Video Article

# Reconstruction After Abdominoperineal Resection with a Modified Taylor Flap

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URL: https://www.jove.com/video/59303
DOI: doi:10.3791/59303

Keywords: Taylor flap, abdominoperineal resection, colorectal cancer, rectus abdominis muscle, musculocutaneous flap, perineal reconstruction

Date Published: 12/17/2018

Citation: Boccara, D., Chaouat, M., Serror, K., Dutot, M.C., Mimoun, M., Levy, S. Reconstruction After Abdominoperineal Resection with a Modified Taylor Flap. *J. Vis. Exp.* (), e59303, doi:10.3791/59303 (2018).

## Abstract

Healing after abdominoperineal resection is often difficult especially in patients that have undergone radiation therapy. Furthermore, vaginal reconstruction is an important issue for the women that undergo this surgery. The goal of this work is to describe our surgical technique of perineal reconstructions with Taylor musculocutaneous flaps and provide an overview of its results. The technique consists of drawing a skin paddle from the pit of the scapula to the umbilicus. The skin paddle is then harvested with the rectus abdominis muscle. The muscle insertion on the pubic bone is left intact to prevent any tension on the pedicle. Postoperative care concentrates on surveillance of the coloration of the flap and measures that allow patients to stand up as soon as possible. No pressure on the flap is tolerated for the first three weeks.

Between 2000 and 2010, the 68 patients who underwent reconstruction with a Taylor flap, healed within a median time of 30 days. The reoperation rate was 11.7% including 1 for herniation. The principal causes for delayed healing were wound dehiscence, abscess, and partial necrosis. However, no flaps required removal. The mean duration of hospitalization was 23.7 days.

The localization of the skin paddle in an area were anastomosis between the deep inferior epigastric artery, the superior epigastric artery and the lumbar arteries are very dense offers a reliable blood supply. The muscle harvested makes the flap bulky enough to fill the dead space caused by the abdominoperineal resection. Taylor flaps substantially improve the reconstruction of defects resulting from abdominoperineal resection. They enable complete and rapid healing with low morbidity.

## Introduction

Abdominoperineal resection is a frequently performed procedure in gastrointestinal surgery. It is the reference treatment[1] for lower rectal cancers and can also be necessary after the failure of conservative treatment (e.g., radiation therapy and chemotherapy) of the anal canal, or to treat damage from tumors of the perineum or the pelvis.

The occurrence of sometimes serious complications such as gastrointestinal perforations, infections, and perineal fistulae[2] led to modification of perineal reconstruction techniques to accelerate healing and limit the sometimes very disabling functional or aesthetic sequelae[3,4]. In the most recent series published, the complication rates of resection without reconstruction ranged from 35% to 66%[5] and resulted in serious degradation of patients' quality of life. There are three major difficulties to resolve: an empty pelvis, closing the defect, and reconstructing the resected organs (e.g., vagina).

Described in 1983 by Taylor[6,7], the rectus abdominis myocutaneous flap is vascularized by the deep inferior epigastric artery and its two collateral veins. These vessels provide numerous perforators that are concentrated around the umbilicus and run through the muscle to vascularize the skin of the abdomen. The rich vascularization of its skin paddles simultaneously enables healing despite earlier irradiation and coverage of the defect, while also making it possible to limit the risk of infection.

Since 2002, the department of Plastic Surgery of St. Louis Hospital in Paris offered reconstruction with flaps to all patients undergoing abdominoperineal resection in treatment of lower rectum or anal canal cancer. The surgery is performed by a team of surgeons from the gastrointestinal surgery department at St. Antoine Hospital and plastic surgeons from St. Louis Hospital. Flaps made of omentum, gracilis, and the gluteus maximum have been used in turn for this purpose; today the Taylor flap is the leading choice for this type of reconstruction. Its reliability and trophicity, and the size of the skin paddle make it the flap of choice for covering defects after abdominoperineal resection. The purpose of this surgical procedure is to provide patients and surgeons an easy and reliable solution to most of the complications that follow the abdominoperineal resection.

## Protocol

This protocol follows the guidelines of our institution's human research ethics committee.

 

## 1. Patient installation and preparation

1. Install patient in lithotomy position. Perform disinfection and sterile draping using standard procedures while ensuring free access to the perineum, the entire abdomen up the xiphoid appendix and the inferior angle of the scapula.

## 2. Drawings

1. Measure the height and width of the perineal resection with a ruler placed from one skin edge to the other.
2. Draw the line from umbilicus to the inferior angle of the scapula. This line is the axis of the flap.
3. Draw a flap centered on the previously marked line.
    1. The width of the flap should the same as the perineum resection. Use a pinch test to make sure that one will be able to close the skin after having harvested the flap.
    2. If there is a need for vaginal reconstruction, make sure that the length of the flap is equal to the length of the vaginal depth plus the height of the perineal resection plus twice the thickness of the flap. One can expand the length of the flap to the inferior angle of the scapula.
4. On the abdomen, mark an approximation of the position of the linea alba and the lateral extremity of the abdominis muscle.

## 3. Harvest of the flap

1. Use a surgical blade to incise the skin according to the drawings.
2. Use an electric scalpel to progress to the aponeurotic plane all around the flap. Make sure the incision is vertical and does not slip slightly under the flap.
3. Cauterize vascular branches as needed.
4. Separate the subcutaneous fatty tissue from the underlying aponeurosis using the electric scalpel. Start from the lateral extremity and progress toward the umbilicus until the lateral extremity of the abdominis muscle can be seen, then stop.
5. Upon arriving at the lateral extremity of the abdominis muscle, incise the anterior sheath of the aponeurosis of the abdominis muscle with a surgical blade, all around the flap.
6. Insert Metzenbaum scissors between the abdominis muscle and the posterior sheath of the aponeurosis, horizontally just above the flap.
7. Use the electric scalpel to section the muscle on the scissors. At this point the superior epigastric vessels are visible; these must be either coagulated or ligatured with a multi-filament coated 3-0 surgical suture.
8. Use the electric scalpel to separate the abdominis muscle from its anterior aponeurotic sheath in the portion that is caudal to the flap.
9. Separate the muscle from its posterior aponeurotic sheath and the fascia transversalis in a cranio-caudal direction.
    1. Use Metzenbaum scissors or a wet gauze for this step.
    2. Notice that the deep inferior epigastric vessels can be seen all along this step.
    3. Notice that the lateral and medial sides of the muscle are not adherent and can be easily separated from the abdominal external oblique muscles and from the linea alba.
10. Stop the dissection when on the pubic bone (**Figure 1**).

## 4. Transposition of the flap

1. Handle the flap using the left hand and insert it into the abdominal cavity while a second surgeon pushes the bowel upward.
2. Use the right hand, introduced into the perineal defect, to extract the flap (**Figure 2**).
3. Make sure there is no tension on the pedicle.

## 5. Flap modeling for vaginal and perineal reconstruction

1. Fold the flap to obtain an **L shape**.
2. Use the scapular side of the flap to reconstruct the posterior wall of the vagina.
    1. Suture the lateral extremity of the flap to the cervix uteri with interrupted sutures using a multi-filament coated 3-0 surgical suture.
    2. Progress in a symmetrical fashion to suture the flap to the remaining vaginal wall until arriving at the skin.
3. Suture the umbilical side of the flap to the posterior extremity of the perineal resection using the same multi-filament suture.
4. Insert a drain in the pelvic cavity.
5. Finish suturing in the same fashion (**Figure 3**).

## 6. Abdominal Closure

1. Separate the subcutaneous fatty tissue from the aponeurotic plane for about 2 cm in the lateral and cranial position to obtain more cutaneous laxity.
   CAUTION: Do not separate the aponeurosis from the subcutaneous fatty tissue in the caudal direction because it has already been separated from the muscle. Thus, this action could lead to the necrosis of the aponeurosis.
2. Suture the anterior sheath of the abdominis muscle aponeurosis that is under the location from which the flap was harvested, to the linea alba using a running suture with multi-filament coated 1-0 surgical suture.

CAUTION: Be careful to not strangulate the pedicle with the running suture, if necessary stop the suture a few centimeters before the pubic bone.

3. Close the skin with subcuticular interrupted sutures and a subcuticular running suture using a mono-filament 3-0 surgical suture.

## 7. Postoperative management

1. Take all measures so the patient stands up as soon as possible.
    1. Have the patient standing on postoperative day one.
    2. Take the urinary catheter off as soon as possible between fifth and tenth day.
    3. Remove drains when they are filled with less than 30 mL a day.
2. Authorize sitting position very progressively until three weeks after surgery. One can prescribe a (floating) round tube so that the sitting position does not lead to excessive pressure on the flap.

## Representative Results

Out of 68 patients, operated between 2000 and 2010, the results were as follows[8].

**Healing:**

The mean time to healing was 47.3 days with a range of 13 to 197 days and a median of 30 days. At 3 weeks, 38% of the patients had healed, at 2 months 74%, and 100% at the end of the study. The 5 patients who had no radiation therapy healed in a mean of 28.8 days (range = 15-55 days, median = 19 days). Globally the longer times to healing were due to local complications such as scar dehiscence, partial flap necrosis, or abscess necrosis. The median duration of hospitalization was 23.7 days (range = 11-64 days, median = 19 days).

**Complications:**

Two types of complications can occur. The most frequent are those of the recipient site and the flap, followed by those of the donor site. Complications were considered early when they occurred in the 90 days after surgery.

**Recipient site and flap**

*Early complications*: We observed dehiscence in 12 patients. Eleven were managed by local care and one required suturing. Three patients had partial necrosis that required only simple surgical debridement. Five patients also had an abscess at the junction between the flap and the recipient area. Two required surgical drainage on day eight and day 10. *Late complications*: Only one single patient had a complication more than 90 days after surgery (D92): cellulitis at the junction between the flap and the thigh. It was handled by antibiotic therapy and surgical lavage. None of these complications ultimately prevented permanent healing.

**Complications of the donor site (see Table 1)**

Two patients underwent surgical debridement for an area of cutaneous necrosis, followed by sutures. Three abscesses were drained with local care. Of the 68 patients, 4 minimal herniations were observed. A more substantial herniation required surgical revision with placement of a prosthetic mesh because it had disabled the patient more than a year after surgery. In conclusion, no flap was removed and all patients healed.

**Figure 1: Taylor flap on the abdomen.** Before modeling the flap, we fully release the Taylor flap. Please click here to view a larger version of this figure.

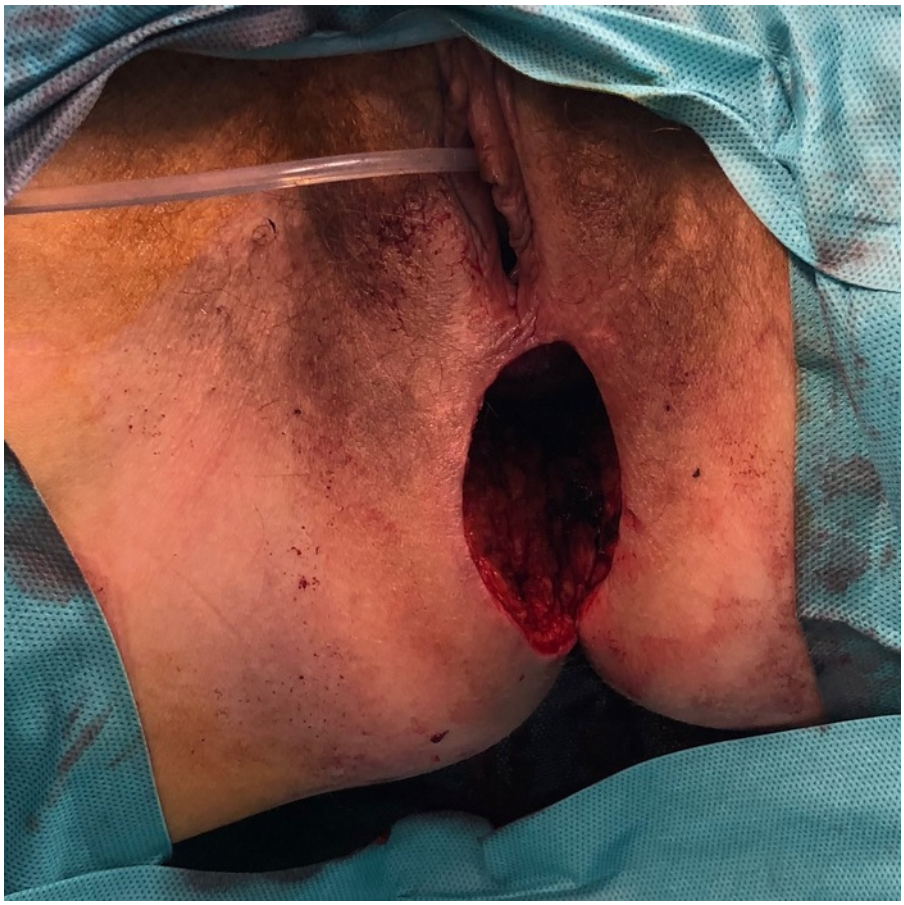

**Figure 2: Abdoperineal resection.** Wound defect after abdoperineal resection is shown. Please click here to view a larger version of this figure.

**Figure 3: Taylor flap on the perineum.** Before modeling the flap, we handle the flap using the left hand and insert it into the abdominal cavity while a second surgeon pushes the bowel upward. We suture the anterior sheath of the abdominis muscle aponeurosis that is under the location from which the flap was harvested, to the linea alba using a running suture with multi-filament coated surgical suture. Please click here to view a larger version of this figure.

| COMPLICATIONS | NUMBERS | REOPERATION |
|---|---|---|
| DEHISCENCE | 12 | 1 |
| NECROSIS | 6 | 3 |
| ABSCESS | 5 | 2 |
| CELLULITIS | 1 | 1 |
| ALL | 24 | 7 |

**Table 1: Flap complications.**

## Discussion

Perineal healing is a major issue in terms of quality of life for patients that have undergone abdominoperineal resection. Extensive resection and irradiation together can make this healing extremely uncertain and very lenghty[9,10,11,12]. The occurrence of complications such as infections, abscesses, dehiscence, and chronic wounds is quite frequent in these conditions (up to 65% according to the series[13,14]). Perineal reconstruction with a Taylor flap can dramatically reduce the incidence of theses complications[13,14].

We usually chose the right side of the body to harvest the flap in order to allow the issue of a stoma on the left side. We believe that the muscle insertion on the pelvic bone can be expected bear the weight of the flap and avoid any kind of tension on the pedicle. For the same reason, it is of paramount importance to stop the suture of the aponeurosis a few centimeters before the pelvic bone to avoid strangulation of the pedicle.

One alternative to a Taylor flap is direct closure of an omentoplasty. In the series reported by Lefevre et al.[15], the complication rate, the duration of healing, and the occurrence of a perineal hernia were significantly higher (48.9% vs. 26.8%; $P = 0.0336$ and 117 days vs. 18.7 days, $P = 0.0019$; 15.4% vs. 0%) than with a Taylor flap, with nearly identical abdominal hernia rates (9.3%). They concluded that the Taylor flap is a technique that reduces perineal complications and time to healing in patients with an abdominoperineal resection for anal cancer without increasing abdominal wall morbidity.

Other cover flaps can be used, including gracilis[16,17,18,19,20], gluteus maximus[21,22,23,24,25] or free deep inferior epigastric perforator (DIEP) flaps. A gracilis flap can be used to reconstruct the posterior vaginal wall. When complete vaginal resection takes place, a second flap of the gracilis muscle can be used to reconstruct the vagina. This flap has numerous disadvantages as compared to the Taylor flap. Its small size prevents its use with large defects. Its reliability is substantially poorer, with necrosis observed in 10 to 25% of cases according to the series[13,14]; this makes it a second-line flap, to be used only after the failure to construct a flap from the rectus abdominis muscle (or the determination of its impossibility). The gluteus maximum flap is also a second choice, because of its scarring, low mobility, and chronic pain[26,27,28,29]. The principal advantage of the DIEP, is the absence of secondary eventration[30]. However, the complexity and burden of its use for patients who are often already fragile also make it a second-line choice.

The choice of an immediate or secondary reconstruction can also be debated. All patients in our study had immediate reconstructions. Early coverage of the defect diminishes the risk of complications[2,3,4]. The relatively short duration of this procedure (an hour on average) and the low complication rate for the donor site have encouraged us to continue this protocol.

For the women who had a colpectomy, reconstruction appears useful not only for healing but also for functional and psychological aspects[31,32]. A study published in 2010 by Corte et al.[33] showed a resumption of sexual activity for more than 85% of the women. In our series, 28 of the 37 women with reconstruction of the posterior vaginal wall by a Taylor flap were able to resume sexual activity.

Postoperative management is key to reduce the complication rate to a minimum. All measures should be taken to allow patients to stand up as soon as possible and pressure on the flap is contraindicated for the first three weeks[34]. Since 2010, we have completed more than 150 perineal reconstruction using a Taylor flap.

## Disclosures

The authors have nothing to disclose.

## Acknowledgements

The authors have no acknowledgments.

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