
REVIEW

GUIDELINES FOR POST-OPERATIVE CARE AND MONITORING OF FREE FLAPS

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SUMMARY

A Free flap is a unit of tissue removed from the original site (donor site) along with its blood vessels to be used for reconstruction of another area (recipient site) in the body. The procedure of raising a free flap and performing the anastomosis is a technically challenging, long and costly procedure in both financial and physical terms for both the staff and the patient. The few days after the procedure are critical and monitoring the free flap is mandatory not only for the safety of the flap but also for the patient. Accurate monitoring of the flap permits an opportunity for timely return to theatre if the tissues become compromised in the early postoperative period. Previous studies have reported successful salvage rates between 28 and 87.5% and the rates for return to theatres were between 13% and 20%. Compromised circulation is the reason for re-exploration of free flaps in 5-25% of cases. These figures reflect the importance of accurate monitoring of the flap, bearing in mind that the success of flap is always of huge importance for the patient for early recovery, rehabilitation and good quality of life. Any small changes in the flap colour, texture, capillary refill or even temperature can indicate underlying changes that might need emergency re-exploration to avoid the loss of the flap and indeed to provide the best service for the patient. So even small changes need to be reported. Early detection of vascular compromise can save a flap and might prevent further complications or surgeries. A review of other guidelines was performed before writing up these guidelines to provide the best and safest service that is most suitable to our practice. These guidelines should be followed for every free flap procedure in the plastic surgery department, unless specifically stated and documented by the surgeon. It is mandatory for all staff involved in the post operative care of these patients to be aware of these guidelines including all junior doctors and nursing staff. Free flap monitoring is predominantly carried out by the experienced nursing staff, or a junior nurse under supervision. Any changes should be immediately reported to the senior nurse and the junior doctor who will review the flap and report to the on-call team.

Key words: flap, free flap, flap surveillance

RÉSUMÉ

Instructions pour l'assistance post-opératoire et le monitoring des lambeaux libres

Un lambeau libre est une unité de tissus prélevé au site d'origine (site donneur) avec ses vaisseaux sanguins pour être utilisé pour la reconstruction d'un autre domaine (site receveur) dans le corps. La procédure d'élever un lambeau libre et la réalisation de l'anastomose est une procédure techniquement difficile, longue et coûteuse en termes financier et physique à la fois pour le personnel et le patient. Les quelques jours après la procédure sont critiques et le suivi du lambeau libre est obligatoire non seulement pour la sécurité du volet mais aussi pour le patient. Une surveillance précise du volet permet une possibilité de retour en temps opportun au théâtre si les tissus deviennent compromis dans la période postopératoire précoce. Des études antérieures ont rapporté des taux de récupération réussis entre 28 et 87,5% et les taux de retour étaient entre 13% et 20%. La circulation compromise est la raison de ré-exploration des lambeaux libres dans 5-25% des cas. Ces chiffres reflètent l'importance de la surveillance précise du volet, en gardant à l'esprit que le succès du volet est toujours d'une grande importance pour le patient pour une récupération précoce, la réadaptation et la bonne qualité de vie. Tous les petits changements dans la couleur des volets, texture, remplissage capillaire ou même température peuvent indiquer des changements sous-jacents qui pourraient avoir besoin d'une re-exploration d'urgence pour éviter la perte du volet et en effet de fournir le meilleur service pour le patient. Donc, même de petits changements doivent être signalés. La détection précoce du compromis vasculaire peut sauver un volet et pourrait éviter d'autres complications ou des interventions chirurgicales. Un examen des autres lignes directrices a été effectué avant la rédaction de ces lignes directrices pour fournir le meilleure et le plus sûr service qui est le plus approprié à notre pratique. Ces directives doivent être suivies pour chaque procédure de lambeau libre dans le département de chirurgie plastique, sauf indication contraire et documentée par le chirurgien. Il est obligatoire pour tout le personnel impliqué dans la prise en charge post-opératoire de ces patients d'être au courant

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de ces lignes directrices, y compris tous les jeunes médecins et le personnel infirmier. Toute modification doit être immédiatement signalée à l'infirmière en chef et le jeune médecin qui examinera la volet et fera un rapport à l'équipe.

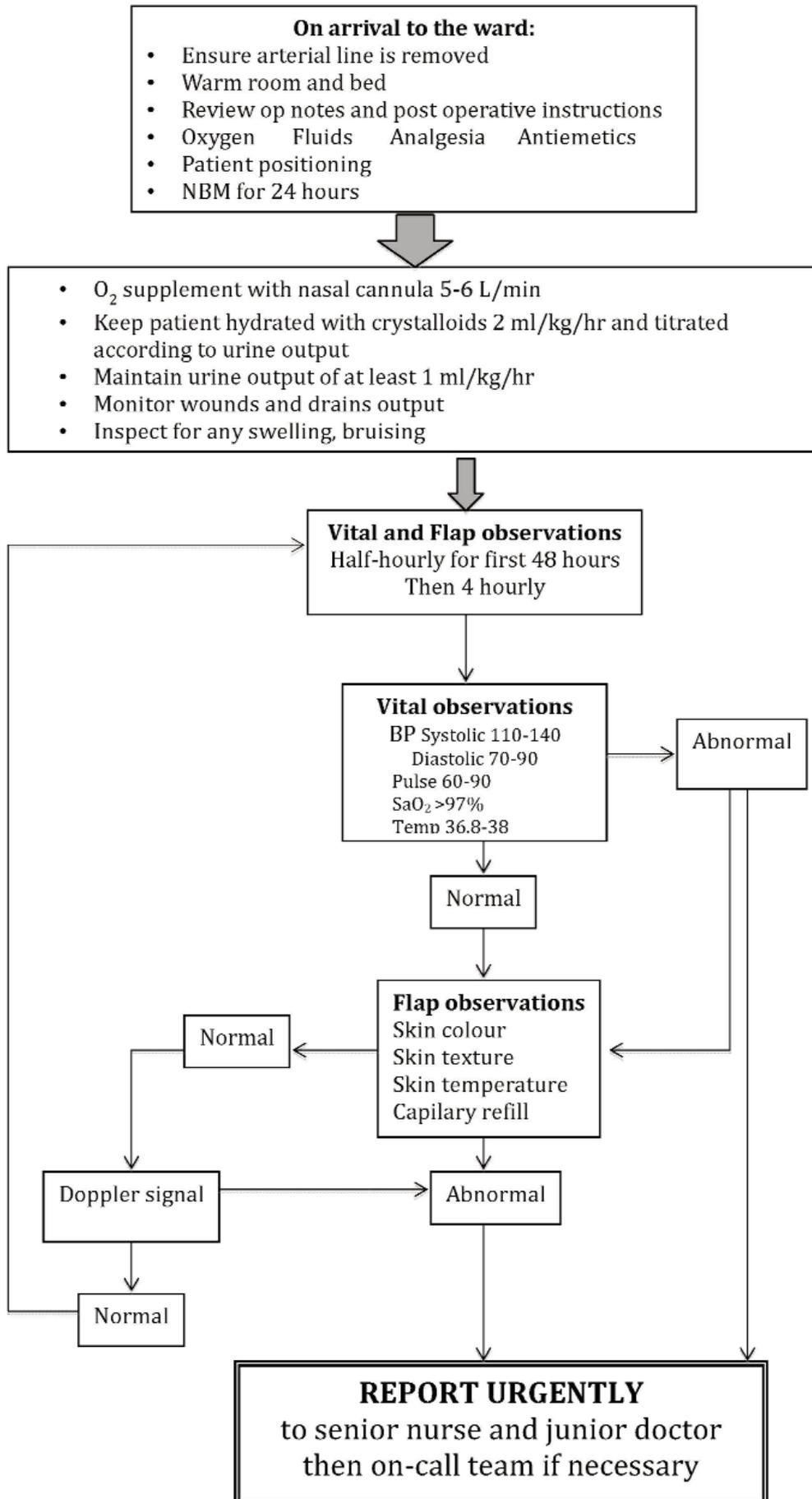
Mots clefs: lambeau, lambeau libre, surveillance du lambeau

GUIDELINES (Table 1)

- These guidelines should be followed for every free flap procedure in the plastic surgery department, unless specifically stated and documented by the surgeon.
- Always discuss with the surgeon for any special requirements in the post-operative period and review the operative notes for any special instructions.
- Usually patients are back to the ward after the procedure, if so the arterial line is to be removed
- Maintain a warm environment, warm bed and warm room
- Positioning of the patient is usually documented in the post op notes. If not should be discussed with the operating consultant.
- Analgesia: PCA morphine, regular Paracetamol and Ibuprofen orally
- Antiemetics as Ondansetron 8 mg orally tds for the first 24 hours. This is because vomiting causes stress and rise in arterial and venous pressures.
- Oxygen supplement of 5-6 L/min via nasal cannula for at least the first 24 hours.
- Keep the patient well hydrated. The principle is to avoid dehydration with adequate fluid and also to avoid overhydration as tissue oedema may affect the free flap oxygenation. So continuous infusion is necessary. This is usually in the form of 2 ml/kg/hr of crystalloids (Hartmans). However, this needs to be titrated according to the urine output.
- A fall in BP or urine output or any signs of hypovolaemia should be immediately corrected by crystalloids such as Hartmans. Colloids can be considered if necessary. Blood transfusion is not usually considered unless there is a history of significant blood loss and after discussing it with the on call surgical team.
- Continue IV fluids for at least the first 24 hours (preferably warm fluids)
- Urine output to be maintained of at least 1 ml/kg/hr
- Limited venous access due to previous chemotherapy, lymphoedematous operative side, anxiety or dehydration. Premed and warm water can help. If difficult, consider help from a senior colleague, followed the 1st anesthetist on call if necessary.
- The patient is kept nil by mouth for the first 24 hours. This is a precautionary action taken in case the patient is returned to theatres due to circulatory compromise.
- Vital observations and Flap monitoring should be carried out half-hourly in the first 48 hours. This I to be followed by 4 hourly observations if patient is vitally stable and the flap observations were satisfactory.
- Monitor wounds and drains output, amount and colour for any signs of active bleeding.
- Inspect for any swelling, bruising that might denote

Table 1

Post-op care Guidelines	Parameters	Rationale	
vital observations	BP	Systolic 110-140 Diastolic 70-90	Low BP and abnormal pulse may indicate inadequate blood supply to the flap. Compare with pre-op BP.
	Pulse	60-90	
	SaO ₂	>97%	Low SaO ₂ may lead to inadequate tissue perfusion and may indicate airway compromise
	Temp	36.8-38	
Urine output	Should be > 1 ml/kg/hours	Is indicative for tissue perfusion. Poor output can indicate dehydration and so poor free flap perfusion	
Flap observation	Colour	Observe for any change in colour. Pale, blue or dark red colours indicate either reduced arterial supply or venous return	
	Swelling	Swollen or congested flap may indicate poor venous return	
	Texture	"Spongy" flap may indicate poor arterial supply	
	Capillary refill	2-4 seconds	Fast Cap refill may indicate venous compromise. Also slow refill may indicate poor arterial supply
Doppler observation	Watch for any change in the Doppler signal		
Wound site and drain	Monitor the wounds and drains (amount and colour). Excess drainage can indicate active bleeding.		
Positioning of patient	Follow post op instruction. This is important to avoid kinking of vessels and also to control swelling.		



underlying collection, haematoma

- Chest physiotherapy to start on the second day to reduce the risk of postoperative chest complications
- Start anti-coagulation prophylaxis immediately as enoxaparin SC once a day and consider physiotherapy and mobilization as soon as possible to reduce the risk of thromboembolism and pulmonary embolism.
- Arrange for bloods to be sent on day 1 for FBC, u&e, and coagulation profile. Usually blood transfusion is not considered for free flap patients unless the haemoglobin is less than 70 g/L, abnormal vital signs or specially stated by a senior.

FLAP OBSERVATIONS

Flap observations are carried out using a wooden tongue depressor or a flat, sterile object to check for the flap blanching and capillary refill.

Always make yourself aware of the flap colour, texture, temperature, capillary refill and the Doppler signal on the start of your shift (at the handover) as this will help you to assess the flap and notice any changes.

- Skin colour: change in colour of flap is one of the first sign of flap compromise. Pale flap usually reflects compromised arterial supply and that not enough blood is passing through. Blue or dark pink reflects an underlying venous problem
- Skin texture: assess the adequacy of blood flow. "Spongy" flap may indicate poor arterial supply. A congested or swollen flap may indicate poor venous return or infection.
- Temperature: cold flap indicates inadequate blood supply
- Capillary refill: Slow refill (more than 4 sec) can be symptomatic of reduced blood flow (arterial problem). Whereas a fast flow (less than 2 sec) can be symptomatic of venous problem.
- Doppler signal: This is performed by placing the hand held Doppler probe on the site of the new anastomosis, which is usually marked intra-operatively with a marker pen or marker stitch. (avoid applying pressure which can lead to vascular occlusion)

In the case of a suspected Doppler failure, which may be suspected when the arterial signal cannot be detected whilst all other flap observations are normal. First start by examining the Doppler on a normal pulse (one of the health professional team's radial pulse). If there is no signal then change the batteries. If there is still no audible signal then ask for help from theatres who can provide a replacement Doppler overnight or the general surgery team usually has an access to a Doppler scan which they use for their vascular cases.

- Pinprick response: In addition to the above, the surgeon might ask to perform the pinprick test to assess the dermal bleeding. This should be done using a sterile needle. Moderate bleeding or bright red blood indicates a well-vascularized flap. Rapid bleeding of dark blood indicates venous congestion. Minimum amount of dark blood may indicate arterial occlusion.

FLAP CHART

It is a document that is used to record the flap monitoring results.

CHANGES TO MICROVASCULAR FLAP

Any changes in the flap observations should be immediately reported to the senior nursing staff as well as the junior doctor in charge. They should immediately review the flap and who will be reporting to the on call registrar.

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