Modified Gluteus Maximus Flap In The Treatment of Fecal Incontinence

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Hisham M. Amer, M. Abdulmoneim Elmasry, M. Elmarzoky, and Islam Abdelrhman Abdelmoneim

Abstract

This study includes a new trial and modification of using gluteus maximus flap in treatment of 10 patients complaining different grades of fecal incontinence due to old injury to the anal canal either iatrogenic or traumatic. Patients were collected along the period between September 2008 till March 2010 aiming to change their mode and quality of life which was full of limitations in social interaction, physical activity and employability. This study suggests that this modification is better than old trials in gluteus maximus flap as it is easier in access, separation and complete wrapping of the whole anal canal in formation of neosphincter.

KEYWORDS: Fecal incontinence, Modified, Gluteus maximus flap, Wrapping, Neosphincter.
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Introduction:

The term “anal incontinence” is usually used to denote any involuntary anal leakage, whether of solid, liquid, or gas at improper place and at improper time [1]. Many factors contribute to the ability to control feces consistency, Peristalsis, Rectal capacity, sensibility of rectum, central nervous system and Pelvic floor muscles, since anal continence requires intact sensation and motor innervations, and an anatomically intact sphincteric complex [2].

History:

In 1902, Chetwood [3] first described the use of the gluteus maximus muscle as an anal neosphincter was further developed. It was developed along the time by many surgeons till 1944 by Bistrom [4] then attention turned from the gluteus maximus muscle as a potential neosphincter and focused on the gracilis muscle till 1981, Bruining [5] reintroduced the gluteus again and many techniques described till 1995.

Aim:

The aim of this work is to study the effect of transposition of a unilateral or bilateral gluteus maximus muscle flap which will be separated from both origin and insertion depending on its long neurovascular pedicle and is totally warped around the anal canal and sutured to the midline in patients with anal sphincteric defect that causes fecal incontinence due to trauma to the anal canal, either accidental or iatrogenic, applied to the type of patients who has just soiling or with major complete incontinence.

Patient and method:

Ten patients were collected along the period between September 2008 till March 2010 aiming to change their mode and quality of life which was full of limitations in social interaction, physical activity and employability, admitted with multiple degrees of fecal incontinence according to Cleveland score of fecal incontinence. Iatrogenic patients were 2 after normal vaginal delivery, 2 after multiple pilectomy and 1 after repair of imperforate anus by pull-through procedure. The traumatic patients were 1 due to fall from height, 2 due to sharp impaled injury and 2 due to motor car accident. Complete detailed history were taken about the trauma they were suffered and if they had incontinence is to flatus, to stools or both, how many time they change their clothes, using of pads and effect on social contact and activity. They were had clinical examination by inspection, the presence of fecal matter, prolapsed hemorrhoids, dermatitis, scars, skin excoriations, the absence of perianal creases or a gaping anus may be noted. Neurological examination of the back and the lower limbs, the anocutaneous
reflex examination for intact sensation, and digital rectal examination were performed. Complete laboratory investigations including manometric studies using a water-perfused catheter applying a continuous and a stepwise pull-through technique with the evaluation of resting anal pressure (RAP), maximum resting pressure (MRP), maximum squeeze pressure (MSP), anal canal length (ACL), and rectoanal inhibitory reflex (RAIR) use a balloon tip catheter. Saline enema test using 200 ml saline was also carried out in all patients, and pelvic Magnetic Resonance Imaging (MRI) was also helping as it has been shown to provide superior imaging with better spatial resolution, particularly for defining the anatomy of the external anal sphincter and also integrity and state of both gluteus maximus muscles.

All patients and their families informed about the role of muscle transposition as one option in the management of anal incontinence when anal sphincters were either nearly absent or severely damaged. All of them agreed and signed an informed consent form. All patients were received 1 g cefotaxime and 500 mg metronidazole 2 hours before, during and after the operation for at least 5 days.

With the patient under general anesthesia and in prone position, jack-knife position with buttocks tapped apart to facilitate exposure (Fig. 1); a radial incision was performed over gluteal region about 10 centimeters or less above and parallel to the infragluteal crease corresponding to the projection of the lower edge of the gluteus maximus muscle with modified length according to each case and to weather anoplasty will be performed or not starting from the perianal skin most of the patients needed a V-Y advancement flap (Fig. 2).

Elevation of skin flaps to show the lower border of both gluteal muscles, then dissection of lower muscle slip was done using monopolar diathermy from underlying fascia and separation of the slip from both sacral origin and insertion at iliotibial tract (Fig. 3), taking the separated insertion (distal part) in a hand and separation of the undersurface was done keeping in mind that the pedicle is located proximally until flap became free from underlying surface; now we have a muscle slip free at both sides distally and proximally with intact pedicle, the same was repeated for the other side (Fig. 4). Anoplasty then done using the V-Y incision to elongate and restore the anal canal in cases that anal canal was destructed or shortened by trauma. Both slips from both sides were approximated at origin (proximal end) posteriorly behind anal canal with polyglycolic acid sutures, also insertions (distal end) were approximated in front of the anal canal without tension and without using fascia lata as muscle was easily reached anteriorly without any kink in the pedicle or tension as we were not passing the midline and good hemostasis then was done (Fig. 5). The wound was closed primarily with interrupted polyglycolic acid sutures, leaving suction drains on both sides and Vaseline gauze in the new anal canal (Fig. 6).
Fig. 1. Jack-knife position with buttocks tapped apart

Fig. 2. A radial incision with V-Y flap showing lower border of the gluteus maximus muscle
Fig. 3. Separated muscle flap from both origin and insertion with intact pedicle

Fig. 4. Approximated both origin and insertion (wrapping) around anal canal
Fig. 5. Complete muscle wrap with newly repaired anal canal

Fig. 6. Skin closure with Vaseline gauze inside anal canal and portovac inside both flaps
Postoperatively, patients received fluids intravenously; nothing was allowed per oral for 2 days for only the patients who were not having colostomy and were given narcotics for analgesia and to help decrease gastrointestinal motility. Thereafter, they start low residue diets for 1 week.

The patients allowed to ambulate on the second day after the procedure but is not permitted to sit or lie down on back for 2 weeks, avoiding traction over the flaps, also was not permitted to sit in or use water bath for at least 2 weeks; suction drain was removed 5-10 days postoperatively.

At the beginning of the fourth postoperative week most patients could perform voluntary contraction of the gluteus, although biofeedback was necessary using a special endoanal electrical stimulator (Myoplus) (Fig.7).

Patients followed both objectively and subjectively for about 2–6 months using clinical assessment, manometric studies, saline infusion tests and magnetic resonance imaging (MRI).

**Results:**

Four of the traumatic patients have colostomy immediately after trauma and one of the iatrogenic (the one who had imperforate anus) needed colostomy during the operation that to permit better healing of skin flaps.

9 was underwent bilateral modified gluteus maximus flap and 1 was unilateral, 7 of the patients need anoplasty for new anal canal formation.

Post operative morbidity was in the form of infection in the anoplasty wound (v-y) flap was occurred in 6 patients (60%), which led to variable degrees of wound dehiscence, 3 of them was traumatic and 3 was iatrogenic, although traumatic wound was more aggressive in dehiscence due to scaring and soft tissue loss.
All of the patients showed satisfactory results with good clinical improvement which was revealed with clinical examination, daily chart of fecal habits and post operative manometry. All patients showed significant changes in manometric pattern when compared to preoperative values in the form of increasing in the MRP, MSP (Tables 2, 3, 4&5).

Surgery was followed by sessions of training with a special apparatus (Myoplus) for (2-6) months. 6 were completed the training and showed satisfactory post training clinical and manometric changes, 2 are going in training, 2 were not compliant for training.

All of the patients who have colostomy were followed for colostomy closure.

<table>
<thead>
<tr>
<th>Pt.</th>
<th>Preoperative score</th>
<th>Postoperative score</th>
<th>Post training</th>
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<tr>
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<td>have colostomy</td>
<td>4</td>
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</tr>
<tr>
<td>1</td>
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<td>5</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>14</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>6</td>
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</tr>
<tr>
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Table 1: Patients scoring according to Cleveland score

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<tr>
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<tr>
<td>MRP mmHg</td>
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<td>44</td>
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<tr>
<td>MSP mmHg</td>
<td>60</td>
<td>113</td>
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Table 2: Change in MRP & MSP pre and post-operative
Table (3): Descriptive statistics for all patients according to MRP (maximum resting pressure) and MSP (maximum squeezing pressure)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
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<td>MRP (maximum resting pressure)</td>
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<tr>
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<td>70</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
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<td>35</td>
<td>55</td>
<td>43.7</td>
<td>6.3</td>
</tr>
<tr>
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<td>180</td>
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<td>36.8</td>
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</table>

Table (4): Comparison between pre and post MRP (maximum resting pressure)

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>Mean</th>
<th>SD</th>
<th>P-value</th>
<th>Sig.</th>
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<td>MRP (maximum resting pressure)</td>
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<td>10.6</td>
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<tr>
<td>Postoperative</td>
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<td>59.7</td>
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</table>

Table (5): Comparison between pre and post MSP (maximum squeezing pressure)

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>Mean</th>
<th>SD</th>
<th>P-value</th>
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<td>MSP (maximum squeezing pressure)</td>
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<td>Preoperative</td>
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<tr>
<td>Postoperative</td>
<td>10</td>
<td>113.6</td>
<td>36.8</td>
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</tbody>
</table>

P-value was calculated by paired t test. SD: Standard deviation S: P-value < 0.05 (Significant) HS: P-value < 0.01 (High significant). P-value > 0.05 (Non significant)
**Discussion:**

The present study involved the delayed management of ten cases suffering from traumatic fecal incontinence. Four cases presented with an already performed proximal diverting colostomy, invalidating the use of preoperative Cleveland score to assess their continence. Preoperative anorectal manometry was performed in all cases to act as a baseline assessment prior to intervention. MRI study was performed in selected cases such as a patient presenting with incontinence following a pull-through operation in early childhood during the management of a high imperforate anus. Transrectal ultrasound was not routinely used due to the absence of an anal canal in some severely traumatized patients in the present study.

Primary sphincter repair was not attempted in this study, because it involved the delayed management of a cohort of patients with either almost complete loss of sphincter mass in some cases or the expected atrophy of the native sphincters secondary to the effect of their disinsertion (muscle fraying and true shortening) or the unattended to pudendal neuropathy (traction or actual injury of the nerve or its inferior rectal branch).

Accordingly muscle transfer to replace the damaged sphincter was the preferred technique to be adopted in the cases under study. Artificial anal sphincters were not used because of the higher cost and the frequently associated sepsis in the presence of a foreign body (the cuff of the sphincter).

The gluteus maximus muscle transfer was the elected operation rather than the gracilis muscle transfer with or without its pace maker (dynamic graciloplasty) for several reasons.

Although medical literature does not provide a randomized controlled trial to compare the efficacy of the gluteus maximus muscle to the gracilis muscle in creating a neosphincter, the reported disadvantages of the non stimulated gracilis muscle transplant dissuaded the authors from implementing them. Disadvantages of the gracilis flap include early muscle fatigue (Type II skeletal muscle fibers), difficulty training them to contract (which is accomplished via thigh adduction), incomplete rectal wrap, inability to generate a high squeeze pressure, and frequent constipation due to distortion of the anorectal angle. The gracilis may, in fact, serve as a static sling with some contractile properties. On the other hand the gluteus maximus can generate significant sustained squeeze pressures and add considerable bulk to the perirectal space sealing any rectal microperforations [6][7].

Several authors suggested modifications to allow easier encircling of the anus by the gluteus maximus muscle. Advocators of the use of one gluteus maximus muscle disinsert the attachment on the posterior gluteal tubercle of the femur, saving a strip of tendon and periosteum for later fixation to the ischial tuberosity on the
contralateral side (i.e. proximally based flap). The lower third of the gluteus maximus muscle is then harvested after identifying and preserving the inferior gluteal nerve and vascular pedicle. The inferior gluteal flap is elevated from lateral to medial and subsequently split with bipolar cautery. This maneuver creates a slightly longer inferior slip, which is transposed through a posterior tunnel around the rectum, and a shorter superior slip, which is transposed through the anterior tunnel in the rectovaginal septum in females. After transposition and balancing, the gluteal slips are brought to the contralateral ischial tuberosity and secured with a modified Kessler tendon repair [7][8].

A further modification was adopted in the present study based on two realized observations; First the fact that gluteus muscle flaps survive and function whether they were proximally or distally based (pedicle close to the insertion), second suturing of the mobilized strips to each other across the midline would decrease the tension facilitating anal canal encirclement with no need of establishment of a non-physiologically sound attachment to the mobilized strips to the ischial tuberosity on either side.

The potential advantages of this modification are; easier anterior encirclement allowing low tension suturing of the distal ends of the dissected flaps, with reconstruction of a perineal body. Furthermore the proximal ends of the flaps can be sutured together behind the anal canal (relatively more demanding) thus completing the doughnut–like encirclement of it with its consequent elongation and narrowing via a relatively elongated high resting pressure zone is constructed. Finally the bilateral non-split muscle fibers physiologically sound suturing to each other on both sides of anal canal would prevent the shortening and consequent atrophy expected in disinserted muscles.

The operative difficulties encountered in this series were related to the difficulty in reconstruction of a squamous epithelium lined anal canal through using V-Y or local island flaps in the more advanced cases. These difficulties were related to the previous perineal scarring consequent to the primary injury pattern. Infection and partial sloughing of this skin tube accounted for a 60% incidence of containable surgical site infection.

The relative increase in postoperative sepsis in this series in comparison to other reported series maybe related to the liberal criteria of inclusion adopted in this study (less obstetric and relative increase in advanced trauma to the perineum etiologies of traumatic fecal incontinence).

To improve sustainability of contraction of the transposed muscles postoperative intermittent home stimulation using the anal plug of the Myoplus apparatus was adopted in analogy to the effect of the pace maker in dynamic graciloplasty (change type II skeletal muscle fibers to type I fibers normally present in the native external muscles)
sphincter, the latter can sustain long-term contraction.

An interesting finding in this study was the presence of a statistically significant increase in maximum resting pressure (table 2) contrary to previous studies. The explanation for that finding is the absence of a relatively long tight wrap to the anal canal in the proximally based flaps (no actual posterior encirclement) as well as distally based split flaps (decreasing its power of contraction).

These encouraging findings stimulate more patient recruitment to further validating the results. Future suggestions are to seek the help of microvascular surgeons to construct a versatile skin tube to replace the lost or compromised anal canal using free flaps; this would possibly improve postoperative dehiscence associated with the modified gluteus maximus neosphincter construction adopted in this study.

References:


