Cervical incompetence: surgical treatment of twenty-four cases during pregnancy

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ONE of the most exciting concepts in obstetrics and gynaecology is that of the mechanical function of the cervix in the maintenance of pregnancy.

In 1947 Danforth provided the first satisfactory anatomic explanation of the role of the cervix in retaining pregnancy, and pointed out the correlation of this important function with the prevention of abortion.

The first clinical report of the repair of an incompetent cervix with a satisfactory result in two subsequent pregnancies was that of Palmer & La Comme in 1948.

In 1950, Lash & Lash described the diagnosis and repair of cervical defects as they are related to recurrent late abortions.

Since then 'cervical incompetence' has become a well-known entity and many cases of successful surgical repair of the defect have been reported. Some of these operations were performed by trachelorrhaphy either prior to (Palmer & La Comme, 1948; Rubovits, Cooperman & Lash, 1953; Picot, Thompson & Murphy, 1958) or during pregnancy (Baden & Baden, 1957). Following Shirodkar's paper in 1955, the emphasis has been upon repair of the cervical defect during pregnancy by means of a constricting suture (Barter *et al.*, 1958; Johnstone, 1958; McDonald, 1957; Tacchi & Snaith, 1962).

The syndrome described as the 'incompetent cervix' refers to a defect of the cervix usually, but not always, resulting from a previous labour or surgery, which leads to the premature termination of an otherwise normal pregnancy during the middle trimester.

The author presents a series of twenty-four cases treated in a busy obstetrical-gynaecological unit over a period of 5 years where the preferred policy is to correct the cervical defect during pregnancy, using a modified Shirodkar technique similar to that described by Tacchi & Snaith (1962).

The method of termination of pregnancy of the successfully treated cases was vaginal delivery, except in the presence of an obstetrical indication for Caesarean section other than cervical incompetence.

Material

During the 5-year period (1962-66) the diagnosis of cervical incompetence was made in twenty-four patients. These twenty-four patients had had ninety-three pregnancies which had resulted in the birth of nineteen viable infants, sixty-five mid-trimester abortions and nine first-trimester abortions (Table 1): the salvage rate in terms of viable infants were therefore 20.4%.

None of the patients had given birth to a viable infant following a mid-trimester abortion.

TABLE 1

Foetal salvage and incidence of abortion before diagnosis in twenty-four patients with cervical incompetence

Total number of patients=24
Total number of pregnancies=93
Viable infants=19 (20.4%)
Mid-trimester abortions=65 (69.9%)
First-trimester abortions=9 (9.7%)

The patients' ages ranged from 22 to 38 years (averaging 29.8 years) and individually they had been previously pregnant from one to seven times.

Incidence

During the 5-year period under study, there were 4301 gynaecological admissions (including 1560 abortions of all types) and 7875 women were delivered after the 28th week of gestation in the maternity department.

The twenty-four patients in the series were admitted to hospital on twenty-seven occasions. The apparent incidence of cervical incompetence

is therefore 0.63% of the gynaecological admissions (or 1.7% of all types of abortion admitted) and 0.34% of the deliveries (Table 2).

TABLE 2
Incidence of cervical incompetence at
St Giles' Hospital, London

Year	Deliveries (after 28th week gestation)	Gynaeco- logical admissions	Cases of cervical incompetence
1962	1560	795	5
1963	1491	843	4
1964	1680	880	5
1965	1545	902	7
1966	1599	981	6
Total	7875	4301 (including 1560 abortions)	27

Aetiological factors

The apparent factors which immediately antedated the mid-trimester abortions, and which were considered to be of significance in the causation of cervical incompetence in the present series, are shown in Table 3.

TABLE 3
Aetiological factors contributing to cervical incompetence
in twenty-four patients

Aetiological factors which immediately ante-dated the mid-trimester abortions	No. of patients	Per cent
Previous pregnancy—with no other apparent cause	6	25.0
Obstetrical trauma		
High forceps delivery	2	45.8
Mid forceps delivery	2	
Extensive cervical laceration delivery	1	
Previous gynaecological operation		
Dilation of cervix for dysmenorrhoea	3	33.4
Dilation and curettage	5	
No apparent cause	5	20.8
Total	24	100.0

Diagnosis

Three criteria for diagnosis were employed in this series.

The first was a previous history of second-trimester abortion which had resulted in the delivery of a living but non-viable foetus. Such a delivery should not have been accompanied by painful uterine contractions characteristic of labour.

In the non-pregnant woman, the diagnosis might be confirmed by the easy passage of a No. 8 Hegar dilator without discomfort.

The second important criterion (and the definitive diagnosis of cervical incompetence) was the observation of progressive cervical dilatation and effacement, and seeing foetal membranes protruding through the partially dilated cervix of a patient, in the second trimester of pregnancy, who was not in labour (Fig. 1). Such patients usually complained of a slightly bloody mucous vaginal

FIG. 1. Speculum examination of the cervix showing foetal membranes protruding through the partially dilated cervix. The patient was not in labour.

discharge and a sense of pelvic pressure followed by the appearance of membranes at the vaginal introitus. Uterine contractions or vaginal bleeding was never a complaint, but frequency of micturition might be mentioned.

The third criterion for diagnosis (in the non-pregnant state) was a cervico-hysterogram which was performed on only one patient in this series (Fig. 2).

Twenty-one of the patients (87.5%) were diagnosed during pregnancy (Table 4) and seven of these already in the mid-trimester complained of

TABLE 4
Diagnosis of incompetent cervix
(twenty-four patients)

	No. of cases
Non-pregnant	
Cervico-hysterogram (secretory phase)	1
History of previous pregnancies	1
No resistance to a No. 8 Hegar	1
Pregnant	
History of previous pregnancies	14
Effacement and progressive dilatation of cervix	7

vaginal discharge and pelvic pressure. The latter group showed varying degrees of cervical effacement and in one patient the membranes were

FIG. 2. Cervico-hystrogram: showing an abnormally dilated cervical canal with loss of definition of the internal os.

bulging into the endocervical canal. Fourteen cases were diagnosed and treated on the basis of previous obstetric history.

The diagnosis was made in the non-pregnant state in three cases.

Patients presenting with a suggestive history of cervical incompetence and already pregnant when first seen were admitted for observation and weekly speculum examination of the cervix, beginning at about the 10th week of gestation.

Treatment

Medical treatment alone has proved to be unsuccessful in preventing abortion and premature labour in the woman who has a proved cervical incompetence.

Bed rest, sedation and hormone therapy have also been tried with questionable success.

It is now generally accepted that corrective surgery is the main hope for treating this condition. Surgical treatment of the condition may be undertaken prior to pregnancy (Lash & Lash, 1950) or during pregnancy (Shirodkar, 1955).

Surgically, the cervix has been attacked at the internal (Shirodkar, 1955; Barter *et al.*, 1958), mid-cervical (McDonald, 1957) and external (Baden & Baden, 1957) os levels, as well as all three simultaneously (Rubovits *et al.*, 1953).

Shirodkar originally used fascia lata (taken from the patient's thigh) as his suture material, but since then a variety of material has been used, including braided silk, Kangaroo tendon,

nylon, catgut, tantalum wire, Dacron strips and even No. 16 gauge poly-ethylene tubing. The ligature material used in the present series was mersilene tape (a polyester fibre manufactured by Ethicon) with attached needles, and the technique employed, as already mentioned, was a modification of Shirodkar's internal os circlage procedure and similar to that described by Tacchi & Snaith (1962). Mersilene tape is non-absorbable and causes no reaction in the tissues. The policy adopted throughout this series was to carry out surgical repair of the defect at 14–16 weeks pregnancy—unless the patient was first seen (or the diagnosis confirmed) after that stage of pregnancy.

Just before the operation, the patient is given an intramuscular injection of 17 α -hydroxyprogesterone caproate 250 mg, in order to decrease uterine irritability.

Operative technique

With the anaesthetized patient in the lithotomy position, the vulva and vagina are gently swabbed with antiseptic solution.

When there is effacement and dilatation of the cervix, the Trendelenburg-lithotomy position can facilitate the operative procedure by decreasing pressure on the membranes and causing them to recede.

The cervix is exposed, with the help of a vaginal speculum, and the anterior and posterior lips grasped gently with sponge-holding forceps.

A small transverse incision is made at the junction of the bladder and cervix, and the bladder pushed up with digital dissection to reveal the cervix at the level of the internal os.

A short vertical incision is then made in the posterior vaginal fornix at 6 o'clock.

One of the attached needles of the mersilene tape is passed from the anterior incision, beneath the superficial connective tissue of the cervix counter-clockwise to be brought out through the posterior incision. The other attached needle is then passed in a similar manner, clockwise around the left side of the cervix to appear at the posterior incision. The suture is tied tightly posteriorly (so that the internal os is snugged tight) and the ends of the knot are left 1 in. long, and exposed in the vagina.

The exposed anterior part of the tape is anchored to the underlying cervix with a No. 1 chromic catgut suture, and the vaginal wall incisions closed with interrupted No. 0 chromic catgut sutures.

Excessive bleeding was not encountered in the present series and the operating time varied between 15 and 28 min, with an average time of 20 min.

Post-operative care

For the first 36 hr, the patient is sedated with intramuscular injection of Omnopon gr. 1/3 6-hourly and prophylactic antibiotic (crystamycin or tetracycline) is given for 7 days. The patient is allowed up on the 3rd day and she is discharged home on the 8th post-operative day.

Coitus is prohibited for 3 months and she is advised to avoid heavy lifting and straining at stool. She is strongly advised to report the onset of labour or any symptoms to her own doctor or to the hospital.

Weekly speculum examination of the cervix is carried out and weekly intramuscular injections of 17 α -hydroxyprogesterone caproate 250 mg given until the 20th week of pregnancy.

Unless there is an obstetrical indication for Caesarean section, the patient is admitted into hospital at 38 weeks of pregnancy, for the stitch

to be removed, under sedation with intramuscular Omnopon gr. 1/3.

Results

Of twenty-seven circlage operations performed during pregnancy for correction of cervical incompetence, twenty-one resulted in the delivery of viable infants (Table 5). The remaining six were considered failures. This represents a foetal salvage rate of 77.8% as compared with 20.4% before surgical correction. Cervical suture was carried out at 14–16 weeks gestation on twenty-two occasions with the delivery of nineteen viable infants, and at 18–24 weeks gestation on five occasions with delivery of two living infants. The failures included one woman (Case 11) first seen when already 24 weeks pregnant and the cervix partly effaced and about 2.5 cm dilated with the membranes bulging.

TABLE 5
Results with surgery in twenty-four cases of cervical incompetence—treated during pregnancy

Patient	Age	Previous viable infants	Previous abortions		Gestation age at operation (weeks)	Gestation age at delivery (weeks)	Mode of delivery	Live or dead infant	Weight of infant	
			First trimester	Second trimester					lb	oz
1	27	0	1	1	14	41	Sp.	Live	7	12
2	27	1	0	2	19	19½	Sp.	Abortion	Not weighed	
3	23	0	0	1	16	40	Sp.	Live	7	8
4	27	0	1	3	14	34	Sp.	Live	4	10
5	38	0	0	5	14	24	Sp.	Dead	1	14
									(Abruptio placentae)	
6	29	2	0	1	16	39	Sp.	Live	6	3
7a	27	0	1	6	16	40	C.S.	Live	5	8
7b	29	1	1	6	14	39	C.S.	Live	7	4
8	33	1	0	5	14	39	C.S.	Live	7	6
9a	34	2	0	4	20	21	Sp.	Abortion	Not weighed	
9b	36	2	0	5	16	38	Sp.	Live	7	8
10	31	0	0	3	16	36	Sp.	Live	6	10
11	31	1	1	2	24	24½	Sp.	Abortion	1	10
12	22	0	0	2	16	36	Sp.	Live	5	14
13	29	1	0	2	14	39	Sp.	Live	8	2
14a	26	0	0	2	14	17	Sp.	Dead	Not weighed	
14b	27	0	0	3	14	18	Sp.	Dead	Not weighed	
									(I.U.D. following acute pyelonephritis)	
15	32	1	1	3	15	40	C.S.	Live	7	10
16	37	2	0	3	14	39	C.S.	Live	5	13
17	27	1	0	2	16	41	Sp.	Live	8	2
18	30	1	1	2	18	37	Sp.	Live	6	0
19	26	0	1	2	18	34	Sp.	Live	5	2
20	29	0	0	2	14	37	Low forceps	Live	6	0
21	36	2	0	3	15	36	Sp.	Live	5	0
22	33	1	1	4	16	39	C.S.	Live	7	6
23	34	2	0	4	15	38	Sp.	Live	6	8
24	26	1	1	1	16	38	Sp.	Live	6	14

Note: The cases are not numbered in chronological order of admission or treatment.

C.S. = Caesarean section; Sp. = Spontaneous delivery.

Three patients (Cases 7, 9 and 14) had the procedure performed in two successive pregnancies.

Three patients (Cases 2, 9a and 11) went into premature labour 3–7 days following the surgical correction, and one patient (Case 5) had an unexplained abruptio placentae at 24 weeks, 10 weeks after the cervical closure (Table 6).

TABLE 6
Summary of failures in twenty-seven procedures performed during pregnancy for correction of cervical incompetence

Total number of procedures	= 27
Successful	= 21 (77.8%)
Failures	= 6 (22.2%)

<i>Causes of failure</i>	
Premature labour (3–7 days following cervical closure)	3
Abruptio placentae	1
Intra-uterine death of foetus—3 weeks after operation	1
Intra-uterine death of foetus (4 weeks after procedure)—following acute pyelonephritis	1

In one patient (Case 14) the suture had to be removed following unexplained foetal death 3 weeks after the operation. In her subsequent pregnancy, cervical circlage was performed at 14 weeks gestation. At 18 weeks she had a severe attack of pyelonephritis which was followed by foetal death.

Labour and method of delivery

The suture was divided and removed at the onset of established premature labour or at the 38th week of pregnancy.

Fifteen of the twenty patients who had successful pregnancies were delivered vaginally. One of them had a low forceps delivery for foetal distress. Two patients went into premature labour at 34 weeks, another three went into labour at 36 weeks, and the remaining fifteen patients were delivered at 37–41 weeks gestation (Table 5).

Labour was usually short—the duration varied from 6 hr to 22½ hr, with an average time of 13½ hr.

Five women, including one who had had two successful ligations. (Case 7), were delivered by Caesarean section (Table 7).

Discussion

While spontaneous abortion is a common complication of pregnancy, cervical incompetence as a cause of abortion is relatively rare. In the present series it represented 0.63% of all gynaecological admissions, 1.7% of all types of abortion and 3.4 per 1000 deliveries. Picot, Thompson & Murphy (1959) estimate the incidence at 3 per 1000 deliveries, Baden & Baden (1957) found 1 in 300 pregnancies and Quigley & Lynes (1964)

TABLE 7
Indications for Caesarean section

Total number of deliveries	= 21
Number of Caesarean sections	= 6 (including one woman who had two successful ligations)
Incidence of Caesarean section	= 28.6%
<i>Indications</i>	
Previous Caesarean section for failed forceps	1
Foetal distress (Case 7)	1
Previous Caesarean section (Case 7)	1
Severe pre-eclamptic toxæmia	1
Unstable lie	1
Breech presentation and small pelvis	1

reported an incidence of 2.1 per 1000 deliveries and 0.6% of gynaecological admissions in their series. In Javert's series (1961) of habitual abortion cases, he found that on the basis of history, 17% were probably due to incompetent cervix, although he thought that 10% would be nearer the truth.

There is still some controversy as to the exact aetiology of cervical incompetence. One school of thought, headed by Shirodkar, believe that it is due to physiologic inability of the cervix to retain the enlarging uterine contents, and maintain that a true anatomic defect is not always present. On the whole they favour surgical correction of the defect, using Shirodkar's technique or its modification, during the 14–18 weeks of gestation.

The second school of thought, led by Lash, holds that the condition is due to an anatomic defect of the cervix as a result of trauma. They favour surgical correction of the defect in the non-pregnant state.

At present, it would seem that the Shirodkar school of thought has the majority of followers.

Before a diagnosis of cervical incompetence is made, it is important to rule out the other possible causes of mid-trimester abortions—uterine abnormality, gamete defects, uterine fibroids.

A reliable and important diagnostic aid is an accurate obstetric history of sudden, painless spontaneous abortions occurring between the 14 and 28 weeks of gestation. Haemorrhage is not a feature of this type of abortion.

During pregnancy, the woman whose cervix is incompetent may complain of watery vaginal discharge or of a feeling of pressure in the vagina—due to prolapsed intact membranes. A definite diagnosis of cervical incompetence can be made by the observation of progressive shortening and dilation of the cervix (and seeing the membranes bulging through the partially dilated cervix) in a woman who is not in labour and is 14–28 weeks pregnant.

The pregnant woman with a history suggestive of cervical incompetence should be admitted into hospital at about the 10th week gestation for observation and weekly speculum examination of the cervix.

Cervico-hysterogram is of little help in the patient who has a clear-cut history of cervical incompetence. If it has to be done, it is perhaps better carried out in the secretory phase of the cycle for Asplund (1959) has shown that under the influence of progesterone the internal os becomes more constricted. It should also be remembered that the defect may be due to a congenital weakness in an underdeveloped uterus, and in such a case the cervico-hysterogram will show no defect because the incompetence of the cervix is functional and not apparent before pregnancy. Surgical correction of the defect is the choice of treatment once the diagnosis is made.

When the operation is performed in the non-pregnant state, there is always the possibility (however remote) that the patient may fail to become pregnant subsequently.

The Shirodkar type operation is more likely to be successful if performed at 14–16 weeks gestation and before effacement and dilatation of the cervix. Three of the six unsuccessful procedures (i.e. 50%) in the present series were carried out after the 18th week of gestation.

When the cervix is more than 50% effaced and over 3.5–4 cm dilated, it would seem better to perform the McDonald type of closure (which is simpler, faster and more easily reversible) rather than the Shirodkar procedure.

Mersilene tape (Ethicon) with attached needles would appear to be the suture material of choice in the surgical treatment of cervical incompetence: it is non-absorbable, non-irritating and does not cut into the cervix.

It may be argued that in cases of cervical

incompetence, 17 α -hydroxyprogesterone caproate injections are unnecessary. While this is true, the author believes that the use of this progestagen in the immediate post-operative days and preferably in the first half of the pregnancy, reduces possible uterine irritability and the incidence of premature labour and enhances the results of surgical treatment of the defect.

In the author's experience, the injections also help greatly to improve the psychological outlook of these unfortunate patients—who are often over-anxious and depressed.

No virilization of the female foetuses was noted in the present series.

The pregnant patient who has had surgical correction of an incompetent cervix should be carefully observed throughout the rest of the pregnancy. Two women at least have died as a result of surgical treatment of the incompetent cervix, one from rupture of the uterus (Page, 1958), the other from sepsis (Dunn, Robinson & Steer, 1959).

Labour in the successfully treated cases of cervical incompetence is usually short and the delivery is affected easily.

In the present series, Caesarean section was reserved for those with obstetrical indications. The obvious advantage of Caesarean section is that the patient may have further pregnancies without the need for a repetition of cervical closure.

On the other hand, there is the risk that the permanent insertion of a non-absorbable cervical suture, if unnoticed, or forgotten, might give rise to severe lacerations or uterine rupture in any subsequent pregnancy. Vaginal delivery avoids the more major operative procedure of Caesarean section.

The results in this series compare very favourably with others already reported (Table 8).

TABLE 8
Comparative results of surgical treatment of cervical incompetence by different authors

Author	Cases treated			Successful cases		
	Pregnant	Non-pregnant	Total	Pregnant	Non-pregnant	Total
McDonald (1957)	70	—	70	33	—	33 (43%)
Isaacs & Pavlic (1962)	12	—	12	8	—	8 (66.7%)
Barter (1962)	22	—	22	16	—	16 (72.7%)
Tacchi & Snaith (1962)	20	6	26	14 (70%)	3 (50%)	17 (65.4%)
Crocker & Stitt (1963)	34	17	51	18 (52.9%)	8 (47.1%)	26 (50.9%)
Lash & Lash (1950)	—	93	93	—	61 (65.6%)	61 (65.6%)
Quigley & Lynes (1964)	33	5	38	21 (63.6%)	3 (60%)	24 (63.2%)
Present series	27	—	27	21 (77.8%)	—	21 (77.8%)

The reported causes of failure include accidental rupture of the membranes during operation, dissolution of the fascial strip, delay of the operation until cervical dilatation and effacement has occurred, any complication of pregnancy, e.g. abruptio placentae, and finally amnionitis giving rise to uterine irritability and premature labour.

In the present series, cervical closure was avoided in the presence of ruptured membranes, infection, cervical dilatation of more than 4 cm with effacement, uterine bleeding and uterine contractions.

Careful selection of patients and surgical correction (before marked cervical dilatation and effacement has occurred) of the incompetent cervix at 14–16 weeks gestation should improve the success rate.

Summary

Cervical incompetence is now a well-known entity in the practice of obstetrics and gynaecology.

The incidence and diagnosis of the condition is described.

The results of surgical treatment of the defect, using a modified Shirodkar technique, in twenty-four pregnant women are presented. The foetal salvage rate (in terms of viable infants) following cervical closure was 77·8% as compared with 20·4% prior to surgical correction. The incidence of Caesarean section among the successful pregnancies was 28·6%. Careful selection of patients for the operation is important.

The Shirodkar type of operation performed preferably at 14–16 weeks gestation appears to offer the best hope for the unfortunate woman with cervical incompetence.

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