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The transverse lumbar perforator flap: An anatomic and clinical study

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KEYWORDS

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Sacral sore;
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Summary *Background and aims:* Lumbosacral defects are complex reconstructive problems requiring tension-free vascularised soft tissue reconstruction in patients who often have comorbidities. In an area prone to recurrent tissue breakdown, both free and islanded flaps risk complete failure. Cadaveric studies have demonstrated the consistency of lumbar perforators, yet ipsilateral lumbar perforator flaps have modest reconstructive potential owing to geometric limitations. An axial pattern lumbar perforator flap based on a contralateral lumbar perforator may surmount these problems; however, it has only been described in a small clinical and cadaveric study previously.

Methods: An anatomical study was performed in the consecutive patients undergoing computed tomographic angiography (CTA) of the trunk, assessing the presence and location of lumbar artery perforators. The use of midline or contralateral lumbar artery perforators in the lumbar perforator flap was assessed in the reconstruction of lumbosacral defects.

Results: A total of 102 patients with 102 lumbosacral defects have been managed with the use of contralaterally based transverse lumbar perforator flaps over a period of 20 years. In 96 patients, the defects requiring reconstruction followed debridement of a pressure ulcer, with seven cases following debridement of pilonidal sinuses and one following abdominoperineal resection. There were 65 men and 37 women, with a mean follow-up of 1.5 years. Necrosis of the tip of the flap occurred in 3%, with no cases of complete flap loss. Recurrence occurred in two cases (both sacral pressure sores). All recurrences and/or necrosis were managed with flap advancement or skin grafts. All the donor sites were closed directly.

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Conclusion: The contralateral-based transverse lumbar perforator flap is a simple, reliable, versatile and, in some cases, reusable choice in the management of lumbosacral defects. Flap dimensions of 24 × 15 cm can be based on one lumbar perforator.

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Introduction

Soft tissue defects of the sacral region are complex reconstructive challenges characterised by undermined tissue, oedema, ischaemia, bacterial contamination and recurrence.¹ Successful surgical management relies on excising all the affected tissue, covering with well-vascularised soft tissue, avoiding suture lines in the pressure areas and preserving surgical alternatives in the anticipation of recurrence.² The traditional approaches include the transverse latissimus dorsi myocutaneous flap,^{3,4} the transverse lumbosacral back flap² and the thoracolumbar sacral flap.⁵ However, myocutaneous flaps require the sacrifice of muscle creating a functional deficit in ambulant patients. The muscle is also more sensitive to subsequent ischaemic insults.¹ The lumbosacral back flap has a limited arc of rotation, requires a back cut and demands grafting of the donor site. The thoracolumbosacral flap requires extensive dissection and also requires a back cut. More recently, a number of islanded perforator-based flaps have been proposed.^{6–12} Kato et al. first described a perforator flap based on the fourth lumbar perforator.¹³ While the fourth lumbar perforator was found to be of consistently good calibre, the flap was islanded owing to the perception of poor blood supply across the midline. However, in 1991, the senior author (BSM) published a provisional clinical series attesting that the lower lumbar perforators reliably crossed the midline to supply a contralateral-based axial pattern flap.¹⁴ Basing a transverse lumbar flap on the contralateral lumbar perforator thus permitted a greater flexibility in flap design and arc of rotation and negated the need for islanding which is technically more demanding and results in an insensate flap. The results of this cadaveric study have now been used to provide soft tissue cover for 102 midline lumbosacral defects. The authors' clinical experience is described, with previous findings differing from those of Kato and Taylor, in that closer to the midline small perforators are seen that supply a plexus across the midline, on which the flap is based).

Patients and methods

The clinical anatomical component of this study was undertaken comprising a cohort of 500 hemi-posterior trunk walls in 250 consecutive patients undergoing preoperative computed tomographic angiography (CTA) prior to autologous breast reconstruction. All patients were planned for either free DIEP (deep inferior epigastric perforator) or SIEA (superficial inferior epigastric perforator) flaps. All the

participants were women, with a mean patient age of 54 years (range 32–70) and a range of body habitus types. Institutional ethical approval was obtained prospectively. The posterior trunk was included in all scan data.

All patients underwent preoperative imaging with CTA, with all imaging performed at a single institution and a single arterial phase scanning protocol employed in each case, which maximised the arterial filling of the lumbar artery and its branches. The scanner used was a 64-slice multi-detector row CT scanner (Siemens Medical Solutions, Erlangen, Germany), with 100 ml of intravenous contrast (Omnipaque 350; Amersham Health, Princeton, NJ, USA). The CTA images were reformatted into maximum intensity projection (MIP) and three-dimensional volume-rendered technique (VRT) images using the commercially available software (Siemens InSpace; Version: InSpace2004A_PRE_19, PA, USA; Figures 1–3). All reconstructed images were reviewed for the presence of the lumbar arteries and their branches, and thin axial slices were used for measurement of its diameter.

Anatomical information recorded included the location of the third and fourth lumbar arteries and their perforators, with measurements from the midline, measured at the level of the deep lumbar fascia (a relatively fixed anatomical landmark in the deep plane). The vessel diameters were recorded as the internal diameter of the vessel to the closest 0.1 mm. All anatomical data derived from the CTA analysis were recorded as absolute values and presented quantitatively in Tables and graphs.

An operative approach was also included, with findings recorded in consecutive patients who underwent lumbosacral reconstruction using this flap between 1991 and 2011

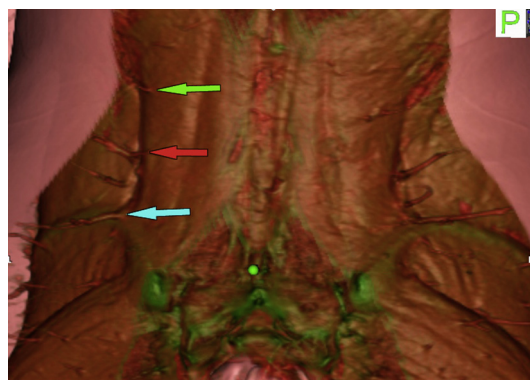


Figure 1 Computed tomographic angiogram of the posterior trunk, with a three-dimensional reconstruction highlighting (arrows) the lumbar artery perforators at the point at which they perforate the deep fascia.

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