



Autologous Oral Mucosal Mesh Graft for Vaginoplasty: Seven Tips in the Techniques

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Abstract

The demand for sexual life makes vaginoplasty a crucial need for patients who had complete vagina agenesis. We present our experience on vaginoplasty by using a maximum amount of meshing oral mucosal grafts in a case series study on 43 patients. The patients were followed up for an average of 19 months, ranging from 6 months to 4 years. No serious complications were reported. The patients gained good results also at neovagina and donor sites. These results were proved on clinical, endoscopy images, and biopsies. We recommend seven tips in the techniques to be used to achieve these significant results.

Keywords Vaginal agenesis · Vaginoplasty · Oral mucosal grafts · Mesh grafts

Introduction

The absence of a vagina in complete vaginal agenesis patients impacts their sex life; therefore, the need for vaginoplasty is essential. There are different methods to reconstruct a vagina using different material for lining the neovagina, and they expose different advantages and disadvantages. The vaginoplasty using oral mucosa was first proposed by Lin et al. and Yeşim et al. in 2003 [1, 2]. The main pitfall of this technique is the limitation of the mucosal amount. To overcome this shortage, the technique was modified by different ways to use the mucosal grafts [2–4]. Nevertheless, using the

maximum amount of oral mucosa has not been mentioned. During January 2014 and June 2021, 43 complete vaginal agenesis patients including 36 patients with Mayer-Rokitansky-Küster-Hauser syndrome and 7 patients with androgen insensitivity syndrome underwent vaginoplasty surgery with maximum amount of mesh oral mucosal grafts. In this article, we aim to share our experiences and key points to achieve optimal results by using this method.

Surgical Technique

The patients were administered general anesthesia with endotracheal intubation inserted through the nose during the surgery. A team of surgeons made an inverted T incision with a horizontal line across the position of the vaginal vestibule. There are obvious traces at the vaginal vestibule, which is about 1–2 cm hole or hollow mark, pale pink, thinner than the surrounding area skin (Fig. 1a). The right way for dissection is a fibrous band that could be seen in preoperative MRI (Fig. 1b). Blunt scissors were used to dissect with the first length of 1 cm, and then the surgeons used a finger to finish it up and back with a length of about 8–10 cm and a width of about 3 cm. To avoid bladder and rectum injury, the dissection always oriented parallel to the Foley's catheter which was inserted to the urethral towards the Foley's balloon. Another team harvested the oral mucosa. A strip of mucosa and submucosal tissues was taken from the upper lip and cheek that was approximately 5 mm above the Stensen's duct with a

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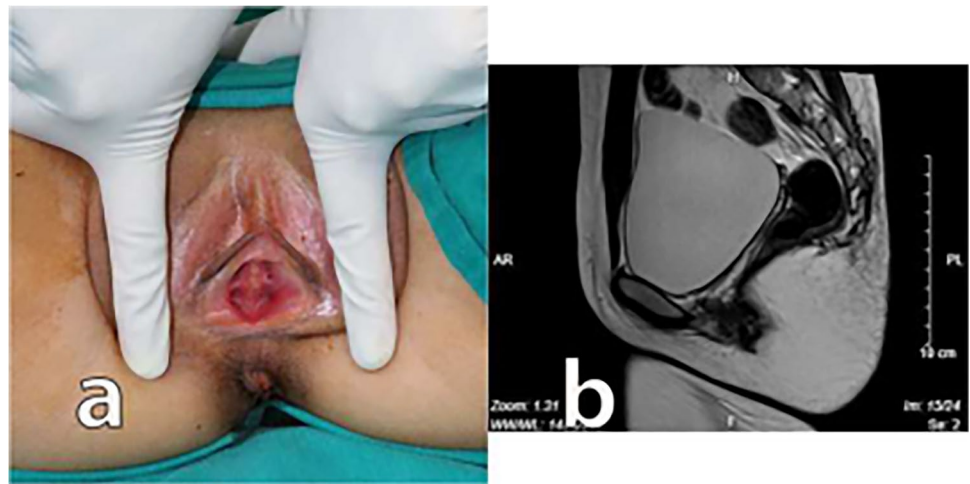
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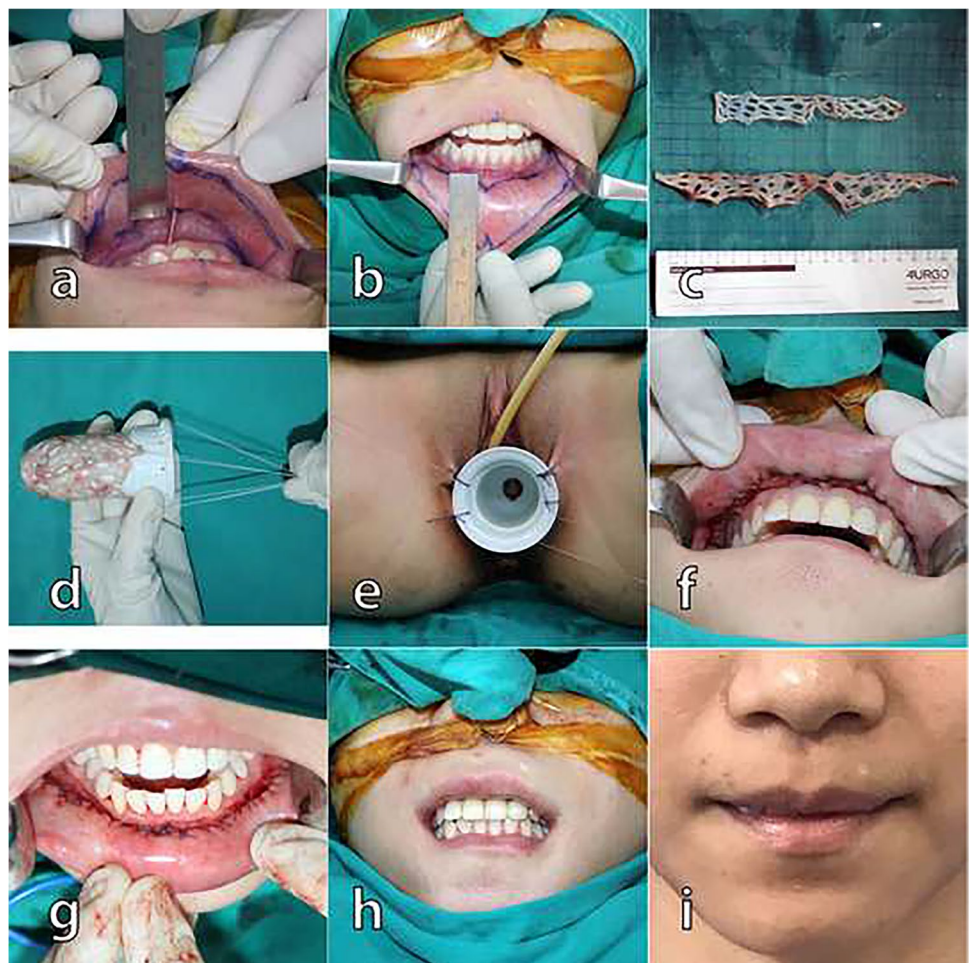
Fig. 1 **a.** A 21 years old lady with Mayer Rokitansky Küster Hauser syndrome presented vaginal agenesis. **b.** Uterovaginal hypoplasia was observed on MRI



length of 12–15 cm and a width of 1.5–2 cm. A similar graft was obtained from the lower lip and cheek that is about 5 mm below the Stensen’s duct (Fig. 2a,b,c). The limit of the incision for harvesting oral mucosal grafts is at least 5 mm from the vermilion border and at least 5 mm from the oral vestibule. A

knife (number 15) was used to harvest the graft. The donor site was closed directly (Fig. 2f,g). The graft, once harvested, was dissected to remove the submucosal tissue and then meshed. Each strip of the mucosal graft was divided into two segments with a length of approximately 6–8 cm. The strips of grafts

Fig. 2 **a, b.** The mucosal grafts in the upper lip, lower lip and buccal were harvested on both sides. **c.** Oral mucosa meshed. **d.** Oral mucosa meshed covered the vaginal dilator. **e.** Vaginal dilator covered by oral mucosa meshed was inserted and fixed in the neovaginal cavity. **f, g.** Direct closure was performed at the donor site. **h.** Lip contour was slightly deformed after mucosal harvesting. **i.** Lip contour was normal after one month



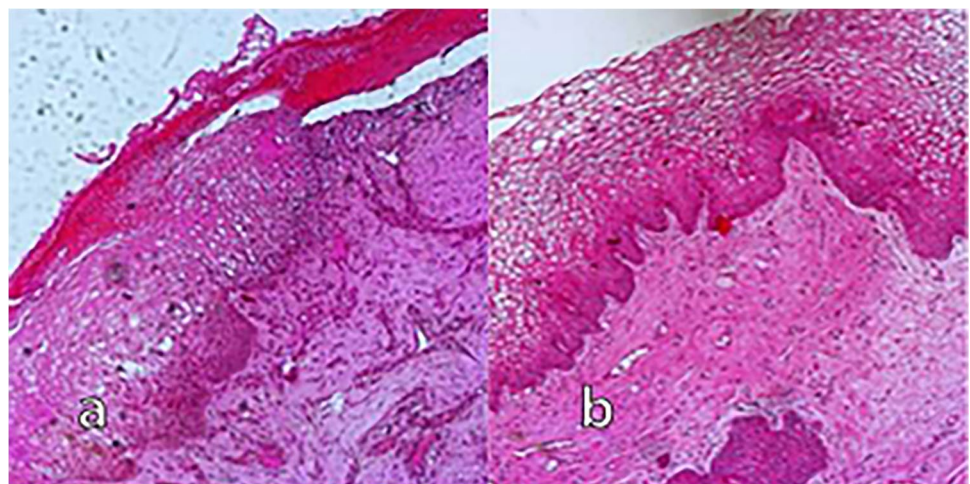
were placed upside down on a dilator with a hole in the top. To ensure that the mucosal piece did not roll up and for the mucosal graft to spread evenly over the entire dilator surface, vicryl rapide 5.0 sutures were used to stretch the graft edges horizontally. Finally, 4–6 vicryl 4.0 stitches were used to pull the ends of the mucosal strips to stretch their length on the dilator while inserting the dilator into the neovaginal cavity (Fig. 2d). The following step, a nylon 3.0 sutures were used to fix the dilator to the labia majora skin (Fig. 2e). We finished the process by using betadine gauze to stuff the inside of the dilator to absorb fluid, and using compression tape to fix the outside. Postoperative care was implemented by changing the gauze inside of the dilator daily. All patients had a dilator and a urinary catheter and were also maintained with parenteral nutrition for 10 days after surgery. On an average, patients were discharged about 15 days after surgery. Patients were instructed to use the device to perform self-dilation after being discharged from the hospital within 3 months, to maintain the result of surgery. Patients were instructed that sexual intercourse could be started only at approximately 6 weeks after surgery. The length and width of the neovagina were measured indirectly through the size of the largest dilator that could be inserted into the neovagina every examination. Ability to have sex after surgery was also assessed. The mucosal donor site was evaluated for oral shape and ability of opening maximum of the mouth. Vaginal mucosa biopsies were performed at 5 positions, including top, anterior, posterior, right, and left of the neovagina for 11 patients at 3 months postoperatively. In addition, both biopsy samples and endoscopy were performed for 3 patients at 6 months postoperatively for patients who consented to these tests.

Results

The patient's age ranged from 19 to 44 years old (average being 28 years old). The mean total follow-up time was 19 months, ranging from 6 months to 4 years. All neovaginas were well-formed with a mean static depth of 7.5 cm (range, 6–9 cm) and were capable of inserting dilators with the diameter of up to 3.8 cm. It was observed that all vaginal tunnels were covered with a pink-colored smooth lining after one month. Only four patients had slight vaginal bleeding about 3–5 days postoperative, and it was controlled successfully by replacing gauze and cleaning the blood clot with saline. There were no other complications. The lip contour was deformed after mucosal removal in 11 patients (Fig. 2 h), but they returned to normal, and the patients could open their mouths maximum after 1–3 months (Fig. 2i). A total of 25 patients reported sexual intercourse with satisfaction.

Neither pain nor bleeding was reported during intercourse from these patients. The rest of the patients did not yet have sexual partners; however, they reported that they could easily insert the dilator into the neovagina. At 3 months postoperatively, histopathology tests on 11 patients demonstrated that the graft had degradation, but it recovered. At 6 months postoperative, the cells were morphologically similar to those of oral mucosa cells with mitosis in the basal layer, demonstrating good epithelium development (Fig. 3a,b). The stroma layer returned to the same as the normal oral mucosa. In all of 11 endoscopic images, the mucosal lumen is epithelialized, smooth, and shiny pink in the entire neovaginal cavity (Fig. 4).

Fig. 3 **a.** Histological image after 3 months of incompletely covered epithelium. **b.** The epithelium was completely covered after 6 months



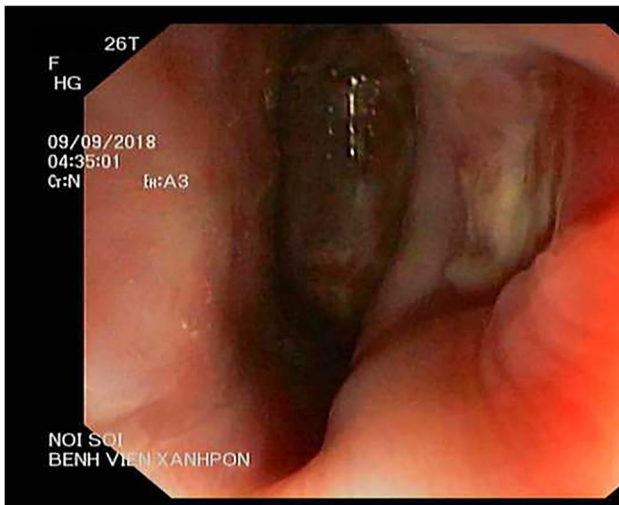


Fig. 4 Vaginal endoscopy showed epithelial lining completely covered

Discussion

A non-surgical interventional approach to vaginal agenesis was proposed first by Frank et al. [5]; then, this method was improved by Ingram et al. [6] which was found to be easier to control patients and safer and more cost-effective than surgery. However, it can be intrusive and boring for the patient's life and should be indicated for a short vagina [7, 8]. For complete vagina agenesis, vaginoplasty surgery is more appreciated. The principle of vaginoplasty surgery is to create a vaginal pocket and cover the inner side to prevent it from cicatrizing. Several methods were performed to cover the surface of the vaginal pocket such as using thin skin grafting [9, 10], the intestinal tract [11], pedicle skin flaps, or oral mucosa [12]. Each method exposes its pros and cons. Several authors agreed that oral mucosa could be considered a suitable material for vaginal reconstruction [1–4, 13]. The greatest advantage of this material is that the oral mucosa is a non-keratinized stratified squamous epithelium, which is quite like the histological structure of the vaginal mucosa. With the successful implementation of vaginoplasty using mesh mucosal grafts for patients with vaginal agenesis, we share seven important tips to achieve optimal results:

- (1) Dissecting the vaginal cavity in the correct layer: If the dissection is correct, there is always a fibrous band that is a relic of the Muller duct. During surgery, correctly identifying dissection will limit complications and bleeding.
- (2) Maximizing mucosal taken in buccal, upper, and lower lip: Lin et al. [1] first used 2 grafts of $2.5 \times 6\text{--}8$ cm from both cheeks. After that, many authors have improved this technique including

dividing oral mucosa into small pieces with an area of $2\text{--}4$ cm²; cutting oral mucosa into 1-mm² pieces; crushing oral mucosa into microscopic pieces; and punching buccal mucosa into meshed holes [2–4]. All of these authors only harvested the cheek mucosa. They might be afraid of the deformity of the donor site. To increase the amount of graft to cover the entire vaginal lumen and facilitate faster complete epithelialization, we propose to take the maximum amount of oral mucosa from both cheeks, upper lip, and lower lip and then punch holes. We noticed an effect on lip deformities and limited the opening of the mouth after surgery in 11 patients. However, lip contour and function returned to normal on re-examination within 1–3 months. We also did not experience other complications at the donor sites.

- (3) Removing a little of submucosa tissue: If the submucosal tissue is too thick, it will affect the viability of the graft. However, the histological structure of the oral mucosa includes the mucus-secreting cells. Moreover, Lin et al. and Li et al. proved that the mucus-secreting cells can survive and function after transplantation [1, 3]. Therefore, over-dissecting and leaving only the epithelial layer will lose the mucus-secreting cells in the graft and reduce the quality of the graft.
- (4) Stitching the strips of grafts in 2 directions: In fact, the graft is easily displaced during the insertion of the dilator into the vaginal cavity, so suturing the graft horizontally helps to spread the mucosa evenly on entire surface of the dilator. In addition, the sutures at the terminal end of the graft were stretched in opposite directions to prevent the graft from being rolled up during the insertion of the dilator into the vagina. Thus, the contact area of the graft with the recipient site is larger, increasing the viability and speeding up the epithelialization process of the mucosa.
- (5) Using a dilator with an absorbent hole at the top: When the patient is lying down, the vaginal cavity slopes downward and backward, making it difficult to retain the blood and fluid. Using a hollow dilator with a hole at the top and the insertion of gauze helps fluid from the top of the vaginal cavity. When performing vaginoplasty with full-thickness skin grafts, Han et al. also emphasized the role of drainage holes and absorbent gauze in the cavity of the dilator [14].
- (6) Parenteral nutrition: In the first 10 days, parenteral nutrition aims to reduce the patient's defecation leading to infection of the vaginal cavity. This also helps the patient to be able to rest completely on bed so that the dilatation is well fixed.
- (7) Vaginal dilation and early sexual intercourse after surgery are essential to prevent the vagina from retracting and maintaining the surgical results.

Conclusion

Vaginal reconstruction with maximization of the amount of mesh autologous oral mucosa could give good results at neovagina and donor site. The authors recommend seven tips to achieve good results including maximization of the oral mucosa; removal of only small amount of submucosa; dissection the vaginal cavity in the right layer; suturing the graft in two directions on the hollow core dilator; using a dilator with an absorbent hole at the top; parenteral nutrition in the initial days; and maintaining dilation after surgery.

Author Contribution Pham Thi Viet Dung: first and corresponding author, performed the operation and conceptualization, and writing and revising the manuscript.

Tran Thiet Son: reviewing and editing the manuscript.

Ta Thi Hong Thuy: performed the operation and writing and revising the manuscript.

Vu Hong Chien: performed the operation.

Le Anh Huy: writing and revising the manuscript.

Declarations

Conflict of Interest The authors declare no competing interests.

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