Endoscopic Harvest of Gracilis Muscle Flap for Reconstruction of Rectovaginal Fistula
— A Case Report and Literature Review

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Intractable rectovaginal fistula (RVF) is a troublesome complication after treatment of perineal cancers or infection. Complex fistulas which are larger than 2.5 cm in diameter or the recurrent cases may be repaired with abdominal procedure or tissue transposition. Gracilis muscle flap is widely used in various reconstruction in regard to the donor site deformity and bacterial resistance. Endoscopic surgery is the trend of the surgery development. We presented a 46 years old woman with posterior wall RVF after the rectal cancer surgery. Considering the failure of previous five times of operations, endoscopic harvest of gracilis muscle flap for reconstruction of RVF was performed. Distal gracilis muscle flap was rotated and fixed by tension-free suturing to the fistula site. The follow-up sigmoid fiberoscopy showed good healing of the flap without any leakage. The donor site scar was not obvious. There were five merits for endoscopic harvest of the gracilis muscle flap as followings: reduced total incision length, less time required, equal success rate, less morbidity, and of cost equivalency. This approach may be another alternative to resolve a complex RVF. (J Plast Surg Asso R.O.C. 2008;17:382∼389)

Key words: rectovaginal fistula, gracilis muscle flap, endoscopic surgery

Introduction

Rectovaginal fistula (RVF), the abnormal epithelium-lined communications between the rectum and vagina, can be the result of either congenital or acquired disorders. The presenting symptoms are always annoying psychosocially and sexually. The treatment options, depending
on the complexity of the fistula, may include primary repair, local flap repair, and distant tissue transposition. In 1960s, there were some articles describing the use of gracilis in the repair of various perineal problems, including urinary fistulae after proctectomy, rectovaginal and vesicovaginal fistulae following pelvic radiation.\(^3\) With the advance of mini-invasive surgery and the trend for cosmetic issue, resistance of minimal donor site morbidity and better infection muscle were achieved by endoscopic harvest of gracilis muscle flap. We presented our experience of endoscopic harvest of gracilis muscle flap for the reconstruction of intractable RVF.

**Case Presentation**

A 46-year-old woman sustained an early rectal cancer located about 7 cm above the anal verge 3 years ago. She accepted the procedure of low anterior resection (LAR) with loop ileostomy. There was no chemotherapy or radiotherapy after the operation due to early stage of the lesion. The postoperative course was smooth. However, RVF was sequentially found after performing closure of ileostomy 4 months later. In order to close the fistula, she received fistula repair and loop colostomy. Despite of the total five times of operations, the RVF relapsed thereafter.

She came to our out-patient clinic for the problem of persistent dyschezia and odorous discharge from her vagina. Bimanual examination revealed a RVF between the cervical fornix and the anastomotic area in diameter of 0.5 cm which located about 3 cm above the anal verge. The colorectal surgeons performed the anoplasty for anastomosis stricture and colonic stenting at first. Unfortunately, the follow-up course revealed the recurrence of stool and flatus occasionally discharged from her vagina. Therefore, further reconstruction surgery was arranged.

Two local vaginal rotational flaps were used to cover the vaginal defect, combined with T-loop colostomy but poor wound healing with recurrent flatus and intestinal juice discharge were encountered. Moreover, the size of the RVF progressed to 2 x 2 cm\(^2\) (Fig. 1).

In regarding of bacterial resistance and cosmetic reason, endoscopic harvest of gracilis muscle flap was chosen.\(^5\) During flap harvest, the patient was set in lithotomy position. The pre-operative design was made according to the position of inguinal ligament, femoral artery and patella position, and the pivot point was set at the pedicle area located 8 cm away from the inguinal ligament (Fig. 2). The proximal incision wound was 5 cm in length (Fig. 3). The gracilis muscle was identified via the incision wound and dissected along the muscle with the assistance of endoscope. The distal muscle end was cut. The dissected gracilis muscle flap was 25 cm in length. There was a subcutaneous tunnel created to allow the flap to pass to the fistula site (Fig. 4). Distal gracilis muscle flap was rotated and fixed by tension-free suturing to the fistula site. The vagina mucosa for the gracilis muscle flap was excised in order to create a raw surface for wound healing between the gracilis muscle and the vagina wall. Donor site was closed primarily without any drain inserted. The total operation time for harvest of gracilis muscle was 30 minutes. Foley catheter was removed one day after the operation. The patient was restricted with bed rest for 10 days to prevent any traction of the gracilis muscle. Irrigation of the vagina by 1:20 diluted better-iodyne aqueous solution was done every 6 hours. The patient was discharged 12 days after the operation. The postoperative course was smooth except transient hypesthesia over right medial thigh. It resolved one month later. Two months
later, the follow-up sigmoid fiberoscopy showed
good healing of the RVF wound without any
leakage. The colostomy was closed 3 months
after the gracilis muscle flap surgery, and no
striction of rectum was found. Complete closure
of the RVF was achieved (Fig. 5) and there was
no obvious scar in her medial thigh (Fig. 6). The
follow-up duration was one year and there was
neither stricture nor recurrent RVF noted.

![Fig. 1. The rectovaginal fistula: 2x2 cm in size, and 3 cm above the anal verge.](image1)

![Fig. 2. pre-operation design according to the inguinal ligament, femoral artery and patella position.](image2)

![Fig. 3. Endoscopic harvest of gracilis muscle flap was done and was ready for transfer.](image3)

![Fig. 4. The gracilis muscle flap was transferred to the perineum via the subcutaneous tunnel.](image4)

![Fig. 5. Three months after the gracilis muscle flap transposition showing closure of the RVF.](image5)

![Fig. 6. The donor site healed well with no obvious scar.](image6)
Discussion

RVF is regarded as the abnormal epithelium-coated communications between the rectum and vagina. The simple RVFs are small (< 2.5 cm in diameter), of low or mid-vaginal septum, and caused by trauma or infection. The complex ones are large (> 2.5 cm in diameter), of high vaginal septum, caused by inflammatory bowel disease, radiation, or neoplasm, and of multiple failed repairs. (Table 1.) There is further classification according to vaginal defect that differentiates partial (type I) and circumferential (type II) defects. In partial defects, the anterior or lateral wall defects belong to type IA and the posterior wall defects are the type IB. In circumferential defects, those that involved upper two-thirds of the vagina are classified as type IIA and those that have total defect are type IIB. Although the fistula of our patient was classified as type IB, and the size was small, it was a complex type based on the fact of multiple failed attempts.

The most common symptom of RVF is uncontrollable passage of flatus and stool from vagina. The fecal soiling of the undergarments psychosocially and sexually frustrated the patient. In addition, the presence of stool incontinence indicating disrupted anal sphincter is also the key point to be solved by our surgical strategies. Our patient complained about malodorous vaginal discharges without fecal incontinence.

The management of RVF may be classified into three categories: local repair, abdominal procedure and tissue transposition (Table 2). The local repair can be done transanally, transvaginally, or transperineally. Transanal procedures include endorectal advancement flap (EAF) and layered closure. EAF, the most common transanal method, was first described as “sliding flap” to obliterate the internal opening of a fistula tract without altering anal sphincter function. Despite the success rate ranged from 29 to 95 percent in different studies, Sonoda T et al. found that a higher rate of failure was present in fistulas that resulted from Crohn’s disease and rectovaginal fistulas (recurrence rate 50% and 56.8% respectively).

Table 1. Classification of RVF

<table>
<thead>
<tr>
<th>RVF</th>
<th>Diameter</th>
<th>Position</th>
<th>Cause</th>
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<tbody>
<tr>
<td>Simple</td>
<td>&lt; 2.5 cm</td>
<td>Low or mid-vaginal septum</td>
<td>Trauma or infection</td>
</tr>
<tr>
<td>Complex</td>
<td>&gt; 2.5 cm</td>
<td>High vaginal septum</td>
<td>Inflammatory bowel disease, radiation, neoplasm and multiple failed repairs</td>
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Table 2. Management options for RVF

I. Local repairs
A. Transanal approach
   1. Endorectal advancement flap (EAF)
   2. Layered closure
B. Transvaginal approach
   1. Inversion of fistula
   2. Layered closure
C. Transperineal approach
   1. Fistulotomy
   2. Perineoproctotomy and followed by layered closure
   3. Sphincteroplasty

II. Abdominal procedures
A. Low anterior resection (LAR)
B. Onlay patch anastomosis
C. Abdominal perineal resection
D. Coloanal anastomosis
E. Diverting colostomy, temporary or permanant

III. Tissue transpositions
A. Bulbocavernosus (the Martius technique)
B. Gracilis
C. Sartorius
D. Gluteus maximus
E. Omentum: omental J-flap
Alternative techniques of local repairs include perineal and vaginal procedures. Among perineal approaches, fistulotomy frequently resulted in postoperative incontinence. Though perineoproctotomy followed by layered closure is a popular transperineal approach with good successful rate in several studies, bleeding, wound hematoma, and urinary tract dysfunction are among the reported complications. Sphincteroplasty is preferred if there is fecal incontinence, anal sphincter defect, or abnormal anal manometry in simple RVFs. Transvaginal approach includes inversion of fistula and layered closure, but these studies are few. In our patient, two local rotation flaps were used with concomitant T-loop colostomy after the failure of colonic stenting, but the effect was disappointing and the recurrence was found thereafter.

Abdominal procedures are mainly used in correcting complex RVFs. They consist of LAR, onlay patch anastomosis, abdominal perineal resection, coloanal anastomosis, and temporary or permanent diverting colostomy. Abdominal wall hernia, rectus abdominis muscle weakness, and intra-abdominal infection were the possible complications in these procedures.

Among the tissue transposition procedures, the Martius technique which uses the bulbocavernosus muscle for repairing the middle to upper third of the vaginal vault is most popular. However, it is doubted that the structural support is insufficient. The use of sartorius, gluteus maximus, omentum or rectus muscles were few and all before 1980s.

Gürlek A et al. presented a successful management of a woman with multiple RVFs by using a large deepithelialized neurovascular pudendal thigh flap (Singapore flap). The neurovascular pudendal thigh flap for vaginal reconstruction was first described by Wee and Joseph from Singapore in 1989. It is a fasciocutaneous flap supplied by the posterior labial vascular bundle and innervated by the posterior labial branch of the pudendal nerve. Despite its wide use in perineal surgery, there are certain disadvantages such as technical difficulty, time consuming, presence of hair after the surgery, and numbness of vagina.

According to Lowry, simple fistulas may be approached through the vagina, perineum, or rectum. For complex fistulas, considering the abnormality of the surrounding tissue and the necessity of interposition of well-vascularized tissue between the rectum and vagina, abdominal procedure or tissue interposition techniques are necessary. For the disadvantages of the abdominal procedures and the use of other neighboring tissues mentioned above, we chose gracilis muscle flap as the target tissue for transposition.

Mowlem and Creevy firstly applied gracilis muscle in the repair of a urethroperineal and a vesicoperineal fistula after removal of the rectum. Mobilizing the gracilis muscle included the following steps: a longitudinal thigh incision, releasing of gracilis from its tibial insertion with preserving its neurovascular pedicle, subcutaneous tunneling to the perineum, and rotation of gracilis muscle flap over the neurovascular pedicle to the perineal area.

The advantages of gracilis muscle flap encompass well-placed, constant vascular pedicle, easily being mobilized and harvested, and no functional deficit after being removed. However, the scar resulted from the open harvest is unsatisfied cosmetically. Besides, the early complications include pain, infection, hemorrhage and temporary nerve palsy. The aforementioned disadvantages lead us to apply the use of endoscope in this patient.

Endoscopic harvest of the gracilis muscle flap was first applied for upper limb reinnervated free muscle transfer by Doi et al.
Ramakrishnan et al. treated it as a pedicled flap for fecal incontinence in 4 cases and a free flap for the gunshot wound of foot in 1 case. No complication was reported in this study. Furthermore, there were remarkably decreased medial thigh scar length, and limited damage to the lymphatics and vessels. Moreover, the anatomical location of the gracilis muscle (i.e. the most superficial muscle of the adductor group) also makes it suitable for endoscopically assisted muscle harvesting. Recently, the minimally invasive procedures without endoscopic assistance was used by Jeng SF et al with a 5 cm proximal incision wound for identifying and dissecting the pedicle of the gracilis muscle flap and a small 1.5 cm distal incision at the muscle insertion for dissection of the distal muscular attachment. The time to harvest gracilis muscle flap was 36 minutes in average. The donor site morbidity in their series was only transient hypesthesia in two of twelve cases without any other complication. We modified this method with only proximal 5 cm incision wound under endoscopic assistance to minimize the donor site morbidity and to reduce time of flap harvest to 30 minutes.

In conclusion, comparing to the conventional open technique there were five merits that endoscopic harvest of the gracilis muscle flap fulfills: reduced total incision length, less time required, equal success rate, less morbidity, and of cost equivalency in the setting of contemporary plastic operation theater. For properly selected complex RVFs, endoscopic harvest of the gracilis muscle flap could not only repair the RVF successfully but also have minimal donor site morbidity.

Reference

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內視鏡取得股薄肌皮瓣使用於直腸陰道瘻管

── 病例報告及文獻回顧

鄭旭棠 陳信翰 林孟羲 吳肇毅 周爾康 張家寧

會陰部癌症或是感染所導致的難治性直腸陰道瘻管是一個相當棘手的問題。大於二點五公分的複雜瘻管或是反覆發生者則必須考慮採用腹部手術或是組織轉移的方式。股薄肌皮瓣因其併發症少且感染率低，被廣泛地運用在各種重建手術。內視鏡手術是目前外科手術的發展趨勢。我們在此提出一位四十六歲女性，在經過直腸癌手術之後，發現有直腸陰道後壁瘻管。考慮到她已經經歷過幾次失敗的修補手術，我們採用內視鏡的方式來取得股薄肌皮瓣，並將其轉置於瘻管處。大腸纖維鏡追蹤檢查顯示皮瓣癒合良好並無滲漏。大腿內側傷口並不明顯。採用內視鏡的方式來取得股薄肌皮瓣有下列五項優點：減少總切口長度、手術時間較短、相同的成功率、併發症較少以及在費用上並無額外支出。對於複雜性直腸陰道瘻管，此一方式或許可以作爲手術上的另一種選擇。