

## THE VALUE OF PLASTIC OPERATIONS PERFORMED ON THE FALLOPIAN TUBES

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Despite the fact that the world's population is increasing at a rate demanding the serious attention of mankind, and despite the high degree of parity so commonly seen, with their associated childbirth hazards, numerous childless couples remain who will leave no stone unturned to have their great wish — a successful pregnancy — fulfilled.

The importance of this problem is reflected in the establishment of special 'infertility clinics' by many gynaecological departments. Obviously, the complete investigation of such couples ranges from an investigation of sperm and ovum formation, through the processes and organs along their respective roads of travel, to a study of the eventual nidation and survival of the fertilized ovum.

One aspect of this problem is dealt with in this paper, viz.: Blockage of the Fallopian tubes with the attempted restoration of patency and function. It is sad to reflect that in approaching this problem, lack of understanding or irresponsibility on the part of many of the patients, as well as oversight of basic principles on the part of the investigator, lead to unsatisfactory results.

Tubal plastic repair in cases of infertility is a relatively uncommon operation. It was decided to follow-up patients who had had some type of plastic tubal operation done at the Groote Schuur Hospital in the 3-year period 1959 — 1961, to determine what the patient pregnancy rate was and what the resultant tubal patency rate was.

During the 3-year period 1959 — 1961, a total of 467 new patients were seen at the Groote Schuur Hospital Infertility Clinic, consisting of 184 patients (39%) with primary infertility, 257 (55%) with secondary infertility, while in 26 this information was not available. The racial incidence was 43 European, 319 Coloured and 105 Bantu patients —

Infertility	European	Coloured	Bantu
Primary	20	126	38
Secondary	20	180	57
Unknown	3	13	10

A total of 18 patients were referred for surgery from this clinic, and 34 others collected in whom tubal plastic surgery had been incidental to the primary indications for laparotomy.

It is difficult to work out the incidence of tubal plastic surgery in patients with infertility since the attendance of patients at this special clinic has been poor. Out of the 467 patients 182 (i.e. 38.7%) disappeared after the initial consultation. In many of these the husband had been sub-fertile and the patient had been asked to attend after a repeat semen analysis was done. Very often the patient did not return because her husband refused re-examination. Not more than 72 patients (15.4%) had the essential investigations completed, (i.e. diagnostic curettage, tubal insufflation and hysterosalpingography). Mastroianni, of

the Yale Infertility Clinic,<sup>6</sup> reports an incidence of 81 major operations out of 689 patients (i.e. 11.8%) over a 1-year period. His series includes myomectomies and ovarian cystectomies, in addition to tubal plastic operations.

### THE SURVEY

During the 3-year period 1959 - 1961 a total of 64 tubal plastic operations were done. The records of 12 patients could not be traced. Letters were written to the remaining 52 patients. Of these, 23 letters were returned undelivered. The remaining 29 patients attended for follow-up. The patients' ages varied from 22 to 42 years, with an average age of 31.9 years. There were 3 European, 41 Coloured and 8 Bantu patients who presented with primary infertility in 20 and with secondary infertility in 32.

### Indications for Laparotomy

The indications for laparotomy were as follows:

Referred from infertility clinic	18 patients
Ovarian or tubo-ovarian cysts	10 "
Fibroid uterus for myomectomy	16 "
Ectopic pregnancy	6 "
Unknown	2 "
<b>Total</b>	<b>52 patients</b>

One patient aged 35 years had a total abdominal hysterectomy done for persistent menorrhagia 13 months after a bilateral salpingostomy and myomectomy had been done.

### Types of Plastic Tubal Surgery

Bilateral salpingostomy (various types)	23 patients
Unilateral salpingostomy (various types)	25 "
Tubal implantation	2 "
Salpingostomy + implantation	1 "
Tubal irrigation	1 "
<b>Total</b>	<b>52 patients</b>

Cortisone was used postoperatively in only 2 patients in this series.

Polythene tubing was used in 1 patient with tubal implantation.

Postoperative insufflation and/or hystero-gram was done in only 6 patients.

### Materials and Methods

The patients who attended for the follow-up for this survey were asked about any pregnancies following the operation and if there were none, whether they had been concerned about becoming pregnant again.

A general and gynaecological examination was made and where possible an insufflation was performed using carbon dioxide in the postmenstrual phase; and a hystero-

salpingogram under screening in the X-ray department was done in as many cases as possible.

Two patients who had not had a diagnostic curettage done pre-operatively were booked for this procedure. Semen analysis was requested in 5 cases where this investigation had not been done previously.

## RESULTS

### 1. Pregnancies

One pregnancy had occurred out of 29 patients who had undergone tubal plastic surgery and who attended for follow-up. The patient was a 29-year-old Coloured female, with a 10-year history of secondary infertility. A right salpingostomy and salpingolysis was done. The patient had not been investigated for infertility, apart from a dilatation and curettage 2 years previously. She gave birth to a live infant 1 year and 7 months after the operation. Cortisone was not used.

### 2. Tubal Patency

Tubal patency was investigated by doing an insufflation with carbon dioxide and/or by doing a hysterosalpingogram. These investigations were always done in the post-menstrual half of the cycle. 25 of the 29 patients were investigated in the above way. The remaining 4 had no tests done at all, because of evidence of tubal masses or because of refusal to be examined or non-attendance. Tubal insufflations were done on 16 patients, hystero-grams only on 2, and the 2 examinations combined were done in 7. Amyl-nitrite inhalations were given to all patients during the insufflation tests. A water-soluble dye ('endografin' or 'urografin 76') was used for the hysterosalpingogram. All patients were screened and had postero-anterior as well as left and right oblique exposures taken. A '20-minute' film was also taken. Non-patency was diagnosed if the carbon dioxide did not pass through the tubes at a pressure of 160 mm.Hg or lower, or if no spill was seen on hysterosalpingogram. Tubes were considered to be patent if the carbon dioxide passed through at pressures below 160

mm.Hg, or if spill was present on hysterosalpingography. (It has been accepted that at pressures of 150 mm.Hg or higher a positive test means a degree of stenosis, too severe for the average-sized ovum to pass.)

### Results of Patency Tests

No particular pain or discomfort was experienced by any of the patients tested. A severe pelvic infection with abscess formation necessitating colpotomy, followed 3 days after an insufflation in one case. No other known complications occurred.

Patency was present in 4 patients, non-patency in 18, inconclusive results in 2, and patency on hystero-gram and non-patency on insufflation in 1 (total 25).

	Patency	Non-Patency	Inconclusive
Insufflation ....	1	14	2
Hystero-gram ....	2	1	
Insufflation + hystero-gram .	1	3	
Total	4	18	2 (24)

Patency on hystero-gram and non-patency on insufflation was present in the remaining patient. Failure to attend accounts for the fact that only 5 patients had both insufflation and salpingography done.

The result of the diagnostic curettage done postoperatively on one of the patients revealed tuberculous endometritis. The importance of a routine pre-operative curettage to exclude endometrial tuberculosis cannot be over-emphasized.

A few patients expressed no concern about having further pregnancies.

The results of the plastic tubal operations done during the period surveyed have been very discouraging. Inadequate pre-operative investigations, combined with insufficient postoperative care and poor follow-up, are factors undoubtedly accounting in part for these poor results.

TABLE I. RESULTS OF SERIES PUBLISHED ON TUBAL PLASTIC OPERATIONS

Series	No. of cases	Operation	Pregnancies		Patency	Remarks
			Total	Live		
Greenhill, <sup>10</sup> 1937 ..	818	Tuboplastic operations	54 (6.6%)	36	—	—
Palmer, <sup>8</sup> 1942-1959 ..	396	Salpingostomy	135 (34.0%)	52	—	Cortisone during last few years
Martius, <sup>5</sup> 1951 ..	65	Salpingostometoplasty	34 (52.3%)	—	—	—
Traenckner, <sup>16</sup> 1953 ..	49	Tubal reconstruction and anastomosis	5 (10.2%)	—	—	—
Palmer, <sup>8</sup> 1950 ..	40	Tubal implantation	13 (32.5%)	—	—	—
Green-Armytage, <sup>4</sup> 1955	38	Tubal implantation	14 (37.0%)	—	—	Polyethylene splint for 16-20 weeks
American Society for Study of Sterility, <sup>12</sup> 1956. (Sieglar and Hellman)	931	Salpingolysis (68 surgeons)	270 (24.0%)	212	—	Results obtained by 84 different surgeons who had performed at least 10 tubal-plastic operations
	891	Salpingostomy (72 surgeons)	184 (20.3%)	134	—	
	191	Resection-anastomosis (54 surgeons)	15 (7.8%)	8	—	
	272	Tubal implantation (51 surgeons)	44 (26.0%)	24	—	
Cauwet, <sup>1</sup> 1958 ..	69	Tubal plastic operations	18 (26.0%)	13	—	Polyethylene tubing
Moore-White, <sup>7</sup> 1960 ..	16	Tubal implantation	— (56.0%)	— (31%)	—	No cortisone or polyethylene splints
Groote Schuur Hospital, 1959-1961	29	Tubal plastic operations	1 (3.8%)	1 (3.8%)	16.6%	Result obtained by several surgeons using various techniques



## HISTORICAL ASPECTS AND PRE-OPERATIVE CARE

Tubal plastic operations for the treatment of infertility have been performed for several decades. The term 'salpingostomy' was used by Skutsch as early as 1890.<sup>11</sup> Polk (1894) used the word 'salpingolysis' and reported a short series of 12 cases.

A previous generation of gynaecologists did not favour elective tubal plastic surgery (Greenhill, Roberts, Buxton, Topkins, etc.). Gelhorn in 1911 felt that conservative surgery, in the presence of microscopic evidence of tubal damage, was not indicated. In recent years series have been reported with steadily improving results (Table I). The type of pathology at present is not likely to be very different from that found 20-30 years ago. The improvement has been brought about by better selection of cases following improved pre-operative investigation; by better pre-operative preparation and by increased attention to operative techniques and postoperative care. Antibiotics and cortisone have also been used for various periods by most of the recent investigators (Green-Armytage,<sup>3</sup> Palmer,<sup>8</sup> Wainer *et al.*,<sup>12</sup> etc.).

A 'medical technique' has been practised at the Hammer-smith Hospital (London). In cases where the hysterosalpingogram does not show too great an obstruction or deformity of the tubes, weekly intra-uterine injections of a freshly prepared mixture of procaine hydrochloride, streptomycin sulphate and hydrocortisone are given for 4-6 weeks. The obstruction was relieved in many cases, and several successful pregnancies have been obtained. If this method fails, surgical treatment is indicated (Green-Armytage<sup>3</sup>). Bennoun (1954, 1956) and De Moraes and Peano (1958), as reported by Green-Armytage,<sup>3</sup> have claimed an 88% tubal patency and a 70% pregnancy rate on the above regime.

Palmer<sup>8</sup> gives a postoperative course of cortisone for 6 weeks. A 33% pregnancy and a 40% patency rate out of 65 cases was claimed. Green-Armytage advocates one week of cortisone (prednisone 15 mg./day) pre-operatively, and 3 weeks of cortisone postoperatively in decreasing dosages.

## PRE-OPERATIVE INVESTIGATIONS

## 1. Semen Analysis

The results obtained from an analysis of 338 consecutive semen analyses at the Groote Schuur Hospital Infertility Clinic will show the importance of routine semenology before the female partner undergoes investigations.

A total of 32 European, 240 Coloured and 66 Bantu males were examined. Nearly 60% of all males were found to have an abnormal semen analysis at the initial visit. Male subfertility may be of little import where the female is normally fertile, but where borderline fertility exists in the female it may be of considerable consequence.

## RESULT OF 338 SEMEN ANALYSES (1959-1961)

Semen	European	Coloured	Bantu
Normal	20 (62.5%)	101 (42%)	20 (30%)
Subfertile	12 (37.5%)	121 (50%)	34 (51.5%)
Sterile	0	18 (8%)	12 (18.5%)
Total	32	240	66

## 2. Diagnostic Curettage

This should always be done in the premenstrual phase. Curettings are sent for histological examination and for guinea-pig inoculation and Kirschner culture. Sharman<sup>9</sup> found endometrial tuberculosis in 5.5% of 1,898 patients with primary infertility. A total of 8 patients with tuberculous endometritis were diagnosed from the Groote Schuur Hospital Infertility Clinic during the 3 years under review. No true incidence can be given since only a small percentage of patients were admitted for, or attended for curettage. Endometrial biopsy, which indicates the changes and pathology in only a very small area of endometrium, should not be used to exclude tuberculosis. The following case history demonstrates this point well:

E.E., aged 30 years, presented with primary infertility of 4½ years' duration. Menses were regular and normal. Endometrial biopsy did not reveal pathology. The endometrium was in the secretory phase. A curettage done 9 months later showed tuberculous endometritis.

## 3. Tubal Insufflation (Rubin's Test)

It has been accepted that the 'tubal factor' is the commonest cause of sterility.<sup>2,3,13</sup> A total of 245 insufflations were done at the Groote Schuur Hospital Infertility Clinic during 1959, 1960 and 1961. A positive test with gas passing through at pressures below 160 mm.Hg was obtained in 50 patients (20.4%). The test was inconclusive in 19 (7.7%) and negative (or only positive above 160 mm.Hg) in 176 (71.9%). Patency was not confirmed by doing an erect X-ray of the abdomen to detect the presence of air under the diaphragm as suggested by Grant.<sup>2</sup> However, the patient was usually questioned about shoulder-tip pain, this being a symptom of diaphragmatic irritation following the escape of gas through a patent tube.

The combination of dilatation and curettage and insufflation should be discouraged since they should be done at different times of the cycle. False negative insufflation tests during the premenstrual phase could possibly be found as a result of the thicker endometrium blocking the uterine tubal orifice.

## 4. Hysterosalpingography

This is indicated in all cases, and particularly where doubt exists about the insufflation result. Unsuspected pathology may be detected. Sobrero *et al.*<sup>14</sup> reported 74 patients with unsuspected pathology detected by salpingography on 500 consecutive patients (14%), i.e.:

Hydrosalpinx	33
Fibroids	27
Polyps	5
Congenital defects	9

Using a water-soluble dye ('endografin' or 'urografen'), a total of 138 hysterosalpingograms under screening were done during 1959-1961. Amyl nitrite was not routinely used during hysterosalpingography. Normal findings with spill were found in 29 patients (21.9%), congenital deformities in 5 and cornual block in 10. An abnormal salpingogram with or without spill was found in the remaining 89 patients. The results were inconclusive in 5.

It is important to be aware of the problem of tubal spasm, first recognized by Meakers<sup>2</sup> nearly 25 years ago. At least 3 negative tubal patency tests, including salpingo-



graphy, must be obtained before spasm is excluded. Nevertheless, Grant reported 25 pregnancies occurring in patients with 3 negative patency tests.<sup>2</sup>

### 5. The Postcoital Test (Huhner's Test, Sim's Test)

This test gives information about the male and the female, as a couple. Six hours should elapse after coitus before the cervical mucus is examined. A sample must be obtained from near the internal os. The appearance of the cervical mucus, including the presence of *spinnbarkeit*, can be studied at the same time. *Spinnbarkeit* (the ability to form threads) of the cervical mucus is an index of oestrogenic activity, and is maximal round about the time of ovulation.<sup>14</sup>

Routine postcoital tests were not done at the Groote Schuur Hospital Infertility Clinic.

### THE OPERATIVE TECHNIQUE

No details about the technique are given, but a few points of importance are emphasized. The surgeon doing the primary operation has the greatest chance of success, and everything possible should be done to ensure initial success.

#### 1. Cornual Obstruction

A probe should never be passed from the fimbrial end into the uterus since the interstitial portion of the tube is very small and may have a tortuous course, and therefore false passages are easily created. After occluding the cervix with a myomectomy clamp, air can be injected through the uterine fundus to test for tubal patency, or to determine the site of an obstruction. The use of polythene tubing is favoured by some authors<sup>4,17</sup> and considered unnecessary by others.<sup>7,8</sup> Green-Armytage<sup>4</sup> uses polythene and leaves it in position for 16-20 weeks. Antibiotic cover is essential where polythene is used.

Meticulous haemostasis and the use of fine instruments and suture materials are all essential in tubo-plastic surgery.

#### 2. Salpingostomy

All adhesions must first be separated and raw areas reperi-tonealized. The minimum amount of surgery will give the best results. A tubal biopsy should be done in all cases as a useful guide to future treatment and prognosis. A procedure to ensure that the uterus remains anteverted is considered essential at the completion of the plastic operation. The anaesthetist should be informed whenever cortisone has been used pre-operatively.

#### 3. Ectopic Pregnancy

In patients where fertility is to be preserved, salpingectomy should be avoided if possible. The products of gestation should be removed, all bleeding points clamped and haemostasis secured. Further reconstruction attempts are unnecessary since the tube can reform functionally if not anatomically, if left alone. A procedure to ensure that the uterus remains anteverted will be necessary in certain cases.

The patient must be warned about the higher chance of a recurrence in the preserved tube.

### POSTOPERATIVE CARE

1. Antibiotics prescribed as a routine for 5-7 days lessen the likelihood of a recrudescence of a dormant infection.

2. Cortisone for a variable period (see under 'pre-operative care') has been used by most recent authors writing about this subject. They report improved results.

3. Insufflation. To prevent possible postoperative emphysema and infection, this should not be done within the first post-operative fortnight.

4. Elevation of the foot-end of the bed for the first 48 hours (Green-Armytage, 1960). This could possibly help by keeping

bowel out of the pelvis, thus reducing the chance of adhesions of bowel to the pelvic organs.

### DISCUSSION AND CONCLUSION

The results of tubal plastic operations at the Groote Schuur Hospital during 1959-1961 have been presented, as well as some of the findings at the infertility clinic.

The importance of routine investigation is stressed, particularly semenology, diagnostic curettage and tests for tubal patency. Stallworthy<sup>15</sup> in Oxford has been able to combine all the investigations in one sitting in the early postovulatory phase. It is doubtful whether this is justified in our own clinic where pelvic infection is a relatively common condition. It would also seem dangerous to expose a possible early implantation to an X-ray examination.

It is suggested that curettage should precede insufflation, although it has now been accepted as a safe procedure to perform salpingography in patients with suspected tuberculous salpingitis<sup>15</sup> (Stallworthy, 1952; Asplund and Ryden, 1952). Definite improvement has been obtained by the pre- and postoperative use of cortisone and antibiotics.

The importance of diagnosing and treating endocrinal derangements as a cause of infertility is not discussed in this paper. Patients with menstrual irregularities, in addition to infertility, are initially referred to the gynaecological endocrine clinic.

All histological sections, as well as the bacteriological investigations, were done and reported upon by members of the joint Pathology Staff of the University of Cape Town/Cape Provincial Administration.

Dr. A. J. S. Burger (Department of Urology) examined the males and did the semen analyses.

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