

Use of autologous buccal mucosa for vaginoplasty: a study of eight cases

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BACKGROUND: Vaginal agenesis is a rare condition and treatment methods are varied. The difference between most of the surgical techniques is the graft material used. The purpose of this study was to describe the procedure and outcome of creating a neovaginal pouch lined with autologous buccal mucosa. **METHODS AND RESULTS:** Between August 2000 and February 2002, eight patients with Mayer–Rokitansky–Kuster–Hauser syndrome were admitted to our hospital. All of the patients successfully underwent neovaginoplasty with autologous buccal mucosa as graft material. The buccal mucosal wound completely healed 2 weeks after the operation and the neovaginal length and calibre were well formed. Follow-up ranged from 0.5 to 1.5 years. One patient encountered post-operative vaginal bleeding and another patient suffered from urinary bladder injury. **CONCLUSION:** This is the first reported procedure of vaginoplasty with autologous buccal mucosa as graft material. Our method is ideal in its simplicity, provides good cosmetic results, and improves the vaginal length of the patient.

Key words: buccal mucosa/vaginoplasty

Introduction

Absence of the vagina is due to congenital abnormalities, such as Mayer–Rokitansky–Kuster–Hauser (MRKH) syndrome, but may also be the result of pelvic tumour surgery or radiotherapy. The incidence of congenital vaginal agenesis (MRKH syndrome) is estimated at 1:4000 to 1:10 000 female births (Rock and Azziz, 1987). Furthermore, congenital absence of the vagina is associated with anomalies of the renal (34%) and skeletal (12%) systems.

There are many methods for constructing neovaginas, such as Frank's method (Frank, 1938) and the Abbe–McIndoe (McIndoe and Bannister, 1938) procedure. Other surgical methods include constructing neovaginas out of bowel segments (Burger *et al.*, 1989; Franz, 1996; Hensle and Reiley, 1998), pudendal-thigh flaps (Joseph, 1997), fasciocutaneous flaps (Morton *et al.*, 1986), gracilis myocutaneous flaps (McCraw *et al.*, 1976), labia minora flaps (Flack *et al.*, 1993), flaps raised following tissue expansion of the labial pocket (Chudacoff *et al.*, 1996), peritoneum and bladder mucosa (Martinez-Mora *et al.*, 1992; Soong *et al.*, 1996), amnion (Ashworth *et al.*, 1986; Nisolle and Donnez, 1992), and the interceed absorbable adhesion barrier (Jackson and Rosenblatt, 1994).

Although Frank's method is non-surgical, its success has proven variable and unpredictable (Ashworth *et al.*, 1986). Procedures including free skin grafts, peritoneal grafts, local skin flaps, and bladder mucosal grafts may scar the patient. Bowel segments have the disadvantages of abdominal scarring

and the possibility of bowel obstruction. The use of human amnion is complicated because it requires amnion banking, lengthy preparation time, and scheduled concomitant elective Caesarean deliveries. It also has an added risk of donor–patient viral infection.

The use of autologous buccal mucosa is uncommon, but has been employed for urethral reconstruction when local epithelial tissue and bladder mucosa were not available (Burger *et al.*, 1992; Dessanti *et al.*, 1992). In this case series, we describe our limited experience with autologous buccal mucosa as graft material for vaginoplasty. Our aim was to create a functionally and cosmetically normal neovagina using the simplest available techniques.

Materials and methods

Our study group consisted of eight young Taiwanese girls with MRKH syndrome who were treated in our hospital between August 2000 and February 2002. All patients exhibited primary amenorrhoea, normal secondary sex characteristics, and a vaginal dimple without vaginal orifice. They all underwent a pre-operative work-up which included chromosome study, intravenous pyelography and diagnostic mini-laparoscopy to evaluate the bilateral ureter, kidney, ovary and uterus. The girls and their parents were counselled before operation about the optimal operation time and the method, as well as the possible complication of the procedure.

The eight patients underwent neovaginoplasty with autologous buccal mucosa as graft material in between August 2000 and February 2002. All patients were placed in the lithotomy position, under general

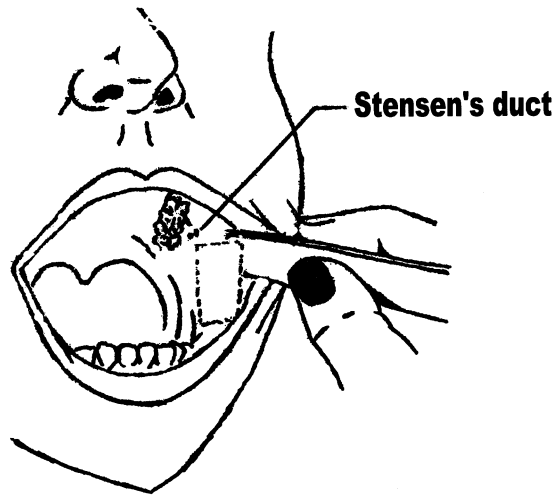


Figure 1. Exposed inner cheek with outline for a buccal mucosal graft. Stensen's duct is opposite the upper second molar.

anaesthesia and nasal tracheal intubation. We began by creating a vaginal vault capable of accommodating the length of two fingers by blunt dissection in the plane between the urinary bladder and rectum. A Foley catheter and a rectal tube were inserted in order to prevent bladder and rectum trauma during construction of the new vaginal canal. Before harvesting the graft, the surgeon cleaned the buccal mucosa with an iodine solution and identified the opening of the Stensen's duct and the duct of parotid gland. The donor site on the inner aspect of the cheek was marked (Figure 1). The length of the graft was $\sim 2.5 \times 6$ to 8 cm. A mouth retractor was applied and a full-thickness graft was harvested by a knife and scalpel. Haemorrhaging was controlled by electrocautery and gauze. Great care was taken to avoid injuring the Stensen's duct and the neurovascular supply to the buccinator muscle. Incisions deeper than the submucosal layer were avoided since dissection of the buccinator muscle can lead to damage of the buccal neurovascular bundle. Branches of the facial nerve lying deep within this muscle will most likely not be damaged by the incision. We made pin-hole size incisions on the grafted buccal mucosa to increase the size of the graft. The graft was then irrigated



Figure 2

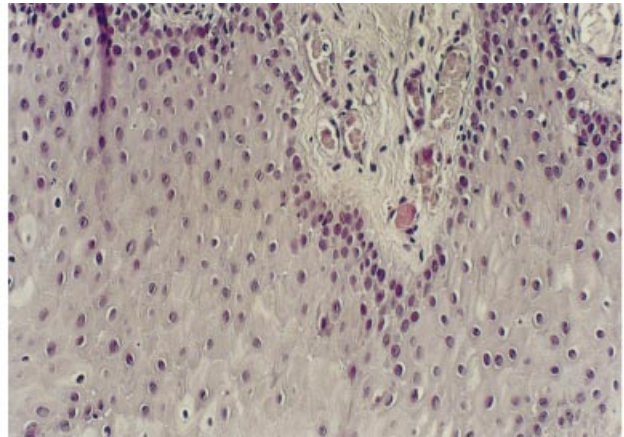


Figure 4



Figure 3



Figure 5

Figure 2. Stents which are 2 cm in outer diameter and 12 cm in length for the neovagina made from a 20 ml syringe.

Figure 3. Well-formed neovagina with no exudate or granulation tissue.

Figure 4. Biopsy of the neovagina showed stratified squamous epithelium. Haematoxylin and eosin stain, $\times 40$ magnification.

Figure 5. Buccal mucosa 6 weeks after vaginoplasty.

Table I. Characteristics of patients who underwent neovaginoplasty

Patient	Age at diagnosis (years)	Age at operation (years)	Associated anomaly	Operative time (min)	Blood loss (ml)	Hospitalization (days)	Complication
1	17	23	None	245	250	18	Bladder injury
2	17	23	None	165	200	16	
3	16	20	None	170	100	16	
4	18	28	None	165	100	16	
5	13	20	None	150	100	11	
6	18	20	None	195	200	12	Wound bleeding
7	18	21	None	180	150	12	
8	16	20	None	150	200	11	

with warm saline to retard desiccation. The donor site was closed with 3–0 absorbable running sutures. The buccal mucosal graft was fixed to the newly created vaginal space and the edge was sutured to the minor labia and perineal skin. The mould was then inserted into the newly created cavity and sutured to the perineal skin after haemostasis (Figure 2).

The patients took antibiotics for prophylaxis. A Foley catheter was maintained for 1 week to avoid post-operative urine retention and contamination of the external genitalia by urine. The rigid vaginal mould was removed on the seventh day without bleeding or foul discharge. After no signs of vaginal necrosis were detected, a larger mould was inserted after irrigation of the neovagina with normal saline solution. The patient was advised to wear the vaginal mould day and night during the initial 3 months post-operative period. Patients were examined monthly for the first 6 months. At each visit, oral mucosa, vaginal depth and epithelium were noted in order to assess the functional length of the neovagina and the recovery of oral mucosa. These patients were advised to wear the vaginal mould each night until normal sexual intercourse resumed.

Results

The operation was performed successfully in all eight patients. The characteristics of the patients who underwent the operation are shown in Table I. The operative time was between 150 and 245 min and blood loss during operation was estimated to have been between 100 and 250 ml in all cases. There were post-operative complications in two patients: urinary bladder injury in one case and vaginal bleeding in the other case. In all cases, a neovagina was well formed, 8 cm in depth (range 6–10), and two fingers in width. The hospitalization period ranged from 11 to 18 days. There was no exudate, drying or granulation tissue found in the neovagina, and the vaginal tunnel was covered with a pink smooth lining (Figure 3). The biopsy of the neovagina did not reveal atrophy (Figure 4). The oral mucosa completely healed (Figure 5).

Post-operatively, the patients were placed on a liquid diet on day 3 and a normal diet on day 6. All patients were mobile on day 10. Foley catheter was maintained for 1 week in case of possible bladder injury caused by the operation. All patients urinated smoothly after bladder training and no fistulae were found. Post-operative vaginal bleeding in one patient was caused by trauma to the neovagina when the vaginal mould was inserted. No bleeding occurred after resuturing of the wound, and the wound healed well, although some granulation tissue

was formed. The tissue was removed by electrocautery and the vaginal length was 8 cm in length and two fingers in width.

Discussion

This report is the first published study of vaginoplasty with autologous buccal mucosal graft material. Various surgical procedures have been described for correcting vaginal agenesis and the difference between procedures lies in the substance covering the newly created space. The graft may be skin, intestine, bladder mucosa, peritoneum or amnion. The use of intestine is much more common, because there is no need for persistent dilation (Hensle and Chang, 1999). However, profuse secretions, unpleasant odour and ulcer of the mucosa have been reported (Turner-Warwick and Kirby, 1990). Skin grafts have the disadvantage of leaving a permanent scar on the donor site. The same is true for intestine, peritoneum and bladder mucosa vaginal reconstructions which require laparotomy.

Autologous buccal mucosa as graft material was first reported by Humby (1941) for use in repairing hypospadias. In addition, buccal mucosal grafts have been used by ophthalmologists, orthodontic and maxillofacial surgeons for reconstructive surgery of the conjunctiva, tongue, cheek, larynx and trachea. In the late 1980s buccal mucosa began to be employed for urethral reconstruction (Caldamone *et al.*, 1998). Buccal mucosa as suitable implantable graft material for urethral reconstruction was first tested on dogs. The macroscopic and light microscopic examination of the embedded buccal mucosa 3 months post-operatively demonstrates well-vascularized, non-scarred tissue and intact mucosa with slight atrophy of the squamous epithelium (Burger *et al.*, 1992). In addition, histological examination of the buccal mucosal graft compared with skin grafts has revealed that the buccal mucosa has a thicker epithelium and thinner lamina propria which should promote revascularization of the graft from the recipient bed (Duckett *et al.*, 1995). These properties lend themselves to a good free graft reconstruction. The majority of buccal mucosa graft procedures have used the inner lip as the donor site which completely heals after 2 weeks (Lopes *et al.*, 1996). In our series, during the first 2 days after the procedure, the patients suffered some pain and swelling of the buccal area but these patients were able to eat ice cream on day 2 and a soft diet on day 4, and a normal diet on day 6. Damage of the buccal

neurovascular bundle, haemorrhage and infection are potential complications of the donor site. Avoiding incisions of the submucosal layer of the buccal area, local compression and external cooling of the donor site may prevent these complications. Liquid or soft diet and daily cleaning of the wound may avoid post-operative discomfort.

Autologous buccal mucosa has successfully substituted skin and bladder mucosa grafts in urethroplasty because it is an easily accessible, non-hair-bearing material, provides excellent cosmetic results and a constant and adequate blood supply. In this series, we performed vaginoplasty using buccal mucosa as a graft. Our patients had a normal diet, no difficulties opening their mouth, adequate vaginal length without stricture, and no scarring of the donor site 6 months after the procedure. Maintenance of vaginal dilation via a vaginal mould is suggested until normal sexual intercourse is resumed. In summary, although no conclusive recommendation can be made based on these limited cases, the results achieved with our patients are encouraging.

References

- Ashworth, M.F., Morton, K.E., Dewhurst, J., Lilford, R.J. and Bates, R.G. (1986) Vaginoplasty using amnion. *Obstet. Gynecol.*, **67**, 443–446.
- Burger, R.A., Riedmiller, H., Knapstein, P.G., Friedberg, V. and Hohenfellner, R. (1989) Ileocecal vaginal construction. *Am. J. Obstet. Gynecol.*, **161**, 162–167.
- Burger, R.A., Muller, S.C., El-Damanhoury, H., Tschakaloff, A., Riedmiller, H. and Hohenfellner, R. (1992) The buccal mucosal graft for urethral reconstruction: a preliminary report. *J. Urol.*, **147**, 662–664.
- Caldamone, A.A., Edstrom, L.E., Koyle, M.A., Rabinowitz, R. and Hulbert, W.C. (1998) Buccal mucosal grafts for urethral reconstruction. *Urology*, **51** (Suppl. 5A), 15–19.
- Chudacoff, R.M., Alexander, J., Alvero, R. and Segars, J.H. (1996) Tissue expansion vaginoplasty for treatment of congenital vaginal agenesis. *Obstet. Gynecol.*, **87**, 865–868.
- Dessanti, A., Rigamonti, W. and Merulla, B. (1992) Autologous buccal mucosa graft for hypospadias repair: an initial report. *J. Urol.*, **147**, 1081.
- Duckett, J.W., Copen, D., Ewalt, D. and Baskin, L.S. (1995) Buccal mucosal urethral replacement. *J. Urol.*, **153**, 1660–1663.
- Flack, C.E., Barraza, M.A., and Stevens, P.S. (1993) Vaginoplasty: combination therapy using labia minora flaps and lucite dilators: a preliminary report. *J. Urol.*, **150**, 654–656.
- Frank, R.T. (1938) The formation of an artificial vagina without operation. *Am. J. Obstet. Gynecol.*, **35**, 1053–1055.
- Franz, R.C. (1996) Sigmoid colon vaginoplasty: a modified method. *Br. J. Obstet. Gynecol.*, **103**, 1148–1155.
- Hensle, T.W. and Chang, D.T. (1999) Vaginal reconstruction. *Urol. Clin. North. Am.*, **26**, 39–47.
- Hensle, T.W. and Reiley, E.A. (1998) Vaginal replacement in children and young adults. *J. Urol.*, **159**, 1035–1038.
- Humby, G. (1941) A one-stage operation for hypospadias. *Brit. J. Surg.*, **29**, 84.
- Jackson, N.D. and Rosenblatt, P.L. (1994) Use of interceed absorbable adhesion barrier for vaginoplasty. *Obstet. Gynecol.*, **84**, 1048–1050.
- Joseph, V.T. (1997) Pudendal-thigh flap vaginoplasty in reconstruction of genital anomalies. *J. Pediatr. Surg.*, **32**, 62–65.
- Lopes, J.A., Valle, J., Timon, A., Blasco, B., Ambroj, C., Murillo, C. and Valdivia, J.G. (1996) Use of autologous buccal mucosal graft for urethral surgery in males. *Eur. Urol.*, **29**, 227–230.
- Martinez-Mora, J., Isnard, R., Castellvi, A. and Lopez, O.P. (1992) Neovagina in vaginal agenesis: surgical methods and long-term results. *J. Pediatr. Surg.*, **27**, 10–14.
- McCraw, J.B., Massery, F.M., Shanklin, K.D. and Horton, C.E. (1976) Vaginal reconstruction with gracilis myocutaneous flaps. *Plast. Reconstr. Surg.*, **52**, 176–183.
- McIndoe, A.H. and Bannister, J.B. (1938) An operation for the cure of congenital absence of the vagina. *J. Obstet. Gynaecol. Br. Emp.*, **45**, 490–494.
- Morton, K.E., Davies, D. and Dewhurst, J. (1986) The use of the fasciocutaneous flap in vaginal reconstruction. *Br. J. Obstet. Gynecol.*, **93**, 970–973.
- Nisolle, M. and Donnez, J. (1992) Vaginoplasty using amniotic membranes in cases of vaginal agenesis or after vaginectomy. *J. Gynecol. Surg.*, **8**, 25–30.
- Rock, J.A. and Azziz, R. (1987) Genital anomalies in childhood. *Clin. Obstet. Gynecol.*, **30**, 682–696.
- Soong, Y.K., Chang, F.H., Lai, Y.M., Lee, C.L. and Chou, H.H. (1996) Results of modified laparoscopically assisted neovaginoplasty in 18 patients with congenital absence of vagina. *Hum. Reprod.*, **11**, 200–203.
- Turner-Warwick, R. and Kirby, R.S. (1990) The construction and reconstruction of the vagina with the colocoecum. *Surg. Gynecol. Obstet.*, **170**, 132–136.

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