



Vaginal switch—a useful technical alternative to vaginal replacement for select cases of cloaca and urogenital sinus

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Received 7 November 2012; accepted 12 November 2012

Key words:

Cloaca;
Vaginal reconstruction;
Vaginal switch maneuver;
Vaginal replacement

Abstract

Aim: The aim of this study was to describe the indications, technical details, and complications of a surgical maneuver designed to repair the vagina in select cases of cloaca and urogenital sinus.

Methods: A vaginal switch maneuver (VSM) is applicable when patients have two high large hemivaginas, and the distance between both hemiuteri is longer than the longitudinal length of the vaginas. It consists of resecting one hemiuterus and the vaginal septum, tubularizing both hemivaginas to create a single one, and switching down the vaginal dome of the side of the resected hemiuterus. Sixty patients who underwent this procedure were reviewed.

Results: Mean common channel length was 5.2 cm. Complications occurred in twenty-six (43%) and included: acquired vaginal atresia that later required a vaginal replacement (n=11), introital stricture (n=6), incidental oophorectomy owing to damaged blood supply (n=4), vaginal-urethral fistula (n=3), partial vaginal dehiscence (n=1), and partial vaginal mucosal prolapse (n=1). In four cases VSM was unsuccessfully attempted owing to ischemia, and a partial vaginal replacement was performed. Forty-five patients (75%) were able to keep their native vaginal tissue as a vagina. Thirty patients are older than 12 years of age, and eight are menstruating.

Conclusion: The vaginal switch maneuver is a useful alternative to vaginal replacement. In spite of the morbidity, it is valuable because of the inherent advantages of preserving native vaginal tissue.

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Cloacas with a common channel length of <3 cm can be repaired with a posterior sagittal approach and a maneuver called Total Urogenital Mobilization [1]. Further vaginal reconstruction is required in patients with cloacas with common channels >3 cm².

According to our decision-making algorithm [2], when total urogenital mobilization is not enough for the vagina to

reach the perineum, a trans-abdominal extended total urogenital mobilization is required, followed by carving of the pubic bone to shorten the distance between the pelvis and the new introitus. If at that point the vagina still does not reach the perineum then a complete separation of the vagina from the urinary tract is required. This represents the most technically demanding and sophisticated step of a cloacal repair and still may not be enough for the vagina to reach the perineum. In such cases, reconstructive options could include a vaginal replacement with bowel, or a vaginal switch maneuver (VSM) if the child's anatomy allows.

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The VSM may be applicable in specific cases of cloaca and urogenital sinus when patients have two large hemivaginas, located very high in the pelvis, and the transverse distance between both hemiuteri is longer than the longitudinal length of the vaginas (Fig. 1). The maneuver consists in resecting one hemiuterus and switching the dome of that hemivagina down to the perineum (Fig. 2), preserving the blood supply to the ovary. The vaginal septum is resected and both hemivaginas are then tubularized as a single unit (Fig. 3).

The aim of this study was to describe the indications, technical details, and complications of this surgical maneuver.

1. Methods

We reviewed the medical records of 60 children (58 cloacas and 2 urogenital sinus) in which the vaginal switch maneuver was utilized, spanning 1989 to 2011. The review included the occurrence of operative or post-operative complications, the need for reoperation, and follow up.

IRB approval was obtained for this study (# 2010–0836).

2. Results

The senior author's personal series includes 568 cases of cloaca of which 210 had a common channel length >3 cm,

and the vaginal switch maneuver was used in 58 patients (10.2%). The maneuver was also used in two cases that had a urogenital sinus with a normal rectum. The average common channel length in children that were reconstructed using the VSM was 5.2 cm. VSM was used during the primary repair in 51 children and as a reoperation following failed repairs at other institutions in 9.

Right hemiuterus resection with a right vaginal dome switch was performed in 40, while the left side was switched down in 19. There was no information concerning the side in one child. This was an arbitrary decision in 51 cases. However in the others it was influenced by the presence of an obstructed unilateral Mullerian structure ($n=4$); atrophic or hypotrophic Mullerian structures ($n=2$), and a damaged or absent hemiuterus (owing to a previous hysterostomy done in an attempt to drain a hydrocolpos) ($n=2$), and to protect a single ureter ($n=1$).

Post-operatively 26 (43%) children suffered from a complication, including: acquired vaginal atresia that later required a vaginal replacement ($n=11$), vaginal opening stricture that required an introitoplasty ($n=6$), incidental oophorectomy owing to damaged ovarian blood supply which occurred during the resection of a hemiuterus ($n=4$), vaginal-urethral fistula ($n=3$), partial vaginal dehiscence that required perineal resuturing ($n=1$), and partial vaginal mucosal prolapse that required surgical resection ($n=1$). In 4 cases VSM was attempted but was unsuccessful owing to ischemia of the switched vagina, and these children required a partial vaginal replacement.

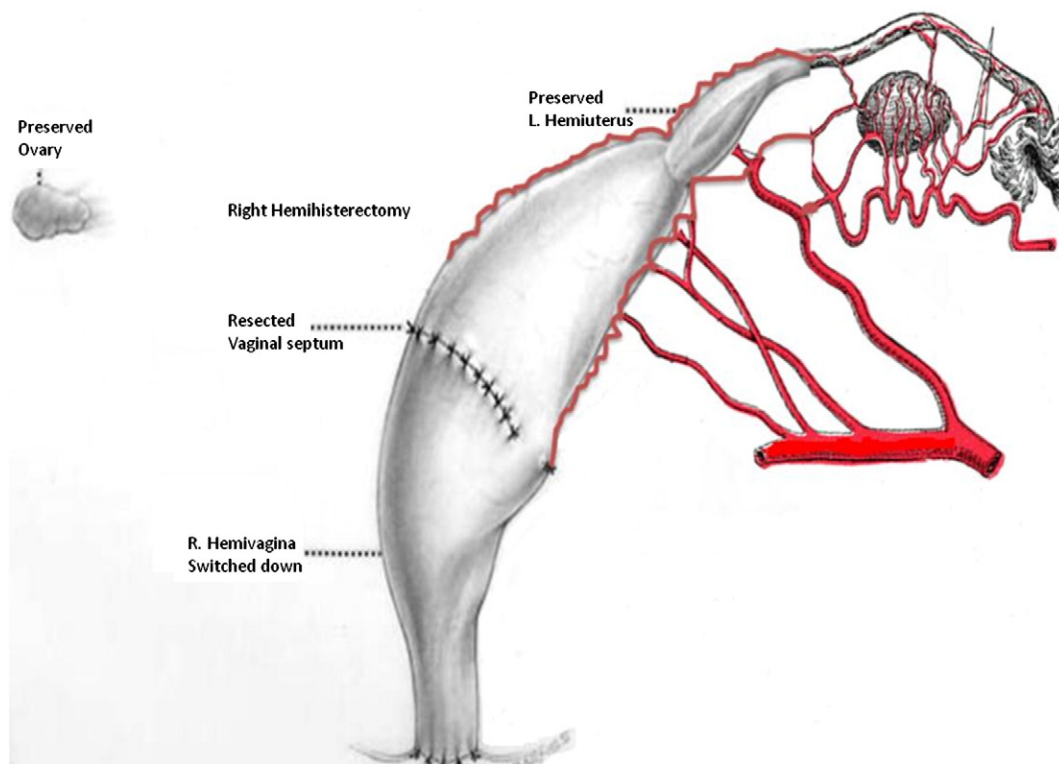


Fig. 1 Anatomy required to use the vaginal switch maneuver.

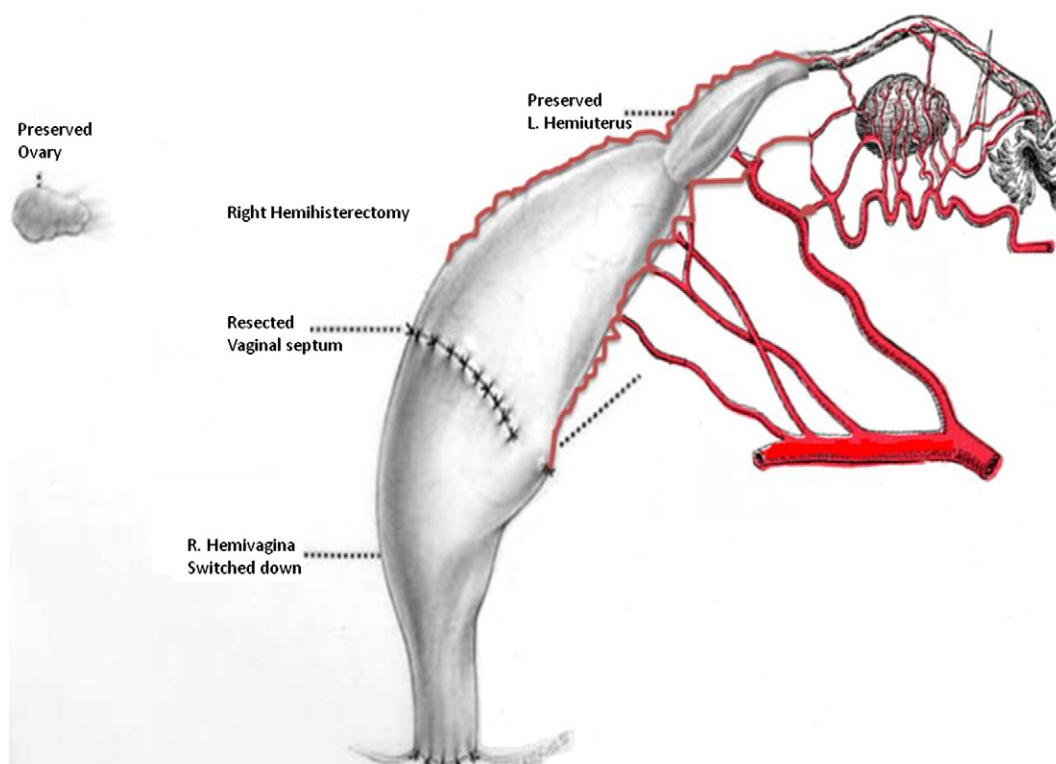


Fig. 2 End result of the vaginal switch maneuver after the resection of one hemiuterus.

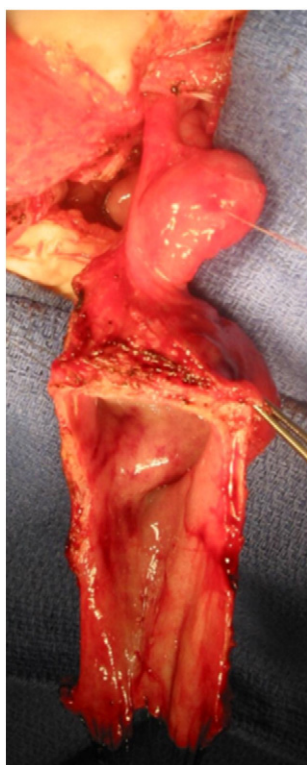


Fig. 3 Picture of a case of vaginal switch, with the vagina ready to be tubularized.

On follow up, 45 (75%) children have native vaginal tissue ultimately utilized as a vagina, 11 have required vaginal replacement (n=6 with rectum, n=4 with small bowel, and n=1 with colon). The final status of the vagina is unknown in four patients as they are waiting for reoperation.

Thirty patients that are >12 years of age, and of these 8 are menstruating and 3 are incapable of menses (hysterectomy n=2, bilateral oophorectomy n=1). There was no information in the medical charts regarding the status of menstruation in the other 19 patients.

3. Discussion

Cloacas with common channels >3 cm represent a serious surgical challenge and frequently require a partial or a total vaginal replacement with bowel (rectum, colon or small bowel) for vaginal reconstruction [2].

However there is no perfect way to replace the vagina. Total or partial vaginal replacement with bowel has been used for a long time and its disadvantages include a malignant potential [3,4], failure of neo-vaginal growth constructed during infancy due to lack of a hormonal response during puberty, neo-vaginal prolapse [5,6], diversion colitis [5–7], ulcerative colitis in the neo-vagina [8], and excessive mucous production [5,6]. Skin flaps

have also been used however the main disadvantages include lack of elasticity, fibrosis and the lack of lubrication [5,9,10].

Therefore, we believe that every effort should be made to use the child's own vagina. The VSM is a technique which can be used to reach that goal. We acknowledge that our experience has shown a significant number of complications, but we believe that as a consequence we have also learned ways to avoid them.

The most serious type of complication was acquired atresia or stricture of the introitus. Both, we believe, were a consequence of poor blood supply of the vaginal tissue that was pulled down and during the operation there was usually some concern about the duskiness, congestion, or lack of bleeding of the vaginal tissue. At that point the alternative would be to perform partial vaginal substitution. We have now realized that the vaginal intramural blood supply is very delicate and is less robust than that of the rectal intramural blood supply. Our experience with the rectal pull-through has taught us that, provided the rectal wall was preserved intact, the intramural blood supply is enough to supply the distal portion of the rectum and even when the rectum looks a little dusky during the operation it does survive well in the long-term. This rule is less applicable to the vagina and in future we feel that we should be more liberal about the use of a partial vaginal replacement, in order to avoid necrosis and dehiscence that affects the most distal portion of the vagina. The blood supply of the proximal vaginal portion and preserved hemiuterus was almost always good. In fact, this allowed us to re-operate on some patients and perform partial distal vaginal replacement, preserving the original proximal portion of the native vagina.

We also learned, early in our series, to be extremely careful during the resection of the selected hemiuterus in order to prevent damage to the ovarian blood supply as occurred in four of our patients. Fig. 1 illustrates this intimate relationship of the uterine and ovarian blood supply in the Mullerian structures (Fallopian tubes and hemiuterus) and, in order to prevent ovarian damage, resection of the Mullerian

structures must be performed as close as possible to those structures and away from the ovary.

Vaginal urethral fistula happened in three children although in one of them it was a very tiny communication that did not require surgical repair. This too can also be explained by a poor blood supply combined with apposition of the suture lines from the posterior urethra and the anterior vaginal wall and is also a preventable complication with appropriate care.

VSM is a useful alternative to vaginal replacement when there are specific anatomic features present. Even though surgical morbidity may be high, we believe that it is worth trying because of the inherent advantages of having normal vaginal tissue that will respond to hormonal stimulus during puberty.

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