

Surgical technique and 'How I do it'

Welcome to the first of a series of articles in which AJOPS invites plastic surgeons from Australia and New Zealand to share their surgical expertise and methodologies for performing complicated plastic surgical procedures.

Since its introduction in the early 1990's, Associate Professor Felix Behan's keystone perforator island flap (KPIF) has proved itself to be a valuable addition to the armamentarium of plastic surgeons in closing difficult reconstructive defects. In particular, the KPIF is extremely useful in the closure of defects of the lower limb.

The mechanism by which the flap maintains its robust vascularity, despite being raised on very small calibre vessels and then being placed under significant tension, is yet to be fully elucidated. However, as this video shows, the flap is very versatile and can close a wide variety of defects that otherwise would need more complicated pedicled or microvascular free flap reconstruction.

We trust you will find this video enlightening and that it will serve as resource for you when learning how to perform these flaps, or allow you to refer back to see how Professor Behan raises the KPIF and reassess the nuances in this surgical technique.

Mark Ashton and Mark Lee
Editors-in-Chief

Australasian Journal of Plastic Surgery

How to do lower limb reconstruction using the keystone perforator island flap

Introduction

This guide summarises the keystone perforator island flap (KPIF) in lower limb reconstruction from the groin to the ankle.

Depending on the anatomical site and the dermatome locations, the KPIF can be rhomboidal or rectangular in shape. Gillies principle of reconstructing tissue defects using 'like with like' is integral to the KPIF's ability to provide an aesthetic reconstruction.

An absolute prerequisite for this technique is to have the KPIF 'fascial lined'. The flap can be undermined by up to two thirds. The flap's

longitudinal axis is orientated parallel to and along the dermatomal precincts.

The controversial aspect of creating an island in the skin and subcutaneous tissue only has the dynamic effect of forcing the circulation to the random perforator support and eliminating the subdermal plexus.

The vascular reaction of this islanding is illustrated by the hyperaemia that is consistently observed, suggesting an increase in blood flow. The clinical sign of this hyperaemia, termed the 'red dot sign', is that it bleeds more on the flap side than the receiving side. This hypervascularity allows closure of the flap under tension.

The clinical characteristics are best summarised by the acronym **PACE** which refers to:

- Pain:** The procedure is relatively pain free.
- Aesthetic:** Using the 'next best tissue' gives an acceptable aesthetic outcome.
- Complications:** From a vascular viewpoint complications are rare but sometimes premature rupture occurs at the suture site of tensional closure.
- Economics:** The timeframe for the procedure is relatively short (1-2 hours) compared to alternative methods of reconstruction and postoperative vascular surveillance and monitoring are not necessary.

Method

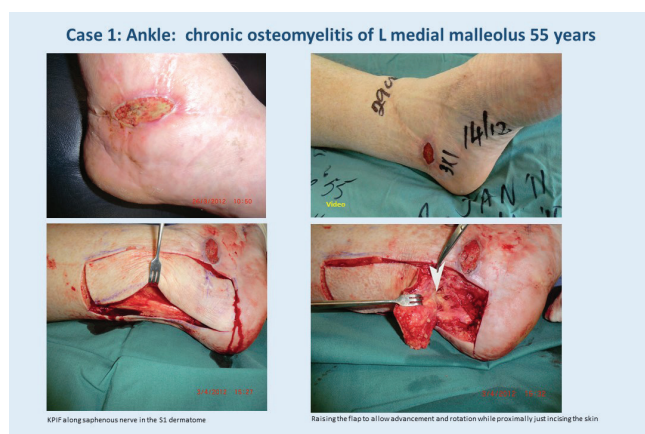
A video describing key procedural steps of Felix Behan's KPIF technique for lower limb reconstructions can be found on the AJOPS YouTube channel (link below).

Conclusion

In summary, the acronym PACES unifies the KPIF concept—a relatively pain-free postoperative phase, good aesthetic outcome, low complication rates, efficient timeframe—and finally, the regaining of topical sensation.

Felix Behan MBBS FRACS FRCS

Associate Professor, Department of Surgery, St Vincent's Hospital, University of Melbourne, Fitzroy, Victoria, AUSTRALIA



Supplementary online material

Video accompanying this text can be found on the AJOPS YouTube channel:
<https://youtu.be/cwmFD4mucwo>

Further reading

- Behan FC. The keystone design perforator island flap in reconstructive surgery. *Aust NZ J Surg*. 2003;73:112–120. <https://doi.org/10.1046/j.1445-2197.2003.02638.x>
- Pelissier P, Santoul M, Pinsolle V, Casoli V, Behan FC. The keystone design perforator island flap. Part I: anatomic study. *J Plast Reconstr Aesthet Surg*. 2007;60:883–87. <https://doi.org/10.1016/j.bjps.2007.01.072> PMID:17446152
- Behan FC. Evolution of the fasciocutaneous island flap leading to the keystone flap principle in lower limb reconstruction. *ANZ J Surg*. 2008;78:116–17. <https://doi.org/10.1111/j.1445-2197.2007.04382.x> PMID:18269468
- Behan FC, Lo CH, Shayan R. Perforator territory of the key-stone flap: use of the dermatomal roadmap. *J Plast Reconstr Aesthet Surg*. 2009;62:551–53. <https://doi.org/10.1016/j.bjps.2008.08.078> PMID:19046659
- Behan FC, Rozen WM, Kapila S, Ng SK. Two for the price of one: a keystone design equals two conjoined flaps. *ANZ J Surg*. 2011 June;81(6):405–06. <https://doi.org/10.1111/j.1445-2197.2011.05772.x> PMID:22022822
- Behan FC, Rozen WM, Tan S. Yin–yang flaps: the mathematics of two keystone island flaps for reconstructing increasingly large defects. *ANZ J Surg*. 2011;81:574–75. <https://doi.org/10.1111/j.1445-2197.2011.05814.x> PMID:22295411
- Behan FC, Rozen WM, Lo CH, Findlay M. The omega— Ω —variant designs (types A and B) of the keystone perforator island flap. *ANZ J Surg*. 2011;81:650–52. <https://doi.org/10.1111/j.1445-2197.2011.05833.x> PMID:22295410
- Behan FC, Findlay MW and Lo CH. *The keystone perforator island flap concept*. Chatswood, Sydney: Elsevier Australia, 2012.
- Shayan R, Behan FC. Re the 'keystone concept': time for some science. *ANZ J Surg*. 2013;83:499–500. <https://doi.org/10.1111/ans.12303> PMID:24049789
- Behan FC. *Surgical tips and skills*. Sydney: Churchill Livingstone, 2014.

OPEN ACCESS

Citation: Behan F. How to do lower limb reconstruction using the keystone perforator island flap. *Australas J Plast Surg*. 2021;4(2):105–107.

DOI: <https://doi.org/10.34239/ajops.v4n2.341>

Published: 30 September 2021

Copyright © 2021. Authors retain their copyright in the article. This is an open access article distributed under the Creative Commons Attribution Licence 4.0 which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.