



## General Surgery

## FLAP CAPILLARY BLOOD GLUCOSE MONITORING AS A PREDICTOR OF FLAP SURVIVAL IN LIMBERG FLAP FOR PILONIDAL SINUS SURGERY.

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**ABSTRACT** **Background:** Pilonidal sinus is treated with wide local excision and primary closure, which carries high recurrence, post-operative morbidity and cosmetic implications. In order to overcome that limberg transposition flap is done. Post-operative flap survival is crucial for proper healing. Hence there is a need for a tool to predict flap survival as earliest. Flap capillary blood glucose monitoring is such a tool which is, done as a clinical basic procedure, with no harm to patient or the flap. **Methods:** To prospectively validate flap capillary blood glucose monitoring serially, as an indicator to predict flap survival in limberg flap in pilonidal sinus surgery patients at Government medical college & ESI hospital-general surgery department. Conducted as a prospective cohort study among 30 patients who underwent wide local excision and limberg flap for pilonidal sinus in the Department of General Surgery, Government Medical College & ESI Hospital between June- 2021 to November- 2021. Estimated capillary blood glucose at the edge of flap 3mm away from incision site, using glucometer at 0, 6, 24- hours following surgery. **Results:** Of the 30 patients who underwent limberg flap surgery, 1 patient developed postoperative flap necrosis due to venous thrombosis. 1 patient developed flap infection which was treated with appropriate antibiotics after culture and sensitivity and the flap survived. Rest of the 28 patients had healthy flaps and uneventful postoperative period. Of the 30 patients who underwent limberg flap for pilonidal sinus 29 patients in whom the flap survived had flap glucose level more than 62mg/dl, in the first 24 hours. **Conclusion:** Monitoring flap capillary blood glucose serially in postoperative period in order to identify the flaps in risk, to start early goal directed therapy to improve flap survival and the patients can benefit. This simple and cheap technique can be used for routine monitoring of Limberg flaps along with the routine clinical evaluation.

**KEYWORDS :** limberg flap, pilonidal sinus, glucose, gangrene, flap survival

## INTRODUCTION

Pilonidal sinus is treated with wide local excision and primary closure, which carries high recurrence, post-operative morbidity and cosmetic implications. In order to overcome that limberg transposition flap<sup>1</sup> is done. Post-operative flap survival<sup>2</sup> is crucial for proper healing. Hence there is a need for a tool to predict flap survival as earliest.

Flap capillary blood glucose monitoring is such a tool which is,  
- done as a clinical basic procedure,  
- With no harm to patient or the flap.

Flap failure in limberg flap leads to serious morbidities. The current monitoring process for assessing flap perfusion remains mostly subjective. The objective of this study is to measure capillary glucose levels using glucometer in detecting post operative flap tissue ischemia in patients undergoing transposition flaps. This is an efficient, simple and cheap technique to detect early post operative flap ischemia in limberg flaps.

## Methods

## Objective

To prospectively validate flap capillary blood glucose monitoring serially, as an indicator to predict flap survival in limberg flap in pilonidal sinus surgery patients at Government medical college & ESI hospital-general surgery department.

## Methodology

**Study Design:** Prospective cohort study.

**Sample Size:** 30 patients.

## Inclusion Criteria

- 30 patients who underwent wide local excision and limberg flap for pilonidal sinus in the Department of General Surgery, Government Medical College & ESI Hospital
- Aged 18 years and above.
- Between June- 2021 to November- 2021.

## Exclusion Criteria

- Patients who are below 18 years.
- Pregnant patients.

## Study Method

To estimate capillary blood glucose at the edge of flap 3mm away from incision site, using glucometer at 0, 6, 24- hours following surgery.



## Outcome

1. FLAP HEALTHY AND SURVIVED,
2. FLAP INFECTED BUT SURVIVED,
3. FLAP NECROSED/ GANGRENE.

## Implications Of The Project

To validate flap capillary blood glucose serially in postoperative period in order to identify the flaps in risk, to start early goal directed therapy<sup>3</sup> and to improve flap survival and the patients can benefit.

The study was conducted at Government medical college & ESI hospital at department of general surgery for a period of 6 months from June-2021 to November-2021 after the institutional ethical committee approval.

30 patients with pilonidal sinus requiring surgery were selected. Patients below 18 years and pregnant patients were excluded.

Doppler ultrasonography of the gluteal vascular pedicle<sup>4</sup> based flaps with good tissue oxygenation<sup>5</sup> was selected. A drop of blood was taken from the flap and from the fingertip using a needle and blood glucose measurements were done serially at 0,6,24 hours using the same glucometer device. The data were analyzed. The flaps were clinically also assessed as per protocol<sup>6</sup>. The finger capillary blood glucose level will be used as a control for the flap blood glucose level.

## RESULTS

Of the 30 patients who underwent limberg flap surgery, 1 patients

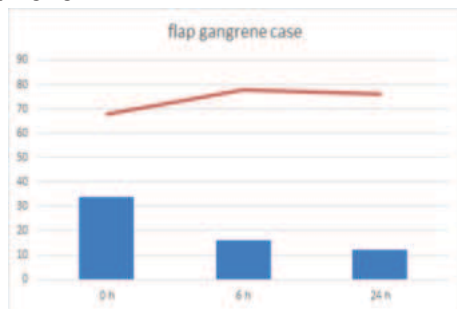
developed postoperative flap necrosis due to venous thrombosis.<sup>7</sup> one patient developed flap infection which was treated with appropriate antibiotics after culture and sensitivity and the flap survived. Rest of the 28 patients had healthy flaps and uneventful postoperative period.

Correlation between the clinical observation and glucose level measurement can be seen from the below table.

**Table- 1.**

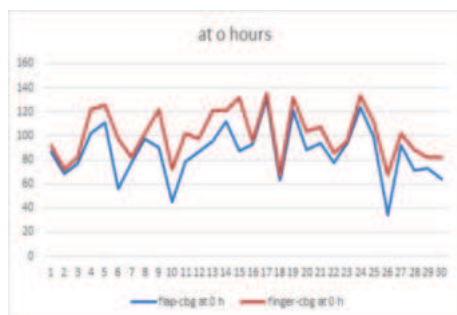
| s.no | flap-cbg |     |     | finger-cbg |     |     | outcome            |
|------|----------|-----|-----|------------|-----|-----|--------------------|
|      | 0        | 6   | 24  | 0          | 6   | 24  |                    |
| 1    | 87       | 82  | 92  | 92         | 90  | 103 | survived           |
| 2    | 69       | 66  | 74  | 72         | 76  | 68  | survived           |
| 3    | 77       | 72  | 76  | 82         | 77  | 76  | survived           |
| 4    | 102      | 98  | 122 | 122        | 124 | 124 | survived           |
| 5    | 111      | 121 | 112 | 126        | 128 | 124 | survived           |
| 6    | 56       | 87  | 88  | 98         | 92  | 92  | survived           |
| 7    | 78       | 68  | 76  | 82         | 86  | 78  | survived           |
| 8    | 98       | 86  | 99  | 102        | 111 | 104 | survived           |
| 9    | 90       | 100 | 112 | 122        | 106 | 112 | survived           |
| 10   | 45       | 68  | 72  | 72         | 72  | 68  | survived           |
| 11   | 79       | 68  | 87  | 102        | 98  | 88  | survived           |
| 12   | 87       | 122 | 92  | 98         | 122 | 102 | infected, survived |
| 13   | 96       | 78  | 88  | 121        | 102 | 98  | survived           |
| 14   | 112      | 102 | 98  | 121        | 98  | 106 | survived           |
| 15   | 88       | 78  | 86  | 132        | 98  | 96  | survived           |
| 16   | 93       | 82  | 86  | 96         | 98  | 92  | survived           |
| 17   | 132      | 102 | 121 | 136        | 126 | 138 | survived           |
| 18   | 63       | 72  | 68  | 68         | 76  | 76  | survived           |
| 19   | 121      | 126 | 130 | 132        | 128 | 132 | survived           |
| 20   | 89       | 86  | 92  | 104        | 112 | 106 | survived           |
| 21   | 94       | 98  | 104 | 108        | 126 | 112 | survived           |
| 22   | 78       | 82  | 69  | 86         | 92  | 89  | survived           |
| 23   | 94       | 78  | 83  | 96         | 88  | 98  | survived           |
| 24   | 124      | 112 | 102 | 134        | 126 | 126 | survived           |
| 25   | 99       | 78  | 86  | 112        | 104 | 100 | survived           |
| 26   | 34       | 16  | 12  | 68         | 78  | 76  | flap necrosis      |
| 27   | 92       | 84  | 78  | 102        | 98  | 88  | Survived           |
| 28   | 71       | 78  | 82  | 89         | 92  | 90  | Survived           |
| 29   | 73       | 67  | 72  | 82         | 84  | 82  | Survived           |
| 30   | 64       | 72  | 72  | 82         | 76  | 78  | Survived           |

Figure 1 illustrates flap glucose levels at 0,6,24 hours in patients who developed gangrene.

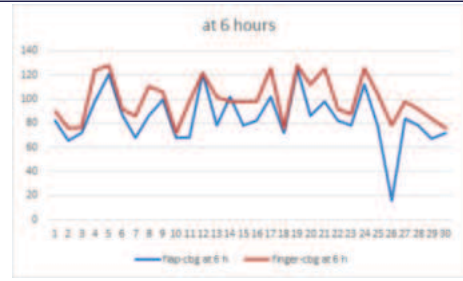


**Figure-1.**

Figure 2 illustrates mean flap capillary glucose levels at 0, 6, and 24 hours.



**(a) At 0 hour:**



**(b) At 6 hours:**



**(c) At 24 hours:  
Figure 2**

Detection of postoperative complication earlier can prevent flap loss. Despite the results further detailed study is necessary.

## DISCUSSION

Monitoring the Limberg flap after pilonidal sinus surgery is of vital importance especially during the first few hours, because the timing of reoperation may determine flap salvage or loss<sup>8</sup>. The use of this objective measurement can reduce the need for human resources.

Flap blood glucose level of 62mg/dl, for detection of flap survival had a sensitivity, specificity and positive predictive value of 86.66%, 100%, and 100% at 0 hour, 100%, 100%, 100% at 6 hours and 97.77%, 100%, 100% at 24 hours respectively. More studies with more data series are needed to determine the exact value. The present study confirms a decrease in capillary glucose in the flap which underwent necrosis and gangrene in the first 24 hours after surgery. Other complications such as infection cannot be detected using capillary blood glucose measurements. Therefore further evaluation of postoperative changes in flap survival is recommended.

## CONCLUSION

This simple and cheap technique could be used as a routine technique in monitoring transposition flaps and predict flap survival in Limberg flaps in pilonidal sinus patients along with the routine clinical evaluation.

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