Journal of Surgery
Aoyagui AY, et al. J Surg 9: 11061
www.doi.org/10.29011/2575-9760.011061
www.gavinpublishers.com
Review Article

Estimated Glycemic Confidence Interval in Determining the Quality of a Graft after Venous Occlusion of the Pedicle in Rats

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Citation: Aoyagui AY, Fernandes M, Valente SG, Hirakawa CK, Nakachima LR, et al. (2024) Estimated Glycemic Confidence Interval in Determining the Quality of a Graft after Venous Occlusion of the Pedicle in Rats. J Surg 9: 11061 DOI: 10.29011/2575-9760.11061

Received Date: 19 May 2024; **Accepted Date:** 28 May 2024; **Published Date:** 30 May 2024

Introduction

Currently, the flaps used to cover complex wounds are subject to failure in the event of occlusion of the vascular pedicle. Fortunately, the flap can be saved if revascularization only briefly occurs [1,2]. For this reason, postoperative monitoring has been highlighted as a key parameter in early identification of these cases. Among these, the parameters that always stood out in the literature were a) color, b) temperature, c) turgor, and d) bleeding scarified edges. However, the time interval between the occurrence of occlusion and clinical signs may delay the diagnosis. In this context, several authors have introduced the evaluation of patchwork complex measures with hand-specific work and costly measures such as Doppler ultrasound of the vascular pedicle [3-5], measurement of tissue oxygenation, intra-arterial or intravenous catheters, microdialysis [6], changes in metabolism [7,8], and evaluation with probes for thermal diffusion [9]. However, another measure that is also studied, and is less complex, is blood serum glucose, the point of interest in this study.

Decreases in glucose serum levels and glycogen storage occur early in the flaps with a good prognosis [10], returning to normal by the seventh day after the procedure. In pathological cases, where there is formation of clots or thrombi, a decrease in flap sugar levels is more pronounced, more frequently observed in congestion situations (venous involvement), and also in ischemia or both [11-13]. Even with the use of anticoagulants, clot formation can occur [14]. Following this line of reasoning, glycemic measures can be used to monitor flaps and decrease rate in blood glucose values would be indicative of occlusive changes in the pedicle [15]. In the literature, there have been statements about flap monitoring using an absolute glycemic measure, which can be hard to rely on because the established relationship values are influenced by systemic glucose concentration, which can vary among individuals. With continuous monitoring, the high cost becomes unfeasible in most of the healthcare centers worldwide. For these reasons, the aim of this study was to establish a confidence limit interval to determine the extent of flap distress, taking into account the glycemic measures by measurement with glucometers available in almost all hospitals, which reduces costs and facilitates the specificity and dissemination of this evaluation, which is important in grafts.

Materials and Methods

This experiment was conducted in the laboratory of Microsurgery of the Hand and Upper Limb Department of Orthopedics and Traumatology of a Surgery reference center in Brazil, approved by the internal ethics committee (972,081,013). For the development of the project we used male Wistar rats of the isogenic strain SHR (N = 20, age = 2.5 months, body weight = 280–300 g), provided by the Experimental Models Development Center for Medicine and Biology of the Federal University São Paulo (CEDEME–UNIFESP). During the study, the experimental animals were kept in a vivarium, with light/dark cycle (12h:12h), temperature of 21 ± 2°C, receiving water and standard rat chow ad libitum.

Anesthesia

The animals were anesthetized by intra-peritoneal injection with xylazine anesthetic solution composed by 1 U/100g and ketamine 1 U/100g.

They were divided into two homogeneous groups. They underwent surgery to establish an inguinal flap where the systemic blood glucose levels were measured (via flow) and at the flap edge.

Groups:

• Exposed: 10 SHRs underwent surgery for inguinal flap dissection, followed by occlusion of the pedicle vein.

• Controls: 10 SHRs underwent surgery for inguinal flap dissection, leaving an intact pedicle.

Surgical Technique

Once anesthetized, the animals were submitted to trichotomy of the abdominal region at the level of the knee, with the group assignment randomly chosen. The antisepsis in incised locations was achieved with 70% alcohol. The rat was placed supine and the legs were fixed to the table plane, with a tape. Based on the femoral artery, an inguinal flap, measuring 3 cm long and 2 cm wide, was drawn parallel to the midline, including the femoral artery inside. Then, the skin was incised, followed by blunt dissection of the planes on the medial side, exposing the femoral artery and its branch to the inguinal flap. After exposure of the pedicle (measuring approximately 2 cm with an outside diameter of the vessel of at most 2 mm), the flap was dissected from the cranial portion to flow, isolating the vascular pedicle. In the group in which the venous occlusion was performed, the vein was dissected at the emergence of the pedicle vessels and connected with Prolene 7-0. The surgical procedure was performed under 25x magnified view through a microscope.

Blood Glucose Measurement

Blood glucose level was measured in a drop of blood, both from the caudal vein of the animal (Figure 2B; through venipuncture needle) and at the flap edge (Figure 2A; through the inguinal flap edge fragment), with the aid of a specific Local device (Accu-Chek active; Roche Pharmaceutical Chemicals S/a) composed of sensitive strips for biochemical determination of glucose (Accu-Chek active glucotrend).

Samples were collected at different times, and the data recorded in a spreadsheet and displayed in graphs, as described below:

1. 0 minutes–before connecting the vein;

2. 30, 60, 90, and 120 minutes–after connecting the vein.

Statistical Analysis

Statistical analysis was performed using descriptive statistics such as mean, standard deviation, standard error (mean standard deviation), and correlation to the characterization of quantitative variables in the study population. In the tests for comparison of quantitative variables, we initially checked the normality by the Shapiro-Wilk test because the sample size was small. The Shapiro-Wilk test did not reject the hypothesis of normality ($p > 0.05$), indicating that the data ($n = 20$) are derived from a normal distribution, and therefore parametric tests can be used.

We used the paired t-test for comparisons between glucose measurements, and we used Student's t test for comparisons between groups. A more refined analysis was performed using a linear models generalized test with repeated measures in order to check the influence over time, with a comparison of groups as well as checking group-time interactions. The results were expressed as mean, maximum, minimum, standard deviation, IC, risk factor, percentage, absolute values used for each test, and a p value < 0.05 was considered statistically significant.

Results

Experimental Data

Glycemic behavior of the groups was evaluated in three stages, first, as a function of time, comparing the groups (control vs. exposed) to measure the degree of flap distress, and a second analysis between glycemia collection sites (Local vs systemic) to observe the times at which they were correlated. In the final stages, the times that had a positive correlation were used to determine the range of glucose values of the Local test that might indicate the boundaries between healthy tissue and distress, expressed always as the percentage of the glycemic value of the commercial test in reference to the systemic blood glucose measurement.

Parametric Data Evaluation

To establish reliable indices in comparisons, we first established normality of the samples by using the Shapiro-Wilk normality test. Normality was not rejected for the variables investigated, with $p > 0.05$ (Table 1).

Glycemic Performance Evaluation of the Local Test

We observed that the glycemic index in the exposed group decreased over time, while in the control group it remained stable, characterized by a regular upward curve (Figure 1).

In the group of interest, this reduction was associated with disruption of blood flow as measured by the Local test, which caused a constant reduction in glycemic rates by exposing the

tissue to hypoxia. Note that this variation was significant when comparing the exposed and control groups from 30 until 120 minutes (0, p = 0.985; 30 min, p = 0.01; 60 min, p = 0.002; 90 min, p <0.0001; 120 min, p = 0.001) (Table 2,3).

Evaluation of Systemic Glycemic Behavior

On comparing the groups for systemic measurement, there was no significant difference over time (0, p = 0.985; 30 min, p = 0.1; 60 min, p = 0.12; 90 min, p = 0.81; 120 min, p = 0.51) (Table 2,3 and Figure 2).

Correlation Between the Local and Systemic Tests

There was a positive correlation in the exposed group at three stages of evaluation, at time 30 minutes where a weak but positive correlation (r = 0.602) was observed, and at times 60 and 90 minutes, with a positive and strong correlation (r = 843 and r = 782, respectively) (Table 4,5) (Figures 3).

In the control group this correlation was positive only at 60 minutes (r = 664) and 90 minutes (r = 824) (Table 6 and 7) (Figures 3).

Local/Systemic Glucose Ratio

After determining the success of the experimental model, we evaluated the times when the glucose values of the Local test correlated with those of the systemic test, to establish the maximum rate, minimum, and average in groups according to the relationship of these two variables (Table 8, Figure 11). It was possible to determine, for this sample, below 50% (GR/GS×100) value on the retail test, indicating flap damage. Values above 60% indicated good quality of the flap, and those with values between 50 and 60% should be observed carefully.

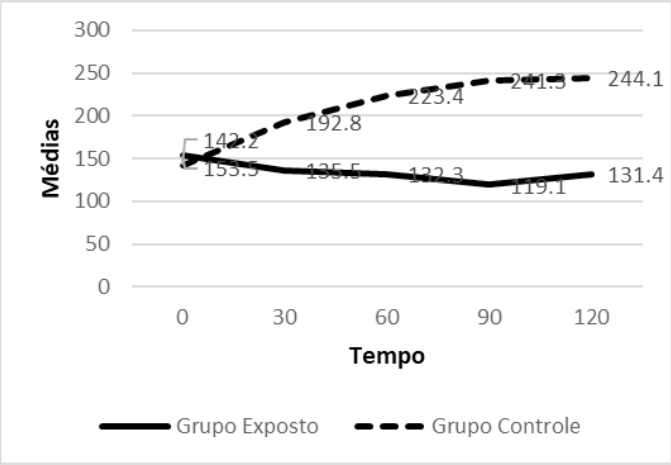

Figure 1: Glucose flap per group versus time.

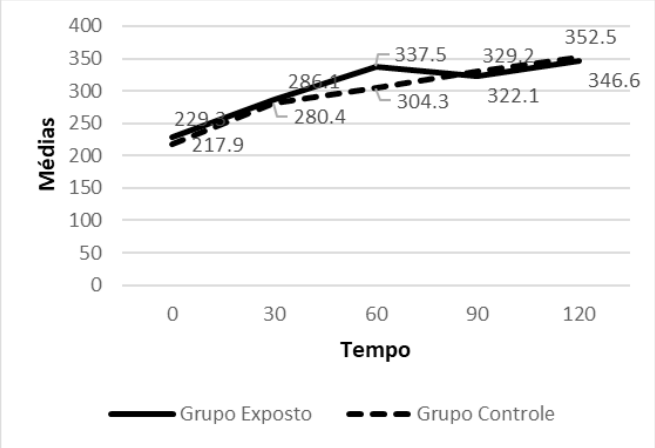

Figure 2: Systemic blood glucose level per group versus time.

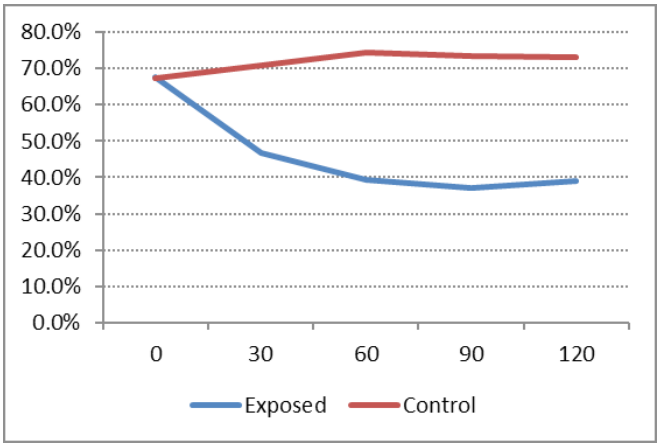

Figure 3: Representation of the correlation between the Local and systemic test results in the exposed group and control, depending on the indicated time.

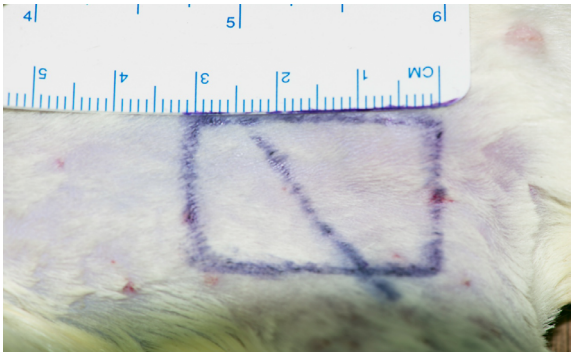

Figure 4: Flap length.

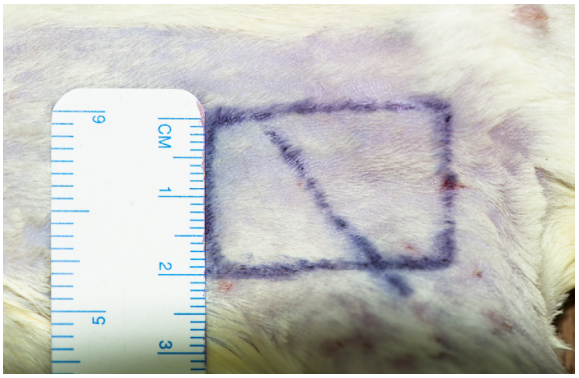

Figure 5: Flap width.

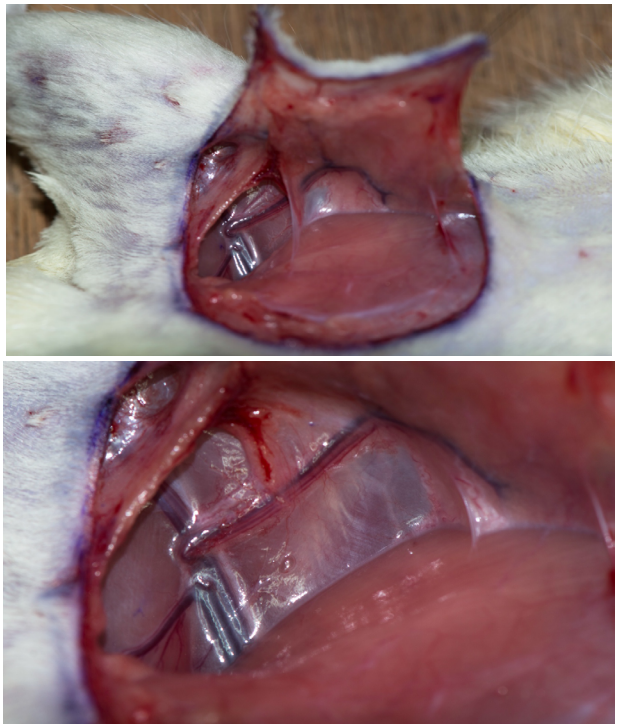

Figure 6. Flap and Pedicle dissection.

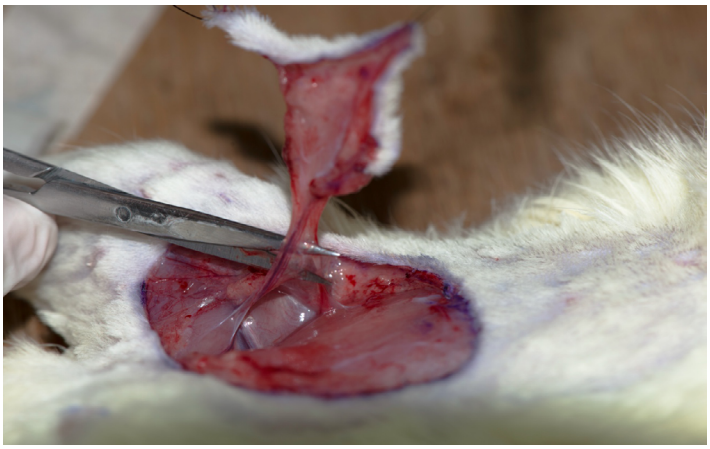

Figure 7: Flap harvested isolated only for the pedicle.

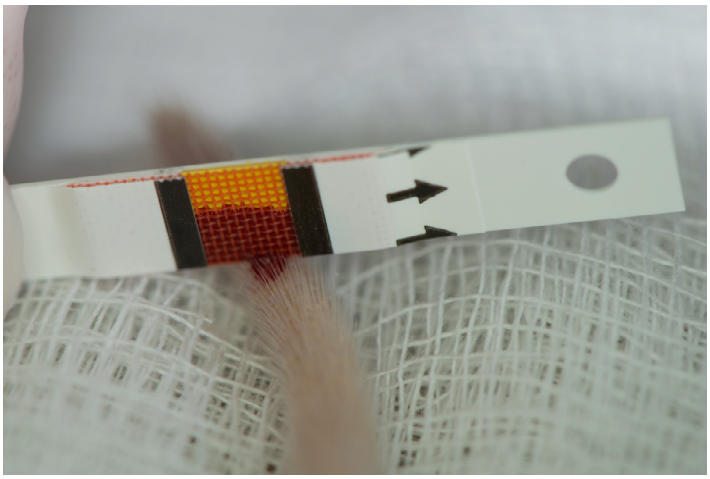

Figure 8: Systemic blood glucose measument form the rat tail.

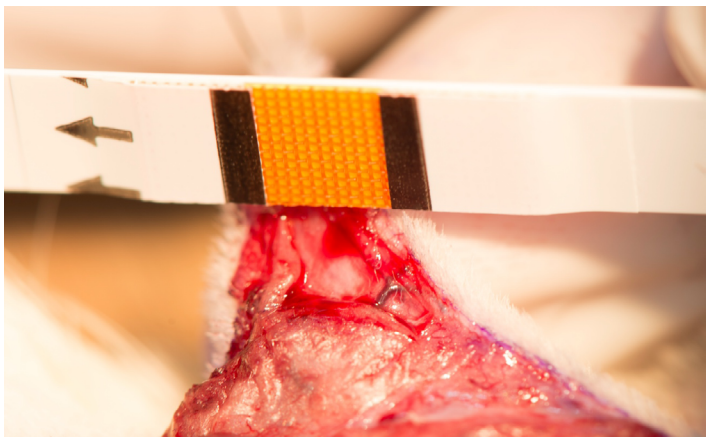

Figure 9: Flap blood glucose measument from the edge of the flap.

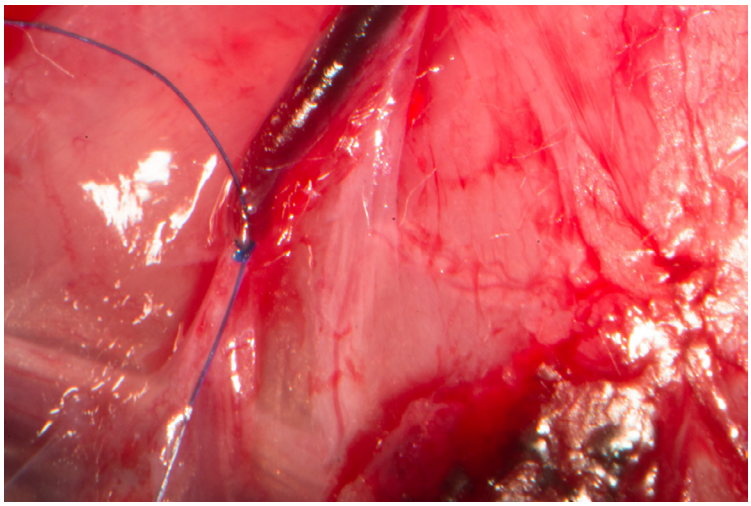

Figure 10: Flap pedicle interrupted.

		Média	Standard deviation	Minimum	Q1	Median	Q3	Maximum
Time=0	Control	67.40%	21.10%	44.20%	50.50%	59.10%	90.10%	102.80%
Time=0	Exposed	67.70%	23.10%	43.60%	50.00%	62.90%	79.00%	117.00%
Time=30	Control	71.00%	18.80%	40.60%	55.50%	67.10%	91.30%	93.20%
Time=30	Exposed	46.80%	14.90%	28.20%	35.00%	46.50%	57.70%	77.80%
Time=60	Control	74.30%	15.80%	50.50%	62.80%	74.80%	85.00%	101.90%
Time=60	Exposed	39.20%	12.60%	26.30%	28.80%	36.80%	45.70%	68.70%
Time=90	Control	73.50%	9.80%	60.50%	66.40%	68.80%	82.80%	88.20%
Time=90	Exposed	37.00%	9.40%	20.40%	29.80%	37.00%	44.90%	51.20%
Time=120	Control	73.10%	31.60%	39.20%	51.20%	61.90%	95.70%	142.90%
Time=120	Exposed	39.10%	13.20%	15.80%	29.70%	39.30%	48.60%	60.10%

Figure 11: Representation of minimum and maximum values of the groups, control and exposed, for the percentage of Local glycemic test results correlating with the systemic blood glucose test results.

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
glic_ flap _0	0.121	20	0.200*	0.945	20	0.293
gilc_sist_0	0.158	20	0.200*	0.935	20	0.191
glic_ flap _30	0.12	20	0.200*	0.967	20	0.684
gilc_sist_30	0.18	20	0.088	0.947	20	0.317
glic_ flap _60	0.111	20	0.200*	0.947	20	0.318
gilc_sist_60	0.107	20	0.200*	0.974	20	0.838
glic_ flap _90	0.117	20	0.200*	0.952	20	0.396
gilc_sist_90	0.117	20	0.200*	0.969	20	0.73
glic_ flap _120	0.118	20	0.200*	0.936	20	0.202
gilc_sist_120	0.129	20	0.200*	0.938	20	0.224
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

		Mean	N	Std. Deviation	Std. Error Mean	p
Pair 1	glic_flap_0	147.85	20	42,450	9,492	0.095
	glic_flap_120	187.75	20	83,449	18,660	
Pair 2	gilc_sist_0	223.6	20	40,329	9,018	<0.0001
	gilc_sist_120	349.55	20	84,357	18,863	

Table 1: Representation of the normality test data.

Paired Samples Correlations				
		N	Correlation	Sig.=p
Pair 1	glic_flap_0 & glic_flap _120	20	-0.217	0.359
Pair 2	gilc_sist_0 & gilc_sist_120	20	-0.25	0.287

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	glic_flap_0 - glic_flap_120	-39,900	1,01,496	22,695	-87,402	7,602	-1,758	19	0.095
Pair 2	gilc_sist_0 - gilc_sist_120	-1,25,950	1,02,198	22,852	-1,73,780	-78,120	-5,512	19	0

Table 2: Comparison between groups (control and exposed) depending on the times studied.

Paired Samples Statistics							
Grupo			Mean	N	Std. Deviation	Std. Error Mean	p
Exposed	Pair 1	glic_ flap _0	153.5	10	50,069	15,833	0.466
		glic_flap_120	131.4	10	50,154	15,860	
	Pair 2	gilc_sist_0	229.3	10	29,945	9,469	0.011
		gilc_sist_120	346.6	10	98,747	31,226	
Control	Pair 1	glic_ flap _0	142.2	10	35,020	11,074	0.001
		glic_flap_120	244.1	10	71,622	22,649	
	Pair 2	gilc_sist_0	217.9	10	49,646	15,700	0.001
		gilc_sist_120	352.5	10	72,474	22,918	

Table 3: Representation of test values, confidence interval, and variations.

Paired Samples Correlations					
Grupo			N	Correlation	Sig.
Exposed	Pair 1	glic_ flap _0 & glic_ flap _120	10	-0.676	0.032
	Pair 2	gilc_sist_0 & gilc_sist_120	10	-0.486	0.154
Control	Pair 1	glic_ flap _0 & glic_ flap _120	10	0.312	0.380
	Pair 2	gilc_sist_0 & gilc_sist_120	10	-0.089	0.806

Paired Samples Test										
Grupo			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Exposed	Pair 1	glic_flap _0 - glic_ flap_120	22,100	91,734	29,009	-43,523	87,723	.762	9	.466
	Pair 2	gilc_sist_0 - gilc_ sist_120	-1,17,300	1,16,294	36,775	-2,00,492	-34,108	-3,190	9	.011
Control	Pair 1	glic_flap_0 - glic_ flap _120	-1,01,900	69,211	21,886	-1,51,410	-52,390	-4,656	9	.001
	Pair 2	gilc_sist_0 - gilc_ sist_120	-1,34,600	91,427	28,912	-2,00,003	-69,197	-4,656	9	.001

Table 4: Analysis of paired data between systemic blood glucose value and Local blood glucose test results of the exposed groups at the evaluated times.

Mean blood glucose values by time and group

	Flap Glycemia					Systemic Glycemia				
	Time									
Group	0	30	60	90	120	0	30	60	90	120
Exposed	153.5	135.5	132.3	119.1	131.4	229.3	286.1	337.5	322.1	346.6
Control	142.2	192.8	223.4	241.3	244.1	217.9	280.4	304.3	329.2	352.5

Table 5: Analysis of the correlation between systemic value and Local test results of exposed groups at the evaluated times by Pearson index.

Group Statistics					
	Grupo	Mean	Std. Deviation	Std. Error Mean	p
glic_flap_0	Exposed	153.5	50,069	15,833	0.566
	Control	142.2	35,020	11,074	
gilc_sist_0	Exposed	229.3	29,945	9,469	0.542
	Control	217.9	49,646	15,700	

glic_flap_30	Exposed	135.5	52,926	16,737	0.01
	Control	192.8	34,915	11,041	
gilc_sist_30	Exposed	286.1	41,565	13,144	0.783
	Control	280.4	49,151	15,543	
glic_flap_60	Exposed	132.3	45,911	14,518	0.002
	Control	223.4	61,965	19,595	
gilc_sist_60	Exposed	337.5	62,477	19,757	0.272
	Control	304.3	68,302	21,599	
glic_flap_90	Exposed	119.1	36,336	11,491	<0.0001
	Control	241.3	56,671	17,921	
gilc_sist_90	Exposed	322.1	63,897	20,206	0.811
	Control	329.2	66,824	21,132	
glic_flap_120	Exposed	131.4	50,154	15,860	0.001
	Control	244.1	71,622	22,649	
gilc_sist_120	Exposed	346.6	98,747	31,226	0.881
	Control	352.5	72,474	22,918	

					95% Confidence Interval of the Difference	
	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
	18	0.566	11,300	19,322	-29,294	51,894
	18	0.542	11,400	18,334	-27,119	49,919
	18	0.01	-57,300	20,051	-99,425	-15,175
	18	0.783	5,700	20,356	-37,065	48,465
	18	0.002	-91,100	24,387	-142.33	-39,864
	18	0.272	33,200	29,272	-28,298	94,698
	18	0	-122.2	21,288	-166.92	-77,475
	18	0.811	-7,100	29,237	-68,526	54,326
	18	0.001	-112.7	27,650	-170.79	-54,610
	18	0.881	-5,900	38,734	-87,278	75,478

Table 6: Analysis of paired data between systemic blood glucose value and Local test results of the control group at the evaluated times.

Correlations (n=20)											
		glic_ flap _0	gilc_ sist_0	glic_ flap _30	gilc_ sist_30	glic_ flap_60	gilc_ sist_60	glic_ flap_90	gilc_ sist_90	glic_ flap_120	gilc_ sist_120
glic_flap_0	Pearson Correlation	1	0.151	0.335	.465*	0.054	-0.263	-0.224	-0.104	-0.217	0.095
	Sig. (2-tailed)		0.525	0.148	0.039	0.821	0.262	0.343	0.662	0.359	0.689
	N	20	20	20	20	20	20	20	20	20	20
gilc_sist_0	Pearson Correlation	0.151	1	0.045	0.146	0.063	0.232	-0.014	-0.128	0.108	-0.25
	Sig. (2-tailed)	0.525		0.85	0.538	0.792	0.324	0.952	0.591	0.651	0.287
	N	20	20	20	20	20	20	20	20	20	20
glic_ flap _30	Pearson Correlation	0.335	0.045	1	0.185	.527*	-0.145	.474*	0.096	0.289	-0.042
	Sig. (2-tailed)	0.148	0.85		0.434	0.017	0.543	0.035	0.686	0.217	0.861
	N	20	20	20	20	20	20	20	20	20	20
gilc_sist_30	Pearson Correlation	.465*	0.146	0.185	1	0.013	-0.107	-0.051	-0.248	-0.013	0.043
	Sig. (2-tailed)	0.039	0.538	0.434		0.956	0.654	0.83	0.291	0.955	0.857
	N	20	20	20	20	20	20	20	20	20	20
glic_ flap _60	Pearson Correlation	0.054	0.063	.527*	0.013	1	0.273	.732**	.468*	.735**	0.073
	Sig. (2-tailed)	0.821	0.792	0.017	0.956		0.244	0	0.037	0	0.761
	N	20	20	20	20	20	20	20	20	20	20
gilc_sist_60	Pearson Correlation	-0.263	0.232	-0.145	-0.107	0.273	1	0.093	.615**	0.252	0.049
	Sig. (2-tailed)	0.262	0.324	0.543	0.654	0.244		0.695	0.004	0.284	0.837
	N	20	20	20	20	20	20	20	20	20	20
glic_ flap _90	Pearson Correlation	-0.224	-0.014	.474*	-0.051	.732**	0.093	1	.472*	.834**	-0.084
	Sig. (2-tailed)	0.343	0.952	0.035	0.83	0	0.695		0.035	0	0.726
	N	20	20	20	20	20	20	20	20	20	20

gilc_sist_90	Pearson Correlation	-0.104	-0.128	0.096	-0.248	.468*	.615**	.472*	1	0.378	0.127
	Sig. (2-tailed)	0.662	0.591	0.686	0.291	0.037	0.004	0.035		0.101	0.595
	N	20	20	20	20	20	20	20	20	20	20
glic_ flap _120	Pearson Correlation	-0.217	0.108	0.289	-0.013	.735**	0.252	.834**	0.378	1	-0.01
	Sig. (2-tailed)	0.359	0.651	0.217	0.955	0	0.284	0	0.101		0.966
	N	20	20	20	20	20	20	20	20	20	20
gilc_sist_120	Pearson Correlation	0.095	-0.25	-0.042	0.043	0.073	0.049	-0.084	0.127	-0.01	1
	Sig. (2-tailed)	0.689	0.287	0.861	0.857	0.761	0.837	0.726	0.595	0.966	
	N	20	20	20	20	20	20	20	20	20	20

Table 7: Correlation analysis by Pearson index between systemic and Local blood glucose of control groups at the evaluated times.

Correlations				
Grupo			glic_ret_0	gilc_sist_0
Exposed	Pearson Correlation	glic_ flap _0	1,000	0.039
		gilc_sist_0	0.039	1,000
	Sig. (1-tailed)	glic_ flap _0	.	0.457
		gilc_sist_0	0.457	.
	N	glic_ flap _0	10	10
		gilc_sist_0	10	10
Control	Pearson Correlation	glic_ flap _0	1,000	0.239
		gilc_sist_0	0.239	1,000
	Sig. (1-tailed)	glic_ flap _0	.	0.253
		gilc_sist_0	0.253	.
	N	glic_ flap _0	10	10
		gilc_sist_0	10	10
Correlations				
Group			glic_ret_30	gilc_sist_30

Exposed	Pearson Correlation	glic_ flap _30	1,000	0.602
		gilc_sist_30	0.602	1,000
	Sig. (1-tailed)	glic_ flap _30	.	0.033
		gilc_sist_30	0.033	.
	N	glic_ flap _30	10	10
		gilc_sist_30	10	10
Controle	Pearson Correlation	glic_ flap _30	1,000	-0.134
		gilc_sist_30	-0.134	1,000
	Sig. (1-tailed)	glic_ flap _30	.	0.356
		gilc_sist_30	0.356	.
	N	glic_ flap _30	10	10
		gilc_sist_30	10	10
Correlations				
Group			glic_ret_60	gilc_sist_60
Exposed	Pearson Correlation	glic_ flap _60	1,000	0.543
		gilc_sist_60	0.543	1,000
	Sig. (1-tailed)	glic_ flap _60	.	0.052
		gilc_sist_60	0.052	.
	N	glic_ flap _60	10	10
		gilc_sist_60	10	10
Control	Pearson Correlation	glic_ flap _60	1,000	0.664
		gilc_sist_60	0.664	1,000
	Sig. (1-tailed)	glic_ flap _60	.	0.018
		gilc_sist_60	0.018	.
	N	glic_ flap _60	10	10
		gilc_sist_60	10	10
Correlations				
Group			glic_ret_90	gilc_sist_90
Exposed	Pearson Correlation	glic_ flap _90	1,000	0.582
		gilc_sist_90	0.582	1,000
	Sig. (1-tailed)	glic_ flap _90	.	0.039
		gilc_sist_90	0.039	.
	N	glic_ flap _90	10	10
		gilc_sist_90	10	10

Control	Pearson Correlation	glic_ flap _90	1,000	0.824
		gilc_sist_90	0.824	1,000
	Sig. (1-tailed)	glic_ flap _90	.	0.002
		gilc_sist_90	0.002	.
	N	glic_ flap _90	10	10
		gilc_sist_90	10	10
Correlations				
Group			glic_ret_120	gilc_sist_120
Exposed	Pearson Correlation	glic_ flap _120	1,000	0.193
		gilc_sist_120	0.193	1,000
	Sig. (1-tailed)	glic_ flap _120	.	0.297
		gilc_sist_120	0.297	.
	N	glic_ flap _120	10	10
		gilc_sist_120	10	10
Control	Pearson Correlation	glic_ flap _120	1,000	-0.284
		gilc_sist_120	-0.284	1,000
	Sig. (1-tailed)	glic_ flap _120	.	0.213
		gilc_sist_120	0.213	.
	N	glic_ flap _120	10	10
		gilc_sist_120	10	10

Table 8: Representative percentage of the glucose ratio of the Local test in relationship to the systemic test (GR/GS x100).

Discussion

Monitoring flaps has a fundamental role in the success of the surgery, in case of a new approach. Parameters such as color, turgor and perfusion, and temperature measurements by thermal diffusion poor can suggest flap distress. Considering the blood glucose as a parameter evaluation, we can detect possible failure earlier. Systemic blood glucose level presents variations throughout the day and throughout a surgical procedure. Likewise, the values found in the flaps may also be subject to the same variations. Studies have been conducted to determine the values on retail tests to be considered to indicate distress. Sitzman in 2010, using the retail test on vertical abdominal flaps in rats, studied the decrease in blood glucose level in flaps because of occlusion of both the arterial and venous system, and compared the values obtained for the same flap in contralateral operated rats. Assuming sensitivity and specificity of 100%, a decrease in blood glucose value ≥ 7 mg/dL/min or decreased blood glucose values ≥ 2 mg/dL/min was associated with the level < 118 mg/dL [12].Assessing the decrease in glucose level in the work by Sitzman, we realized that the curve follows a pattern similar to the flap glycemic index. Hjortdal 1991 and Cohen 1983 noted that Local test blood glucose values decreased, returning to normal values by the seventh day [16,17]. Hara in 2012, evaluating data from 33 free flaps in humans, found the absolute value of 62 mg/dL as the cutoff value from the ROC curve, determining a sensitivity of 88% and specificity of 82% for flap damage [15].

In this study comparing the blood glucose measurements in the flap and systemic determination of the flap glycemic index, our results suggest that monitoring can be performed in a comparative way, besides using the absolute measure. The results we found show that both viable flaps and those in distress have similar measures at time 0. However, after 30 minutes, the experimental group showed values indicating distress, which was also evident in the following times. Another interesting point was to establish

an interval in which to observe the flap, where less than 50% value indicates distress, between 50 and 60% value should be carefully observed, and a value >60% indicates the flap has good indications for success, contrary to an absolute cutoff value, as indicated by Hara et al. The values found in this study may not match those of other species, despite being the model most frequently used, because of its resemblance to the human model, because our index were glucose levels relative to the percentages of retail test/glucose systemic test values, which can be a very interesting parameter to be studied in daily practice.

Conclusion

FGI may be used as a postoperative assessment tool to determine flap distress during an early stage in experimental models. In addition, it might be useful in clinical practice, but its specificity needs to be confirmed in humans as well.

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