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Flap Capillary Blood Glucose Monitoring As a Predictor of Flap Survival in Below Knee Amputation Stump

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Abstract: *Monitoring of flap blood glucose levels during and after surgery is important for determining flap salvage or loss. Decision to re operate and do revision amputation was solely based on clinical assessment and no objective measurement is available till date. The objective of this study is to validate flap capillary blood glucose monitoring serially as an indicator to predict flap survival in below knee amputation patients. The study was conducted at Coimbatore medical college hospital, general surgery department from march-2016 to june-2016. 50 patients with peripheral arterial occlusive disease with established gangrene of lower limb requiring BK amputations were selected. Out of the 50 patients who underwent BK amputations 45 patients in whom the flap survived had flap glucose level more than 62mg/dl, in the first 24 hours. This simple and cheap technique can be used for routine monitoring of BK amputation flaps along with the routine clinical evaluation.*

Keywords: *BK flaps, glucose, gangrene, flap survival*

I. Introduction

Flap failure in BK amputation[1] 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 BK amputations. This is an efficient, simple and cheap technique to detect early post operative flap ischemia in BK flaps.

II. Methods

The study was conducted at Coimbatore medical college hospital at department of general surgery for a period of 4 months from march-16 to june-16 after the institutional ethical committee approval.

50 patients with peripheral arterial disease[2] with established gangrene of lower limb requiring BK amputations were selected. Patients below 18 years, pregnant patients and traumatic amputations [3] were excluded.

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

III. Results

Of the 50 patients who underwent BK amputations, 5 patients developed postoperative flap necrosis due to venous thrombosis [7] and developed gangrene leading to revision amputation. 6 patients developed flap infection which was treated with appropriate antibiotics after culture and sensitivity and the flap survived. Rest of the 39 patients had healthy flaps and uneventful postoperative period.

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

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

Figure-1.

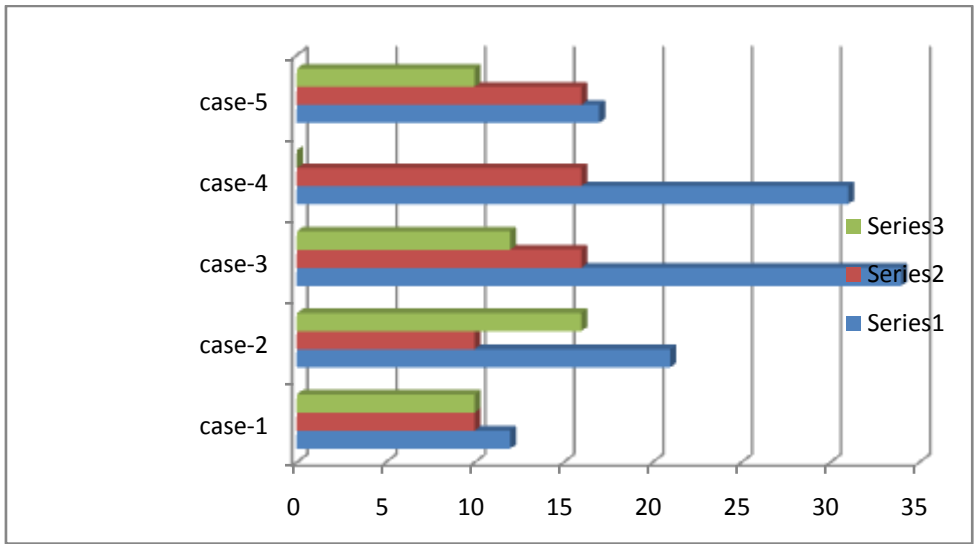


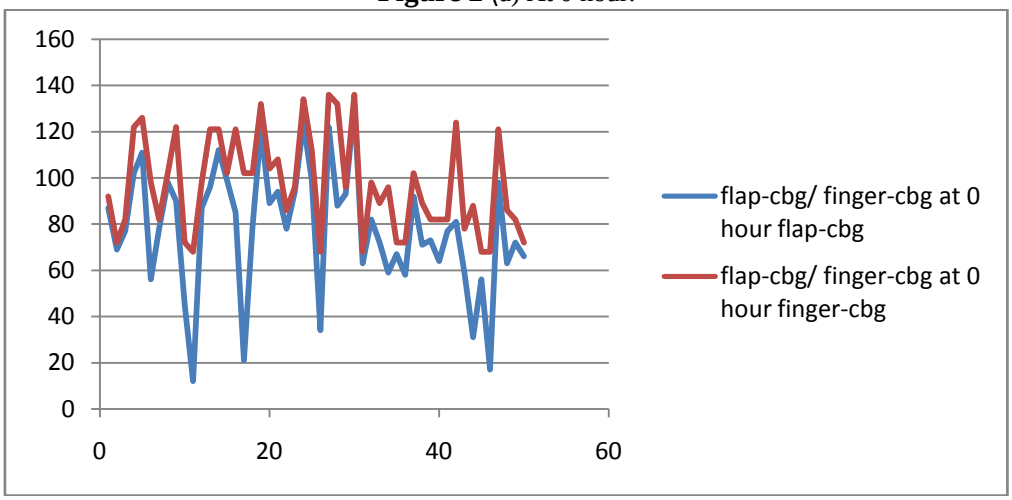
Table-1

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	12	10	10	68	72	68	gangrene
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	99	78	88	102	88	89	survived
16	85	78	98	121	118	104	infected,survived
17	21	10	16	102	98	121	gangrene
18	79	68	87	102	98	88	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	gangrene
27	122	88	121	136	121	102	infected,survived
28	88	78	86	132	98	96	survived
29	93	82	86	96	98	92	survived
30	132	102	121	136	126	138	survived
31	63	72	68	68	76	76	survived
32	82	86	76	98	96	98	infected,survived
33	72	68	76	89	102	78	survived
34	59	79	86	96	68	98	survived

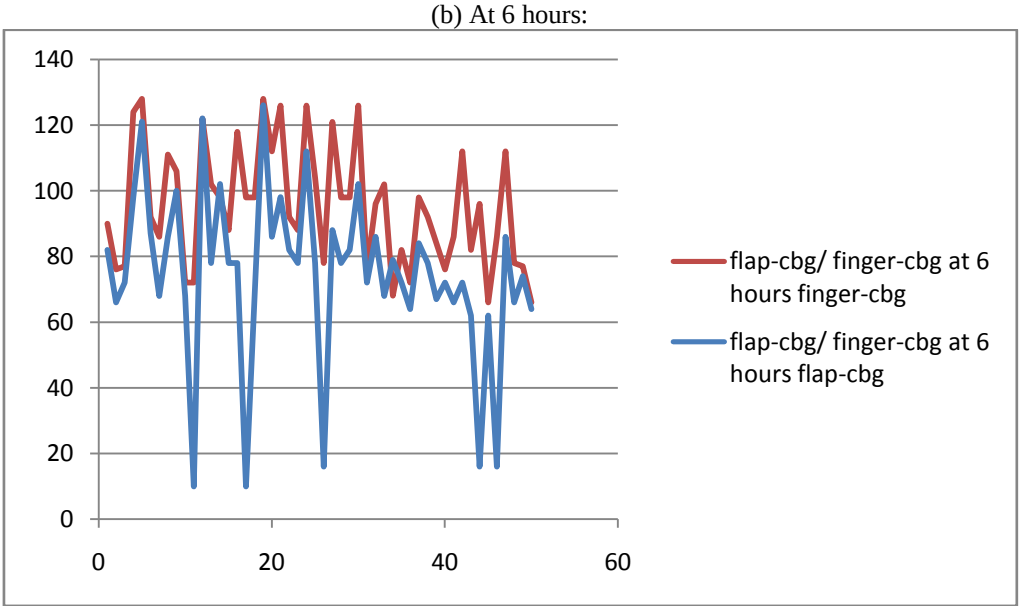
35	67	72	74	72	82	78	infected,survived
36	58	64	66	72	72	68	survived
37	92	84	78	102	98	88	survived
38	71	78	82	89	92	90	survived
39	73	67	72	82	84	82	survived
40	64	72	72	82	76	78	survived
41	77	66	72	82	86	86	survived
42	81	72	98	124	112	120	infected,survived
43	59	62	64	78	82	66	survived
44	31	16	0(low)	88	96	98	gangrene
45	56	62	58	68	66	72	survived
46	17	16	10	68	86	66	gangrene
47	98	86	102	121	112	124	survived
48	63	66	72	86	78	88	survived
49	72	74	66	82	77	76	survived
50	66	64	72	72	66	66	survived

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

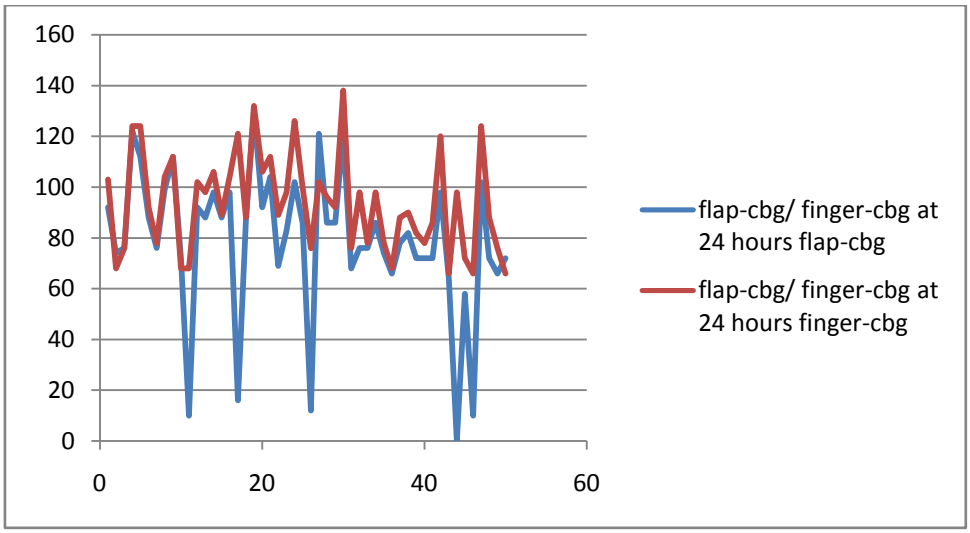
Figure 2 (a) At 0 hour:



(b) At 6 hours:



(c) At 24 hours:



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

IV. Discussion

Monitoring the BK flap after Bk amputation is of vital importance especially during the first few hours, because the timing of reoperation may determine flap salvage or loss[8]. The use of this objective measurement can reduce the need for human resources.

Flap blood glucose level of 62mg/dl[9] , for detection of flap survival had a sensitivity, specificity and positive predictive value of 86.66%, 100%, 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 all 5 flaps 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.

V. Conclusion

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

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