

The Standard of Care for Post-op Skin Flap Assessment

Plastic Reconstructive Surgery Package



Type R (Right Angle)

head: epoxy, diameter, 15 mm;
height, 7 mm
optional suture holes shown

Recommended:

- **BLF21A**
- **2 each, Type R probes** (surface)

Optional:

- **1 each, Type PS probe** —
implantable for buried muscle flaps

**Detects changes
in flow before
clinical indices
appear**

Flow Monitor BLF21A Features

Large Digital Display

Flow values are easily read.

One Button Operation

No confusing menu screens or endless manuals.

Self-Calibrating Probe

Assures that each new probe measures the same.

Low Received Light

Clearly shows when the probe does not have good contact with the tissue.

Time Constant

Smooths readings for easy determination of developing trends.

Alarm Option

Alarm alerts staff that values have fallen below set levels.

Dual Channel Option

For those cases where monitoring two different sites simultaneously becomes important.

Adjustable Carrying Handle

Provides an easy way to transport the BLF21; also adjusts to become a stand.

RS232 / BNC Connectors

Provides you with the option of interfacing the BLF21 to a strip chart recorder and/or a computer for easy data acquisition and retrieval.

Cost Effective

System will pay for itself in just 10 flap cases. Of course, if the BLF21 alerts for intervention before one flap has failed, its value will have exceeded its cost.



Transonic Systems Inc.

Excellence in Quantitative Hemodynamics

34 Dutch Mill Road, Ithaca, NY 14850 USA; Tel: 800-353-3569, 607-257-5300;

Fax: 607-257-7256; Internet: www.transonic.com

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Perfusion Monitoring of Autologous Tissue Transplants

APPLICATION

Site: skin flap
 Species: human
 Vessels: skin microvasculature
 Duration: pre-operative
 intra-operative &
 3 - 6 days post-operative

PROBE type R with suture holes

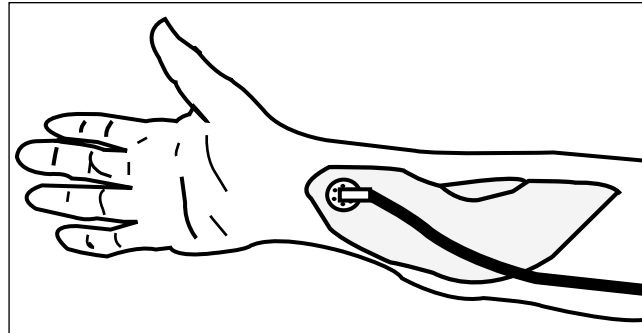


Fig. 1: Type R probe, shown sutured to a lateral arm/proximal forearm flap.

SURGICAL APPROACH

The laser-Doppler flow probe is held or taped in the center of the intact tissue of the proposed flap and blood flow is recorded. Care must be taken to attach the probe so that it is held in contact with the tissue without applying pressure which would occlude the vessels under study (see technical note TN-101). Prior to raising the flap, mark the location of the measurement by outlining the probe head and cable exit (to show orientation) so that the probe can later be replaced in nearly the same spot. Following anastomoses, the probe is re-applied to the site by suturing or taping in place.

Perfusion values are recorded every half hour for the first 12 hours and hourly thereafter for three to five days. If the recorded value falls to 50%_(1,2) of the original value for two consecutive periods, the flap is assessed by a physician and the anastomoses are reexplored, if necessary.

A computer based recording system is recommended in addition to the above recording by staff. The Transonic personal computer interface (-P Option) allows continuous display and collection of data. A daily graph of flow trends may be printed. Following analysis and interpretation by the physician, this graph can be incorporated into the patient's chart.

TYPICAL FLOW RANGES OBSERVED

<u>Donor Site</u>	<u>Perfusion Units</u>	<u>Donor Site</u>	<u>Perfusion Units</u>
Forearm radial	4.87 ± 1.64	Rectus abdominis	4.79 ± 2.57
Fibula	4.74 ± 1.81	Scapular	2.43 ± 0.81
Latissimus dorsi	2.20 ± 1.39	Tensor Fascia Lata	2.44 ± 1.00

ACKNOWLEDGEMENTS

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References

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- Goldberg, J., Sepka, R.S., Perona, B.P., Pederson, W.C., Klitzman, B., "Laser Doppler Blood Flow Measurements of Common Cutaneous Donor Sites for Reconstructive Surgery", *Plastic and Reconstructive Surgery*, Vol. 85, No. 4, p. 581-6, 1990.
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- Brenman, S.A., Barber W.B., Pederson, W.C., Barwick, W.J., "Pedicled Free Flaps: Indications in Complex Reconstruction", *Annals of Plastic Surgery*, Vol. 24, No. 5, p. 420-6, 1990.



Sample Policy for Post-Op Laser Doppler Monitoring in Reconstructive Surgery

Purpose:

To assure safe and consistent guidelines for monitoring the vascular status following:

- replantation
- revascularization
- free tissue transfer procedures
- rotational flap procedures.

Sample Policy:

- A. The RN performing Laser Doppler monitoring will have been inserviced and trained in Laser Doppler monitoring.
- B. There must be a physician's order to initiate laser Doppler monitoring.
- C. The physicians's order will include the following:
 1. Desired frequency of flow readings.
 2. Flow reading parameters for physician notification (e.g., if value decreases to 50% of baseline reading).
 3. Discontinuation of Laser Doppler monitoring..
- D. The physician will choose the appropriate probe and monitoring site.
- C. The physician will set the following Laser Doppler monitor parameters:
 1. Reference level.
 2. Alarm level
 3. Settling time (10 sec, 1 min or 5 min)
- F. The RN will document the flow readings on a vascular assessment flow sheet.
- G. An experienced and inserviced RN may adjust the above parameters as deemed necessary when changes in the baseline flow readings occur.
- H. The senior Plastic Surgery resident, Hand or Microsurgery fellow or staff physician will be notified by the RN when the flow reading falls below 50% of the baseline value.
- I. When the monitoring has been discontinued, the RN will clean the laser Doppler probe with an alcohol wipe, place it in a biohazard bag for sterilization. The plastic surgery nurse specialist or the resident will be notified for proper sterilization and storage.
- J. The RN will verify with the CSC that the appropriate charges are initiated at the time of physician order and stopped when the monitoring has been discontinued.





Tram Flap Perfusion Measurement Rat Model

Application

Site: **skin over TRAM flap**
Species: **Rat**
Type: **Sprague Dawley**
Gender: **Male**
Body Weight: **360 - 520 gm**
Duration: **Intraoperative, acute**

Probe Data

Type: **R, Right Angle Probe**

Application

For studies of the physiology of flaps, the rat provides a safe, inexpensive, but comparable model for some flaps, notably the transverse rectus abdominis musculocutaneous (TRAM) flap. The laser Doppler flowmeter provides a useful tool for continuous monitoring of the blood flow to the tissue of the flap in the rat as it does in human flap surgery.

Surgical Approach

Rats were anesthetized with enflurane induction and a mixture of ketamine and acetylpromazine given intramuscularly. The rat's hair was removed with a depilatory agent. A rectangle was marked out on the abdomen from the tip of the xiphoid to just above the pubis, overlying the rat's rectus abdominis muscle. TRAM flaps were then raised. Flaps were bipedicle with both a superior pedicle (supplied by the cranial epigastric artery - a continuation of the internal thoracic artery), and an inferior pedicle (supplied by the caudal epigastric artery - excluding anastomosis to the deep circumflex iliac artery). Only certain ipsilateral rectus abdominis musculocutaneous perforators were left intact to connect the abdominal wall. Contralateral muscle perforators, superficial epigastrics and other collateral vessels were ligated. The linea alba was incised and lifted to observe the blood supply to the flap. The pedicles were individually cross clamped with micro clamps to observe the contribution to the tissue perfusion by each individual pedicle. The flaps were isolated with a Silastic sheet to prevent neo-vascularization and reset into its original position after dividing one of the pedicles. The survival of the flaps were evaluated at 48 hours post surgery.

Flow Measurements

The right angle probe was placed in the middle of the flap's quadrant overlying the ipsilateral rectus abdominis muscle and was fixed in place with two-sided adhesive tape. The analog signal was recorded and averaged over five minutes to obtain values. Readings were made prior to incision (initial), following incision with both pedicles perfusing the tissue (baseline), and with each pedicle cross-clamped, in turn.

Flow Ranges Observed

Mean Perfusion of TRAM as a % of Baseline Flow

<i>Number</i>	<i>Initial</i>	<i>Baseline</i>	<i>Superior Pedicle</i>	<i>Inferior Pedicle</i>
10	185	100	92	44

Reference

Hallock, G.G., Rice, D.C., "Physiologic Superiority of the Anatomic Dominant Pedicle of the TRAM Flap in a Rat Model," Plastic & Reconstruct Surg, 1995; 96(1): 111-8.