Is dobutamine the best inotrope to use during free flap transfer?

Free flaps are different from pedicled flaps in that they are denervated with complete sympathectomy of all vessels, whereas the feeding artery and the draining vein to which the vessels are anastomosed have intact innervation. The optimal sympathomimetic agent to use to support blood pressure without having an adverse effect on free flap circulation remains contentious.

Physiology

The guiding principle of anaesthesia for microvascularized flap is the maintenance of an adequate blood flow. The physiology of microcirculation is based on the Hagen–Poiseuille law which quantitatively relates the laminar flow of a liquid through a rigid tube to the driving pressure. Although the microcirculation is too complex for a strict application of the formula, changes in perfusion pressure and cross-sectional area both influence circulation within free flaps.

An additional factor which affects flow is pulse pressure. An adequate pulse pressure ensures a longer period of capillary patency for the same mean arterial pressure because of relaxation of the precapillary sphincter. Despite the same mean arterial blood pressure peripheral vasoconstriction reduces flow to the flap, but the extent of this has not been quantified.

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Evidence for the use of inotropes

Almost all the research conducted so far has focussed on blood flow in the flaps and there are very limited data on the effects of inotropes on long-term survival of free flaps. In animal models, vasopressors such as systemic phenylephrine appear to reduce flap perfusion despite an increase in mean arterial blood pressure. Theoretically, using vasodilators to improve microvascular perfusion is an attractive option, but in practice the resultant decrease in mean arterial blood pressure adversely affects blood flow. Inotropes which are used may increase the systemic blood pressure that perfuses the flap, but the associated vasoconstriction (assuming denervated flaps maintain such control) may paradoxically result in flap ischaemia.

Shafik et al (2005) observed that on commencement of dobutamine, an inodilator, there was an increase in flap blood flow. This was accompanied by an increase in cardiac index and decrease in systemic vascular resistance. In another small study, Corderio et al (1997) found that milrinone – another inodilator – had no effect on flap flow or survival.

Interestingly, it is likely that the vasoconstrictive effect on the flap, where vessels are maximally constricted because of handling and a decrease in temperature, may be overcome with the increase in blood pressure. Eley et al (2012) demonstrated a dose-dependent increase in free flap skin blood flow with noradrenaline in a small study looking at effects of inotropes in patients having free flap transfer following head and neck cancer surgery. They found that tachycardia caused by dobutamine frequently limited its use in a subgroup of patients with cardiac disease.

Conclusions

In practice, small incremental doses of ephedrine or metaraminol are often used if required to correct hypotension intraoperatively. If an inotrope is required it is logical, given the current evidence base, to use dobutamine. However, it is essential that hypotension is addressed by optimizing cardiac preload first through adequate fluid resuscitation (Ahmed-Nusrath et al, 2010) to optimize flap flow before any inotrope is used. **BJHM**

Ahmed-Nusrath A, Pathare S, Bonner S (2010) Anaesthesia for oral and maxillofacial cancer surgery. In: Shaw I, Kumar C, Dodds C, eds. *Anaesthesia for Oral and Maxillofacial Surgery*. Oxford University Press, London: 207–28

Cordeiro PG, Santamaria E, Hu QY, Heerdt P (1997) Effects of vasoactive medications on the blood flow of island musculocutaneous flaps in swine. *Ann Plast Surg* **39**(5): 524–31

Eley KA, Young JD, Watt-Smith SR (2012) Epinephrine, norepinephrine, dobutamine and dopexamine effects on free flap blood flow. *Plast Reconstr Surg* **130**(3): 564–70

Jones SJ, Scott DA, Watson R (2007) Milrinone does not improve free flap survival in microvascular surgery. *Anaesth Intensive Care* **35**(5): 720–5

Shafik MT, Pugh S, Raj N (2005) The effect of dobutamine on the blood flow of free flaps. *Anaesthesia* **60**(3): 310–11

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