MAIN RISK FACTORS AND EFFECT OF ANTICOAGULATION ON DEVELOPMENT OF FREE FLAP THROMBOSIS

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Background and goal of the study

Perioperative anticoagulation remains a controversial topic in free flap transfer surgery. Furthermore, it is still unclear which patients are particularly prone to free flap thrombosis.

We aimed to analyze thrombogenic risk factors and the role of anticoagulation in free flap surgery.

Materials and methods

Observational prospective case control study was performed analyzing data from 2014-2017 period. Patient demographical data, including main risk factors for free flap thrombosis (recent trauma, smoking, thrombogenic comorbidities) were registered. Standard coagulation tests, as well as rotational thromboelastometry (RTE) were performed preoperatively; hypercoagulation was defined as functional fibrinogen to platelet ratio (FPR) ≥ 42 . Thromboprophylaxis was provided by decision of a surgeon with enoxaparine 40 mg SC once a day, starting 12 hours after surgery. Incidence of free flap thrombosis was analyzed as primary outcome, secondary main thrombotic risk factors were evaluated.

Results

Totally, 89 patients were included (Tab.1). Recent trauma (<1 month) was detected for 29/89 patients. The hypercoagulability in RTE (FPR ≥ 42) was found for 21/89 patients, and recent trauma was shown as significant factor for hypercoagulative state (14/21 patients had recent trauma, $p < 0.001$). Free flap thrombosis developed in 18/89, with subsequent necrosis in 16/89 patients on average the 1st postoperative day.

We found slight association between FPR ≥ 42 detected by RTE and free flap thrombosis, AUC 0.597, $p = 0.2$, sensitivity 33%, specificity 78.6% (Fig.1) and free flap necrosis AUC 0.628, $p = 0.11$, sensitivity 37.5%, specificity 81.3% (Fig.2). Raised platelet count was found as potentially thrombogenic factor in our series ($p = 0.023$, Tab.2). Additionally, thromboembolic prophylaxis (provided in 42% of patients) demonstrated correlation with decreased rate of free flap thrombosis OR 0.21 (CI 95% 0.054-0.86); $p = 0.03$ (Tab.3). In contrast, association with thrombotic events was not found for other factors such as smoking ($p = 0.94$), recent trauma ($p = 0.902$) and FPR ≥ 42 ($p = 0.283$).

Regarding recent trauma patients, prolonged operative time correlated with higher thrombosis risk ($r = 0.553$; $p = 0.021$). As for patients group without acute trauma, platelet count ($r = 0.281$; $p = 0.034$) and postoperative anticoagulation ($r = -0.266$; $p = 0.044$) influenced thrombosis rate (Tab.4).

Tab.1. Demographical and laboratory data

	FPR <42	FPR ≥ 42	P value
	N = 68 (76,4%)	N = 21 (23,6%)	$< 0,001$
Age, years	44 (54-35)	39 (49-30)	0,142
Sex, female	8 (11,6%)	4 (19%)	0,464
Recent trauma	17 (25%)	14 (66,7%)	$< 0,001$
Smoking	25 (36,2%)	11 (52,4%)	0,169
Thromboprophylaxis	28 (42,4%)	9 (42,9%)	0,972
Hyperfibrinogenemia	22 (31,9%)	19 (90,5%)	$< 0,001$
Thrombocytosis	6 (8,7%)	12 (57,1%)	$< 0,001$
Leg	48 (69,6%)	16 (76,2%)	0,784
Hand	19 (25,7%)	3 (14,3%)	0,260
Lumbal	0 (0%)	2 (9,5%)	0,052
Head	2 (2,9%)	0 (0%)	1,000
Operation time	220 (261-159))	240 (304-206)	0,296
HGB	14 (15-12)	11 (12-10)	$< 0,001$
PLT	275 (338-225)	434 (551-358)	$< 0,001$
Fibrinogen	3,6 (4,-2,9)	5 (6-4,5)	$< 0,001$
APTL	33 (35-30)	34 (37-30)	0,57
Prothrombin	98(108-80)	106 (113-90)	0,103
Incidence of free flap thrombosis	12 (17,9%)	6 (28,6%)	0,291
Incidence of free flap necrosis	10 (14,9%)	6 (30%)	0,127

Tab.2. Risk factors individually

Lever thrombosis	Smoking	Patient Age	Hyperfibrinogenemia	Thrombocytosis	Acute trauma	Haemoglobin	Platelet count	Fibrinogen level	Prothrombin level	EXTEM MCF	INTEM MCF	FIBTEM MCF	p/op thromboprophylaxis	FPR ≥ 42	FPR
r - correlation coefficient	-0,002	-0,013	0,144	0,152	-0,01	-0,086	0,239	0,161	0,202	0,198	0,193	0,16	-0,226	0,113	0,128
p*	0,982	0,903	0,172	0,15	0,928	0,416	0,023	0,139	0,056	0,062	0,068	0,135	0,031	0,296	0,234

*Spearman correlation

Tab.3. Risk factors individually (2)

	Odds Ratio	Confidence interval (95%)	p*
Smoking	1,046	(0,325-3,361)	0,940
Thromboprophylaxis	0,215	(0,054-0,860)	0,030
Acute trauma	1,085	(0,296-3,983)	0,902
FPR > 42	2,04	(0,556-7,487)	0,283

*Binary multivariate logistic regression analysis

Tab.4. Risk factors in patients with or without acute trauma

		Thrombo-cytosis	Platelet count	Fibrinogen level	EXTEM MCF	INTEM MCF	FIBTEM MCF	p/op thromboprophylaxis	duration of surgery	FPR	FPR≥42
< 1 mo after trauma	r	0,022	0,195	0,045	0,053	0,025	0,187	-0,188	0,553	0,174	0,212
Free flap thrombosis	p	0,907	0,278	0,807	0,772	0,894	0,313	0,294	0,021	0,35	0,253
> 1 mo after trauma	r	0,267	0,281	0,203	0,231	0,267	0,165	-0,266	0,006	0,109	0,069
Free flap thrombosis	p	0,041	0,034	0,141	0,081	0,042	0,22	0,044	0,973	0,421	0,61

Conclusions:

Patients with recent trauma and prolonged operative time as well as patients without acute trauma having thrombocytosis are considered at higher risk for free flap thrombosis and may benefit from postoperative anticoagulation.