Case Report

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A Case Report on the Lumbar Artery Perforator Flap for Coverage of a Non-Healing Ulcer on the Back

M Lopamudra, MBBS, MS.[1], Manabhanjan Jena, MBBS, M.D.[2]

[1]Department of Plastic Surgery, IMS & SUM Hospital, Siksha'O'Anusandhan, Deemed to be University, Bhubaneswar, Odisha 751030, India.

[2]Consultant Cardiologist, Utkal Hospital, Bhubaneswar, Odisha 751030, India.

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Abstract:

The lumbar arteries are critical for supplying blood to the lower back and flank regions. They provide a robust vascular network that can be utilized for flap surgeries, potentially enhancing flap viability and reducing complications associated with flap loss. The vascular anatomy and skin territory supplied by a single lumbar artery are crucial for establishing a clinically reliable flap that minimizes donor site complications. To address the problem, surgery was performed on the vascular anatomy of the lumbar arteries along with the skin territory supplied by a single lumbar artery. The following case is of a 65-year-old man who presented with a non-healing ulcer in the middle of his back for 9 months. The lumbar artery perforator flap (LAP flap) procedure was performed in this study. The patient underwent tumor excision and split-thickness skin graft for a growth over his back, which was proven to be dermatofibrosarcoma protuberans by histopathology. Coverage of the defect was performed using a LAP flap in a propeller fashion. The flap surgery showed a greater rotational arc and allowed for primary closure of the donor site, addressing the limitations seen in the transverse lumbosacral flaps.

Keywords: Lumbar, perforator flaps

Contact: M Lopamudra, MBBS, MS.
Department of Plastic Surgery, IMS & SUM Hospital, Siksha'O'Anusandhan, Deemed to be University, Bhubaneswar, Odisha 751030, India.
E-mail: drlopam@gmail.com

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Introduction

The vascular supply from the lumbar arteries is utilised for flaps, including transverse posterior-based lumbosacral back flaps and reverse posterior-based latissimus dorsi musculocutaneous flaps, both of which have demonstrated reliability in clinical practice[1-5]. However, these flaps have specific disadvantages. In the reverse latissimus dorsi musculocutaneous flap procedure, the muscle tissue is excised. The transverse lumbosacral back flap exhibits limited range of motion, and the donor site defect cannot be largely closed. If a flap dependent on a singular lumbar artery could be established as a dependable alternative, these concerns could be mitigated[6-7]. This research aimed to delineate the vascular anatomy of lumbar arteries and the corresponding cutaneous region supplied by an individual lumbar artery to assess the feasibility of lumbar artery island flap surgery.

Case Report

A 65-years-old male presented with a chronic ulcer on his back that had remained unhealed for 9 months. He had previously undergone tumour excision and split-thickness skin grafting (STSG) for a growth on his back, which was confirmed as dermatofibrosarcoma protuberans after histological assessment on 2 occasions over the past 10 years (Supplementary Figure 1). Tumor excision and STSG were performed in 1984; after which, he received 15 cycles of radiotherapy. Recurrence at the same site occurred, for which excision and STSG were performed in 1997. The patient has undergone tumor excision and STSG multiple times, and 30 cycles of radiotherapy were given. The patient presented with a non-healing ulcer on his back for 9 months.

Operative procedure

Following comprehensive preoperative preparation, lumbar artery perforators were located via a Doppler ultrasonography probe. Preoperative evaluation by CT scan and USG was performed to determine the dimensions of the tumor and to learn about the invasion of deeper structures. A comprehensive local excision of the ulcer was executed. A lumbar artery perforator flap (LAP flap) was developed from this site, extending obliquely towards the anterior superior iliac spine. The flap was dissected from the distal edge, embracing the lumbar fascia. Upon identifying an appropriate perforator, the flap was excised and turned 180 degrees into the defect through an incision created between the defect and the donor site. The donation site was primarily most closely performed (Figure 1). Although the most common origin pattern is single-origin among the first 3 lumbar arteries, and common-stem origin in the fourth lumbar artery, the first, second, and third lumbar arteries mostly originate at the lower third. The perforators were identified intraoperatively with the help of a hand-held Doppler.

Observation

The flap was healthy. The flap and donor site dressing were done on alternate days. The donor site healed properly (Figure 2). The patient was discharged on the 7th post-operative day. The aesthetic result was acceptable. A good functional and aesthetic result was achieved at the one-year follow-up (Supplementary Figure 2).

Figure 1 The lumbar artery perforator flap with the perforator

Figure 2 Flap inset and primary closure of the primary defect

Discussion

The lumbosacral-based perforator flap is the first documented perforator flap in medical literature. The broader applications of the LAP flap include breast reconstruction and lumbosacral defects. Breast reconstruction allows for the recreation of naturally shaped breasts with a good aesthetic outcome. Lumbosacral defects are a good option for coverage of sacral bedsores and defects on the back. It provides pliable tissue coverage. Kato et al.[7] observed that lumbar perforators traverse the portion of the fascia adjacent to the lateral border of the erector spinae lean muscle, located 5 to 9 cm from the midline. Koshima et al.[8] validated the dependability of these flaps through comprehensive anatomical and clinical investigations, noting that the width of the arterial bundle at the perforation site varied between 1 and 5 mm. The perforators connected to the 2nd, along with the 4th lumbar vessels, were observed to be much more developed than those linked to other arteries. The portion of skin supplied by the 2nd lumbar vessel extended across the posterior midpoint to the lateral edge of the rectus sheath, extending at least 10 cm above the front of the superior iliac spine.

Conclusion

Defects situated in the centre or midline region of the back present difficulties for reconstructive surgeons. An islanded flap utilising lumbar artery perforators serves as a significant method for correcting these types of abnormalities. The dissection procedure is uncomplicated, and the donor site can generally be closed primarily. The LAP flap is also suitable for repairing sacral deformities. Accurate identification of the perforators during the preoperative phase serves as a key to success for the flap procedure.

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Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki Declaration. The Institutional Ethical Committee approved this study, with ethical number: Ref. no./IEC/IMS.SH/SOA/2024/62.

Author contribution

All authors contributed to the conception, design, and writing of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

There are no conflicts of interest to declare.

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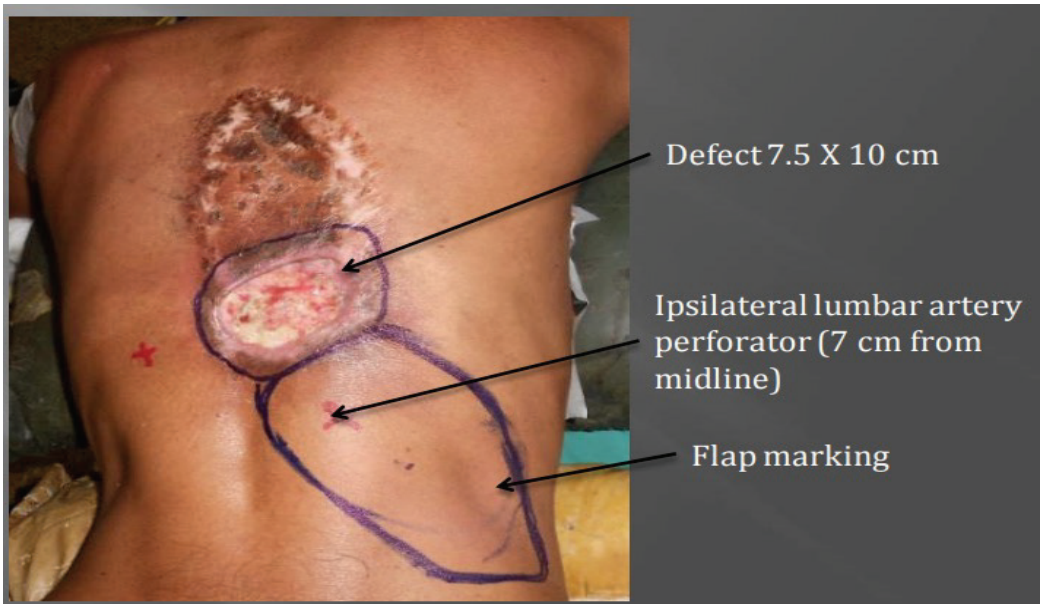

Supplementary Figure 1 Non healing ulcer in the back with the lumbar artery perforator flap markings

Supplementary Figure 2 One month follow up picture