Case report

The unilateral reverse latissimus dorsi flap for soft tissue coverage of midline thoracal defects after spine surgery procedure: A case report

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ABSTRACT

Introduction: The thoracolumbal region is often a difficult area to reconstruct for orthopaedic surgeons. Reconstruction of this area with a standard free tissue transfer is not always possible, and locoregional flaps are often failed due to poor quality outcome and mobilization difficulty.

Case report: A case was presented with unilateral distally based latissimus dorsi flaps reconstruction in patient with midline thoracal soft tissue defect underwent kyphosis deformity correction surgery. This study reported a patient, male, 33 years old who was diagnosed with ankylosing spondylitis and kyphosis deformity. The patient underwent surgical correction of the kyphosis deformity. After 1 month, the patient complained about his open surgical wounds.

Clinical discussion: In our institution, this patient underwent second debridement surgery and unilateral reverse latissimus dorsi flap for thoracal soft tissue defect coverage to obtain well-vascularised tissue, with good resistance to bacterial contamination and easy to shape into such defect. After follow-up for 6 months, the patient shows good outcome and postoperative wound healing was favorable.

Conclusion: We believe that the “reverse” latissimus dorsi flap is a good option to cover this particular region. It is simple, safe, and reliable. It also provides a backup plan for the microsurgery in this region.

1. Introduction

Large midline acquired thoracal defect usually occur because of failure in wound healing following surgery of the spine. A complex three-dimensional tissue defect is usually present. This defect sets the skin in continuity with the depth of the wound where vertebral bone and dura mater are located. Such defects can be associated with a cerebrospinal fluid (CSF) leak, bacterial contamination, or can be a combination of both. This situation can lead to severe septic complications and can be life threatening.

The surgical treatment of wounds located in the median thoracolumbar area is difficult. When occurring after neurosurgical procedures, they may display a high level of complexity because of dural exposure, deep irregular three-dimensional contours, and bacterial contamination of the wound. The difficulty of reconstruction in that region of the body is made greater by the few possible regional flaps available in the vicinity. In order to obtain well-vascularized tissue, with good resistance to bacterial contamination and easy to shape into such defects, the reverse latissimus dorsi flap is a useful surgical option. The reverse latissimus dorsi flap is a versatile flap that can be used for coverage of complicated defect in the midline and contralateral back that cannot be treated only on fasciocutaneous flaps alone. The reverse latissimus dorsi flap is one of the musculocutaneous flap that is more resilient, has more vascularity, and has large surface area to cover defect. This flap is based on the perforators from the lumbar and posterior intercostal vessels. This case report has been reported in line with the SCARE Criteria [1].

2. Case report

This study reported a patient, male, 33 years old, mongoloid, working as an administration employee, without any history of smoking

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or alcohol consumption. Who was diagnosed with Ankylosing Spondylitis and Kyphosis deformity. Patient had history of slouching back from age of 18 years old with no history of trauma nor family history. The slouching back got worse as the patient got older, with new onset of back pain in the age of 33 years old. Patient got examined by a Spine Orthopaedic surgeon, from the lab workup there was no abnormality, and the x-ray examination revealed a severe kyphotic deformity with ankylosing of the spine. Patient was diagnosed as Ankylosing Spondylitis and Kyphosis and underwent deformity correction surgery (Figs. 1 and 2).

The post-operative outcome was excellent with no wound dehiscence for 5 weeks follow up in ward. Patient was discharged from the hospital and took oral antibiotic for 1 week; patient had no history of allergy for the medication. Patient should had come every week after the discharge, instead he came 1 month later complained about his open surgical wound with the size of $30 \times 15 \times 3$ cm$^3$ surrounded with necrotic tissue with bone as the base (Fig. 3).

In our institution, this patient underwent second debridement surgery and unilateral reverse latissimus dorsi flap for thoracal soft tissue defect coverage to obtain well-vascularized tissue, with good resistance to bacterial contamination and easy to shape into such defect. Before surgery, the patient should achieve the Hb level of minimal 10 g/dl, Albumin level of minimal 3.5 g/dl. The preoperative antibiotic used was Intravenous Cefazoline 2 g. For the surgical procedure.

The surgery was conducted by a Hand and Microsurgery Orthopaedic surgeon in a Siloam Hospital at Yogyakarta. First, we drew template on the patient. We drew the anatomical landmark such as contralateral scapula, midline, level of spine, and we also measured the size of the defect and made flap template in the contralateral axilla in oblique manner. We incised the flap template to expose the latissimus dorsi muscle. After that we raised the skin flaps and cut the latissimus dorsi muscle 10 cm from the insertion Fig. 4. We identified the thoracodorsal vessels and nerve, and we raised the muscle until the perforator from lumbar and posterior intercostal vessels. Then the flap was turned over under the subcutaneous tissue over the defect. After that the flap was attached with absorbable sutures. The donor site was sutured in layers and a drain was placed. After surgery patients was positioned in prone or lateral position, the drain was removed by 5 days and sutures were removed by 15 days. There were no complications during the surgery.

The patient was given oral antibiotic for 1 week after discharged form hospital, the patient came to the outpatient clinic twice a week to evaluate the flap and the donor site, and the patient were asked to sleep in the prone or lateral position until the sutures were removed. Patient followed all the postoperative instruction. The outcome was evaluated 2 weeks after surgery. After follow-up for 6 months, the patient showed good outcome and postoperative wound healing was favorable. The flap was healed well. There was no any complication of the flap (Fig. 5).

3. Discussion

The treatment of large defect of the lower back and thoracal area is difficult. Fortunately, large midline thoracal defects are rare. Defect in
this region is usually secondary to surgery of the spine, usually occur after kyphosis correction surgery, tumor removal, lumbar laminectomy, and postoperative pressure sores. As a result, composite tissue defect is often present, that can be associated with the exposure of vertebral bone or dura with CSF leak, bacterial contamination, or a combination of both. This situation can lead to severe septic and can be life-threatening. From the surgical point of view, radical debridement and filling with a well-vascularized flap are required. The choice of the flap will depend on size and depth of the defect. If two-dimensional, it will be much easier to reconstruct, as it will only need a surface coverage. A three-dimensional defect will require the filling of the entire volume of the defect by the flap.

In the case reported in this paper, wound was deep, anfractuous and contaminated by bacteria. Four times the same goals were pursued that led us to choose one reconstructive method: (1) to fill three-dimensional defects with well-vascularized tissue that had to be in close contact with all the surrounding structures and to adequately cover fragile exposed neurological structures; (2) to help in the local control of the CSF leak if present; (3) to provide a local control to bacterial contamination of the wound; (4) to allow for final skin closure of the wound; (5) to provide a low donor site morbidity.

For the reconstruction of large, acquired midline defect of the back, different flaps are available. Most of these flaps, however, are more suitable for surface coverage than for defects that have to be filled in. Local rotation or transposition skin flaps are available, but of limited use because they are difficult to mobilize and will not bring into a three dimensional defect the necessary volume of vascularized tissue. Other fasciocutaneous flaps have been described, including the lumbar artery perforator island flap, the scapular flap based on a reverse latissimus dorsi flap, and the unipedicled latissimus musculocutaneous flap with a thoracolumbar fasciocutaneous extension. Again, these flaps provide skin coverage but no large defect filler. Thus, local flaps are only indicated for small or medium sized surface defects.

A large muscle flap will fill the defect, and help control bacterial contamination, bone exposure and the eventual CSF leak. Such a flap should bring well vascularized tissue into the depth of a midline thoracal wound, in close contact with the fragile neurological structures that need to be protected. Hill et al. reported the successful use of the superior gluteal musculocutaneous flap in the coverage of acquired lower lumbar and sacral wound [6]. In this case report, the myocutaneous flap was used as a turnover flap, where the skin cover was deep epithelialized. Only the upper half of the gluteus muscle was harvested. In this design, the flap is turned over to allow the deep epithelialized skin to be placed deeply in the wound, providing vascularized tissue to close a CSF leak. The muscle part will be superficial to this layer, providing the necessary tissue filler for the large wound. While this solution is valuable, the use of a portion of the gluteus muscle might impair ambulation, so its use should be cautious in valid patient. Also the single pedicle of this flap is skeletonized and placed in a tunnel, so flap survival depends on this delicate situation.

The latissimus dorsi flap is a well-known flap that can be transferred as a muscle only flap, or as a musculocutaneous flap. This flap is usually transferred on its principal pedicle, the thoracodorsal vessels, and has many applications. It can also be transferred based on its secondary lumbar pedicles. It is then vascularized on perforators in the thoracolumbar area and used in a reverse fashion. During flap harvesting the vascularization coming from the thoracodorsal pedicle is transected, and the flap is elevated from cephalad to caudal. The perforators in the lumbar area are segmental vessels arising from the ninth to the eleventh intercostal arteries. They pierce the lumbar fascia and overlying sacrospinal muscle, to enter the latissimus dorsi muscle on its ventral surface. The entire muscle, or a portion of the muscle, can be reliably harvested on these secondary pedicles. This type of transfer is called the ‘reverse latissimus dorsi flap. This flap has been successfully used for thoracolumbar defects as a transposition musculocutaneous flap. In this situation, the superficial skin island remains superficial when placed in
the defect, where it provides the cutaneous part of the reconstruction. This option is good for the coverage of two-dimensional thoracolumbar defects but does not offer the amount of tissue required to fill defects as large and deep as those reported in this article.

The latissimus dorsi flap can be used as a ‘reverse turnover flap’ that is based on lumbar perforators, exactly as the ‘reverse latissimus dorsi flap’. The difference between the two flaps is in the displacement of the flap to reach the defect. A ‘turnover flap’ means that the deepest aspect of the flap becomes superficial, and that the pivot area is the oblique line of alignment of the perforators extending from the ninth to eleventh intercostal arteries. There are only two cases reported in the literature where a ‘reverse latissimus dorsi flap’ had been used as a supercharged transfer for a lumbar extensive defect [8]. The flap was transferred in a turnover fashion to reach a lumbar defect. In addition, the thoracodorsal vessels were sutured microsurgically to the gluteal vessels to ‘supercharge’ the flap. In the other case, the flap was pedicled on one side and transferred to a large-defect on the opposite side. This demonstrates that flap survival can be obtained with the flap based on the lumbar perforators, with no need to supercharge the flap. The availability of a pedicled flap makes the use of free flap microsurgery, with longer operating time, unnecessary to reconstruct large midline lumbar defects. The ‘reverse turnover latissimus dorsi flap’ has a large arc of rotation that allows it to reach the fundus of a lumbar wound and provides a large amount of tissue able to cover especially large wounds. The muscular tissue adapts well to the three-dimensional tissue defects and its ability to control infection in contaminated wounds is well documented. This flap also has the advantage that its lumbar blood supply is usually preserved in large lumbar defects, even after previous extensive surgeries or debridement. Muscle harvest is simple and straightforward, and a split muscle flap can easily be harvested if preservation of an optimal shoulder function is mandatory.

Casas et al. propose to cover extensive thoracolumbar defects with two distinct layers of muscle tissue. The deepest layer is composed of a paraspinous muscle thoracolumbar fascia turnover flap to cover the dura. This muscle transfer fills the deepest portion of the wound and is potentially effective in a contaminated wound. The more superficial layer of the lumbar defect can be reconstructed in different ways. The ‘reverse latissimus dorsi musculocutaneous transposition flap’ is a valuable option. The other options for the superficial layer of closure are the unipedicled latissimus dorsi myocutaneous flap with a thoracolumbar fasciocutaneous extension, the composite latissimus dorsi and gluteus maximus muscle advancement flap including fasciocutaneous bridge, and a bilateral latissimus dorsi advancement flap. In the Casas series, a systematic approach to the reconstruction of lumbar defects is described. After a thorough debridement, deep wounds are closed with two layers of muscle, while smaller, more superficial wounds are reconstructed with only one muscle layer. In his series, only two cases of ‘reverse latissimus dorsi musculocutaneous’ transfers are reported. These two flaps were used in a superficial single-layer closure fashion. So, no case combining a superficial reverse latissimus dorsi musculocutaneous flap and a deep paraspinous muscle transfer was performed. In our series, all the patients presented with deep and large defects. According to the Casas rationale, they should have been treated with a two-layer closure. However, single ‘reverse turnover latissimus dorsi flaps’ did provide all the necessary viable tissue, equivalent to the Casas flap [3]. Moreover, advantageously, the paraspinous muscles are left intact, which is important in spinal static preservation.

In our opinion, single ‘reverse turnover latissimus dorsi’ approach is more efficient and less destructive compared to the two-layer approach proposed by Casas.

After the surgery was done and the flap was healed well, patient had increased quality of life because the patient no longer needs to get wound dressing every 2 days and consume another drug. The patient was given written informed consent by the surgeon and agreed to participate for this case report.

In conclusion, large wounds in the lumbar region are a particularly complex challenge for the orthopaedic surgeon. Reconstruction follows the common sequence of radical debridement and reconstruction of the defect. In the lumbar region, a three-dimensional tissue defect is usually present that can be associated with bacterial contamination, exposure of bone, exposure of neural structures with or without CSF leak. The ‘reverse turnover latissimus dorsi flap’ can fulfill the goals in reconstruction of these defects as a single flap: 1) it will fill the three-dimensional defect with well vascularized tissue, with a close contact with all the surrounding structures, covering exposed deep and fragile neurological structures; (2) it will help in the local control of the CSF leak if present; (3) it will provide a local control to the bacterial contamination of the wound; (4) it allows for final skin closure of the wound; (5) it leaves a low donor site morbidity. In this paper, we report our favorable experience with the reverse turnover latissimus dorsi muscle flap for the coverage of large deep lumbar post neurosurgical contaminated wounds. This procedure is highly reliable and provides a definitive treatment for these lesions. It is, in our opinion, the first option in reconstruction of large deep lumbar midline defect.

4. Conclusion

A case of reconstruction of the midline thoracic defect area using a unilateral reverse latissimus dorsi flap after a spinal surgery procedure is presented. The unilateral flap was raised in a reverse fashion and transferred into the defect with success. This original technique is noteworthy and is a valuable addition to the armamentarium of flaps available to deal with this difficult and problematic area.

Ethical approval

The study have been approved by ethical committee.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Meirizal, Rahadyan Magetsari, and Dea Prista Agatha drafted the manuscript and critically revised the manuscript by Meirizal for important intellectual content. Dea Prista Agatha facilitated all project-related tasks.

Guarantor

Meirizal

Provenance and peer review

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Declaration of competing interest

The authors declare no conflict of interests.

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