Perineal Reconstruction after Abdomino-Perineal Resection Using Gracilis Muscle Flap

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Abstract

Objective: To assess the efficacy of gracilis muscle flap in achieving healing of perineal defects after abdominoperineal resection (APR) for lower rectal or anal cancer.

Methods: Eleven patients were subjected to gracilis muscle flap to reconstruct perineal wounds after APR. Both procedures were done simultaneously in eight patients, while delayed reconstruction was done in three patients. Postoperative complications were reported as well as healing time for all patients.

Results: All patients received radiotherapy as a part of their management before the operation. Indications for operation ranged between recurrent rectal cancer, resistant anal cancer, low rectal cancer in obese patients with expected perineal wound complications, and patients with already non-healing of perineal wounds after APR. The average duration of simultaneous APR and gracilis flap reconstruction was 235.75±32.2 minutes compared to 133.3±12.6 minutes for gracilis flap reconstruction alone. Two patients had superficial donor site infection, one patient had mid-thigh numbness, all patients had minor perineal wound infection as we did not close perineal wounds and they were left to heal with secondary intention, and one patient had minor necrosis of the distal end of gracilis. All complications were treated successfully with conservative measures. The mean healing time of perineal wound was 68.18±19.78 days.

Conclusions: Gracilis muscle flap is an excellent option to assist perineal wound healing after APR for both rectal cancer and anal cancer with minimal complications at both the donor site and the perineal wound.

Key Words: Perineal reconstruction – Abdomino -perineal resection – Gracilis muscle flap.

Introduction

DESPITE advances in stapling techniques, abdominoperineal resection (APR) is still the gold standard option for management of low rectal cancers when safe distal resection margins could not be achieved by sphincter preserving operation [1]. On the other hand, treatment of squamous cell carcinoma (SCC) of anal canal with combined chemo-radiotherapy is not always successful. 16.6% of cases are diagnosed with persistent disease within 6 months of initial combined modality therapy and 10-30% will develop recurrent disease [2,3]. These patients will mostly be offered APR either as an attempt of cure or as palliation. Management of the perineal wound after APR has been a challenge for over 100 years, since it was first described in 1884 by Czerny [4]. as it is associated with a large number of complications [5].

Radiotherapy (RT) is now commonly used as a neoadjuvant therapy for low rectal cancer or as a part of combined modality therapy for anal cancer. It may offer benefit in terms of recurrence and local control, but may add to morbidity postoperatively. In addition, other patient co-morbidities, such as diabetes mellitus, smoking, obesity, and advanced age, may contribute to poor perineal wound healing [6].

The impact of these conditions on perineal wound healing has been variably reported. Failure of primary healing is considered the most important complication following APR. Other complications include pelvic and intra-abdominal sepsis, persistent perineal sinus and need for re-operation. The incidence of perineal wound complications is between 16 to 52 percent of complex pelvic operations that require a pelvic wound [7,8].

The use of vascularised tissue transfer in an attempt to avoid delayed perineal wound healing has been suggested. Reports in the literature describe the use of a variety of pedicled flaps in addition to free-tissue transfer as methods of introducing well-vascularised tissue (in the form of muscle, myocutaneous or fasciocutaneous flaps)
into the wound bed with variable success rates [3,5,9].

This study was designed to assess the efficacy of gracilis muscle flap in achieving healing of perineal defects after abdominoperineal resection for lower rectal or anal cancer.

**Patients and Methods**

The present study was performed over a period of 3 years (December 2007 to December 2010) during which 11 patients were included in the study, who required APR resection with delayed or anticipated poor perineal wound healing. Patients were admitted to colorectal surgery unit, Alexandria Main University Hospital.

Inclusion criteria comprised recurrent rectal cancer after low anterior resection, anal squamous cell carcinoma with failure of combined chemotherapy technique to control the disease whether surgery is for curative or palliative intent, patients with lower rectal cancer indicating APR with BMI more than 35 kg/m², and patients with history of APR with delayed perineal wound healing more than 3 months. Patients with known inflammatory bowel diseases were excluded from the study.

**All patients were subjected to the following:**

**Preoperative measures:**

All patients will be subjected to full history taking, thorough clinical examination, preoperative CT scan of the abdomen and pelvis for staging, endoscopy and biopsy for all lesions, and routine preoperative lab investigations. Informed consent for the whole procedure was taken from all patients.

**Operative measures:**

In eight cases, APR and gracilis muscle flap were done simultaneously. On the other hand, three cases who were rectal cancer upon by APR before but had failure of perineal wound healing for more than 3 month, were operated only for gracilis muscle flap.

**Operative technique:**

- **Abdominoperineal resection:**
  APR was done in the classical way with patient in Lloyd Davis position.

- **Gracilis muscle flap:**
  The patient was then placed in the lithotomy position, with the hips abducted, to keep the perineal defect at a maximum (Fig. 1). Only for cases with history of perineal wound failure after APR, the defect was debrided until healthy looking tissue was seen. The gracilis muscle was mobilized, preserving the neurovascular bundle that was identified using nerve stimulator (Fig. 2), and divided from the tibial insertion. The distal end of the muscle was transposed through a subcutaneous tunnel to the perineal defect (Fig. 3). The distal end of the gracilis muscle was fixed to the lateral wall of the perineal defect and if possible folded in the defect to fill as much cavity as possible with no tension (Fig. 4). The perineal wound was then left to heal with secondary intention. In one patient, in order to avoid tension; the limb from which the gracilis was mobilized had to be put in neutral position during surgery.

**Postoperative measures:**

After the operation, the perineal wound was regularly dressed, intravenous antibiotic prophylaxis was offered for 3 days after the surgical procedure. Patients were instructed to keep the hip joint in neutral position for 3 weeks and avoid excessive extension or abduction of the hip for 6 weeks. The histopathological staging was determined postoperatively. All patients were followed up for a period of one year recording the following:

- **Minor postoperative complications:** Complications of the perineal wound (infection, abscess formation, fistula), complications of the donor site (infection or mid-thigh numbness), or minor flap necrosis.

- **Major postoperative complications:** Major flap necrosis or perineal herniation.

- **Healing time:** Complete wound healing was defined as intact skin with no discharge or clinical signs of infection.

**Results**

This study included 6 males (54.5%) and 5 females (45.5%) with a mean age of 61.6 ±9.3 years. There was no significant gender difference regarding age (p=0.464). The patients had an average BMI of 35.4±5.4kg/m², 5 patients (45.5%) were smokers, and 5 patients (45.5%) were diabetics. Three patients (27.3%) had the diagnosis of squamous cell carcinoma of anal canal, 2 patients (18.2%) had a recurrent rectal cancer after low anterior resection, 3 patients (27.3%) had previous APR for a low rectal cancer with delayed perineal wound healing, and 3 patients had low rectal cancer requiring APR with BMI above 35kg/m². All patients received radiotherapy as a part of neoadjuvant therapy for cancer rectum or as initial chemoradiation for SCC of the anal canal.
Operative data.

Three patients (27%) had delayed perineal wound healing after previous APR and required gracilis muscle flap only, while the rest (8 patients, 73%) were operated upon by APR with immediate gracilis muscle flap. The mean time for APR with immediate flap was 235.75 ± 32.2 minutes. On the other hand, the mean time for debridement and gracilis flap only was 133.3 ± 12.6 minutes.

Postoperative data

Donor site infection was noticed in 2 patients, recognized by erythema and minor discharge and was controlled by conservative measures. We noticed exudative discharge and sometimes pus during regular dressing of perineal wounds in all patients. It was controlled spontaneously as the perineal wounds were left to heal with secondary intention in our technique.

We did not have perineal abscesses or fistulas in patients included in this study. As regard flap viability, only one patient showed necrosis of the distal end of the gracilis muscle that sloughed, the rest of the muscle was viable, and healing of the perineal wound was not affected in this patient. Postoperative complications are shown in Table (1). In addition, there were no significant differences in healing time of perineal wounds as regards patients’ gender, smoking and diabetes (Table 2).

The mean time for healing of the donor site was 16.72 ± 2.97 days. On the other hand, the mean time for perineal wound healing was 68.18 ± 19.78 days. There was no difference in healing time of perineal wound between patients with immediate muscle flap (65 ± 17.72 days) and those with delayed muscle flap (76.67 ± 27.53 days, \( p = 0.63 \)).
Major postoperative complications:
- Infection at donor site
- Mid-thigh numbness
- Minor perineal wound infection
- Perineal abscess
- Perineal fistula

Minor postoperative complications:
- Perineal herniation
- Minor flap necrosis
- Major flap necrosis
- Delayed perineal wound healing

Table (1): Post-operative complications.

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of patients</th>
<th>%</th>
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<tbody>
<tr>
<td>Minor postoperative complications:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Infection at donor site</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>• Mid-thigh numbness</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>• Minor perineal wound infection</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>• Perineal abscess</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>• Perineal fistula</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Major postoperative complications:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Perineal herniation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>• Minor flap necrosis</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>• Major flap necrosis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>• Delayed perineal wound healing</td>
<td>0</td>
<td>0</td>
</tr>
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</table>

Table (2): Effect of gender, smoking and diabetes on healing time.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No. of patients (n=11)</th>
<th>%</th>
<th>Healing time (Mean±SD)</th>
<th>p-value</th>
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<tbody>
<tr>
<td>Gender:</td>
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</tr>
<tr>
<td>Males</td>
<td>6</td>
<td>54.5</td>
<td>66.67±22.06</td>
<td>0.797</td>
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<tr>
<td>Females</td>
<td>5</td>
<td>45.5</td>
<td>70.00±19.04</td>
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<tr>
<td>Smoking status:</td>
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<td></td>
<td></td>
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<tr>
<td>Non-smokers</td>
<td>6</td>
<td>54.5</td>
<td>70.83±15.94</td>
<td>0.053</td>
</tr>
<tr>
<td>Smokers</td>
<td>5</td>
<td>45.5</td>
<td>65.00±25.25</td>
<td></td>
</tr>
<tr>
<td>Diabetes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-diabetic</td>
<td>6</td>
<td>54.5</td>
<td>65.00±20.25</td>
<td>0.586</td>
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<tr>
<td>Diabetic</td>
<td>5</td>
<td>45.5</td>
<td>72.00±20.80</td>
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</table>

Discussion

Complications of perineal wound after APR are common. One of these complications is delayed perineal wound healing which is defined as the non-healing of the perineal wound for more than 3 months, that adds to patient’s morbidity and suffering in the postoperative period. Surgical factors, preoperative radiotherapy, in addition to some patients’ co-morbidities were suggested to be the cause of the non-healing perineal wounds.

Surgical techniques nowadays are concerned with getting negative circumferential margins and reducing local recurrence after APR because those were found to be higher compared to low anterior resection [10]. This was achieved by more radical surgery through resection of more of the levators, as first described by Miles in 1908 [11] and avoiding “waisting” [12]. This had consequently increased the perineal defect. The current guidelines for management of low rectal cancer and squamous cell carcinoma of the anus recommend the use of radiotherapy as a part of neoadjuvant therapy for low rectal cancer and initial combined modality therapy for SCC of the anus to offer benefit in terms of low recurrence and local control [13,14]. The adverse effect of radiotherapy on perineal wound healing is a matter of controversy, although it was believed for a long time that radiotherapy has adverse effects on wound healing [6,8]. Recent studies showed that the cause and effect relationship between radiotherapy and perineal wound healing are equivocal [15]. Co-morbidities such as diabetes and obesity may add to perineal wound complications as well as smoking and steroid therapy [4].

To treat non-healing perineal wounds, surgeons developed techniques of muscle flaps to assist healing of perineal wounds [12,16]. The idea is to bring well-vascularized, non-irradiated tissue and to fill the pelvic dead space with bulky, healthy tissue, thus improving wound healing. In addition, this healthy tissue helps to decrease infection rates through increasing oxygen tension and improving leukocyte delivery in the region of the perineal wound [16]. On the other hand, there are some disadvantages of using these muscle flaps including prolonged time for the surgical procedure, the additional costs, and the potential morbidity (such as infections, flap loss, seroma, perineal hernia) of such procedures. The impact of these disadvantages is usually low compared to the impact of perineal wound complications [9].

From the different options for muscle flaps that could be used for perineal reconstruction, we chose the gracilis muscle due to its extraordinary characteristic of having a very proximal single pedicle which can permit successful perineal transpositioning and the covering of a large area of defect. The function of gracilis muscle is less important than rectus abdominis or gluteus maximus. In addition, its function could be overlapped by the nearby muscles. Gracilis muscle flap was previously studied in treatment of various perineal reconstruction purposes such as perineal fistulas [17], postoperative perineal hernia [18] and perineal wound defects [19,20] with variable success rates.

In our study, complications after gracilis muscle flap are generally minimal. Two out of 11 patients had superficial wound infection at the donor site and only one patient complained of numbness on the medial aspect of the thigh. The use of muscle only in this study may delay wound healing for a while but avoided major problems related to infection and necrosis of the cutaneous flap observed
in studies using myocutaneous flaps \[12,21\]. Careful identification of the neurovascular bundle and avoiding tension on the flap prevent muscle flap necrosis.

In this study, only one patient had minor necrosis of the distal end of the muscle with no effect on wound healing. In one patient, we faced a problem of transposing the gracilis without tension due to its abnormally located neurovascular bundle. Putting the lower limb of this patient in neutral position allowed us to put the muscle flap in the perineal wounds without tension. This patient was kept in the hospital for a longer period than others to make sure of immobilization of his limb with gracilis flap. After 3 weeks, gradual mobilization was allowed and the procedure was successful with no difference in healing time compared to other patients. There was no difference in healing time between patients with immediate muscle flap and those with delayed muscle flap but it is obvious that making both procedures in one setting decreases patient suffering, saves time and is more cost-effective although further studies with larger number of patients have to be done to support this.

Finally, we believe that gracilis muscle flap is an excellent option to assist perineal wound healing after APR for both rectal cancer and anal SCC with minimal complications at both the donor site and the perineal wound.

References


