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To Evaluate The Role Of Capillary Blood Glucose Level In The Assessment Of Survival Of Flaps And Crushed Limbs.

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I. Introduction

A flap is a unit of tissue which is transferred from a donor to a recipient site with its blood supply.[1]There is improvement in the success rate of free tissue transfer due to the advent of microsurgical and instruments and its improvement, there is also the invention of many reliable flaps monitoring methods.[2,3]

Monitoring of flaps after surgery is of vital importance, especially during the first few hours, because the timing of reoperation can define flap salvage or loss.[4,5] Classically, crushed limb and flap viability is evaluated based on clinical parameters such as temperature, color, turgor, capillary refill, and bleeding. Wilson et al[4,6] recommend flap evaluation by trained nurses every 30 minutes in the first 24 postoperative hours and every 4 hours thereafter. Physical examination is necessary but can be faulty due to lack of knowledge or human errors.

It is well known that congestion due to venous thrombosis is more common[3] and more harmful to the flap than ischemia due to arterial thrombosis.[6] An ideal monitoring method should be harmless to the patient and the flap, accurate and reliable, capable of providing rapid response to circulatory change, capable of being used by all personnel, reproducible, inexpensive, and portable.[2]Flaps have a risk of thrombosis at the anastomotic site postoperatively. Tachi et al[7] said tissue glucose level decreases earlier and faster than body glucose level. They hypothesized that when venous congestion occurs, the tissue becomes hypoxic, and anaerobic glycolysis is accelerated, resulting in tissue glucose depletion.

Using objective measures, health professionals who are inexperienced in microsurgery can monitor the flap. The use of capillary blood glucose levels can be useful because it provides objective data without requiring complex apparatus.[8]Hence keeping the above factors in mind and to have a data in North India set up, the present study was undertaken and conducted in General Surgery Department of Subharti medical college, Meerut to evaluate the role of capillary blood glucose in the assessment of survival of crushed limbs and flaps formulate guidelines for monitoring of flaps and crushed limbs using glucometer.

II. Material & Methods

The study was a prospective study of 105 cases of Flap reconstruction (87) and crushed limbs (18) that was admitted in N.S.C.B. Subharti medical college and Hospital, Meerut, during the period from 2017 to 2019. Skin punctures for the pinprick test were made using a needle. The glucometer was used to measure the blood glucose level in the flap and crushed limbs and normal body. It was carried out by measuring capillary blood glucose level of the flap immediately after operation and crushed limbs immediately after injury, 1 h after, then 2hourly thereafter till 48 hours. The data was compared with thecapillary blood glucose level of body and data was analyzed with the help of Pearson product-moment correlation coefficient test (r-value) and p-value for statistically significant data.

III. Observation and Result

105 patients were taken for this study. It was found that when the difference of average capillary blood glucose level in body and flap was less than 20.0 mg\dl all crushed limbs and flaps survived. And when the difference of average capillary blood glucose level in body and flap was more than 30.1(30.6,30.1) mg\dl all crushed limbs and flaps survived. Distribution of patients according to average capillary blood glucose difference between flap/crushed limb and body

Average capillary blood glucose difference	Flap survived	Flap failure	Crushed limb survived	Crushed limb loss	Total
<10 mg/dl	68	0	10	0	78
10.1 - 20 mg/dl	7	0	0	0	7
20.1 - 30 mg/dl	0	0	0	0	0

30.1 - 40 mg/dl	0	11	0	7	18
40.1 - 50 mg/dl	0	1	0	1	2
Total	75	12	10	8	105

IV. Discussion

Flap salvageability depend on early diagnosis of flap congestion. Clinically it is difficult to diagnose. During this study, it was found that there was a direct relation between body glucose level with flap and crushed limbs if it survives ($r > 0.9$). In flap failure and crushed limbs which shows ischemic changes had fall in glucose levels. A significant difference ($p < 0.05$) came out in case of capillary blood glucose level in the flap and limb who survived and failed.

Capillary blood glucose level of the body and compared it to flap/crushed limb and were monitored immediately and followed by every 2 hours for 2 days

Similar study was done by Chao, Meyerson, Povoski, & Kocak[9] who monitored it every 30-60 min for 3 days Flaps and crushed limbs which survived were warm on touch, pink in colour, bleeding on scratch present and had normal turgor showed average capillary blood glucose difference level was less than 20.0 mg\dl. Whereas Flaps and crushed limbs which were lost were cold on touch, violet or black in colour, bleeding on scratch was absent in all crushed limb while some flap failure had bleeding on scratch present but in some, it was absent and was swollen or wrinkled showed average capillary blood glucose difference level was more than 30.1 mg\dl.

V. Summary

This prospective study was conducted in the Department of General Surgery of Subharti Medical College admitted through surgery OPD and emergency or transferred from other department 105 patients out of which 12 flaps were lost and 8 crushed limbs were not salvageable. All have a similar finding of fall in capillary blood glucose level. A difference of more than 30.1 mg\dl on an average was found in these patients. All the flaps and crushed limbs which were survived maintained the capillary blood glucose level and the difference with body glucose was not more than 20 mg\dl on an average.

VI. Conclusion

It concluded from the above study that: Capillary blood glucose level is a diagnostic tool for the evaluation of survival of flaps and crushed limbs. Average blood glucose level difference of more than 30.1 mg/dl is the cut off line for the survival of flap (30.6mg\dl) and crushed limbs (30.3mg\dl). It is reliable, cheap, easy to use, and reproducible. However, more study is needed to assess the capillary blood glucose level in assessment of crushed limb.

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