

Clinical Assessment Score for Monitoring Free Flaps in the Dark Skin

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Abstract

Background: To determine the value of a clinical assessment score in the monitoring of microsurgical free flaps in the dark skinned African patients.

Aims: We devised a simple assessment score incorporating colour, skin temperature, turgor, Doppler pulsation and pin prick response into a single numerical score as an index of adequacy of perfusion for 21 consecutive free flaps at our centre. Each of the parameters score ranges from 0 to 2. A Total score less than 4 indicate a healthy flap while a score above 4 points to possible flap compromise.

Results: A 100% sensitivity rate with no false negatives, with a 14.2 % take back rate was found in this study. While several institutional issues still hamper free flap salvage in this low resource centre.

Conclusion: It appears this may be an objective reliable non invasive assessment method of monitoring free flaps in the dark skinned patients.

INTRODUCTION

Microvascular free flap transfer is increasingly being used in many complex reconstructions worldwide even in the low resource countries. The post-operative risk of vascular compromise resulting in total flap failure necessitates that a protocol for monitoring is adopted to identify and promptly intervene to prevent flap loss.

Following free flap surgery, complications commonly occur within the first three days and it is in this period that flap monitoring appears to be most critical (1). Vascular complications following free tissue transfer is the most severe complication and it is often recommended that all free flaps be monitored. In addition to clinical assessment of colour, temperature, skin turgor and capillary refill, many microsurgeons use other non-invasive and invasive methods to monitor flap health in the post-operative period.

In resource limited settings, there is often paucity of modern technology for monitoring and as such clinical parameters alone often form the bed rock of the monitoring protocol for free flaps. In the course of our practice we observed that colour changes tended to be unreliable in the dark skinned African patient. Skin turgor tended also to be equally inconsistent on account of the presence of oedema following surgery. (1, 2)

These make the clinical assessment of free skin flaps challenging in the African patient. We therefore devised a clinical assessment score comprising of the summation of all the scored clinical parameters. The value of this reflects the overall flap health. Our early experience of using

this score in monitoring free flaps in our centre is the subject of this report.

MATERIALS AND METHODS

Following institutional review board approval, we reviewed the charts of all our free flaps (excluding the muscle flaps) at our centre over a 5 year` period. Preoperative skin marking of the loudest audible perforator is done with a 8 Mhz hand held Doppler with a permanent marker or 5/0 prolene stitch. The method of assessment consists of clinical appearance (relative to the immediate post revascularization colour, when the flap was judged optimal by the most senior surgeon) swelling, arterial Doppler pulsation and surface` temperature (using an infrared thermometer) compared to adjacent normal skin done 2 hourly and a daily pin prick (Figure1).



Figure 1. Pinprick in an anterolateral thigh flap in a dark skinned patient

All this were graded from 0 to 2 as shown in Table1.

Table 1. Clinical Score Assessment Key

clinical score assessment key			
index	0	1	2
colour	Comparable to donor site	Some change	Colour difference
Flap swelling/ tension	Comparable to adjacent tissue	Slight swelling not tense	Obvious tense swelling
Temperature	$\Delta < 1$ degree C	$\Delta 1-1.5$ degree C	$\Delta 1.5 >$ degree C
Doppler auscultation	Normal (comparable to pre-op levels)	Reduced sounds	Absent
Pin prick	Brisk bright red bleed (figure)	Slow bleed OR Dark ooze	No bleed > 15 sec OR slow oozing of serum Brisk dark ooze

Scores – 0-3 healthy flap, **4-8** Doubtful/ Unhealthy flap.

A flap must have a total score of less than 4 to be deemed healthy. Any score above 4 is an indication for intervention. This monitoring is done by members of the surgical team with a 12 hourly review by most senior member of the team. Our patients are often admitted into a high dependency unit for 48 hrs and later transferred to a stepped down facility when deemed stable. The monitoring is continued for 72 hours and thereafter stepped down to 4 hourly.

RESULTS

Twenty three free flaps were performed over a five year period (2012-2016). Twenty one free flaps were assessed. Two muscle flaps did not qualify for this method of assessment. All 21 flaps were monitored by our clinical protocol. All

sixteen flaps that survived had scores less than 4 over three days of 2 hourly monitoring (Mean score was 1.3). Five flaps were lost. These flaps had a mean index of 7.1 at 48 hours post surgery. One flap suffered a sudden loss of Doppler pulsation 5 days after surgery on account of infection in the pedicle area. Three flaps had salvage procedures. Of these one was noted to have index of 6 at 24 hours post surgery clinically judged to be due to arterial occlusion, exploration revealed tight sutures which was loosened, pedicle was irrigated with 2% lignocaine and flap survived completely. In spite of our best efforts four flaps with mean index of 7 could not be salvaged (two on account on our inability to re explore the flaps). The reasons for this include, lack of theatre space and inability to get anaesthetic coverage. There was a 100% sensitivity with no false negatives in this study using this index. Our take back rate was 14.2% of the 21 flaps, this was not a true reflection of compromised flaps in our series as indicated earlier. A third of all re-explored flaps were salvaged.

DISCUSSION

Post operative monitoring has improved the overall success of microvascular free flaps. While the hand held pencil tipped Doppler is commonly used by many surgeons in flap monitoring around the world, the implantable Doppler with piezoelectric crystals embedded in a silicone sleeve sutured around the draining vein (2) is used by some other surgeons. The implantable Doppler

offers the advantage of direct and continuous monitoring of the flaps and as such tends to be more useful in buried and muscle flaps (3).

The Infrared spectroscopy is a non invasive technique that uses the haemoglobin concentration to assess flap perfusion (4). It is currently the most widely used non invasive method worldwide (4). Though the most widely used method of monitoring remains clinical methods, many microsurgical teams use several invasive and non invasive adjunctive techniques to augment clinical flap monitoring.

Though the gold standard of post-operative free flap monitoring is clinical observation of colour and capillary refill (5). This is often difficult to apply in the dark skinned people of African descent as subtle changes in skin colour tend to be easily missed. Temperature measurements are known to be unreliable even when compared to the adjacent skin.

In our practice as in most parts of Africa, there are no available complex invasive monitoring devices and very limited availability of non-invasive monitoring techniques. We noted that the weighting of the various flap clinical signs into a single clinical assessment score was reliable in predicting a failing flap with 100% sensitivity and no false negatives in our patients.

Our findings is similar to that of the Melbourne group who found clinical parameters supplemented with hand held Doppler resulted in a sensitivity of 99.7% and a false negative rate of 0.8% (6, 7).

The small study size limits the power of this study and our low salvage rates indicate that not all troubled flaps could be re explored on account of institutional limitations. We have also noted this method of flap assessment is highly personnel dependent. We agree with the other reports that more elaborate monitoring techniques may be indicated in buried and lower extremity flaps in order to maximize flap outcome.

It appears from our findings that a combination of clinical parameters as a score is simple and reliable. It is cheap, and can be used by both physician and nursing staff in the post-operative monitoring of free flaps in dark skinned patients. But significant training needs to be done to obtain consistent results in its use. It is possible that its widespread use may lead to better free flaps salvage in similar low resources settings.

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Conflicts of Interest: None

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