

Laparoscopic Rectosigmoid Colon Vaginoplasty in Male-to-Female Transsexuals: Experience in Japan

Yuko Mukai^{a*}, Toru Sakurai^a, Toshiyuki Watanabe^a, Tomoko Sako^b,
Morito Sugimoto^c, Yoshihiro Kimata^a, Yoshiko Mori^d, Takeshi Nagasaka^e, and Yuzaburo Namba^f

Departments of ^aPlastic and Reconstructive Surgery, ^bUrology, ^dGastroenterological Surgery, ^fGender Center,
Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama 700-8558, Japan,

^cDepartment of Urology, Onomichi Municipal Hospital, Onomichi, Hiroshima 722-8503, Japan,

^eDepartment of Clinical Oncology, Kawasaki Medical School Hospital, Kurashiki, Okayama 701-0192, Japan

Intestinal vaginoplasty has several advantageous features, such as scarless surgery, low incidence of contraction of the reconstructed vagina, maintenance of vaginal depth, spontaneous mucus production, and a low rate of complications. Therefore, this technique is becoming popular in many countries. Following the global trend, the demand for intestinal vaginoplasty for transsexuals is also increasing in Japan. However, there are few reports on intestinal vaginoplasty in Japan. In this study, we examined the safety and effectiveness of rectosigmoid colon vaginoplasty in the Japanese population. We retrospectively surveyed 18 male-to-female transsexuals who underwent laparoscopic rectosigmoid colon vaginoplasty at the Okayama University Hospital Gender Center between October 2012 and December 2017. One patient had developed an anastomotic leak and 2 patients experienced vaginal prolapse, which needed revision surgery. Both adverse outcomes were comparable with those from previous studies. The anastomotic leak was managed adequately with conservative treatment. To avoid vaginal prolapse, it is important to decide the length of the rectosigmoid segment so that a pull on it does not cause it to become lax, while excessive stress on the feeder vessels is avoided. Based on our study, we concluded that rectosigmoid vaginoplasty was a reliable technique in the Japanese population.

Key words: vaginoplasty, male-to-female transsexuals, rectosigmoid colon

Sex reassignment surgery (SRS) is of major importance to transsexuals for preserving their psychological and physical identity. Due to the crucial impact of SRS on the lives of transsexuals after surgery, surgeons make a concerted effort to provide the best surgical outcomes. However, the preferred method of vaginoplasty in male-to-female (MTF) SRS is still being debated, and each institution adapts different SRS techniques based on their own concepts. Conventional techniques such as the skin grafting [1], penile inversion [2,3], pudendal thigh flap [4,5], M-shaped peri-

neo-scrotal flap [6], and pudendal-groin flap [7] techniques each have various drawbacks, including extensive scarring, contraction of the vaginal canal, and the necessity for lubrication during sexual intercourse [8,9].

In recent years, there have been several reports on intestinal vaginoplasty. Although this method has been used mainly as a secondary procedure after failed penile inversion vaginoplasty [10,11], several advantages have been increasingly reported. For example, scarring is inconspicuous due to the use of laparoscopy, contraction of the reconstructed vagina occurs rarely, vaginal

depth is maintained, and there is spontaneous mucus production facilitating sexual intercourse [11-15]. Furthermore, the technique seems to be associated with a low rate of complications [11]. In summary, intestinal vaginoplasty is expected to be used as the first-choice technique for vaginoplasty in the near future.

Unfortunately, there have been very few reports about intestinal vaginoplasty in the Japanese population. In this study, we discuss the perioperative complications seen in our cases in comparison with the results of previous studies and also assess the safety and usefulness of intestinal vaginoplasty in the Japanese population.

Materials and Methods

This retrospective study was approved (No.1809-012) by the local Ethical Committee. Eighteen MTF SRS patients who underwent laparoscopic rectosigmoid colon vaginoplasty from October 2012 to December 2017 at the Okayama University Hospital Gender Center were included. Patients who declined intestinal vaginoplasty or who had a previous history of an abdominal injury or an abdominal surgery were excluded. During the study period, 2 patients received gender feminization surgery alone because they did not desire sexual intercourse in the future. The procedures were carried out with adequate understanding and written consent of each subject.

Surgical technique. The surgery involved a three-

team approach involving plastic, urological, and general surgeons. Surgery was performed under general anesthesia with the patient in the lithotomy position. The plastic surgery team designed and elevated the penile scrotal skin flap (Fig. 1). After a urethral catheter was inserted into the urethra, penectomy was performed. Following this, orchiectomy was performed by the urology team, and they fashioned the vaginal cavity through a blunt dissection between the rectum and the Denonvilliers' fascia. To this stage, the above technique is identical to other methods of vaginoplasty. Our previous report on pudendal-groin flaps describes it in detail [7].

Next, a rectosigmoid segment was harvested as follows (Fig. 2). The general surgeon performed a laparoscopy using 5 small incisions (the umbilical portion, and both sides of the lateral and lower abdominal parts, respectively). A trocar was inserted through the umbilical portion and a pneumoperitoneum was created. The mesosigmoid was released from its lateral adhesions and mobilized, then divided with an electric scalpel, HARMONIC[®], that uses ultrasonic energy for dissection, cutting, and coagulation. Subsequently, the rectosigmoid colon was transected and stapled by END GIA[®], which was used during laparoscopic surgery to staple the tissue automatically. The pedicled rectosigmoid segment was elevated along with the superior rectal artery, and its required length was determined (13 cm to 16 cm). The peritoneum was perforated to reach the newly formed vaginal cavity. The rectosig-

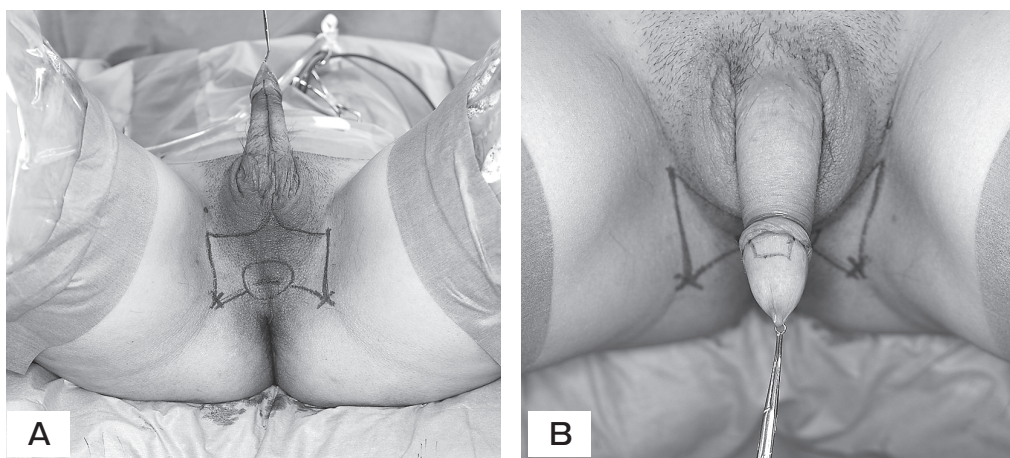


Fig. 1 Design of the penile scrotal flap. **A**, A circle is made around the central tendon and a new vaginal cavity is created into this circle. Cross marks are made on both sides of the ischial tuberosity. With respect to the ventral part of the penis, an incision is made along the raphe penis; **B**, A part of the glans penis is used for clitoroplasty.

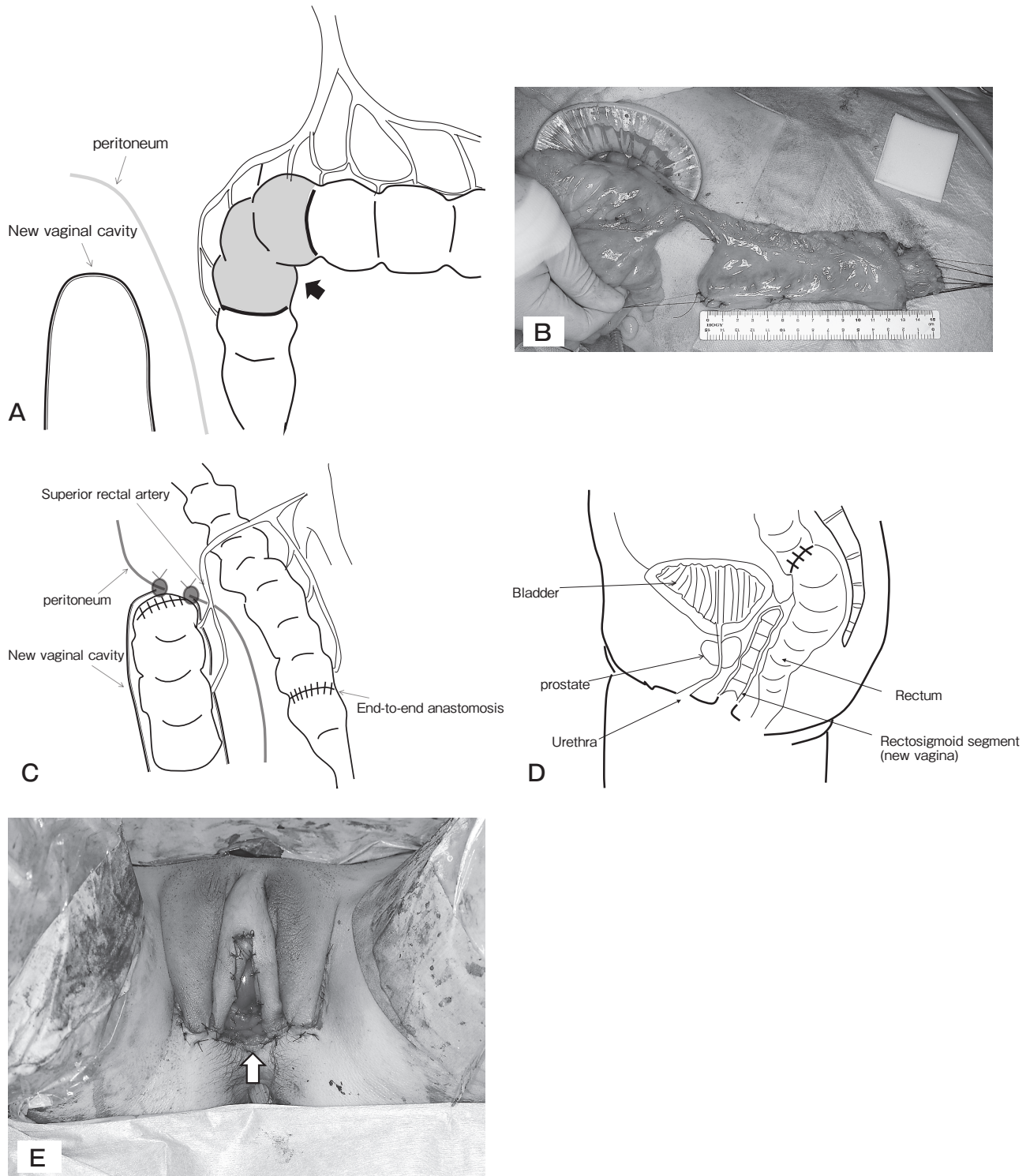


Fig. 2 Rectosigmoid colon segment. **A**, The new vagina is created with the colored region (arrow); **B**, The length of the intestine segment is approximately 13-16 cm; **C**, The intestine segment is transferred into the new vaginal cavity. At this time, we should pay attention not to injure the feeder vessels. Then, the colon segment is fixed to the peritoneum; **D**, The new vagina is surrounded by the bladder, prostate (anterior), and rectum (posterior); **E**, Just after surgery. The new vaginal introitus is indicated (↑).

moid segment was moved into the new vagina without tension on its vascular pedicle. One end of the segment was fixed to the peritoneum. End-to-end anastomosis was performed on the donor site of the rectosigmoid colon. The suction reservoir was placed in the pelvic floor through the right lateral abdominal incision, and a drain was also placed in the rectum leading to the anal canal. The abdominal incisions were closed by the plastic surgeon (Fig. 3). The vaginal introitus was created by sewing the other end of the segment into the surrounding tissues. Clitoroplasty was performed and a new external urethral meatus was also created. Labiaplasty was performed using both sides of the scrotal flap, which concluded the surgical procedure.

Results

The demographic characteristics of the 18 patients who underwent the rectosigmoid colon vaginoplasty are shown in Table 1. The mean follow-up time was 20.8 months.

The mean age \pm standard deviation (SD) at the time of surgery was 34.6 ± 10 years (20-56 years), and the mean body mass index \pm SD was 21.6 ± 2.7 kg/m². Two patients (11.1%) were smokers. Although all the patients had used estrogen as cross-sex hormonal therapy, one patient (5.6%) who had developed deep vein

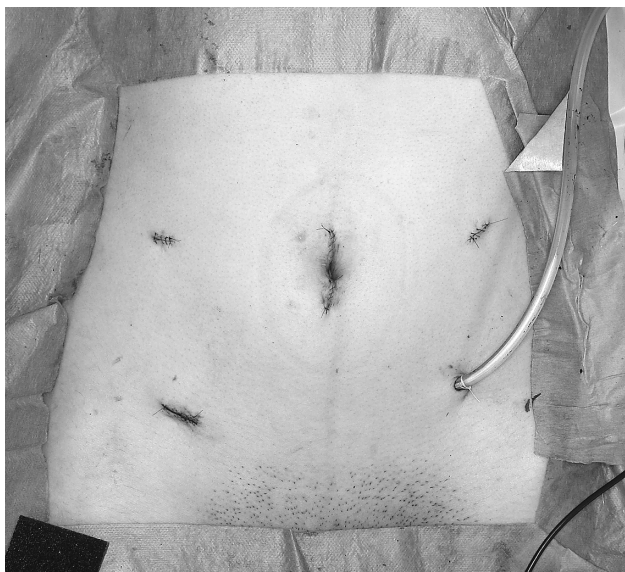


Fig. 3 Abdominal scars. The use of laparoscopic surgery makes the abdominal scars inconspicuous.

thrombosis (DVT) before the operation had discontinued estrogen therapy from the onset of DVT. For this patient, the orchiectomy, clitoroplasty, penectomy and labiaplasty were performed before the vaginoplasty to avoid extended-time surgery. The mean operative time was 470 min and the median blood loss was 420 ml. Two important complications occurred (Table 2). One was the anastomotic leak following the operation and the other was vaginal prolapse that required revision surgery. The duration of typical hospitalization was 15 days. The typical postoperative course includes extensive discharge of intestinal fluids for 3 months after the surgery. The discharge has no intestinal odor, but patients need to exchange sanitary pads several times per day during this time. In most cases, the amount of fluid decreases rapidly after 3 or 4 months. The appearance of the genital region 3 months after surgery is shown in Fig. 4.

Discussion

Intestinal vaginoplasty has received much attention in recent years. Baldwin first described vaginal reconstruction with the ileum for vaginal aplasia and

Table 1 Patient demographics

Variables	Mean \pm SD	no. (%), (n = 18)
Age, year	34.6 ± 10	
Mean BMI kg/m ²	21.6 ± 2.7	
Smoking		2 (11.1)
Medical history		
Depressoin		3 (16.7)
Diabetes mellitus		1 (5.6)
DVT		1 (5.6)
Surgical history		
Orchidectomy		4 (22.2)

SD, standard deviation; BMI, body mass index; DVT, deep venous thrombosis.

Table 2 Short-term and long-term surgical complications

Complication	no. (%), (n = 18)
Complications during hospitalization	
Anastomotic leak after bowel harvest	1 (5.6)
Complications after discharge	
Improve neovaginal prolapse surgery	2 (11.1)

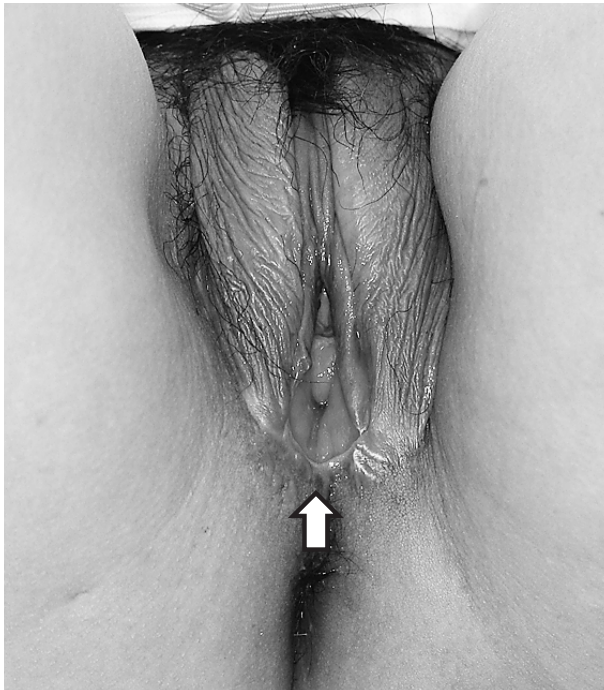


Fig. 4 Aesthetic results after surgery. View of the genital region at 3 months post-surgery. The new vaginal introitus is indicated (↑).

acquired deformity in 1904 [16]. Unfortunately, this procedure was associated with a high mortality rate, and it was abandoned in the early 1970s. Then, in 1978, Markland and Hastings first reported intestinal vaginoplasty in male-to-female transsexual patients [17]. Initially, this method was developed as a second-line surgery because it required intra-abdominal handling [10,11]. Since then, the advantages have come into greater focus along with the increasing number of these surgeries.

Fewer complications, less scarring due to the laparoscopic operation, a texture and visual quality similar to that of the natural vagina, adequate lubrication in the new vagina, and less potential for contraction of the vaginal canal are some of the advantages seen with this method [11-15]. Based on these advantages, some surgeons have advocated that intestinal vaginoplasty be treated as a first-choice technique [18]. In the future, we can expect the number of patients who undergo intestinal vaginoplasty to rise as the procedure becomes increasingly popular.

In addition, in Japan, SRS has been incorporated into the medical insurance system since April 2018. As

a result, the number of SRS cases is also expected to increase in the near future. Although it is generally considered that more published case histories on intestinal vaginoplasty in the Japanese population are needed, there are only a few facilities where it is possible to employ a team approach to address the problems of transsexuals, and only a few specialists who are qualified to perform the operation. As a consequence, only a few studies have been published so far.

In our study, we mainly encountered 2 complications. First, one patient developed an anastomotic leakage along with a pelvic abscess (5.6%). The patient improved without any surgical intervention, but required extended hospitalization, percutaneous drainage, and antibiotic administration. Bouman *et al.* performed total laparoscopic sigmoid colon vaginoplasty for 42 transsexuals. Among the 42 patients, one (2.4%) anastomotic leak occurred, which necessitated laparoscopic reoperation and antibiotic administration [18]. Cao *et al.* described 14 patients with congenital vaginal agenesis who underwent laparoscopic sigmoid colon vaginoplasty [19]. One patient (7.7%) developed intestinal leakage, which was managed by fasting, gastrointestinal decompression, and nutritional support provided intravenously. Okoshi *et al.* reported that localized intrapelvic abscess with posterior leakage is considered a more appropriate indication for transanal drainage than anterior leakage, because of the anatomical relationship of the rectum with the other pelvic organs [20]. Similarly, our patient developed posterior anastomotic leakage and conservative treatment was effective without surgical intervention. Therefore, we think that the leakage direction can be useful in predicting the severity of the patient's medical condition. Unfortunately, this is a debatable point due to the low number of cases.

Next, vaginal prolapse that required revision surgery was observed in 2 of 18 patients (11.1%). Horbach *et al.* described in a systematic review that the prevalence of vaginal prolapse among patients undergoing flap techniques was 1-2% [21]. Bouman *et al.* concluded that the prevalence of mucosal prolapse of the intestinal new vagina was 7.7% in their review [11]. Based on the above findings in the literature, patients who undergo intestinal vaginoplasty should be carefully watched for the development of a vaginal prolapse.

When compared with the incidence of vaginal prolapse in other reports, we found a slightly higher inci-

dence in our patients. To avoid this problem, the perineum side of the rectosigmoid stump is fixed, and the opposite side is laparoscopically pulled and sutured to the peritoneum using tension so that the vaginal skin is slightly drawn into the sigmoid colon.

Hensle *et al.* used the Female Sexual Dysfunction Questionnaire to review their 23-year experience with bowel vaginoplasty for women with Mayer-Rokitansky syndrome and transsexuals, and found that sexual function following bowel vaginoplasty appears to be adequate and durable [22]. Cai *et al.* evaluated the functional outcomes of laparoscopically assisted sigmoid colon vaginoplasty for women with Mayer-Rokitansky syndrome by using the modified Sexual Activity Questionnaire (SAQ), and they determined that 77% of the patients are satisfied with both their surgical and functional outcomes [23]. Horbach *et al.* conducted a systematic review and concluded that there were fewer neovaginal, wound healing, and even gastrointestinal complications in transsexuals who underwent bowel vaginoplasty than in those who underwent the penile skin invasion technique. In addition, the aesthetic outcomes were comparable [21]. Our patients who underwent rectosigmoid colon vaginoplasty reported greater satisfaction with the natural shape of the vagina than the patients who underwent flap vaginoplasty. Therefore, we consider that rectosigmoid colon vaginoplasty is a safe and effective method for SRS and we recommend it as a first-choice technique.

However, this technique cannot be used in certain patients, such as those who had undergone previous abdominal injury or surgery, and it may not be an appropriate choice for patients who do not wish to have sexual intercourse following SRS. For these patients, a flap vaginoplasty, such as a pudendal-thigh flap [4, 5], an M-shaped perineo-scrotal flap [6], or a pudendal-groin flap [7], would be more suitable.

Our study had several limitations—namely, it was designed as a retrospective study with a small number of patients and relatively short follow-up duration. In addition, vaginal depth and width were not measured regularly. Treatment outcomes should be evaluated based on objective assessments; that is, the measurement of the length or width of the new vagina is important. Moreover, prospective patient-reported outcome (PRO) measures are necessary as an assessment for patient satisfaction.

In conclusion, laparoscopic rectosigmoid colon vag-

inoplasty is a reliable procedure for vaginal reconstruction in MTF transsexuals in the Japanese population. Future prospective studies targeting a larger number of cases will be needed, including objective and patient-based assessments.

References

1. Hage JJ and Karim RB: Abdominoplastic secondary full-thickness skin graft vaginoplasty for male-to-female transsexuals. *Plast Reconstr Surg* (1998) 101: 1512–1515.
2. Perovic SV, Stanojevic DS and Djordjevic ML: Vaginoplasty in male transsexuals using penile skin and a urethral flap. *BJU Int* (2000) 86: 843–850.
3. Colebunders B, Brondeel S, D'Arpa S, Hoebeke P and Monstrey S: An update on the surgical treatment for transgender patients. *Sex Med Rev* (2017) 5: 103–109.
4. Wang Y, Lv C, Lou X and Song J: Application of 320-row multidetector computed tomography angiography and three-dimensional reconstruction for pudendal thigh perforator flap. *Plast Reconstr Surg* (2013) 131: 470e–471e.
5. Selçuk CT, Evsen MS, Ozalp B and Durgun M: Reconstruction of vaginal agenesis with pudendal thigh flaps thinned with liposuction. *J Plast Reconstr Aesthet Surg* (2013) 66: 246–250.
6. Namba Y, Sugiyama N, Yamashita S, Hasegawa K, Kimata Y, Ishii K and Nasu Y: Vaginoplasty with an M-shaped perineo-scrotal flap in a male-to-female transsexual. *Acta Med Okayama* (2007) 61: 355–360.
7. Mukai Y, Watanabe T, Sugimoto M, Kimata Y and Namba Y: Vaginoplasty with a pudendal-groin flap in Male-to-female transsexuals. *Acta Med Okayama* (2017) 71: 399–405.
8. Kwun Kim S, Hoon Park J, Cheol Lee K, Min Park J, Tae Kim J and Chan Kim M: Long-term results in patients after rectosigmoid vaginoplasty. *Plast Reconstr Surg* (2003) 112: 143–151.
9. Laub DR, Laub DR 2nd and Biber S: Vaginoplasty for gender confirmation. *Clin Plast Surg* (1988) 15: 463–470.
10. Selvaggi G, Ceulemans P, De Cuyper G, VanLanduyt K, Blondeel P, Hamdi M, Bowman C and Monstrey S: Gender identity disorder: general overview and surgical treatment for vaginoplasty in male-to-female transsexuals. *Plast Reconstr Surg* (2005) 116: 135e–145e.
11. Bouman MB, van Zeijl MC, Buncamper ME, Meijerink WJ, van Bodegraven AA and Mullender MG: Intestinal vaginoplasty revisited: A review of surgical techniques, complications, and sexual function. *J Sex Med* (2014) 11: 1835–1847.
12. Imperato E, Alfei A, Aspesi G, Meus AL and Spinillo A: Long-term results of sigmoid vaginoplasty in a consecutive series of 62 patients. *Int Urogynecol J Pelvic Floor Dysfunct* (2007) 18: 1465–1469.
13. Wu JX, Li B, Li WZ, Jiang YG, Liang JX and Zhong CX: Laparoscopic vaginal reconstruction using an ileal segment. *Int J Gynaecol Obstet* (2009) 107: 258–261.
14. Morrison SD, Satterwhite T, Grant DW, Kirby J, Laub DR Sr and VanMaasdam J: Long-term outcomes of rectosigmoid neocolporrhaphy in Male-to-Female gender reassignment surgery. *Plast Reconstr Surg* (2015) 136: 386–394.
15. Kim SK, Park JW, Lim KR and Lee KC: Is rectosigmoid vaginoplasty still useful? *Arch Plast Surg* (2017) 44: 48–52.
16. Baldwin JF: XIV. The formation of an artificial vagina by intestinal

- transplantation. *Ann Surg* (1904) 40: 398–403.
17. Markland C and Hastings D: Vaginal reconstruction using bowel segments in male-to-female transsexual patients. *Arch Sex Behav* (1978) 4: 305–307.
 18. Bouman MB, van der Sluis WB, Buncamper ME, Özer M, Mullender MG and Meijerink WJ: Primary total laparoscopic sigmoid vaginoplasty in transgender women with penoscrotal hypoplasia: a prospective cohort study of surgical outcomes and follow-up of 42 patients. *Plast Reconstr Surg* (2016) 138: 614e–623e.
 19. Cao L, Wang Y, Li Y and Xu H: Prospective randomized comparison of laparoscopic peritoneal vaginoplasty with laparoscopic sigmoid vaginoplasty for treating congenital vaginal agenesis. *Int Urogynecol J* (2013) 24: 1173–1179.
 20. Okoshi K, Masano Y, Hasegawa S, Hide K, Kawada K, Nomura A, Kawamura J, Nagayama S, Yoshimura T and Sakai Y: Efficacy of transanal drainage for anastomotic leakage after laparoscopic low anterior resection of the rectum. *Asian J Endosc Surg* (2013) 6: 90–95.
 21. Horbach SE, Bouman MB, Smit JM, Özer M, Buncamper ME and Mullender MG: Outcome of vaginoplasty in male-to-female transgenders: a systematic review of surgical techniques. *J Sex Med* (2015) 12: 1499–1512.
 22. Hensle TW, Shabsigh A, Shabsigh R, Reiley EA and Meyer-Bahlburg HF: Sexual function following bowel vaginoplasty. *J Urol* (2006) 175: 2283–2286.
 23. Cai B, Zhang JR, Xi XW, Yan Q and Wan XP: Laparoscopically assisted sigmoid colon vaginoplasty in women with Mayer-Rokitansky-Kuster-Hauser syndrome: feasibility and short-term results. *BJOG* (2007) 114: 1486–1492.