

THE IMPACT OF PREOPERATIVE ANEMIA ON LONG TERM SURVIVAL, AMPUTATION-FREE SURVIVAL, LIMB SALVAGE IN PATIENTS WITH CHRONIC LIMB THREATENING ISCHEMIA

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Introduction

- CLTI- 60% preoperative anemia
- Anemia associated with MAE: MI, renal failure, stroke and all cause mortality, and worse 1-year AFS/limb salvage
- Transfusions
 - Associated with reduced AFS independent of anemia severity related to immunomodulatory effects
 - Associated with wound infection, graft thrombosis, pulmonary complications, MI, and 30d mortality

Aim

- Assess impact of anemia on early and long-term survival, amputation free survival (AFS), limb salvage (LS), and patency rates in patients who undergo revascularization for CLTI

Methods

- CLTI revascularization 1/2007-12/2021
- Preoperative (Hct ≥ 39 , Group I, N=275 (335 limbs)) compared to those with mild anemia (Hct 33.0-38.9, Group II, 266 (338 limbs)) and moderate/severe anemia (Hct < 33.0 , Group III, N=199 (266 limbs)).
- WHO classification for anemia.

Revascularization Procedures

- Endovascular first approach

Results

- 740 patients underwent revascularization (775 limbs)
 - 275 (335 limbs) Group I (Hct ≥ 39)
 - 266 (338 limbs) Group II (Hct 33.0-38.9)
 - 199 (266 limbs) Group III (Hct < 33.0)
- Group I
 - Younger compared to Group II and Group III
 - Less DM, non-ambulatory status, and more active smokers
 - Less likely tissue loss, undergo endovascular interventions
 - Infra-popliteal intervention
 - More likely to have TASC C/D disease.

Table I – Demographic characteristics of groups

	Group I	Group II	Group III	P
	N=275	N=266	N=199	
Age	70.4 \pm 9.9	73.1 \pm 9.7	72.9 \pm 10.9	<0.005
CAD	51.6%	54.9%	59.8%	0.211
HTN	73.8%	82.7%	84.4%	0.006
DM	49.8%	66.9%	68.8%	<0.001
CVD	13.8%	18.4%	14.1%	0.268
HLD	81.5%	77.4%	79.4%	0.513
COPD	27.2%	19.2%	20.1%	0.051
CKD	21.4%	41.7%	52.3%	<0.001
ESRD	2.9%	10.9%	16.6%	<0.001
Active smoker	46.5%	23.3%	24.6%	<0.001
Beta-blocker	51.8%	60.8%	62.3%	0.036
Statins	67.5%	64.2%	65.3%	0.706
ACEI	52.2%	49.8%	48.7%	0.739
ECASA	95.2%	91.3%	95.4%	0.088
Clopidogrel	77.7%	75.6%	76.9%	0.905
Warfarin	13.8%	18.2%	12.7%	0.190
Non-amb	8.0%	21.1%	16.1%	<0.001

Table II – Clinical presentation and interventions

	Group I	Group II	Group III	P
Rest pain	31.1%	14.8%	7.9%	
Tissue loss	69.9%	85.2%	92.1%	<0.001
Prior ispi revasc	16.1%	21.1%	16.1%	0.399
TASC A/B	16.7%	22.9%	24.9%	
TASC C/D	83.8%	77.1%	75.1%	0.034
Open	30.4%	21.6%	16.2%	
Endo	60.6%	78.4%	83.8%	<0.001
Aortoiliac	10.7%	8.3%	6.4%	
Fem-pop	43.0%	36.1%	32.1%	
Infra-pop	46.2%	55.6%	61.5%	0.005
Multilevel	61.5%	49.1%	47.0%	0.721
Preop ABI	0.42 \pm 0.27*	0.45 \pm 0.26	0.48 \pm 0.26*	0.198*
Postop ABI	0.89 \pm 0.17	0.89 \pm 0.17	0.92 \pm 0.13	NS

Perioperative Mortality

- 30-day mortality significantly less in Group I compared to Groups II and III (1.5% vs. 5.6% vs. 4.9%, P=0.015)
- In open revascularization
 - 30-day mortalities 0% Group I,; 6.1% (P=0.035) Group II, 6.7% (P=0.028) Group III
- In endovascular revascularization
 - 30-day mortality rates similar between groups (2.1% vs. 5.5% vs. 3.9%, P=0.188)
- Mean follow-up 42.5 \pm 38.5months (range 0-188months)

Survival

- The overall survival was significantly different in all groups with 5-year survival 52 \pm 3% in Group I, 30 \pm 3% in Group II and 22 \pm 3 in Group III (P<0.001, Figure 1).
- AFS was also significantly different between groups (Figure 2) with 5-year AFS 47 \pm 3% in Group I, 25 \pm 3% in Group II and 16 \pm 3% in Group III (P<0.001, Figure 2).
- In multivariate analysis, CAD, CKD, non-ambulatory status, tissue loss and Hct<39.0 were found to be independently associated with overall survival and AFS (Table III).

Limb Outcomes

- LS Endovascular interventions
 - Significantly different (5-year, 90 \pm 2% in Group I, 83 \pm 3% in Group II and 75 \pm 4% in Group III, P=0.002)
- LS Open revascularization
 - No difference (5-year, 86 \pm 4% in Group I, 89 \pm 4% in Group II and 82 \pm 6% in Group III, P=0.737)
- MALE-free survival similar in endovascular (P=0.842)/ open (P=0.788)
- Freedom from MALE and postoperative mortality similar in ev-treated patients (P=0.529) and open-treated patients (P=0.612).

Patency Rates

- Primary and secondary patency rates similar between groups both in endovascular and open treated patients (P=0.973 for PP, and P=0.124 for SP).

Table III – Multivariate analysis

	Survival		AFS	
CAD	1.5 (1.3-1.8)	P<0.001	1.4 (1.1-1.6)	P<0.001
CKD	1.5 (1.3-1.8)	P<0.001	1.5 (1.2-1.8)	P<0.001
Non-amb	1.6 (1.3-2.0)	P<0.001	1.7 (1.3-2.1)	P<0.001
Tissue loss	1.5 (1.2-1.9)	P=0.001	1.5 (1.2-2.0)	P=0.001
Preop Hct (II)	1.4 (1.1-1.7)	P=0.002	1.4 (1.2-1.8)	P<0.001
Preop Hct (III)	1.7 (1.4-2.1)	P<0.001	1.8 (1.4-2.2)	P<0.001

Conclusion

- Preoperative anemia affected a statistically significant proportion of patients with PAD who had open and endovascular revascularization.
- Increasing severity of anemia associated with lower one-year AFS and LS.
- Further research into blood management initiatives is required to examined how best to correct anemia and improve patient outcomes.

References

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