 10 year period, 1944 through 1954, in a two hundred bed hospital in Michigan, most of which were accomplished for medical indications, reported a mortality risk of 1.67 per 1,000 (1 death in 606 cases). In a particularly comprehensive investigation, Flowers and associates[6] attempted to cover the entire obstetrical experience of the State of North Carolina for 1955, 1956, and 1957 with emphasis on the practice of tubal ligation. These investigators found 3 deaths which could be ascribed to sterilization: the number of births during the 3 year period was estimated at 8,645, giving a mortality rate of .35 per 1,000. It is further reported that 75 per cent of the cases of sterilizations were for the convenience of the patient or for social and economic reasons, and that the 3 deaths were in women with severe obstetrical complications or severe varicosities.

It would appear, then, that earlier studies of the risk of death associated with puerperal tubal sterilization provide estimates of mortality risk ranging from 3.0 per 1,000 to .3 per 1,000 with the likelihood that the higher risk is associated with operations undertaken for impelling medical reasons, while the lower risk is associated with operations on women seeking control of fertility for social or economic circumstances.

Psychological sequelae

If the mortality risk associated with sterilization in women proves to be of tolerable dimensions, there could still be substantial reservation concerning the use of this procedure if serious disability or dissatisfaction were to result as a consequence of emotional changes induced by the operation. A large number of studies on this issue are found in the literature including contributions from European and Indian authors.[7-9] The difficulty in reaching meaningful conclusions from these investigations derives from the differences between the characteristics of one patient group and those of another. Barnes and Zuspan,[10] in a careful follow-up study, secured responses to forty different questions by interviews conducted by a social worker in the patient's home. For 311 women, of an originally selected series of 457, successful interviews were completed. The principal findings were that 90 per cent of patients who had taken the initiative to request sterilization expressed no subsequent regret while among women who had been persuaded to undergo sterilization, 69 per cent had no regret, 27 per cent were ambivalent, and 5 per cent had definite regret. In this connection, it was found that where the indication for sterilization was multiparity, the proportion expressing no regret was 92 per cent. It is safe to infer that, by

and large, in instances of multiparity the patients, themselves, take the initiative in seeking sterilization.

Study design

Since 1956, the Family Planning Association of Puerto Rico, a private, nonprofit organization devoted to orientation, research, and direct services in the field of population control, has been giving advice and economic assistance to people desiring to terminate their reproductive capacity by means of surgical sterilization. Such help is given only on request. The beneficiaries must meet certain requirements set by the Medical Committee of the Association when the operation is requested for economic reasons. These standards are as follows: minimum age of 20 for women and 25 for men; at least 3 living children; emotional stability; a thorough understanding of the irreversibility of the procedure; and reasonable expectance of permanence of the union. In addition, couples are advised to give the matter serious thought and consideration. When there is some medical or social indication for sterilization, the cases are evaluated individually and some or all of the rules may be waived.

Early in the planning of the study it was decided that the number of completed interviews should be at least 10 per cent of the total operations performed and that the best method for obtaining reliable information was the personal interview conducted in the home of the patient by a person professionally trained for this type of work.

A questionnaire containing fifty-six items was prepared by the authors and tested by a social worker with a group of 20 women. After minor modifications suggested by the pilot study, it was administered during 1962 by ten trained social workers with years of experience in different fields of social work and public welfare. These workers interviewed more than 71 per cent of the original sample. Since a greater nonresponse rate was anticipated, the completed interviews turned out to be 15.3 per cent of the universe instead of the expected 10 per cent.

Under the conditions described above, 3,390 women were sterilized during the 6 year period from 1956 through 1961, distributed as shown in Table II. None of these operations were performed during the first 48 hours after delivery and most of them were done 1 month or more after the termination of the last pregnancy. The operations were performed in several different hospitals by many different surgeons with the use of different surgical techniques. About one-third of the total were performed under local anesthesia and the remainder under general or spinal anesthesia.

For each individual year a sample was obtained through systematic sampling, with consideration of the desired sample size and the probable loss of patients resulting from death and migration. On the basis of the experience afforded by the pilot study made to test the questionnaire it was decided to oversample and to select about 20 per cent of the cases in the defined universe.

Of the 772 patients originally chosen by the above described procedure, 253 could not be interviewed for the reasons stated in Table I.

The final sample, made up of the patients who could be interviewed, is shown in Table II.

As may be observed from Table II the sample used for each individual year and for the whole interval from 1956 through 1961 was substantially larger than had been expected. Also the proportion of patients interviewed did not remain uniform throughout the years involved (1956 through 1961) but varied from 12.7 per cent in 1959 to 19.9 per cent in 1957, and it was 15.3 per cent for the 6 year period.

Characteristics of the sample. The median age of the 519 patients who underwent sterilization in the sample studied was 30.1 years with 70 per cent of them falling within the age interval of 25 to 34 years. Fifteen per cent reported ages under 25 years.

Their spouses had a median age of 35.2 years, and 74.7 per cent reported ages between 25 and 44 years. Only 3.9 per cent reported ages under 25 years, while 17.5

Table I

Reasons for no interviews	No. of patients
Could not be located	
Supposedly in United States	75
Supposedly elsewhere in Puerto Rico	10
Whereabouts unknown	104
Total	189
Other reasons	
Dead	4
Others	60
Total	64

Table II. Sterilization of women performed under the auspices of the Family Planning Association of Puerto Rico, 1956 through 1961

Year	Operations (No.)	Patients interviewed (No.)	Patients interviewed in corresponding year (%)
1956	284	45	15.8
1957	427	85	19.9
1958	524	68	13.0
1959	733	93	12.7
1960	779	144	18.5
1961	643	84	13.1
Total	3,390	519	15.3

per cent were reported to be age 45 years and over.

The educational attainments of both the patients and their respective spouses were essentially the same as those reported in the 1960 Census of Puerto Rico for the population aged 25 years or more, namely 4.3 for women and 4.8 for men. The median number of completed school years was found to be 4.2 for the patients and 4.5 for their spouses. Of the 519 patients, only 28, or 5.4 per cent, reported the completion of 12 or more years of schooling. Of these 28 patients, only 4 had had some schooling beyond the twelfth grade.

The occupational distribution of the 519 patients and their respective spouses is shown in Table III.

As could be expected in a country predominantly Catholic by tradition, 440 or 84.8 per cent of the patients reported Roman Catholicism as their religion. This is somewhat larger than the estimated percentage of Catholics among the general population. Protestant groups were represented by 58 or 11.2 per cent of the patients. Of the remaining 21 patients, 3 belonged to other religious groups and 18 belonged to no organized religion.

Roman Catholicism was also predominant

Table III. Occupational distribution

		Patients		Spouse	
		No.	%	No.	%
0	Professionals, technicians, and kindred workers	1	0.2	6	1.2
1	Farmers and farm managers	–	0.0	9	1.7
2	Managers, officials, proprietors—except of farms	1	0.2	22	4.2
3	Clerical and kindred workers	3	0.6	13	2.5
4	Sales workers	1	0.2	19	3.7
5	Craftsmen, foremen, and kindred workers	3	0.6	80	15.4
6	Operatives and kindred workers	33	6.3	77	14.8
7	Private household workers	10	1.9	—	—
8	Service workers, except private household	19	3.7	34	6.6
9	Farm laborers and farm foremen	1	0.2	42	8.1
10	Laborers, except farm and mine	7	1.3	133	25.6
11	Occupation not stated or without occupation (includes housewives)	440	84.8	84	16.2
	Total	519	100.0	519	100.00

among the spouses, as it was found to be the religion of 399 or 76.9 per cent. However, 55 or 10.6 per cent were nonbelievers, a substantially larger proportion than that found among the patients, or female group. Of the remaining 65 patients, 45 belonged to Protestant groups, 7 to other groups, and 13 did not state their religion.

With respect to attendance at religious services the 519 patients reported as follows:

	Patients	*%*
Attended regularly	123	23.7
Attended sometimes only	309	59.5
Never attended (includes the 18 who do not belong to any religion)	87	16.8
Total	519	100.0

Among the 440 Catholic patients, regular attendance at religious services was reported by 21.4 per cent.

At the date of operation the number of marital unions which the patients reported was as follows:

No. of unions	*No. of patients*	*%*
1	366	70.5
2	116	22.3
3+	29	5.6
Not stated or no union	8	1.6
Total	519	100.0

The median number of children for the 519 patients at the time of the operation was found to be 3.7. Those with 3 or more children amounted to 475 or 91.5 per cent of the whole group, while those with 5 or more were 222 or 42.8 per cent.

Only 262 or 51.5 per cent of all the patients reported the use of some method of birth control prior to sterilization. Of these, 148, or 26.6 per cent, of all the 519 patients reported the regular use of such methods.

Table IV presents the number of patients reporting the use of each specified method.

Attention is called to the small number of patients reporting the use of rhythm or coitus interruptus.

Of the 257 patients who said they had not used any birth control method prior to sterilization, 170, or 61.1 per cent, reported knowing about one or more methods.

Table IV

Method	*No. of users*	*Per cent of 262 users*	*Per cent of 519 patients*
Condom	82	31.3	15.8
Jelly	76	29.0	14.6
Foam tablets	42	16.0	8.1
Diaphragm	35	13.4	6.7
Coitus interruptus	4	1.5	0.8
Rhythm	4	1.5	0.8
Other methods	73	27.9	14.1
Not stated	4	1.5	0.8

Table V

Reason for preferring operation	*No.*	*%*
Safer method	208	54.9
Objection to other methods	134	35.4
Medical reasons	35	9.2
Not stated	2	0.5
Total	379	100.0

When asked about the reasons for having preferred the operation to the use of other birth control methods, 379, or 73.0 per cent of the 519 patients, gave a single reason for their preference, while 140 or 27.0 per cent expressed more than one. The 379 patients who gave a single reason for having preferred the operation were distributed as shown in Table V.

Of the remaining 140 patients who gave more than one reason for having preferred the operation, 105 mentioned the safeness of the method as one of the reasons for their preference. This means that "safeness of the method" was reported by 313, or 60.3 per cent, of all the 519 patients.

In 441, or 85 per cent, of the cases the spouse decidedly approved the operation, while in only 19, or 3.9 per cent, he decidedly opposed it. In the remaining 59 cases the spouse approved the operation but with some reservations. Opposition on religious grounds amounted to only 9, or 1.7 per cent, of the cases.

Opposition from close relatives other than the spouse was also very small. In 495, or 95.9 per cent, of the cases close relatives

Table VI

Reason	No.	%
Economic	232	44.7
Poor health	92	17.7
Social	14	2.7
Economic and health	102	19.7
Economic and social	40	7.7
Social and health	7	1.3
Social, economic, and health	8	1.6
Other	24	4.6
Total	519	100.0

Table VII

Hospital	Type	Period covered	No. operations
1	Private	1952-1960	1,972
2	Private	1952-1961	611
3	Government	1950-1960	2,002
4	Government	1951-1961	921
5	Government	1951-1960	1,127
Total			6,633

decidedly approved the operation. Opposition on religious grounds from close relatives was observed again in only 9, or 1.7 per cent, of the cases.

When asked about what made them decide on the operation, the patients responded as shown in Table VI.

Economic reasons were thus involved in 73.7 per cent of the replies, while health reasons were involved in 40.3 per cent and social ones in 13.3 per cent.

Medical sequelae

Mortality rate. No deaths have occurred in the immediate postoperative period in 5,716 women sterilized under the auspices of the Family Planning Association of Puerto Rico from July, 1956, to December, 1962. Though this is a selected and screened group, the absence of fatalities is highly significant and has been critically questioned by several investigators including ourselves. In an effort to clarify this point we have attacked it from two different angles.

A careful survey of the records of several private and government hospitals was made (Table VII) and again no deaths were found.

Another survey was conducted in collaboration with the Bureau of Vital Statistics of the Department of Health of The Commonwealth of Puerto Rico in which death certificates of all women between the ages of 20 and 45 who had died during 1960 were scrutinized and again no evidence was found where the death could be directly related to the operation. Not all these certificates are completely reliable because many of them are filled out by physicians who never took care of the deceased or even knew her. We believe there must be some cases in which sterilization is, at least indirectly, related to death, but, again, this would not show in the death certificate.

As an example, there is the case of M. F. F., a 31-year-old woman who was sterilized in the Municipal Hospital of a small town and next day went into shock which did not respond to usual treatment. She was transferred to a larger District Hospital where she was reoperated upon and died 2 days later. The death certificate lists shock caused by hemorrhagic infarction of small bowel as the immediate cause of death. The preceding operation is not mentioned.

Morbidity

Immediate complications. Among the 519 women included in this series, there were 21 cases of wound infection (4 per cent) and 6 of hemorrhage (1.2 per cent) plus 10 other minor complications. Four hundred seventy-nine women (92.3 per cent) reported no immediate postoperative complications.

Late sequelae. It is obviously very difficult to evaluate retrospectively a variety of symptoms and determine whether they are in any way related to a previous operation. In our questionnaire we attempted to break them down into specific complaints, determine whether they were present prior to operation and, if so, whether there had been any change in the character, duration, severity, etc. General and specific questions were asked from different angles and each woman was requested to evaluate subjectively any changes in her general health. A comparison of postoperative changes in health as evaluated objectively by us from the answers to several different questions, and subjectively

by the women themselves, is shown in Table VIII.

We were agreeably surprised by the high degree of correlation found. It is noteworthy that between 15 and 18 per cent of the women were apparently in worse health than previously, although after studying individual records it is apparent that many of the reported changes in health had nothing to do with the operation.

Psychologic sequelae

The emotional consequences of sterilization were studied by inquiring in detail about changes in sexual relations (including libido, frequency of coitus, and frequency of orgasm); changes in personal relations with the husband and changes in social relations with the rest of the family and with the community; and general satisfaction with the results of the operation.

Changes in several parameters of sexual relationships are presented in Fig. 1. For each of these variables the pattern appears to be relatively constant. Close to 60 per cent of respondents indicate no change. About 12 per cent report an increase in sexual activity while about 24 per cent report a decline.

Further confirmation that sexual relations are substantially unaffected following sterilization is gained from consideration of data describing change in frequency of orgasm as reported by the patient on interview. This information is shown in Table IX.

About 2 of 3 women who were sterilized stated that there was no change in the frequency of orgasm following operation. Because of the extreme emotional tone associated with this experience, accuracy of recall of such information is very high.

Table VIII

	Objective evaluation		*Subjective evaluation*	
Changes	*No.*	*%*	*No.*	*%*
Better	219	42.2	216	41.6
Same	207	39.9	224	43.2
Worse	93	17.9	79	15.2
Total	519	100.0	519	100.0

Table IX. Changes in frequency of orgasm after operation

Changes in frequency of orgasm	*No. patients*	*Per cent total*
More frequent	54	10.4
Same as before	335	64.5
Less frequent	90	17.3
Not stated	40	7.7
Total	519	99.9

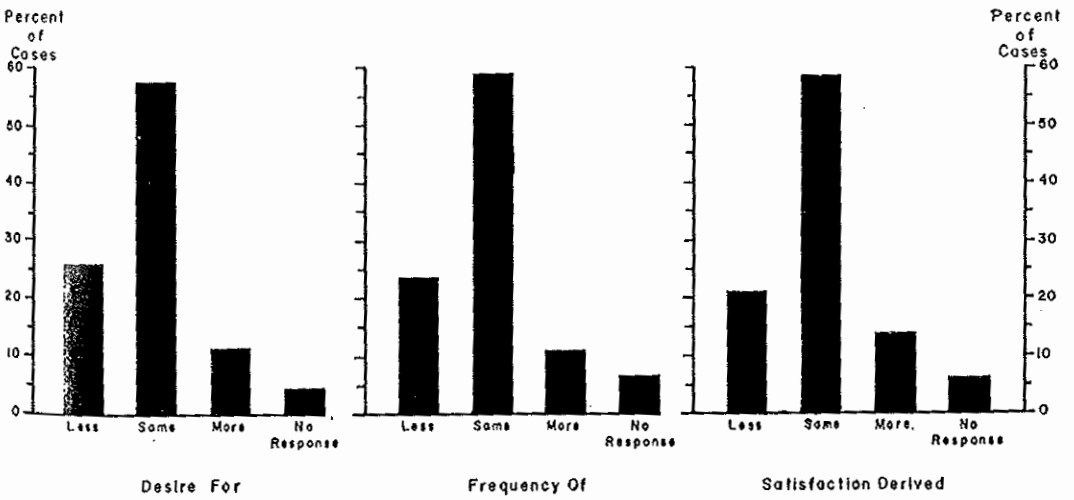

Fig. 1. Postoperative changes in desire for, frequency of, and satisfaction derived from sexual intercourse.

The changes in personal relations with the spouse and with the rest of the family and the community are shown in Table X.

In respect to the patient-husband relationship it is not surprising to find that the changes reported are quite similar to those already cited in connection with sexual relations. There would appear little doubt that the operation had no significant effect in the patient's relationships with the rest of the family and with the community in general. This is probably caused by the general acceptance of sterilization in Puerto Rico as a routine surgical procedure.

Two further attempts were made to probe the extent and direction of psychological effects of sterilization. The patient was asked to describe her state of happiness after the operation as contrasted with before and then was requested to indicate whether or not she was satisfied with the operation. The results of these inquiries are shown in Table XI.

It is worth noting that nearly 70 per cent of the women who underwent sterilization claim to be happier than they were before, 22 per cent are as happy, and only slightly over 8 per cent are less happy in spite of the fact that most of the preceding Tables show a somewhat reduced improvement in the particular relationship studied. In our opinion, the marked increase in happiness is the result of the freedom from fear of unwanted pregnancies.

In respect to Table XII, we would call attention to the high percentage of women who express satisfaction with the operation. This would appear to result largely from the judicious selection of candidates and the rejection of emotionally unstable, immature individuals acting on the spur of the moment.

In connection with the criteria for obtaining help from the Family Planning Association toward sterilization, the minimum age standards will undoubtedly seem very low in more conservative communities, but one must bear in mind that in Puerto Rico, as in most tropical countries, many young girls start reproducing around 15 or 16 and it is not uncommon to find 20-year-olds with 4 or 5 children. Under these circumstances, multiparity is considered more important than chronologic age as a criterion for sterilization.

Table X. Changes in personal relations with the husband, rest of the family, and community

	With husband		*With rest of family and community*	
	No.	*%*	*No.*	*%*
Better	56	10.8	0	0.0
Same	364	70.1	508	97.9
Worse	73	14.1	11	2.1
Not stated	26	5.0	0	0.0
Total	519	100.0	519	100.0

Table XI. Changes in relation to general happiness after operation

	No.	*%*
Happier	360	69.4
As happy	116	22.3
Less happy	43	8.3
Total	519	100.0

Table XII. Satisfaction with results of operation

			No.	*%*
Satisfied			489	94.2
Not satisfied			28	5.3
Poorer health	7	1.3%		
Want more children	7	1.3%		
Problems in marriage	7	1.3%		
Knows of temporary contraception now	3	0.6%		
Religious beliefs	2	0.4%		
Home is wrecked	2	0.4%		
Not stated			2	0.4
Total			519	99.9

Failure rate

Although generally considered the safest contraceptive method, surgical sterilization is not 100 per cent effective. The percentage of failures varies with the surgical technique, other things being equal. In our

series, different surgeons in different hospitals, with the use of different techniques, have all contributed in different proportions to the total sample. There were a total of 5 failures in 519 operations (less than 1 per cent as revealed by subsequent pregnancies), which in our opinion is a tolerable rate of failure.

Comment

Given a relatively young mother, an attained family size of 3 or more living children, limited economic resources, and a desire by both marital members to limit the size of their family to the achieved size, permanent control of fertility would appear to be a rational plan. Sterilization of the woman or man provides a procedure to gain such control.

The position of surgical sterilization in contraception control varies from one place to another. There appears to be a growing number of communities that accept sterilization as a proper procedure under defined circumstances which not infrequently include economic deprivation and multiparity.

In Puerto Rico we have been afforded an opportunity to study on a retrospective basis the medical and psychological sequelae of a large experience of the sterilization of women undertaken chiefly because of economic difficulties. It is probable that this is among the first such experiences reported, since most of the previous studies were primarily concerned with operations performed because of medical reasons.

The cases of sterilization in women studied were a sample of 519 patients, or 15.3 per cent, of 3,390 women sterilized under the auspices of the Family Planning Association of Puerto Rico from 1956 through 1961. The median age of the women was 30.1 years at time of operation, while the median number of living children was 3.7.

An examination of the medical records for the 3,390 cases of sterilization of women provides no evidence of loss of life associated with the operation. A careful survey of records of several private and government hospitals covering some 6,633 additional sterilizations of women failed to uncover a single death. These findings are at variance with results reported by previous investigators. We are of the belief, however, that when women are sterilized for other than medical complications of pregnancy and delivery, i.e., are essentially well, the risk of death associated with interval tubal ligation may not exceed 1 per 10,000, a most favorable outcome when contrasted with the risk of death associated with ordinary childbirth, which is approximately 5 to 10 per 10,000.

No immediate postoperative complications were reported by 479 women, 92 per cent of the interviewed sample of 519. Wound infection was reported in 4 per cent of the cases. Late sequelae of a physical nature proved difficult to assess. It is of interest to note, however, that 42 per cent of the patients reported an improvement in health following sterilization, 43 per cent reported no change, and 15 per cent reported a decline.

A detailed inquiry into the psychological consequences of sterilization leads to the following three conclusions: sexual relations are substantially not affected by sterilization; general relationships between patient and husband and between patient and community undergo changes which are not remarkably different than those which might occur in the absence of sterilization; and the state of happiness of a group of sterilized patients is significantly improved as a result of the operation.

Not infrequently considerable reservation about the desirability of tubal ligation because of probable medical and psychological sequelae can be noted in the literature.[11]

We find no convincing evidence to support this attitude when the patient population under consideration consists of mothers who have attained a family size of 3 or more living children, desire to limit their family to this number, and share with their husband the desire to seek a permanent solution to the problem of fertility control.

When contrasted with the alternative of 10 or more years of contraception by constant use of hormone agents or mechanical

devices, sterilization, in view of our findings, hardly appears to be a procedure of extraordinary physical or psychological risk nor is its employment lacking in simple and clear logic.

Summary

1. The results of a survey of medical and psychological sequelae among a sample of Puerto Rican women, sterilized from 1956 through 1961, has been presented.

2. At the time of sterilization the 519 women included in the study had a median age of 30.1 years, a median number of living children of 3.7, and were predominantly Catholic in religion.

3. The series here reported was concerned primarily with sterilizations performed for economic reasons.

4. No immediate postoperative physical complications were found in 92 per cent of the women studied. For those reporting complications 4 per cent involved cases of wound infection, 1 per cent were concerned with hemorrhage, and 3 per cent were ascribed to minor complications.

5. Psychological findings reported indicate that sexual relations are substantially not affected by sterilization, while the sterilized patients experience a marked improvement in their expressed level of happiness.

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REFERENCES

1. Shajaa, K.: Acta obst. et gynec. scandinav. 12: 114, 1932.
2. Laws of Virginia: Chapter 451, 1962, Article No. 32, Sections 423-427.
3. Tietze, C., and Neuman, L.: Surgical Sterilization of Men and Women, New York, 1962, National Committee on Maternal Health, Publication No. 11.
4. Prystowsky, H., and Eastman, N. J.: J. A. M. A. 158: 463, 1955.
5. August, R. V.: Obst. & Gynec. 5: 715, 1955.
6. Flowers, C. E., Donnelly, J. F., and Burwell, J. C.: North Carolina M. J. 20: 489, 1959.
7. Berthelsen, H. G.: Danish M. Bull. 4: 107, 1957.
8. Naville, A.: Praxis 41: 1020, 1952.
9. De, Nagandraneth: J. Indian M. A. 36: 95, 1961.
10. Barnes, A. C., and Zuspan, F. P.: Am. J. Obst. & Gynec. 75: 65, 1958.
11. Swartz, D. P., et al.: Fertil. & Steril. 14: 320, 1963.