

## Surgical Management of Abdominal Wall Defect Using a Two-Stage Latissimus Dorsi Free Flap: A Case Report

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### Case Report

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**Abstract:** Managing abdominal wall tumors with high risk of relapse usually requires large excisions. It is the case of sarcomas, desmoid fibromatosis and abdominal wall metastases. The repair of large full-thickness defects of the abdominal wall usually needs the combination of a prosthetic material as a replacement of the deep layer and a reliable flap to cover the prosthetic material. Depending on the local condition of the surgical site and the size of the defect, the use of a free flap might become necessary. The authors report the case of a 55 year-old patient who underwent surgery for a relapsing sarcoma of the anterior abdominal wall. A two-stage reconstruction of the abdominal wall defect was performed using a free transfer of a myocutaneous *Latissimus Dorsi* flap. The first stage of reconstruction took place before the excision was performed. The free flap was then folded in the fashion of an “apple turnover” waiting for the second stage to take place, so the excision of the tumor and the final covering could be performed at the same surgical time. Microsurgical transfers imply potential peroperative and postoperative risks, especially the risk of vascular thrombosis. The authors discuss the two-stage surgical transfer of the myocutaneous *Latissimus Dorsi* free flap, its technique, its advantages and its disadvantages.

**Keywords:** Tumour, tissue defect, repair, Plastic Surgery, latissimus dorsi flap Microsurgery.

### INTRODUCTION

The reconstruction of a large full-thickness defect of the abdominal wall can be very challenging.

In this indication, microsurgical transfers are of great value. Thus combining a prosthetic mesh and a myocutaneous *Latissimus Dorsi* free flap offers an ideal solution to most cases. Free flap reconstructions can be performed in one stage or in two separated stages using the technique of the “apple turnover” as described by *Servant* [1].

The authors present the case of a patient who underwent a surgical excision of a relapsing abdominal wall cancer. The defect was reconstructed using a two-stage free transfer of a myocutaneous *Latissimus Dorsi* flap folded in the fashion of an “apple turnover”. They describe the technique, its advantages and disadvantages.

### CASE REPORT

A 55 year-old patient was admitted in the Plastic Surgery Unit for the relapse of a Malignant Fibrous Histiocytoma of the right inferior one third of the anterior abdominal wall, previously treated by iterative surgical excisions six years before and a 50-Gray external beam radiation therapy received 1 year

before. The abdominal CT-scan performed at the admission objectified the involvement of the right rectus abdominis and oblique muscles. The patient was healthy otherwise.

A discussion took place between the members of the surgical team and they eventually agreed to proceed in two separate surgical stages:

The first surgery was performed under general anesthetics. It aimed to harvest an ipsilateral free myocutaneous *Latissimus Dorsi* flap. The measurements of the skin paddle were 170 mm x 90 mm which made the defect suitable for primary closure (Fig. 1).



**Fig-1: Flap design. Skin paddle (170 mm x 90 mm) overlying the latissimus dorsi muscle**

At the same time, a second surgical team was preparing the superficial femoral vessels for a termino lateral anastomosis that was carried out using 9/0 prolene discontinuous sutures. The myocutaneous flap itself was sutured to the abdominal in a distance from the tumor and folded on its greater axis in the manner of an “apple turnover” (Fig.2). A corrugated sheet drain (*Delbet* drain) was placed between the folded sides of the dead space and to avoid the complete fusion of the muscle.

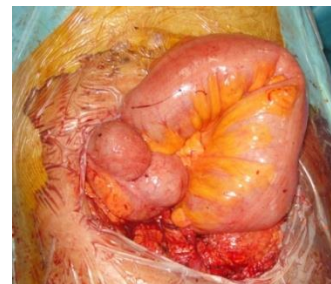
The patient was then admitted in the post-surgical intensive care unit for a better monitoring. There, he benefited from a transfusion of 3 blood units. An anticoagulant treatment (*Enoxiparin* 0,2 ml two times a day) was started immediately and carried on for 15 days. The follow up was uneventful, except for a transient venous turgescence phenomenon that resolved spontaneously.



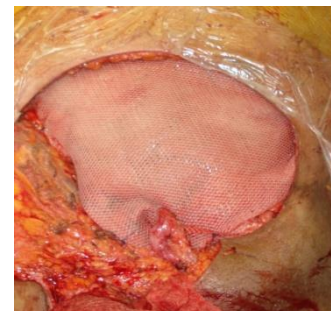
**Fig-2: After vascular anastomosis using the superficial femoral vessels. Note at the bottom, the muscle is sutured at the edges of the inguinal incision so as to protect the vascular sutures. Then, the musculo-cutaneous flap is folded on its greater axis**

The second surgery took place two weeks after the first one. A large (50 mm lateral margins) transfixing excision of the tumor was then performed under general anesthesia. It left a full thickness defect of the right hand side of the anterior abdominal wall (Fig.3).

Then reconstruction took place using a prosthetic double sided mesh to repair the deep layer of the abdominal wall (Fig.4). The intermediate and superficial layers were reconstructed using the myocutaneous flap of *Latissimus Dorsi* that was harvested previously. The flap was unfolded and spread out allowing for the complete closure of the defect (Fig.5).



**Fig-3: Full thickness abdominal wall defect (After tumor resection)**



**Fig-4: Prosthetic double sided mesh repairing the deep layer of the abdominal wall**



**Fig-5: Complete closure**

The follow up was uneventful and the patient was discharged 13 days after his second surgery. He received an additional external beam radiation therapy.

6 months later, cosmetic and functional outcome was very satisfactory. There was no postoperative incisional hernia (Fig.6).



Fig-6: Good cosmetic and functional outcome

## DISCUSSION

The most common cause of full thickness abdominal wall defects is the excision of tumors such as sarcomas and desmoid tumors. Sarcomas of the abdominal wall represent 1 to 5% of soft tissue sarcomas (2). When confronting these kinds of defects, surgeons have to make sure they are offering the best solution from the beginning. Their surgical plan must consider:

- The protection of the abdominal organs by the restitution of the abdominal wall integrity;
- The prevention of any potential weakening of the abdominal wall by performing a tension free closure;
- The cosmetic outcome.

Ideally, surgeons trained in Plastic Surgery and General Surgery will gather their expertise to fulfill these requirements and achieve good anatomical, functional and cosmetic results.

The most common procedure for the reconstruction of transfixing defects of the anterior abdominal wall is the combination of a prosthetic or biological mesh and a cutaneous or myocutaneous flap. Some free flaps find good indications in these situations. They provide well vascularized tissues with good resistance to infection. The surgeons will chose between different types of flaps depending on the size of their skin paddle and the thickness of their muscle. One of the most used free flaps in this indication is the myocutaneous flap of the *Latissimus Dorsi*. Its main features are: A large skin paddle and a thick muscle that provides volume; very few functional and cosmetic sequelae at the donor site; large vessels that allow for easy anastomosis; tissues of good trophicity that allow for a reliable covering of the prosthetic mesh; and an important vascular supply with high blood flow that allow for the use of long bypass grafts if needed.

Moreover, because of good blood supply and quality tissues, the free flap of *Latissimus Dorsi* is a good indication when the patient may be candidate for external beam radiation therapy on the surgical site [3, 4].

On a tactical level, the two-stage transfer allows the surgeons to ensure the flap is viable before the tumor excision [5]. The main advantage of this technique is to provide maximum security for the covering of the prosthetic mesh and the abdominal organs. Although there is a need of two distinct surgeries, the second surgery is drastically shortened since the flap has already been harvested and its vessels have been anastomosed to the recipient site vessels [4]. And if by any chance the flap shows signs of non-viability, the surgeons can still find another covering solution before exposing the abdominal organs to the external environment.

In the author's opinion, the following technical and tactical points deserve to be emphasized:

- The use of the contralateral *Latissimus Dorsi* as a free transfer allows for the potential use of the pedicled ipsilateral muscle in case of relapse. *Bostwick et al.* [6] described the "reverse" *Latissimus Dorsi* flap and its distal pedicle. This flap can be used to cover a defect created by the excision of a contained relapse, when the defect is included in the arc of rotation of the flap. However, this flap would not be the author's prime choice because of its considerable risk of necrosis. Other options are available for a larger relapse.
- The lengthening of the flap blood vessels can be done by the use of long veinous grafts [7]. This is made possible by the diameter of the flap vessels and their high blood flow. The blood supply can be maintained in the flap by lengthening its own thoracic-dorsal vessels by means of veinous grafts [8].

The blood supply can also be maintained by lengthening the flap pedicle using veinous grafts and anastomosing them to the superficial femoral pedicle, [9] or to the superior gluteal vessels [10].

- The size and the tracing of the skin paddle should not be overlooked during the preparation for the surgery. They may influence the patient's position on the operating table and may allow or oppose the simultaneous work of two surgical teams for the harvesting of the flap and the preparation of the recipient site.
- When using the "apple turnover" technique, there is a better chance of covering the whole muscle and protecting the flap pedicle when the skin paddle is large enough. The authors also believe that there is a lower risk of infection and tissue retraction when the muscle is completely covered. This way,

patients' postoperative experience can be made less uncomfortable.

- In a two-stage surgery, the two surgeries should be scheduled close to each other to limit risks of infection and tissue retraction but also to reduce the cost and the length of inpatient stay.

When the delay between the two surgeries is longer than 15 days, it is recommended to interpose a silicon material between the two sides of the flap to avoid muscle fusion and retraction [1].

- It is possible to innervate the *Latissimus Dorsi* muscle by connecting the thoracodorsal nerve to one of the intercostal motor nerves that activate the contralateral *Abdominis Rectus* muscle [11]. This will enable the *Latissimus Dorsi* muscle to flex whenever the contralateral *Abdominis Rectus* muscle flexes, allowing the abdominal wall to be dynamic and functional.
- Although the vascular anastomosis can be performed using the inferior or superior epigastric vessels as recipients, it is more predictable to use the superficial femoral pedicle, especially when a radiation therapy has already been performed or is planned in the future, as it was the case with this patient. Finally, when there is a need to combine a flap harvested from the thigh with the *Latissimus Dorsi* free flap to cover a larger defect, the anastomosis will be performed to the epigastric vessels rather than the superficial femoral pedicle.

## CONCLUSION

Most transfixing anterior abdominal wall defects will need a biological or prosthetic mesh and a reliable flap to ensure closure. The *Latissimus Dorsi* myocutaneous flap is one of the most reliable flaps for this indication. Among its most interesting advantages: good quality tissues and good volume; large skin paddle and high vascular reliability. The two-stage free transfer of this myocutaneous flap increases the surgical predictability and decreases the risks of preoperative and postoperative incidents. The collaboration between General surgeons and Plastic surgeons is of the utmost importance to achieve the best results.

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