Horse shoe flap vaginoplasty—a new technique of vaginal reconstruction with labia minora flaps for primary vaginal agenesis

V. Purushothaman*

Apollo’s National Institute for Reconstructive Hand Surgery, Micro Surgery and Plastic Surgery, Apollo First Med Hospital, 154, P.H. Road, Chennai 600 010, India

Received 3 June 2004; accepted 19 April 2005

KEYWORDS
Horse shoe flap; Vaginal atresia; Vaginoplasty; Labia minora; Dilators

Summary  Reconstruction of the vagina has always been a formidable surgical challenge. A variety of procedures with varying degrees of success have been described, but none has proved to be the ideal method. We have done 15 vaginal reconstructions using labia minora flaps. In the first eight patients, we used two labia minora flaps and sutured them together to create a neovagina. In the last eight patients this new technique of vaginoplasty using horse shoe labia minora flap was used. The neovagina is dilated gradually for a period of 3 months and at the end of 3 months the patient has an adequate sized vagina. All were done for vaginal agenesis. Horse shoe flap vaginoplasty in Mayer, Rokitansky–Kuster–Hauser syndrome is a new technique. The entire hairless skin within the labia majora is used to create a neovagina. Both the labia minora along with the prepuceal skin of the clitoris is elevated as a single flap thereby increasing the dimension of the Neovagina and also augmenting the blood supply of the flap, making it more reliable and finally the design simplifies the technique of suturing the neovaginal tube.

© 2005 The British Association of Plastic Surgeons. Published by Elsevier Ltd. All rights reserved.

A woman born without a functioning vagina is deprived of both coitus and child bearing. She is deeply disturbed and doubts her feminity.

Vaginal agenesis is by no means rare and is a cause of primary amenorrhoea. Incidences vary from one out of 1500 to one out of 80 000. This entity may be a part of several other distinct syndromes. Congenital absence of the vagina is also called as Rokintansky-Kuster-Hauser syndrome. These patients have normal female karyotype and present at the age of the menarche or later because of primary amenorrhoea. They have a normal vulva with an absent vagina, or a vagina that is represented by a shallow dimple. The uterus and cervix are usually hypoplastic. The ovaries and their functions are normal; secondary sexual characters

* Part of this work using bilateral labia minora flaps for vaginal reconstruction in primary vaginal atresia was presented as a free paper in Annual Plastic Surgery Conference of India in 2000 at Agra, India.

* Address: AA 55, 2nd Street, Anna Nagar, Chennai 600 040, India. Tel.: +91 44 2621 3611.

E-mail address: v_purush20002000@yahoo.com.
are also normal. In about 10% of patients a functioning uterus and cervix, and an upper vaginal segment are present. These patients present with cyclical abdominal pain and increasing abdominal mass due to accumulation of menstrual products. Renal anomalies are seen in 34–49% and skeletal anomalies in 10–15%. They are sporadic in appearance and are not hereditary.

The normal vagina is a fibromuscular tube lined with stratified nonkeratinised squamous epithelium. It is inclined postero-superiorly. Its length is 7.5 cm along anterior wall and 9 cm along posterior wall. There are no glands in the mucous membrane and it is lubricated by mucus derived from cervical glands.

An ideal to vagina must be

(i) located at an appropriate place and directed postero-superiorly,
(ii) of adequate dimensions,
(iii) lined by elastile tissue either by full thickness skin or mucosa,
(iv) neither permanently moist nor malodours,
(v) hairless,
(vi) sensate at least at the introitus level and
(vii) constructed by a method that is simple, easily reproducible, single staged with least morbidity.

Though numerous techniques of vaginal reconstruction have been described, the ideal method is yet to be identified. Starting from gradual dilatation, wide varieties of techniques include:

(a) Abbe-McIndoe procedure,
(b) various fascio-cutaneous flap procedure including gluteal thigh flap,
(c) Gracilis myocutaneous flap,
(d) transpelvic rectus abdominis flap,
(e) ileocaecal and colocaecal reconstruction,
(f) free jejunal transfer,
(g) McIndoe like procedures using buccal mucosal graft, split skin graft from scalp or full thickness skin grafts from groin to reduce the donor morbidity.

The territory within the labia majora, i.e. the labia minora and adjoining tissues around the introitus has been rarely used in the past of vaginal reconstruction.

Williams in 1964 described vulvovaginoplasty. He used the tissues within the labia majora, but it was like a misdirected kangaroo’s pouch rather than a true vagina. In O’Brien’s vulvovaginoplasty, he uses the vulval tissue. He takes all the nonhairbearing skin within the labia majora in the shape of a ‘U’ shaped flap based anteriorly and creates a new vagina. This flap divides all the neurovascular input coming from the internal pudendal system.

Fascio-cutaneous flaps are common place in vaginal reconstruction. All the fascio-cutaneous flaps described earlier namely the

1. perineal artery axial flap of Hagerty,
2. the malaga flap by Giraldo, the Singapore flap of Wee and Joseph,
3. modified Singapore flap of Karl Podratz and Woods,
4. lotus petal flaps in vulvo-vaginal reconstruction of Niranjan, are raised from either the hairy skin of labia majora or lateral to it.

They all invariably distort the external appearance of the genitalia apart from leaving an obvious scar in the groin or in the gluteal fold or medial to it.

Labia minora are an excellent alternative to vaginal mucosa and it can offer a medium sized vaginal tube, which can be dilated over a period of
Figure 3  Case 1. Reconstruction: (A) pre-op, (B) horse-shoe flap design, (C) flap elevated, (D) flap tubed, (E) after reconstruction, (F) 6 months later, (G) appearance of introitus, (H) neo vagina admitting two fingers.
2–3 months by gradual dilatation. Similar technique using bilateral labia minora flaps and post-operative dilatation has been done and reported earlier by Flack et al. Our initial technique was similar to that, but in the later few years it was modified by the first author and it continues to give consistently good results (Fig. 1).

**Anatomy of labia minora**

The labia minora are two small cutaneous folds, devoid of fat. They measure roughly 4 cm in length and when unfolded can be as broad as 2 cm. They are joined posteriorly across the median plane by a fold of skin named the frenulum or fourchette. Anteriorly each labium minus divides into two, encircling the clitoris. The upper division passes above to meet its fellow to form the prepuce. Numerous sebaceous follicles are positioned on the opposed surfaces of the labia minora. The internal pudendal artery in females is smaller than in males, but its origin, course and branches are similar. The perineal artery branches from the internal pudendal near the anterior end of the pudendal canal. This divides into a small transverse branch and a long posterior labial branch. The transverse branch passes medially on the inferior surface of the superficial transverse perineal muscle to anastomose with the opposite vessel. After giving the transverse branch, the artery is called the posterior labial artery, it ascends towards the clitoris and gives off three named branches, the artery of the bulb (supplying the vestibular bulb and vagina) the deep artery of the clitoris (supplying corpus cavernosum), and the dorsal artery to the glans and prepuce of clitoris. All these branches intercommunicate as well as anastomose with its counter part across the midline forming a rich network of vascular channels in the shape of a horse-shoe (Fig. 2).

Apart from this anastomosis, anteriorly these branches anastomose with the perineal branch of the deep external artery (the anterior labial artery). The posterior labial branch of the perineal nerve, the inferior and large terminal branch of pudendal nerve supplies sensory branches to this region.

**Clinical experience**

We have done this new technique of horse-shoe flap vaginoplasty in the last eight patients. All had...
vaginal agenesis. The youngest was 16 years and the oldest 27 years. One patient was already married and two of them got married after 6 months. All of them used the dilator for 3 months. There were no significant complications in any of them, donor morbidity being least. The vulva appeared normal, introitus sensate and well lubricated probably due to sebaceous secretions. Few patients complained of abnormal appearance due to lack of labia minora folds (Fig. 5).

Discussion

Vaginal reconstruction for primary vaginal atresia has been a formidable surgical challenge. All previous methods of reconstructions with various local and distant flaps are always compared with the traditional, time honoured Abbe-McIndoe procedure. The problem with the Abbe-McIndoe procedure is the graft contracture, dryness and the need to use the stent for a longer time. Recently

Figure 5  Case 2. Reconstruction: (A) horse-shoe flap marked, (B) flap elevation and cavity created, (C) length of reconstructed tube (6.5 cm), (D) condom with sponge stent, (E) stent inside the neo vagina.
instead of split thickness skin grafts Ozgenel, has used buccal mucosal grafts to line the cavity thereby reducing the problem of dryness. But here again graft take is unpredictable and a soft stent has to be used continuously for 3 months at least during night times. The various fascio-cutaneous flaps namely

1. the perineal artery axial flap of Hagerty,
2. the malaga flap by Giraldo,
3. the Singapore flap of Wee and Joseph,
4. modified Singapore flap of Karl Podratz and Woods,
5. lotus petal flaps in vulvo-vaginal reconstruction of Niranjan, from either the hairy skin of labia majora or lateral to it.

They all invariably distort the external appearance of the genitalia apart from leaving an obvious scar in the groin or in the gluteal fold or medial to it. All myocutaneous (namely gracilis or rectus abdominis flaps) are either too bulky or involve a major complicated procedure. Various intestinal transfer are either pedicled or free tissue transfers. This again is a major procedure with lot of morbidity; in addition they have very copious mucous secretion which can be foul smelling and an embarrassment to the patient. The territory within the labia majora, the labia minora and adjoining tissues around the introitus, has been rarely used in the past of vaginal reconstruction.

Our neovagina uses this territory and is an ideal substitute. It is lined by similar epithelium, well lubricated and sensate at the introitus level. After 3 months it attains adequate dimensions and is fully functional. Three main disadvantages of this procedure are, (1) regular use of dilator for a period of 3 months to increase the dimensions of the cavity, (2) it cannot be used for cases, where the vagina has been excised as in malignancy and (3) absence of labia minora folds was noticed by few of the patients, otherwise this is a simple, easily reproducible procedure with least morbidity especially for vaginal agenesis patients.

References