Original Article

Neovaginoplasty using sigmoid colon flap technique

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Abstract

Background and objectives: Vaginoplasty is a procedure for the reconstruction of vaginal canal. Various surgical techniques have been described for vaginal reconstruction with variable success. The aim of this study was to assess the use of sigmoid colon in vaginal reconstruction of patients with disorders of sex development.

Methods: Eleven patients were included in this study from January 2009 to December 2016. All patients underwent karyotyping, pelvi-abdominal ultrasonography, endocrine and psychiatric assessment. Sigmoid neo-vaginoplasty was the procedure chosen for all the cases. Surgical and functional outcomes were assessed post-operatively over a period of 6 month to 6 years.

Results: The preoperative diagnosis included 9 cases of aplasia of the Mullerian ducts or Mayer-Rokitansky-Küster-Hauser syndrome (MRKH), 1 androgen insensitivity syndrome (AIS) and 1 pseudohermaphrodite case. The mean age of the study population was 22.5 years (range 15-30 yrs). No intra-operative or early postoperative complications occurred. The mean vaginal length achieved was 13.0 cm (range 10.5 – 15 cm). Long term follow-up showed introital stenosis in 2 cases (17%) which resolved well to vaginal dilatation. One patient had pelvic abscess and treated by surgery. Sexual satisfaction was achieved in 10 cases, as 1 case was unmarried.

Conclusion: For patients with disorders of sex development of various etiologies, sigmoid vaginoplasty is the preferred technique for vaginal reconstruction. It is a safe technique and provides the patient with a cosmetic neovagina of adequate caliber with satisfactory functional outcome.

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Introduction

Vaginoplasty is a procedure for the reconstruction of vaginal canal and the vulva that can be performed in various clinical situations. Though a rare procedure, the commonest indication is the congenital absence of the vagina, which occurs as a result of aplasia of the Mullerian ducts (46, XX) or Mayer-Rokitansky -Küster-Hauser syndrome (MRKH). Second indication is disorders of sex development (DSD). A large number of medical conditions involving the reproductive system fall under DSD, which is used as an umbrella term for these anomalies. The most common DSD is congenital adrenal hyperplasia (CAH) followed by androgen insensitivity syndrome (AIS, 46, XY) [1]. Genetic sexual ambiguity and vaginal loss resulting from gynecologic cancer or post traumatic injury are other two indications for neo-vaginoplasty [2]. The ovaries, given their separate embryologic source, are normal in structure and function. Reported incidences of congenital absence of the vagina vary from 1 in 4,000 to 5,000 female births [2,3].

Several surgical techniques are described for vaginal reconstruction. These are chronic dilatation of the

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shallow vaginal introitus (pressure tube technique), Frank's or Vecchietti method of skin graft vaginoplasty (Mclndoe procedure), Davydov's method of reconstruction with peritoneum and use of various skin flaps. None of these procedures are entirely satisfactory, as they may lead to neovaginal stenosis, inadequate length, poor lubrication, or all three. Baldwin was the first one to describe the use of intestinal segment for vaginoplasty in 1904 [4]. Based on this principle, Wallace was able to use the sigmoid colon successfully in 1911 [5]. Later on, this procedure was discontinued due to its high morbidity rate [6]. In the last few decades, the use of bowel segment for vaginoplasty was reviewed including laparoscopic approach after the reported high complication rate of other methods of vaginal reconstruction [7].

The three basic tenets of vaginoplasty are: (a) creation of space between urethra and urinary bladder anteriorly anus and rectum posteriorly, (b) providing this space with a durable lining and (c) maintaining the dimensions and integrity of the newly created vagina.

The advantages of using a bowel segment in contrast to other methods of vaginoplasty are: 1) no graft failure or secondary contracture/stenosis because a vascularized epithelial-lined tube is used, 2) patency and depth can be maintained without a mold and with minimal dilatation, 3) spontaneous mucus production matches that of the normal vagina and facilitates sexual intercourse, 4) dyspareunia, frequently seen with skin grafts, is avoided by the ability of the intestinal segment to withstand local trauma, 5) the use of an intestinal segment offers the option of performing a bowel interposition vaginoplasty during infancy at the time of surgical correction of more complex associated caudal anomalies and 6) avoids the disadvantage of sweating, maceration, hair growth and foul smell associated with skin flaps. The sigmoid colon is the best choice for interposition vaginoplasty because of size, location, and ease of preserving blood supply [8]. In this series, we evaluated the use of sigmoid colon for vaginal replacement among patients with MKRH and DSD.

Methods

Study population and baseline investigations: The current study included 11 patients from January 2009 to December 2016. All were reared as females. Complete hormonal assessment was done. Sigmoid neo-vaginoplasty was the procedure chosen for all the cases. Surgical and functional outcomes were assessed postoperatively. All patients were subjected to history taking and physical examination. All patients underwent karyotyping, pelvi-abdominal ultrasonography, endocrine and psychiatric assessment. Informed written consent was obtained from all patients or their guardians. None of the patients underwent mechanical and/or antibiotic bowel preparation prior to surgery.

Surgical technique: Under general anesthesia and in an extended lithotomy position, a Pfannestiel incision was made to select, mobilize and isolate a segment of 12-15 cm of the distal sigmoid colon on its vascular pedicle, the superior hemorrhoidal artery (Fig. 1a, 1b and 1c). The remaining portion of colon was re-anastomosed (Fig. 1a). A space between rectum and bladder at the site of vaginal dimple was created using progressively larger Hegar dilators. The cul-de-sac was opened over a Hegar dilator pushed through the perineal route. The isolated colonic segment was closed by 2 layers at its proximal end. The distal end was pulled thorough the abdomino-perineal pouch to the perineum where it was sutured to vulvar mucosa (Fig. 1d). The peritoneum was closed above the transposed bowel and the neovagina. Post-operatively, all patients underwent vaginal dilatation program in the form of self-dilatation until the patient became sexually active. Follow-up was done for 6 months to 6 years. Physical examination was performed to assess the vaginal length and width, cosmetic appearance of the neovagina and occurrence of any complications. The grade of satisfaction of the surgical outcome was estimated by a subjective satisfaction score (range from 0 = very disappointed to 10 = satisfied) [8]. All cases were interviewed by the gynecologists to assess the functional outcome among the sexually active patients.

Results

Total patients were 11 with a mean age of 22.5 years (range 15 to 30 years). All were reared as females. They sought medical attention due to primary amenorrhea. No sexual ambiguity was found on physical examination, except in one patient who was male pseudohermaphrodite.

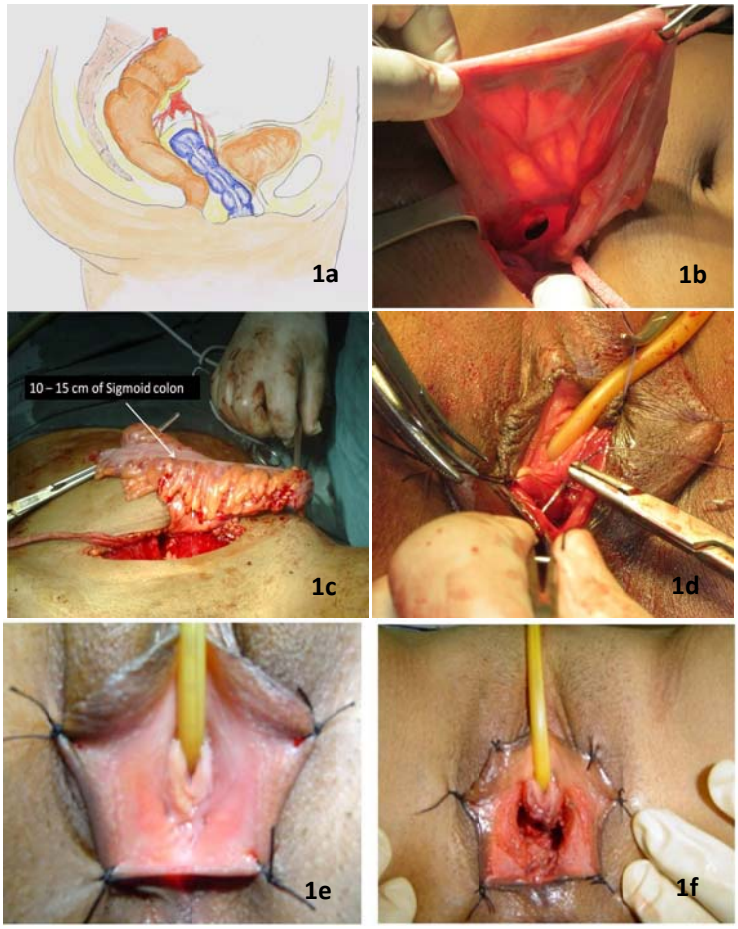

Fig.1: *Photograph showing steps neovaginoplasty using sigmoid colon flap technique. 1a: Schematic representation of reconstructed vagina isolating a 12-15 cm segment of the distal sigmoid colon keeping the superior hemorrhoidal artery; 1b: Mobilized segment of distal sigmoid colon on its vascular pedicle - superior hemorrhoidal artery; 1c: Isolated segment of sigmoid colon; 1d: Suturing of sigmoid colon to vulvar mucosa; 1e and 1f: Appearance of vagina before and after the neovaginoplasty.*

Pre-operative evaluation revealed 9 cases of Mullerian aplasia (MKRH), one case of AIS and one case of male pseudohermaphrodite. In ten cases karyotype was 46, XX and one case had 46, XY (Table-1). According to the age and sex matched reference values, follicular stimulating hormone, luteinizing hormone and estradiol were within the normal limits in all eleven cases [9]. On ultrasonography, rudimentary or absent uterus was found in 10 cases and a developed uterus was seen in the case with AIS (Table-1).

All cases underwent sigmoid vaginoplasty. The mean operative time was 3 hours. No bowel preparation was done. No intra-operative complications occurred and the post-operative period was uneventful. The patients were discharged from the hospital within 6 – 8 days. The mean vaginal length was 13.0 cm (range 10.5 – 15 cm). Excessive vaginal discharge, although present, was not found to be a major complain amongst patients of our series. However, it ceased markedly within the next 1 – 3 months. One patient developed fungal infection of the vagina that was treated with oral and topical antifungal drugs.One patient presented with acute abdomen secondary to pelvic abscess which was managed surgically.

Long term follow-up showed introital stenosis in 2 cases (17%) but both resolved well after vaginal dilatation. Sexual satisfaction was achieved in 10 cases as onepatient was unmarried. During follow up, the neovagina was found to have an excellent cosmetic appearance (Fig. 1e and 1f).

Table-1: *Baseline clinical status of the study population (n=11)*

Clinical status	Number of case
Diagnosis	
a. MKRH	9
b. AIS	1
c. Male pseudohermaphrodite	1
Uterus	
a. Rudimentary/Absent uterus	10
b. Developed uterus	1
Karyotype	
a. 46,XX	10
b. 46,XY	1

Note: *MRKH=Mayer-Rokitansky-Küster-Hauser syndrome AIS=androgen insensitivity syndrome*

Discussion

Congenital absence of the vagina is most commonly caused by Muillerian aplasia, and is frequently called by the eponym Mayer-Rokitansky-Küster-Hauser syndrome (MRKH). Mullerian aplasia is usually accompanied by a rudimentary uterus in the form of bilateral and non-canaliculated muscular buds, normal tubes and ovaries, normal female secondary sex characteristics, and otherwise normal endocrine and cytogenic features. The differential diagnosis of absence of the vagina in an otherwise normal appearing female includes partial absence of the vagina (usually the lower third) and testicular feminization, or the AIS. The latter may be diagnosed during infancy due to the high incidence of bilateral inguinal hernias. The vagina in these patients will be abnormally shallow or absent all together.

Previous including our experiences have shown that the sigmoid colon serves as an extraordinarily effective substitute for the vaginal canal. Obtaining adequate length is no problem, and there is no tendency toward contraction, narrowing, or stenosis provided that the bowel segment has an adequate blood supply, and that the anastomosis to the hymenal region is generous. Wearing a stent is unnecessary and dilatations, if needed at all, are temporary, infrequent (we recommend once weekly), and well tolerated. The thick wall of the colon tolerates trauma with less reaction and bleeding than does small bowel or split-thickness skin graft. Bleeding may be intermittent or bothersome during the first month or two, but thereafter rarely occurs. Though mentioned in various literatures, initial exuberant mucus production by the sigmoid neovagina generally has not been observed and did not present as a problem in our series. The mucosa atrophies to a mild degree in its new position. Moreover, mucus production is sufficient to keep the neovagina moist and lubrication before intercourse is unnecessary.

The sigmoid colon is the best choice for interposition vaginoplasty because of size, location, and ease of preserving blood supply. Minimal long-term care is required, although surveillance must be maintained at regular intervals (every 6 months) to monitor the development of adenocarcinoma in the transplanted bowel segment.

Our study revealed that sigmoid neovaginoplasty can provide the patient with a self-lubricating, aesthetically pleasing neovagina of adequate size without the need for daily vaginal dilatation or vaginal stenting with vaginal molds. It has an excellent functional outcome with low complication rate and a less incidence of introital stenosis.

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Author's contributions

MRI was involved in diagnosis, treatment, follow-up of patients, manuscript writing and overall supervision. AKD, FBI were involved in patient selection, diagnosis and management. RA, MAI and MUA were involved in literature review and data analysis.

Competing interest

Authors declare no conflict of interest.

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