Vaginoplasty

By Theresa Howard, R.N., H.B.A.

The congenital absence of a vagina was first described by Realdus Coumbus in 1572 (Word, 1951). According to Jackson (1965), absence of a vagina is due to a failure of Mullerian duct development. The Mullerian ducts are embryonic tubes from which the oviducts, uterus and vagina develop in the female; in the male, they atrophy. Embryonic failure is usually complete when fallopian tubes are poorly developed, the uterus is rudimentary or absent, and there is no vagina. With a partial anomaly, the Mullerian tubercle fails to grow down and unite with the "up" growing urogenital sinus (Jackson, 1965).

Diagnosis is usually made by primary amenorrhea (absence or suppression of menstruation) at age 15. Examination reveals the absence of a vagina, an imperforate hymen (a hymen without an opening) which causes haematocolpos (retained menstrual blood) or haematometra (monthly subjective symptoms of menses without blood flow).

Surgical correction of the absence of a vagina, or vaginoplasty, had its inception over 150 years ago (Cali and Pratt, 1968) when Dupuytren, in 1817, first reported an attempted surgical correction (Judin, 1927). Since that time, there have been many procedures performed, using many materials to surgically correct for the absence of a vagina.

Techniques of vaginoplasty

This submission will discuss some of the techniques used to form a vagina. It will focus on a description of a new technique performed previously in England and now in North America at the Ottawa Civic Hospital. Vaginoplasty includes techniques using intestinal tissue transplants, simple reconstruction, continuous pressure techniques, the use of free skin grafts, and the McIndoe-Read technique.

Intestinal transplants

In 1904, Baldwin used a length of lower ileum (5 inches). The midpoint of the ileum is pulled farthest down towards the pelvis and is isolated, with care taken to maintain blood supply and restore intestinal continuity. The ends of the loops are closed and the midpoint is pulled down to the perineum (the external region between the vulva and the anus) through a dissected space between the bladder and rectum. The lower, folded end of intestine is opened and sutured to perineal skin. The septum between the two halves of ileum is divided later. Complications which may arise include excessive, irritating mucoid discharge and dyspareunia (Jackson, 1965).

Another intestinal transplant procedure (Schmid, 1957 and Shirodkar, 1960) uses the sigmoid to form a vagina. This technique provides a good blood supply, adeqaute lubrication and little tendency to contracture. However, prolonged aftercare is required and surgery is extensive (Jackson, 1965).

Simple reconstruction

Williams (1964) described his simple vulvovaginoplasty using the inner sides of the labia majora to build up the perineum and form a "normal" size vagina. However, it was later stated by Dhall (1984) that, although the procedure is simple, quicker and requires no skin graft, a follow-up of couples reveals dissatisfaction because of ill-placed vaginal axis.

About the author

Theresa Howard, R.N., H.B.A., recently completed her Honours Degree in Psychology and Women's Studies at the University of Ottawa. She is a full-time operating room nurse in gynecology at the Ottawa Civic Hospital.

Continuous pressure techniques

Simple and persistent use of pressure and dilation composes the non-surgical method of Frank (1938). Solid tubes, 5/16 of an inch wide, are pressed into the hymenal region in a backward direction for half an hour, three times a day. When a definite pit is formed, the normal vaginal line becomes the direction of pressure for the dilators. When the canal reaches a length of 21/2 inches, larger dilators are employed. However, even with persistence, there is a tendency to contracture.

Free skin graft reconstruction

An artificial vaginal cavity, lined with a free skin graft, was first attempted by Heppner in 1872. It failed (Jackson, 1965). Other attempts included Graves in 1921 who used pedicle grafts from the labia minora and inner thigh; Kirschner and Wagner in 1930 who used a sponge-rubber mold with a Thiersch graft; Kanter and Wells, both in 1935, dissected a space and intermittently packed it; Israel in 1935 used a full thickness graft; Friedl-Meyer in 1935 used a Thiersch graft on a spiked-metal mold; Monod and Iselin in 1936 used a dental wax mold; Auvrax in 1934 used a rubber sponge covered with a hernial sac; and Lafargue and Rivere in 1937 used amniotic membranes.

McIndoe-Read Technique

The McIndoe-Read vaginoplasty, according to experts, is easy to perform, no reported mortality, low morbidity and a satisfactory result (Jackson, 1965).

A skin graft of sufficient size to cover a mold is taken from the inner thigh, or from the upper gluteal region if a thicker graft is required.

The perineal area is injected with xylocaine and epinephrine. A metal sound is placed in the urethra and the skin fold, formed with retraction on either side of the vaginal dimple, is divided. The vesicorectal space is then opened with sharp dissection. The cavity is opened manually to the pouch of Douglas (recto-uterine pouch) until it accommodates the mold without tension. After haemostasis is achieved, the mold, covered with the skin (raw surface outward) is inserted. The levator muscles and perineum are united to hold mold in (Jackson 1965).

A foley is left in and the patient is prophylactically covered with antibiotics. The mold remains in place for up to ten days, after which time it is removed under anaesthesia. The cavity is then cleansed and a hard mold is inserted. The procedure calls for the maintenance of the mold's position in the vagina for up to five months, after which daily dilation is necessary until sexual activity is instituted (Jackson, 1965).

Complications

As with any procedure, there can be complications. These complications are outlined by Jackson (1965):

1. Extrusion of the mold. The mold must be replaced at once if it extrudes within the first three to four months. Prolonged dilation is the single most important factor for a successful outcome.

2. Urinary infection. This can be avoided with antibiotic coverage.

3. Recto-vaginal fistula. Excessive pressure from an overly large mold, haematoma, or infection may cause necrosis and fistula.

4. Urethro-vaginal fistula. This, too, results from pressure necrosis.

5. Haemorrhage.

6. Vaginal granulations. Small areas of graft which do not survive will granulate and must be removed with diathermia or currettage.

Within a year, biopsy will confirm if the graft has developed the property of storing glycogen and closely resembles the vaginal mucosa (Jackson 1965).

In 1968, Cali and Pratt reported the long-term results of various vaginoplasty techniques. Up to this time, there were many individual and group reports, but the longest follow-up was only ten years. Their reported research, spanning 46 years, is still, to date, one of the most comprehensive (1968).

To briefly summarize their report, Cali and Pratt stated that, in America (Canada/United States) the McIndoe operation still remains the procedure of choice. An interesting statistic to be mentioned is

that 84 of 113 patients (74%) expressed satisfaction with function and made favourable comments on the results of the operation (Cali and Pratt, 1968).

Technical advances:
Molds:

The McIndoe-Read techique uses a Thiersch graft on a sponge mold; but other materials have been used as well. These include sponge-rubber covered with a condom (Counsellor and Flor, 1957) and a polythene bag filled with glass wool used by O'Connor in 1962 (Jackson, 1965). A summary of various types of molds is described in **Table 1.**

As discussed, these molds are covered with different materials including hernial sacs, split and full skin grafts and amnion.

A further step is the covering of a mold with a proven material with good results. Such a technique is using a sponge-rubber mold covered with amnion.

Amnion

Human amnion has been used since 1910 to promote tissue granulation in skin transplantation, for the treatment of burns and skin ulcers, vaginal reconstruction and the repair of conjunctival defects. Other applications include the use of amnio-plastin after craniotomy, for radical vulvectomies, and peritoneal replacement after pelvic exenteration.

Mammals lie in an amniotic sac that arises from extra-embryonic tissues. The chorion, forming the outer aspect of this sac, is in contact with the maternal cells without being rejected. The inner aspect consists of a predominantly single-celled layer of amnion epithelium and its underlying basement membrane and is bathed by fluid without actually contacting maternal tissue (Faulk et al., 1980).

Human fetal membranes for allograft are harvested from delivery rooms. Maternal blood, meconium and other contaminants are removed by sterile saline irrigation. Thereafter, the membranes are stored in normal saline, with or without antibiotics, at 4° C. Sterilization and storage of the membranes have been accomplished by many means including:

- Preservation in 1:40 solution sodium hypochloride produced no bacterial cultures untill 30 days (Dino in 1966);
- Normal saline with aequous penicillin 50,000 units and streptoxycin 1 gram in 400 ml. of saline with no growth in 30 days; and
- Normal saline with polymixin, ampicillin, gentaycin and amphotericin B at 4° C, remained sterile for two days (Trelford et al in 1973).

Before use, the amnion is separated from the antigenic chorion, and the uncontaminated mesenchymal surface is placed outwards on the mold. The membrane adheres firmly to the raw, newly created vaginal tunnel where it protects underlying granulation tissue and facilitates epithelization (Dhall, 1984).

Amnion in vaginoplasty

Morton (1986) reported the use of amnion in vaginoplasty in London, England from 1983 to 1985. The first reconstruction involved the use of amnion collected one to six days previously, and wrapped around a soft mold of sponge rubber covered by condoms. **(See Diagram A Next Page)**

A McIndoe-Read procedure was performed. The amnion, which was stripped from the chorion leaving only a small portion at one end as a marker to identify the proper surface, was thoroughly rinsed of its storage solution., applied to the mold and secured with suture. After haemostasis was achieved in the new cavity, the mold was inserted and the perineum closed to prevent extrusion. **(See diagram B)**

In seven days, the mold was removed under general anaesthesia. Because a certain amount of fluid had accumulated behind the mold, the cavity was irrigated. A new mold (of the same material) was introduced and the cavity again closed. In a further seven days, the same procedure was again performed. After the final mold was removed, patients were instructed in the use of a plastic vaginal dilator to be used three times daily for 15 minutes. Intercourse was allowed after two weeks.

Morton (1986) reported encouraging results. In the majority of cases, at the first mold change, the amnion formed a distinct layer applied to the vaginal wall. With the second mold, epithelization was virtually complete. Four weeks after the operation, the vaginal epithelium was a healthy pink and granulation uncommon. There were some complications: some bleeding, a rectal injury, labial inflammation, but these were overcome with treatment. In eight to ten weeks, the resulting epithelium was histologically identical to normal vaginal epithelium.

The ultimate result of vaginoplasty depends entirely on the motivation of the patient to carry out the post-operataive dilation. Vaginal contracture occurs both with amnion and skin grafts, if the canal is not properly maintained. However, Morton states that the degree of contracture is certainly not greater and possibly less severe than when a skin graft is used.

The technique of vaginoplasty as outlined by Morton was performed in England and utilized amnion wrapped around a mold of foam sponge inside rubber condoms. This technique had not been reported as performed in North America until March, 1985, when it was done at the Ottawa Civic Hospital by Dr. J.E.H. Spence and Dr. E. Hughes.

Present-day technology

For the McIndoe-Read operation, the OR is set up for an anterior/posterior repair. To this basic set-up is added an extra sterile draped prep table and set of basins where the amnion is cleaned and irrigated, the condoms rinsed and the sterile block of foam cut to the required size. The amnion, harvested within 24 hours of the booked procedure, is brought by the surgeon to the operating room in a sterile solution of saline with 50,000 units penicillin (stored a 4°C) where it is rinsed on the extra prep table. **(Cont'd)**

Table 1

Molds used in McIndoe-Read vaginoplasty

Author	Mold
Wells (1935)	Tightly packed vaseline gauze
Kanter (1935)	Idioform gauze followed by glass dilator
Warton (1938) and Owens (1942)	Balsa wood covered by a condom
McIndoe (1938)	Hollow vulcanite mold
Polycrates (1957)	Metal mold
Shears (1960)	Silver or stainless steel mold
Meigs (1960)	Pyrex glass mold
Stablers (1965)	Hollow "H" shaped dental mold
Salvador Castanand (1963)	1. Soft cylindrical polyethyline plastic bag covered with decron wool 2. Light plastic ethafoam 3. Foam rubber mold of desirable size

(From Khanna and Khanna, 1982)

Diagram A

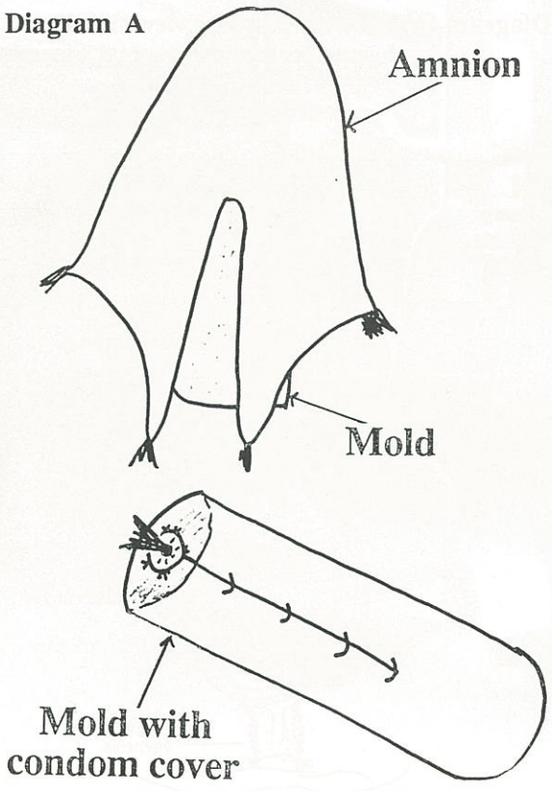


Diagram B Anterior-posterior view of vagina showing mold with amnion in place in vaginal sac

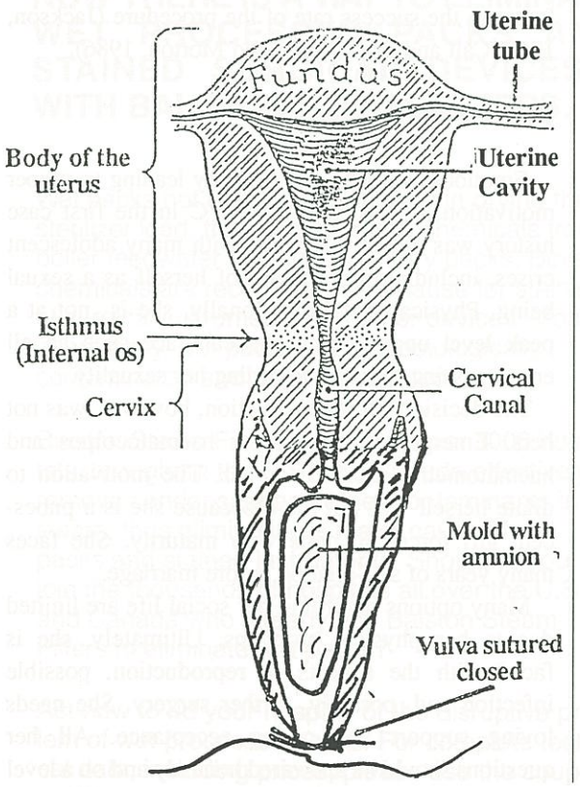


Diagram C[1]
Anterior-posterior view of normal vagina

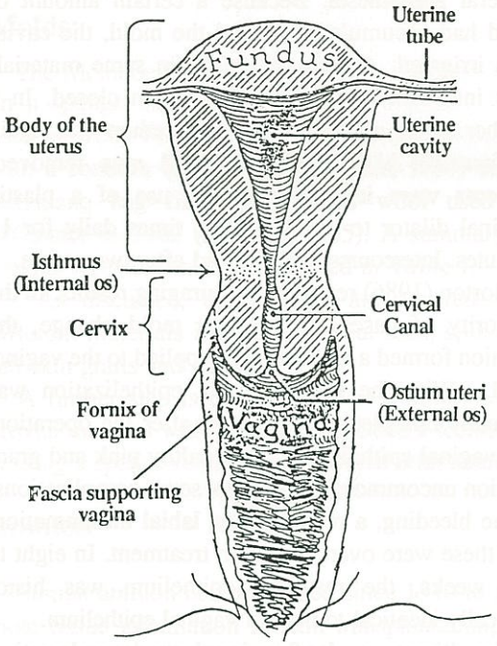
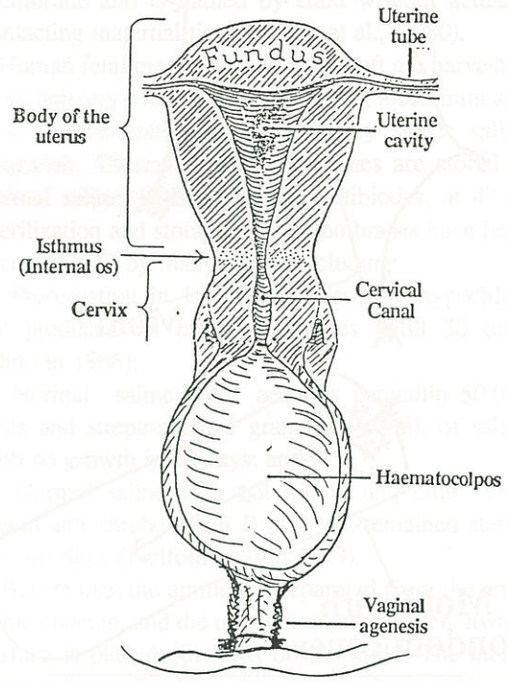


Diagram C[2] **Anterior-posterior view showing haematocolpos and vaginal agenesis**



For the later mold changes, a sterile intravenous tubing is added to the set-up so that a saline flush of the cavity can be accomplished. For all the procedures, a large block of sponge, approximately 30 cm. X 20 cm. X 3 cm., is sterilized previously and ready for use. Ordinary condoms are easily obtained for use. Throughout all procedures, nursing flexibility is necessary as each procedure is unique and dictated to by immediate needs.

Case histories

On the following page are described two case histories of vaginoplasty. These two cases, reportedly the first vaginoplasties using the McIndoe-Read technique and mold in North America, provide two ends of the continuum. The first case (Miss C) is a very young girl with normal uterus and ovaries, but with vaginal agenesis - failure of the vagina to grow or develop. **(See diagram C1 and C2).** Surgery was necessary and performed in a crisis situation.

The second case is a young woman with no uterus, ovaries or vagina. Her surgery was elective. With each, however, separate and individualized care plans are called for. In both cases, dilation is a daily procedure of paramount importance. When not performed, contractures develop quickly. Experts have stated that dilation is the single most important factor in the success rate of the procedure (Jackson, 1965; Cali and Pratt, 1968; and Morton, 1986).

Proper motivation

Emotional stability and maturity leading to proper motivation are necessary. Miss C in the first case history was and still is faced with many adolescent crises, including a definition of herself as a sexual being. Physically and emotionally, she is not at a peak level under which she can face such an all encompassing decision regarding her sexuality.

The decision for reconstruction, however, was not hers. Emergency surgery for haematocolpos and haematometris decided for her. The motivation to dilate herself was not there because she is a pubescent girl forced to cope with maturity. She faces many years of self-dilation before marriage.

Many options regarding her social life are limited due to her physical problems. Ultimately, she is faced with the aspects of reproduction, possible infection and, possibly, further surgery. She needs loving support and caring acceptance. All her questions should be answered honestly and on a level

Clinical Case Histories - Vaginoplasty

Case History 1

Twelve-year old Miss C came to the emergency Department in early 1985 complaining of abdominal pain and pelvic mass. Emergency surgery discovered the congenital absence of 5 cm. of lower vagina. When the upper vagina was entered, an haematocolpos (retained menstrual blood caused by an imperforate hymen) and haematometra (retention of menstrual blood in the vagina and uterus) were found. Penrose drains were used to evacuate the area.

Operation of choice

In five days she returned to the operating room and the drains were removed. There was a reasonable cavity created between bowel and bladder but it was decided that there could not be sufficient dissection to pull the upper vagina down through to the introitus (the exterior orifice of the vagina). Therefore, a McIndoe-Read procedure with amnion mold became the operation of choice.

Foam was cut to approximate measurements and covered with two washed condoms. The condom mold was securely closed with #2 silk. Amnion, harvested and stored as discussed elsewhere, was prepared by stripping the chorion (leaving the marker), spread on the mold and sutured with silk. She was discharged five days later with this mold intact.

In two weeks, she returned to the operating room where the vulvar sutures and the mold were removed. The vagina appeared shiny, clean and healthy. Amnion "tags" were removed. A fine brownish discharge at the suture line was noted. A medium mold was inserted and it was planned to send her home with a small plastic mold for dilation. A chronic ooze was being managed and menstruation was to be controlled with the pill. Three days later, she returned home. **See diagram D**

Two months later, when menstruation was allowed, Miss C had her period, but then developed abdominal pain. She was admitted with fever and this abdominal pain. From the history, it was discovered that home dilation had not been consistent, and stenosis (constriction) was diagnosed. Ultrasound showed a mass in the vagina and another behind the uterus - a pyocolpos (accumulation of pus).

Surgery drained the vaginal mass and a needle aspiration confirmed a residual haemoperitoneum. Two catheters were placed in situ for drainage. The chance of having a hysterectomy to prevent further complications was a viable option at this point.

In eight days, the catheters were removed. The vagina looked good and there was no visible necrosis in the upper area. The lower vagina was glistening and appeared almost normal. Miss C was discharged the next day with home care planned.

In a recheck at six months, Miss C stated that she was feeling a stenosis. Physical examination revealed an "hourglass" stenosis between the original and the new vagina. Again, in the operating room, a stenosis was found where the upper cavity had narrowed. Simple dilation stretched it slightly, proving its elasticity. Discharge from the hospital was within a week's time.

A further six month check, now in 1986, found Miss C well and having normal periods. Her vagina is good and has only a slight constriction.

Case History 2

At the age of 16, Miss R was diagnosed as having primary amenorrhea (delay of menarche). Further investigation found she had Rokitansky's syndrome (vaginal and mullerian agensis), and a single horseshoe kidney. Her secondary sex characteristics were normal, but she lacked a vaginal vestibular dimple. She was followed until 23-years of age, when she requested reconstruction as she was engaged to be married. The (nonsurgical) Frank method of dilation (continuous pressure technique) was recommended, but proved to be unsatisfatory. Consequently, a McIndoe-Read was performed.

In the operating room, a transverse incision was made at the posterior facet. With blunt dissection, a perineal space was created on either side of the upper midline raphe of the perineum which was thicker than usual. This (space) was taken "two finger" lengths to the peritoneal cavity. The sponge mold was secured this time with 3-0 vicryl. The area was closed over the mold. The foley was left in place for two days and prophylactic antibiotics and colace were administered postoperatively.

Successful outcome

After a week, in the operating room, the stitches and mold were removed. Following irrigation and removal of dead amnion tags, the vagina looked good to its full length. A new mold of the same design was inserted and sutured in with #1 vicryl, which was to remain for seven days. Miss R was discharged home after self-dilation was explained.

In one month, the vaginal cavity measured six centimetres; in three months it contracted to three centimetres; but in four months it had dilated to seven centimetres. Today, Miss R is married and enjoys normal sexual activity.

where information is easily processed and understood. It must be remembered that Miss C is an adolescent, albiet, a very mature one.

On the other side of the continuum is Miss R. The reconstructive surgery was elective for her and the decision was made at an age and stage in her life when consequences are optional and totally controlled. Reproduction is only a factor by its absence. Her concept of self is better defined by virtue of age. For her, sexuality is a choice.

Pre, intra and post-op nursing care involve the physical care of any patient undergoing an anterior and posterior repair. Psychologically, the nurse follows the patient's lead and answers all questions honestly. Both of these patients underwent the same procedure, but because of very different circumstances, their nursing care needs are unique.

Vaginoplasty is done for a variety of reasons. There are many techniques for vaginal reconstruction using one's own tissues, another's tissues or no tissues at all. Each has its own advantages. The McIndoe-Read procedure has proven to be the most effective with the fewest number of serious complications. The addition of a newer form of mold with a new type of allograft has been used in England with success and now has been performed at the Ottawa Civic Hospital.

References

1. Ashworth, M.F.; Morton, K.E.; Dewhurst, Sir John; Lilford, R.J.; Bates, R.G., "Vaginoplasty Using Amnion," Obstretics and Gynaecology, Vol. 67, No. 3, March, 1986; pp. 443-446

2. Cali, R.W.; Pratt, J.H., "Congenital Absence of the Vagina," American Journal of Obstetrics and Gynaecology, 1968, 100; pp. 752-763.

3. Counseller, V.S.; Flor, F.S., "Congenital Absence of the Vagina," Surgical Clinic of North America, 1957, 37; pp. 1107-1118.

4. Dhall, K., "Amnion Graft for Treatment of Congenital Absence of the Vagina," British Journal of Obstetrics and Gynaecology, March, 1984; Vol. 91, pp. 279-282.

5. Faulk, W.P.; Stevens, P.J.; Burgos, H.; Matthews, R.; Bennet, J.P.; Hsi, B., "Human Amnion as an Adjunct in Wound Healing," The Lancet, May 31, 1980; pp. 1156-1157.

6. Jackson, I, "The Artificial Vagina," Journal of Obstetrics and Gynaecology of the British Empire, 1965, 72; pp. 336-341.

7. Jeffcoate, I.N.A., "Advancement of the Upper Vagina in the Treatment of Haemotocolpos and Haematometra Caused by Vaginal Aplasia," The Journal of Obstetrics and Gynaecology of the British Commonwealth, November, 1969, Vol. 76, No. 11; pp. 961-968.

8. Judin, S., "Surgery, Gynaecology and Obstetrics," 1927, 44; P. 530, cited in Cali, R.W., Pratt, J.H., "Congenital Absence of the Vagina."

9. Khanna, S. and Khanna, N, "Congebital Absence of Vagina: An Analysis of 18 cases Corrected by the McIndoe Operation Using a Condom Mold," International Surgery, 1982, 67; pp. 345-346.

10. Morton, K.E., "Human Amnion in the Treatment of Vaginal Malfunction," British Journal of Obstetrics and Gynaecology, January, 1986, Vol. 93; pp. 50-54.

11. Williams, E.A., "Congenital Absence of the Vagina; A simple Operation for its Relief," The Journal of Obstetrics and Gynaecology of the British Commonwealth, August, 1964, Vol. LXXI, No. 4; pp. 511-512.

12. Word, B., Southern Medical Journal, Birmingham, Alabama, 44, 375. (Cited in Jackson, I., "The Artificial Vagina.").

Diagram D Anterior-posterior view showing haematocolpos draining