Section: General Surgery

Original Research Article

STUDY TO DETERMINE THE ASSOSIATION BETWEEN TISSUE ISCHEMIA IN FLAP WITH BLOOD GLUCOSE

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Corresponding Author:
Dr. M. Rajavel
Email: pavavij@gmail.com

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S. Firdose[1], Vijayaraghavan Nandhagopal[2], M.Rajavel[3], Karthik S Bhandary[4]

[1]Senior Resident, Department of Surgery, Sri Manakula Vinayagar Medical College & Hospital, Madagadipet, Puducherry, India.
[2]Assistant Professor, Department of Surgery, Sri Manakula Vinayagar Medical College & Hospital, Madagadipet, Puducherry, India.
[3]Associate Professor, Department of Surgery, Sri Manakula Vinayagar Medical College & Hospital, Madagadipet, Puducherry, India.
[4]Assistant Professor, Department of Surgery, Sri Manakula Vinayagar Medical College & Hospital, Madagadipet, Puducherry, India.

Abstract

Background: Aim: To detect the tissue ischemia in free flaps, pedicled flaps and non-buried fascio-cutaneous flaps with the help of blood glucose. **Material & Methods:** This study is a Hospital based Follow-up study done in the Department of General Surgery and Plastic Surgery from February 2021 to December 2022 in SMVMCH, obtaining the approval of Institutional Ethics Committee, the Prospective Data collection was collected for period of 18 months (February 2021 to December 2022). All patients requiring flap reconstruction who presented to the Department of General Surgery and Plastic Surgery, SMVMCH were recruited and included as per the inclusion and exclusion criteria. **Results:** In our study with a total of 68 participants, we found a complete survival rate of 82% and a failure rate of 17.6%. 8.9% of flaps had complete flap failure which was effectively determined by clinical CBG monitoring following which they underwent timely re-exploration. Following re-exploration, 4 flaps survived and 2 flaps failed. 7.3% had partial flap failure which required minor bedside procedures following which they survived. 1.4% with partial flap failure survived with no intervention. We compared the mean CBG difference between survived and failed cases in table 20 which showed a significant drop in CBG values at 24hrs, POD 1 and POD2 when compared with survived cases. **Conclusion:** In our study with a total of 68 participants, we found a complete survival rate of 82% and a failure rate of 17.6%. 8.9% of flaps had complete flap failure which was effectively determined by clinical CBG monitoring following which they underwent timely re-exploration. Following re-exploration, 4 flaps survived and 2 flaps failed. 7.3% had partial flap failure which required minor bedside procedures following which they survived. 1.4% with partial flap failure survived with no intervention. We compared the mean CBG difference between survived and failed cases in table 20 which showed a significant drop in CBG values at 24hrs, POD 1 and POD2 when compared with survived cases.

INTRODUCTION

Flap reconstruction has been utilized for various reasons like reconstruction of a large defect; help improve the blood supply of an inadequately vascularized bed and to restore function. Vascular compromise occurs as a result of venous thrombosis, arterial insufficiency, hematoma or wound dehiscence. There is no ideal way of monitoring that is recognized, however multiple techniques exist.

Aim

To detect the tissue ischemia in free flaps, pedicled flaps and non-buried fascio-cutaneous flaps with the help of blood glucose and surface temperature monitoring.

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MATERIALS AND METHODS

This study is a Hospital based Follow-up study done in the Department of General Surgery and Plastic Surgery from February 2021 to December 2022 in SMVMCH. All patients requiring flap reconstruction who presented to the Department of General Surgery and Plastic Surgery, SMVMCH were recruited and included as per the inclusion and exclusion criteria.

Study Duration

After obtaining the approval of Institutional Ethics Committee, the Prospective Data collection was collected for period of 18 months (February 2021 to December 2022)

Inclusion Criteria

All patients requiring reconstruction of defects with fascio-cutaneous flaps (non-buried), free flaps and pedicle Flaps in all instances from February 2021 to December 2022.

Exclusion Criteria

Patients requiring a mastectomy flap

Patients of age < 18 years

Blood glucose monitoring

Blood glucose levels were monitored intra-operatively and post-operatively. Once the flap is transferred, blood glucose levels of the flap were monitored immediately after surgery, 6 hours and 24 hours after the surgery on POD 0. On POD 1-POD 5, blood glucose levels were monitored every 12 hours. Capillary/ systemic blood glucose levels were also be monitored simultaneously.

Skin punctures were made using a Mievida painless prick pen and Mievida sterile lancets, which is commonly used by diabetic patients. The depth of puncture can be controlled and was set to the deepest setting of 1.8mm. The puncture needle thickness used was 28G. The instrument needle is activated by a spring and the needle recedes soon after the puncture, thus securing the puncture. Sampled blood was placed in Accu-Chek Instant S Glucometer to monitor blood glucose levels by calorimetric determination method.

Figure 1: Mievida painless prick pen with Accu-Chek Instant S Glucometer

RESULTS

Viability of the flap

Table 1: Distribution of patients according to Viability noticed in flaps on POD 0

Viability	Value		p-value
	Viable	Non-viable	
POD 0 – 0 hours	63	5	0.022
POD 0 – 6hours	60	8	
POD 0 – 24 hours	58	10	

(Viable flap*: good capillary refill time, brisk bright red bleeding within 30seconds, absence of tense and edematous flap).

Table 2: Distribution of patients according to Viability noticed in flaps from POD 0 to POD 5

Viability	Value		P-value
	Viable	Non- viable	
POD0 0hr	63	5	0.002
POD0 6hr	60	8	
POD0 24hr	58	10	
POD1 12hr	59	9	
POD1 12hr	61	7	
POD2 12hr	59	9	
POD2 12hr	60	8	
POD3 12hr	64	4	
POD3 12hr	64	4	
POD4 12hr	64	4	
POD4 12hr	64	4	
POD5 12hr	66	2	
POD5 12hr	66	2	

BLOOD GLUCOSE MONITORING

Table 3: Distribution of patients according to CBG measured in flaps on POD 0

FLAP CBG	N	Mean	Std. Deviation	p-value
POD 0 - 0 hours	68	151.47	66.108	
POD 0 – 6 hours	68	145.44	65.885	

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POD 0 - 24 hours	68	127.65	59.587	0.001

Table 4: Distribution of patients according to CBG measured in periphery on POD 0

Periphery CBG	N	Mean	Std. Deviation	p-value
POD 0 – 0hour	68	162.6	54.45	
POD 0 – 6 hours	68	162.22	52.433	
POD 0 -24 hours	68	141.3	47.367	0.001*

Table 5: Distribution of patients according to CBG measured in flaps from POD 0 to POD5

FLAPCBG	N	Mean	Std. Deviation	p-value
POD0-0 hours	68	149.42	64.387	
POD0-6 hours	68	144.51	65.928	
POD0-24 hours	68	128.19	59.864	
POD1-12 hours	68	119.37	49.624	
POD1-12 hours	68	129.91	62.869	
POD2-12 hours	68	128.75	46.996	
POD2-12 hours	68	130.61	50.728	
POD3-12 hours	68	138.57	55.06	
POD3-12 hours	68	137.37	52.348	
POD4-12 hours	68	132.55	51.937	
POD4-12 hours	68	140.1	59.523	0.001
POD5-12 hours	68	137.97	51.135	
POD5-12 hours	68	135.69	53.046	

Table 6: Distribution of patients according to CBG measured in periphery from POD 0 to POD5

PERIPHERY CBG	N	Mean	Std. Deviation	p-value
POD0 -0 hours	68	161.94	54.584	
POD0-6 hours	68	161.75	52.681	
POD0-24 hours	68	141.7	47.604	
POD1-12 hours	68	139.65	39.468	
POD1-12 hours	68	143.16	48.581	
POD2-12 hours	68	135.9	36.919	
POD2-12 hours	68	143.33	41.252	
POD3-12 hours	68	142.96	49.46	
POD3-12 hours	68	141.89	53.536	
POD4-12 hours	68	136.32	49.42	
POD4-12 hours	68	140.97	56.118	0.0001
POD5-12 hours	68	140.46	50.962	
POD5-12 hours	68	139.61	45.21	

SURVIVED FLAPS vs FAILED FLAPS

Table 7: Comparison of mean CBG at different time period between survived and Failed groups

Time	Group	N	Mean	SD	t value	p value
CBG0hrs	Survived	56	159.85	64.82	2.334	0.023*
	Failed	12	112.33	59.80		
CBG6hrs	Survived	56	155.71	63.26	2.931	0.005*
	Failed	12	97.50	58.13		
CBG24hrs	Survived	56	141.42	53.28	4.732	0.001**
	Failed	12	63.33	44.19		
CBG POD 1	Survived	56	131.58	40.84	5.439	0.001**
	Failed	12	60.08	43.68		
CBG POD 2	Survived	56	140.35	38.74	5.388	0.001**
	Failed	12	73.16	41.43		
CBG POD 3	Survived	56	146.73	51.97	2.944	0.004*
	Failed	12	98.16	51.30		
CBG POD 4	Survived	56	139.46	48.58	2.510	0.015*
	Failed	12	99.83	54.54		
CBG POD 5	Survived	56	145.67	44.25	3.131	0.002*
	Failed	12	97.33	63.83		

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Figure 2: Blood glucose monitoring of flap

CONCLUSION

We utilized blood glucose monitoring and temperature monitoring in conjunction with clinical monitoring of flaps in the post-operative period. Based on our study, we conclude that Blood Glucose monitoring is a safe and rapid method that can be used for Early Detection of Tissue Ischemia in flaps in the post-operative period

All participants underwent blood glucose monitoring of flaps and peripheral blood glucose levels in conjunction with clinical monitoring. Mean flap CBG levels measured at 0hr, 6hr and 24hr on POD 0 showed a gradual drop in CBG by 24 hours. When compared from POD 0 to POD 5, gradual decease in mean flap CBG was observed at 24hrs and POD 1 followed by a gradual improvement in flap CBG.

On comparing the mean CBG difference between failed cases with survived cases, significant drop in CBG values at 24hrs, POD 1 and POD2 which was statistically significant (p value <0.05). On comparing the mean CBG difference between Flap CBG and Peripheral CBG, similar findings were noted which was also statistically significant

Our study emphasizes the need for monitoring of flaps till 72 hours post-operatively for early detection of flap compromise.

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