

Free Flap Surgery: The Role of Microsurgery

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Introduction to Microsurgery

The development of the surgical microscope and improvement in surgical techniques led to the birth of microsurgery in the early 1960s. This allowed surgeons to perform extremely intricate operations on previously inaccessible body parts, including the suturing of blood vessels, for the first time.

The first microvascular surgery was performed in 1963 by Jules Jacobsen, who sutured blood vessels as small as 1.4mm.¹ A decade later, plastic surgeons were harnessing microsurgery for "free flap" operations. In these, an area of tissue would be completely isolated from the body, including its blood supply, and transferred to a distant site. Microsurgery would then be used to anastomose vessels from the flap and the local vasculature to keep the tissue alive.

The first free flap surgery was performed in 1973 and used a left iliofemoral free flap to fill a defect on the right lower tibia.² Over the past 40 years, the concept of free tissue transfer and the role of microsurgery have become imperative to reconstructive surgery.



Fig 2 – Reconstruction of the nose using a pedicle tube skin flap from the forehead.

Pedicle Flaps

Prior to microsurgery, pedicle flaps were the best reconstructive technique available and are still performed today. Importantly, with pedicle flaps, the original blood supply to the tissue is still maintained.

Issues arise when tissue in the vicinity of the defect is insufficient or inappropriate. Harold Gillies had developed the Tubed Pedicle Flap (Fig.2) to combat this³, but the transfer of large areas of tissue took months, with patient's having to bare unsightly "skin tubes" for weeks at a time.

References

- Kleinert H. E., Kasdan M. L. (1963) Restoration of Blood Flow in Upper Extremity Injuries. *Journal of Trauma*: 461-476.
- Daniel R. K., Taylor G. I. (1973) Distant transfer of an island flap by microvascular anastomoses: a clinical technique. *Plastic and Reconstructive Surgery* 52: 1111-1117.
- Gillies H. D. (1920) The tubed pedicle in plastic surgery (letter). *Lancet* 7: 320.
- Breastcancer.org (2008) Pictures of Breast Cancer, available at www.breastcancer.org/pictures. (Accessed 04/01/09)
- Serkiel J. M., Moran S.L. (2000) Microvascular reconstruction of the breast. *Seminars in Surgical Oncology*, 19(3): 264-271

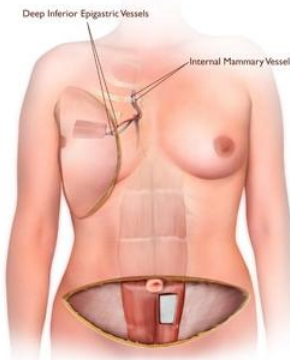


Fig 1 – Breast reconstruction using a free Transverse Rectus Abdominis Myocutaneous (TRAM) flap.⁴

The deep inferior epigastric vessels are identified and cut to isolate the free flap. The tissue is transferred to the chest wall and the vessels are anastomosed to the internal mammary vessels using microsurgery.

"Plastic surgery is a constant battle between blood supply and beauty".

Harold Gillies, 1957

Better For High Risk Patients e.g. Smokers

Improved Aesthetic Outcome

Advantages of Free Flaps⁵

Reduced Donor Site Morbidity

Better Blood Supply to Flap

Microsurgery Technique

The donor site is identified, where the flap will be taken from, and the relevant tissue is dissected.



The blood supply of the tissue, including at least one vein and one artery, is identified, whilst vasculature at the recipient site is simultaneously reviewed.



The blood supply of the flap is cut, separating it from the rest of the body.



The free flap vessels are anastomosed with the vessels at the recipient site using microsurgery (Fig 1).



The free flap is sutured to the defect area and monitored to ensure the blood vessels remain patent. The donor site is then repaired.

Other Free Flaps

Latissimus Dorsi Free Flap - commonly used for covering large soft tissue defects in the head and neck.

Gracilis Free Flap - commonly used for upper limb and breast reconstruction. It is also used as a functioning flap, restoring forearm function and facial reanimation.

Superior Gluteal Free Flap - used for breast reconstruction in patients who are not suitable for free TRAM Flaps, often due to reduced abdominal tissue.

Conclusion

The birth of free flap surgery in the early 1970s granted plastic surgeons an increased degree of flexibility in treating patients. The last 40 years have improved understanding of the viability of free flaps and their blood supply. Surgeons continue to experiment with free tissue transfer to identify the most successful free flaps, in a bid to perform more challenging reconstructive operations.