HYSTEROSALPINGOGRAPHY IN RECURRENT ABORTIONS

by

USHA KRISHNA,* M.D., D.G.O.

MAYA Y. SHAH,** M.D., D.G.O., D.F.P.

PRATIBHA R. VAIDYA,*** M.D., D.G.O., D.F.P., F.C.P.S.

MUKUND S. JOSHI,**** M.B.B.S., D.M.R.E.

M. M. MEHTA,***** M.B.B.S., D.M.R.E.

Introduction

The problem of repeated foetal loss has been investigated from many different angles. After excluding medical causes such as toxemia, diabetes, iso-immunization, etc., and infections such as syphilis, listeriosis, toxoplasmosis, etc., it is necessary to look for abnormalities of the genital tract which could lead to abortions and premature deliveries.

The incidence of uterine abnormalities is rather small in the female population and three-fourths of women with uterine abnormalities are likely to have uncomplicated pregnancy and labour. However, the incidence of uterine abnormalities among women with history of repeated foetal loss is not inconsiderable and among cases where other causes are excluded, uterine abnormalities are found to be the causative factor about 20% of the time.

Hysterosalpingography is now the standard diagnostic procedure in such cases and is useful in the non-pregnant stage to detect or exclude uterine abnormalities such as bicornuate uterus, unicornuate uterus, hypoplastic uterus, intrauterine synaechia and cervical incompetence.

The present study covers 109 selected patients and their hysterosalpingographies. These patients were selected from the special O.P.D. (O.P.D. where cases with bad obstetric histories are investigated and treated) of the K.E.M. Hospital.

Material and Method

Selection of cases: Patients with repeated foetal loss were examined and investigated for various causes leading to pregnancy wastage. The non-pregnant cases with 2 or more consecutive abortions or premature deliveries and in whom other investigations were negative were selected for hysterosalpingography. Patients who had any full-term deliveries prior to the abortions were not taken up for this procedure unless

*Hon. Asst. Gynaecologist & Obstetrician & Hon. Asst. Prof. of Gynec. and Obst.

**Research Officer.

***Lecturer (Enocrinology), Obst. & Gynec. Dtpt.

****Registrar.

*****Hon. Radiologist and Hon. Prof. of Radiology.

Depts. of Obst. and Gynec. and Radiology, K.E.M. Hospital, Bombay-12.

Received for publication on 17-11-1969.

cannula was used and in 15 cases Calwin's cannula was used.

Each type of cannula has its own advantages and disadvantages but we were particularly keen to try the Japanese cannula and vacuum cannula as they have the special advantage of visualising the cervical canal which was important in order to detect cervical incompetence. In the Japanese cannula (Fig. 1) the central hollow thin tube enters the cervical canal and the tip goes a little beyond the external os. The horizontal bars close the cervix well enough to prevent regurgitation of the dye, unless the cervix is irregular or torn (in such cases we had to resort to the use of some other cannula). The central tube, being thin, leaves the portion of cervical canal around it unoccupied. Thus the cervical canal is entirely visualised. This cannula gives little discomfort to the patient and does not traumatise the endocervical mucosa. The cannula can be filled with the dye and the opening closed before insertion, thus preventing the entry of air bubbles into the uterine cavity.

The vacuum type of cannula has an acorn which fits into the external os. The dye is injected by a syringe attached to the cannula through the centre of the acorn. Concentric to the acorn, is a cervical cup which fits snugly over the cervix by means of a vacuum created by a hand pump. This type of cannula causes no trauma and no pain to patients and enables good visualisation of the cervical canal. Leakage of the dye occurs in exceptional cases when the cervix is torn or hypertrophic and does not fit well into the cervical cap. In the Malmstrom's cannula (Fig. 2) the acorn which fits into the external os can be moved back and forth in the cervical cup which fits over the cervix. This facility is achieved by using rubber washers at the sliding joint to hold the vacuum, but this makes sterilization more complicated. In the Soonawalla's cannula (Fig. 3) the acorn and the cervical cap are fixed with respect to each other which makes it possible to sterilize by boiling. Three sizes of cup are available to choose from. A guide wire is passed through the cannula and acorn and this guide wire is first inserted well into the cervical canal. The acorn and cup are then guided into position and after the vacuum is applied, the guide wire is withdrawn. Figure 3 (a) shows hysterogram done with the same cannula.

We failed to do hysterosalpingography with both the Japanese cannula and the vacuum type cannula in one case who had almost complete absence of portio vaginalis of the cervix following a Fothergill's operation and post-operative fibrosis. She gave a history of a first full term prolonged labour followed by prolapse for which she was operated elsewhere. Following this she had two premature deliveries at the 7th month and we tried to take hysterograms to establish the diagnosis of incompetent os.

Radio-opaque dye: The ideal contrast medium should be adequately radio-opaque, rapidly absorbed, rapidly excreted, non-irritant, moderately viscous, capable of standing sterilization, least toxic to living tissues and cause minimum complications. Diaginol aqueous fulfilled most of these requirements and it was quite satisfactory to visualise the uterine outline. It was the most fre-

quently used dye in our series (86 cases). The peritoneal spill was quick and the side reactions were practically absent. Diaginol viscous was used in 18 cases and Lipiodol ultrafluid in 5 cases only, being rather expensive and not easily available. The viscous or oily medium of these two dyes gives a better picture of the uterus and fallopian tubes, as spillage is slow and does not obscure the tubes.

Radiographic exposure: Fluoroscopy was used to help to detect any leakage of the dye into the vagina and also to correct the position of the cannula while injecting the dye. The uterine and adnexal movements could also be observed, and the proper moment for exposure of x-ray plates decided. The total period for which the patient was exposed for fluoroscopy did not exceed 1 minute. Three radiographs were taken for most patients. The first one was taken immediately after filling the uterine cavity and fallopian tubes, the second about 20 to 30 seconds later and the follow-up radiograph after about 15 to 20 minutes. In the few cases where Lipiodol ultrafluid was used as the contrast medium, a follow-up x-ray after 24 hours was taken. For a patient of average build, the radiograph exposure was 24 to 30 mAs at 70 to 75 KV and for patients with larger build 30 to 40 mAs at 75 to 85 KV.

Complications: Although complications are rather rare with good asepsis, proper instruments and newer and safer contrast media, it is necessary to be aware of them. Complications, such as perforation of the uterus, endometrial dislocation and haemorrhage, are unlikely with proper technique. The Japanese cannula and the vacuum type cannula are safer in this respect. Six of our patients had slight bleeding from the cervical lip due to trauma caused by the cannula or the teeth of the volsellum. The use of an aqueous dye minimises the possibility of irritation, granuloma formation and danger of pulmonary embolism, as compared to the oily media.

The uterovenous, lymphatic and interstitial intravasation can be minimised if the immediate post-menstrual period is avoided and excessive and forceful injection of dye is not done. Inflammatory reactions can occur if proper aseptic precautions are not taken or the patient has a focus of infection in the cervix, uterus or fallopian tubes. We had no case of intravasation or inflammatory reaction. Cases that are investigated for sterility are more likely to have infection in tubes and therefore more likely to develop inflammatory reaction as compared to the patients in our series.

Pain due to spasm is not uncommon, though less with the aqueous dyes. Twenty-nine of our patients had mild to moderate pain. Allergic reactions are also less frequent with the contrast media used these days. Three of our patients had nausea and one had bradycardia and excessive perspiration with some fall in blood pressure which was treated.

Analysis of Results and Discussion

In patients with genital tract abnormalities, complications of pregnancy and labour occur more frequently than in normal cases. Zambriske *et al* (1962) reported breech presentations 6 times commoner,

transverse 7 times and caesarean section 7 times oftener in cases with genital tract abnormalities. Abortions were 3½ times more frequent. Rozin (1965) in his series of 54 abnormal hysterograms found 34.6% patients having one or more abortion. In 75% of them, the abnormality was the only cause and in 25% was a cause associated with other factors. In the light of this it is important to look for genital tract abnormalities in cases of habitual foetal loss.

In the present series of 109 hysterograms, 31% showed uterine abnormalities or cervical incompetence. Herbrecht (1951) has shown that when other causes are excluded, 20 to 30% of habitual abortors had uterine abnormalities. Rozin (1965), in his text book, quotes an incidence of abnormalities in 44% of hysterograms. Palmer *et al* (1965) reported 85% abnormalities in their first series of 42 hysterograms in women with a history of three or more abortions, and 63% in their second series of 333 hysterograms of women having 2 abortions. It must be noted that these percentages are for selected cases, and wide variation is in a large measure due to different criteria for selection used by various authors; for example, cases of incompetent os diagnosed clinically during pregnancy were not selected for hysterogram in our series, as compared to other authors. Moreover, the diagnostic criteria for abnormalities like hypoplasia of uterus, arcuate uterus and incompetent os can be extremely variable. The incidence of various anomalies is given in Table III.

Schonfeld *et al* (1967) reviewed the hysterograms of 98 women with 2 or more abortions, 86 of whom had no normal delivery before. They noticed normal uteri in 17 cases, hypoplasia in 18 cases, synaechae associated with hypoplasia in 4 patients and hypoplasia along with incompetent os in 7 cases. Five cases had infantile uterus and 12 cases had arcuate, septate and bicornuate uteri. There were 9 cases of uterine synaechiae and 12 of cervical incompetence.

Of the 44 cases of abnormalities in our series, vaginal and speculum examinations suspected abnormalities in only 9 cases. Three cases showed double cervix, 1 had a vaginal

TABLE III

Anomaly	Rozin (1965)	Palmar (1965) 1st series	Palmar (1965) 2nd series	Present series
Bifid uterus		7	64	16
Unicornuate uterus	25			5
Arcuate uterus				6
Hypoplastic uterus		7	39	5
Incompetent os		15	114	10
Uterine synaechiae	26		18	1
Submucous fibroid	27			1
Inflammation				
Other anomalies	10	11	13	—
Normal	112	7	85	65

septum, 4 cases were diagnosed as hypoplastic uteri and 1 had a cervical tear and incompetent cervix. This shows that clinical examination is not sufficient to diagnose these abnormalities.

Uterine Bifidity: There were 16 cases of uterine bifidity. Double uterus, uterus didelphys, bicornuate uterus etc. were included in this group. Two of the bifid uterii had associated congenital incompetence of the cervical os. Reiss has shown the high incidence of cervical incompetence associated with congenital uterine abnormalities and uterine hypoplasia. One case had uterine hypoplasia and bifidity associated. Figs. 4a and 4b show some of the hysterograms of uterine bifidity.

Hysterograms will usually show similar pictures for bicornuate uteri and septate uteri. For a precise diagnosis the external outline of the uterus must be obtained by gynaecography.

Unicornuate uterus: There were 5 cases of unicornuate uterus. There is the possibility of faulty diagnosis of unicornuate uterus in cases where the uterus has axially rotated and markedly deviated. The axially rotated uterus can be recognised by the presence of two fallopian tubes (Figs. 5a and 5b).

Mrs. D. was a patient with unicornuate uterus with history of 3 abortions. During the last pregnancy she complained of some pain in the abdomen and at another hospital this was diagnosed as ectopic pregnancy probably because of the soft bulge on one side. A laparotomy was reportedly done and the unicornuate uterus discovered. The patient aborted at that time. Following this, we did the hysterogram. During the pregnancy that followed, the patient was kept in bed practically throughout and given progesterone and Isoxsuprine (Duvadilan) emperically. She went into labour at 37 weeks but developed inco-ordinate uterine action and required caesarean section.

Hypoplastic uterus: There were 5 cases of hypoplastic uteri in this series. The altered corpo-cervical ratio and the small quantity of contrast media required to outline the uterus (not more than 2 ml.) helped to establish this diagnosis. Though a case of marked hypoplasia cannot be missed, the diagnosis of borderline cases is difficult. Menstrual history, obstetric history, clinical findings and measurement of utero-cervical length are essential aids to diagnosis. All the cases of hypoplasia in our series had histories of abortions in the first and second trimesters (none later than 5 months). However, repeated pregnancies may increase the size of the uterus and carry on the pregnancy for a longer duration.

Arcuate uterus: Five patients in our series had arcuate uteri. Although they had histories of habitual abortions, it cannot be attributed entirely to the arcuate uterus. Besides the extent of convexity in the uterine cavity that should classify it as arcuate cannot be exactly defined.

Incompetence of cervical os: In order to diagnose this abnormality it is essential to use a cannula that would help to delineate the cervical canal, as the anatomical defect lies at the junction of the uterus and cervix. The funneling at the internal os and the width of the cervical canal at that point are important diagnostic features. The ratio between the real width of the transverse bar of the Japanese cannula and its width on the hysterograph was calculated. Us-

ing this ratio, the width of the cervical canal on the x-ray was converted to obtain the real width of the cervical canal. It must be stressed that besides the hysterogram, the details of obstetric history, the clinical findings at the time of abortion or premature delivery, and the passage of Hegar's dilator No. 8 in the nonpregnant state, are important aids to diagnose incompetence of the cervix. After the diagnosis is reached it is extremely important to watch and detect in time the cervical dilatation that might take place in the next pregnancy. Causes of cervical incompetence have been discussed by Krishna *et al* (1968).

The association of congenital cervical incompetence with uterine bifidity has been mentioned earlier. Moreover, surgery to remove the septum in bifid uteri may also be responsible for development of incompetence of the cervix. Two of our cases with incompetence were cases who had undergone surgery to remove the septum. One was a case of sterility in whom the septum had been excised, but incompetence of the cervix had developed and therefore the patient had 2 consecutive premature deliveries. Hysterograms confirmed the diagnosis of cervical incompetence. During the pregnancy that followed this diagnosis, the patient was kept at complete bed rest from the 26th week onwards and carried almost to term. Another patient had been operated upon for uterine bifidity after 2 abortions. After the operation the patient aborted twice again and cervical incompetence was diagnosed by the aid of hysterograms.

Figure 6 shows a hysterogram of cervical incompetence.

Uterine synaechiae: The possibility of uterine synaechiae should be kept in mind while studying a hysterogram of a case with repeated abortions. Of 33 cases of uterine synaechiae reported by Sweeny, 29 gave a history of 2 or more abortions. The incidence of uterine synaechiae is extremely variable and detection depends on detailed scrutiny of the hysterogram. We had only one case where the irregularity at the fundus gave the impression of uterine synaechiae along with cervical incompetence. The differential diagnosis was uterine bifidity (Fig. 7).

Zondek and Rozin (1964) showed that uterine defects diagnosed as synaechiae could be due to functional spasm of the uterine muscle and can be abolished by injection of a local anaesthetic agent in the vicinity of the nerves reaching the uterus.

Submucous fibroid: We had only one case of submucous fibroid in our series, possibly because fibromyoma are usually diagnosed clinically and not referred for hysterosalpingography. Schonfeld *et al* (1967) also did not observe any case of fibroid in their series of 98 women with a history of 2 or more abortions.

Other abnormalities: There was one case of dilated fenestrated cervix (Fig. 8) which could be due to chronic cervicitis. Friedman *et al* (1968) have shown the relation of viral infection in the cervix to habitual abortions and sterility.

Treatment: Surgical correction of uterine bifidity by one of the suitable operations such as Straussman's (1952) Jones' (1953) or Tompkin's (1962) metroplasty with necessary modifications have been tried by various authors and impressive re-

sults have been reported as shown in Table IV.

TABLE IV

Year	Author	Pre-operative results No. of pregnancies	Pre-operative results % foetal salvage	Post-operative results No. of pregnancies	Post-operative results % foetal salvage
1952	Straussman	111	4	85	86
1959	Dunselman	494	13	235	86
1966	Straussman	53	2	34	85
1966	Thompson, et al	51	12	20	60
1968	Capraro, et al	34	21	11	82

Judicious selection of the case, proper haemostasis and avoidance of infections are very important for the success of such operations. The shape and size of the uterine cavity resulting from the operation is an important factor affecting the outcome of subsequent pregnancy. Adhesions and kinking or blockage of the tubes are associated risks and may even lead to sterility. When incompetence of the os is associated with bifidity, simple cervical circlage during pregnancy should be tried before resorting to surgical correction of the bifidity. Mrs. K. had bifidity associated with incompetence, and tightening of the cervix in the 22nd week of pregnancy helped to carry her till term.

Five cases in our series were operated for uterine bifidity, all of them elsewhere, with indifferent results. At the present stage, we are unable to opine on the results of operative treatment.

The treatment for incompetent os is either cervical circlage or when the os opens up after about 28 weeks, conservative treatment with bed rest. Six of our patients who conceived after hysterosalpingography had cervical circlage done on them and of them 5 had full term normal deliveries while the 6th is continuing her pregnancy. Two patients whose hysterograms similarly revealed incompetence, were prescribed conservative treatment, and of them, one had a full term normal delivery, while the other is continuing pregnancy.

Summary

1. Hysterosalpingography to detect uterine abnormalities is an essential investigation in cases of repeated foetal loss, after other causes have been excluded.

2. One hundred and nine cases with repeated foetal loss were studied, with the aid of hysterography in this series. 31% showed abnormalities of the genital tract.

3. The experience with the Japanese design of cannula and the vacuum type cannula is discussed. The merits of these cannula particularly in delineating the cervical canal are outlined.

4. The features of genital tract abnormalities, their effect on foetal outcome, and methods of treatment are discussed.

Acknowledgements

We thank the Dean of the K.E.M. Hospital and Seth G. S. Medical College for permitting us to present the hospital data. We are grateful to Dr.

R. P. Soonawalla for assidiously helping us in the use of the vacuum cannula of Malmstrom's design, as well as his own design. We are grateful to Dr. B. N. Purandare and to Dr. V. N. Purandare for the facilities and valuable guidance. We thank Dr. S. K. Sharma and Dr. Jaya Krishna for their help in this project.

References

1. Capraro Vincent J., Chuang Justin T. and Randall, C. L.: Obst. & Gynec. **31**: 97, 1968.
2. Dunselman, A. J.: Congenital malformation of uterus. Results of Straussman metroplastic operation. Boekdrukkerji, Helmond, The Netherlands, 1959.
3. Friedman, S., Gans, B., Eckerling, B. and Hoenig, H.: Viral infection as a cause of sterility—A preliminary communication. 6th World Congress on Fertility and Sterility, Tel Aviv, Israel, 1968, p. 203.
4. Herbrecht, I.: Gynaecologia, Basel, **131**: 1, 1951.
5. Jones, H. W. and Jones, G. E.: Am. J. Obst. & Gynec., **65**: 325, 1953.
6. Krishnan Jaya, Krishna Usha R. and Purandare, B. N.: J. Obst. & Gynec. India, **18**: 573, 1968.
7. Palmer, R., Pulsford J. and Josette Proust: Acta Obst. & Gynec. Scandinav. **44**: 126, 1965.
8. Rozin: Uterosalpingography in Gynaecology. Charles C. Thomas, Springfield, Illinois, 1965, p. 199.
9. Straussman, E. O.: Am. J. Obst. & Gynec. **64**: 25, 1952.
10. Schonfeld, V., Mares, J., Zvinger, A., Valenta, M.: Zentralbl. Gynak, **89**: 909, 1967. Quotation from Year Book of Gynec. & Obst. by Greenhill, 1968, p. 88.
11. Thompson, J. P., Smith, R. A. and Wlch, J. S.: Obst. & Gynec. **28**: 363, 1966.
12. Tompkins, P.: Surg. Clin. N. Am. **12**: 1049, 1962.
13. Zondek, B. and Rozin, S.: Am. J. Obst. & Gynec. **123**: 88, 1964.
14. Zambriskie, J. R.: Pregnancy and the malformed uterus. West J. Surg. Obst. Gynaec. **70**: 293, 1962. Quoted from J. Obst. & Gynec. Br. Cwlth. p. 728.

See Figs. on Art Paper IV-V-VI