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Preserving the neurovascular supply in the Hall-Findlay superomedial pedicle breast reduction: an anatomical study

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Dissection

Summary *Background:* The Hall-Findlay superomedial pedicle technique is widely used for breast reduction, and, despite low complication rates, nipple—areola complex (NAC) necrosis and denervation are still the two most common complications, particularly when resection volumes exceed 600 g. An understanding of the anatomy of the neurovascular pedicle of the NAC is paramount in avoiding these complications.
Methods: An anatomical study was undertaken on 11 female cadaveric breast specimens (nine fresh and two embalmed). The neurovascular anatomy of the breast was explored through dissection, microdissection, radiographic, computed tomographic, photographic and cross-sectional studies. The superomedial pedicle was mapped out on each specimen, and the course of the relevant nerves and vasculature was identified.
Results: The arterial supply to the superomedial pedicle was found to originate from a single dominant vessel in each specimen, while the venous drainage was via an extensive branching network. Both vascular patterns traversed the pedicle in a superficial plane. The innervation of the pedicle was via intercostal branches, which coursed extremely superficially in the pedicle.
Conclusion: De-epithelialisation or superficial thinning of the superomedial pedicle for breast reduction is at high risk for complications related to vascular compromise or denervation. Where greater resection is needed, this should be done from the deep surface or the base of the pedicle, contrary to previous descriptions.

Breast reduction surgery involves the removal of excessive breast tissue in hypertrophic breasts, while aiming to provide long-term aesthetic and functional outcomes for patients. Despite the widespread use of breast reduction,

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surgical complications are not uncommon, with scarring, impaired wound healing, unfavourable aesthetic appearance, nipple necrosis and denervation of the nipple continuing to plague outcomes. These complications have driven an evolution in breast reduction techniques.

Breast reduction procedures have been modified over time, with different methods employed for skin and glandular resection. The 'inverted-T scar' described by Wise in 1956 is based on a key-hole technique, with peri-areolar, vertical and inframammary fold scars.[1] This technique has been widely used ever since with a variety of associated nipple–areola complex NAC pedicles. The 'vertical scar' was originally designed by Lassus (1964), and is also used in the Lejour (1994) technique and is aimed to reduce the amount of scarring and the complication of T-junction skin necrosis.[2–6]

The evolution of neurovascular pedicles used in breast reduction surgery has also developed over time in a move to avoid complications, with both bipedicled and unipedicled techniques described. The vertical bipedicle and superior pedicle techniques have been postulated to threaten NAC innervation by transecting lateral branches of the fourth intercostal nerve.[6–10] In addition, the vascular pedicle has been thought to get kinked or compressed during inset. However, other techniques such as the central pedicle and inferior pedicle also transect these lateral neurovascular branches.[11–14]

The superomedial pedicle technique, described by Orlando and Guthrie in 1975,[15] and later developed to include more breast parenchyma beneath the pedicle, aimed to preserve both the vascularity and innervation to the NAC.[16,17] In 1977, Arufe et al. confirmed adequate vascularity of the superior pedicle with preoperative arteriograms on several patients.[18] More recently, in 1999, a modified Lejour technique, retaining a short scar but using a superomedial pedicle, has been popularised by Elizabeth Hall-Findlay.[19] While Hall-Findlay has since shown the long-term safety of the superomedial pedicle in large series, with maintenance of NAC sensitivity and viability, larger reduction procedures (over 600 g) are still noted to be associated with an increase in complication rates.[19–21]

This modified superomedial pedicle technique has since become a popular option for breast reduction, and, although complication rates have remained low, NAC necrosis and denervation still occur, particularly when resection volumes are large. The current study addresses the intrinsic anatomy of the Hall-Findlay breast reduction technique through angiographic and dissection studies and relates this anatomy to the above-mentioned complications and suggests modifications to the surgical technique, in order to reduce the complication rates related to the neurovascular supply to the superomedial pedicle for breast reduction.

Methods

An anatomical study was undertaken on 11 female cadaveric breast specimens; of these, nine were fresh cadaveric specimens and two were embalmed (standard preserving solution: 10% ethanol, 30% glycerol and 60% water). The cadavers spanned a wide range of body habitus types, and the cadaver age ranged from 36 to 91years, with a mean age of 70years.

The neurovascular anatomy of the breast was explored through a combination of dissection, microdissection techniques, radiographic and cross-sectional studies. The superomedial pedicle was mapped out on each specimen, and the course of the relevant nerves and vasculature was identified.

Arterial anatomy

A total of seven fresh cadaveric breast specimens were used for the arterial study. The entire anterior chest wall was removed from the respective cadaver, and the internal mammary arteries were identified and cannulated with 20-gauge cannulae. Radio-opaque contrast mixture was constituted using the technique described in 1986 by Rees and Taylor.[22] This contrast mixture combined powdered lead oxide and gelatin, in a 50 °C water suspension. Each artery was subsequently injected with this contrast mixture until increasing resistance was experienced.

Angiograms were subsequently produced by plain radiography. After imaging, the layers of the anterior chest wall were removed, leaving only the breast with the deep fascia attached posteriorly. All deep perforators entering the breast from the underlying pectoralis major muscle were identified and tagged. A template (Figure 1) was used to map out the Hall-Findlay superomedial pedicle. The remaining breast tissue was divided into segments. The pedicle and each of the segments were dissected out and cross-sectional radiographic studies

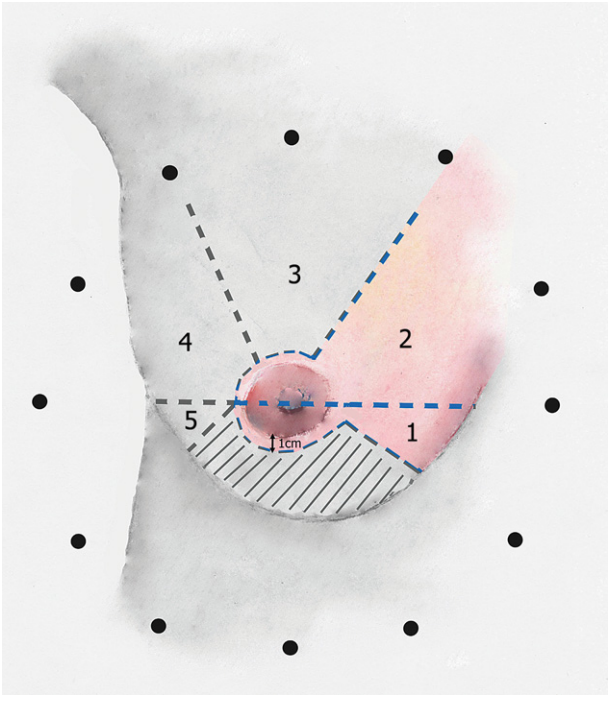

Figure 1 Template for analysis of the vascular anatomy of the superomedial pedicle for breast reduction. The superomedial pedicle is based upon segments 1 and 2. The remaining lateral tissue comprises segments 3–5. The shaded area inferiorly indicates the resected tissue. The reference points within this template are based on a 'clock-face' pattern centred at the nipple.