

# EFFECTS OF ASCORBIC ACID ADMINISTRATION ON ANAEMIA CORRECTION IN HAEMODIALYSIS PATIENTS

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## BACKGROUND AND OBJECTIVE

Administration of ascorbic acid in haemodialyzed patients is reported to increase the availability of iron for erythropoiesis, improving the anaemia response to the treatment [1-5].

The study aimed to evaluate the effects of intravenous (iv) ascorbic acid on anaemia correction in haemodialysed (HD) patients (NCT02225886).

## STUDY DESIGN. SUBJECTS AND METHODS

All 69 adult stable HD patients with at least 2 mo on HD in the participant center, without any other cause of anaemia were **randomized 1:1** to receive for one month either **iv ascorbic acid (300 mg 3 times/wk, post-HD, in 100mL saline solution, except for the sessions with iv iron) or placebo (100 mL saline solution)**. Patients monitoring and treatment and continued according to Best Practice Guidelines [6].

**The primary efficacy parameter was the dose of erythropoietic stimulating agent (ESA, i.e. darbepoetinum)**, while haemoglobin (Hb), serum ferritin, transferrin saturation (TSAT) and Erythropoietin Resistance Index (ERI) were **secondary efficacy variables**. Tolerance to vitamin C, occurrence of adverse reactions and number of withdrawals were safety variables.

## RESULTS

Preliminary per protocol analysis after 6 mo of follow-up was performed on 66 patients [51% males, median age 64.0 (61.2-67.8) years, with 29% primary glomerulopathies, 27% vascular diseases and only 14% diabetic nephropathy], 30 and 36 in intervention and control groups, respectively. There were no differences between groups in age, gender, percentage of diabetics, haematologic and iron status, inflammation, nutritional state or dialysis adequacy.

Hb similarly increased after 6 mo in both groups. However, after the first 3 mo, the rise in Hb was significantly higher in the intervention group.

ESA dose significantly decreased after 6 mo only in the intervention group, while it remained stable in controls.

Serrum ferritin increased only in patients on vitamin C and only after 6 months. In the same group, there was an increase in TSAT, starting with the 3rd month of intervention.

**Iron requirements decreased only in intervention group: 256.7 (207.9-305.4) vs 443.3 (367.6-519.1) mg/mo at baseline, p=0.02, compared to 386.1 (336.2-436.1) vs 433.3 (327.0-539.7) mg/mo, p=0.2, in controls.**

The ERI was similar at initiation, but became significantly lower after 3 mo only in the intervention group and remained so throughout the study [4.2 (2.4-5.2) at 6 mo vs 6.5 (5.5-8.2) IU/kg per g/dL Hb at baseline, p=0.02].

A binomial logistic regression model focusing on ERI's determinants showed controls to be 8 times more exposed to ESA resistance as compared to those receiving vitamin C.

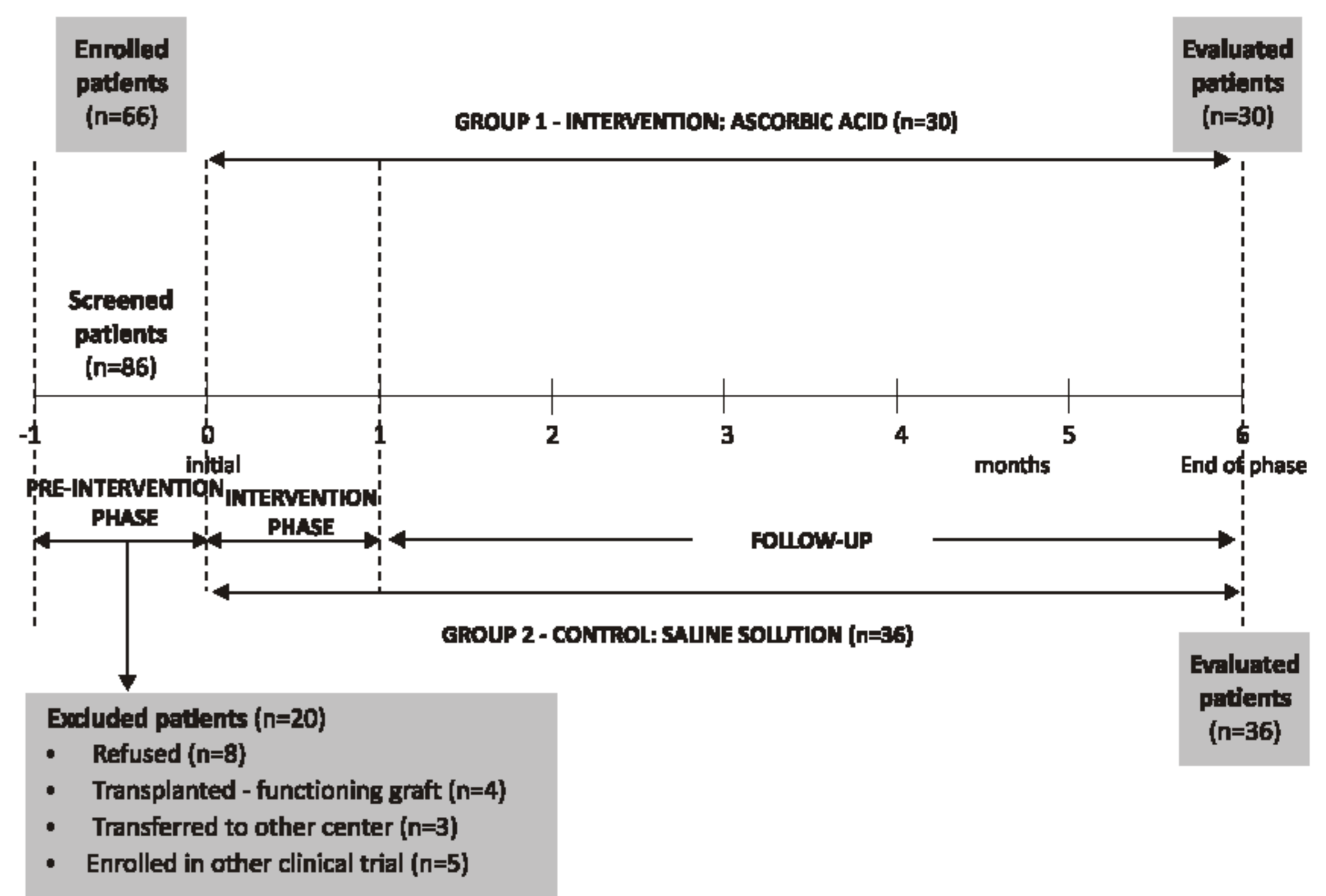
There were no significant changes in any of the other factors interfering with anaemia correction and no adverse reactions were noted.

## CONCLUSIONS

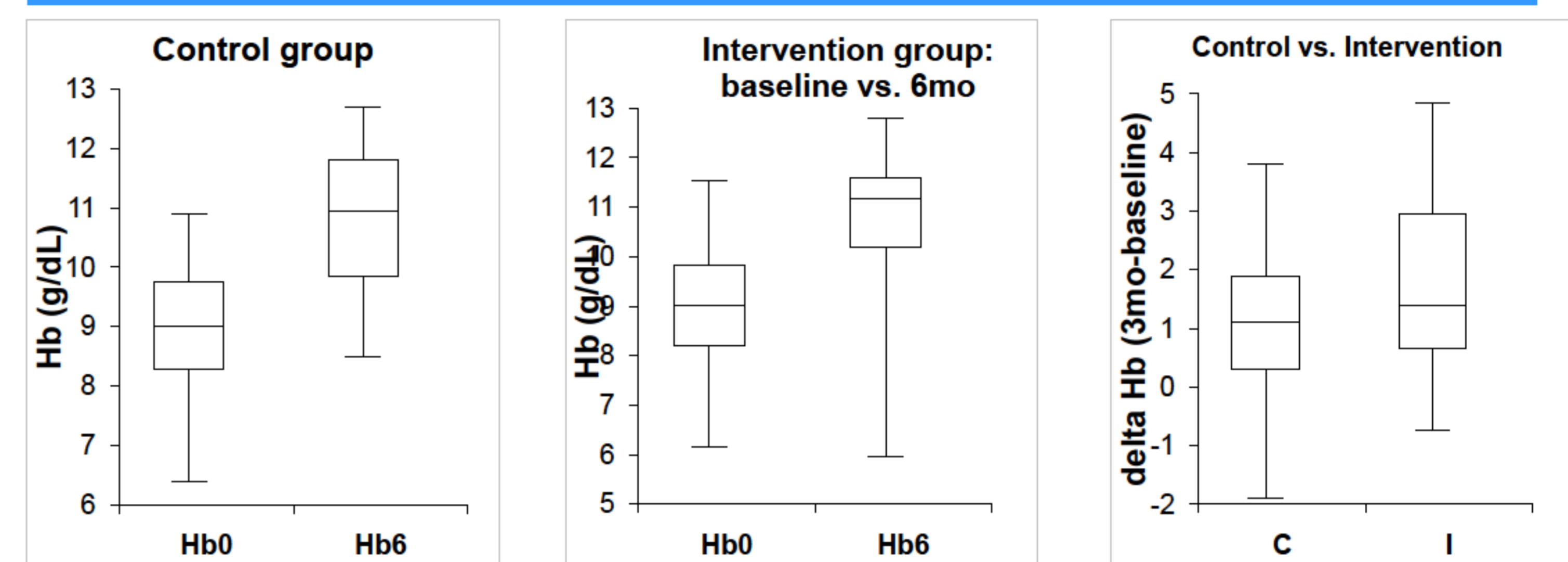
**Ascorbic acid intravenously administered seems to ameliorate iron metabolism, to increase iron available for erythropoiesis and to improve anaemia correction, allowing for reduction in iv iron and ESAs requirements in HD patients.**

## REFERENCES

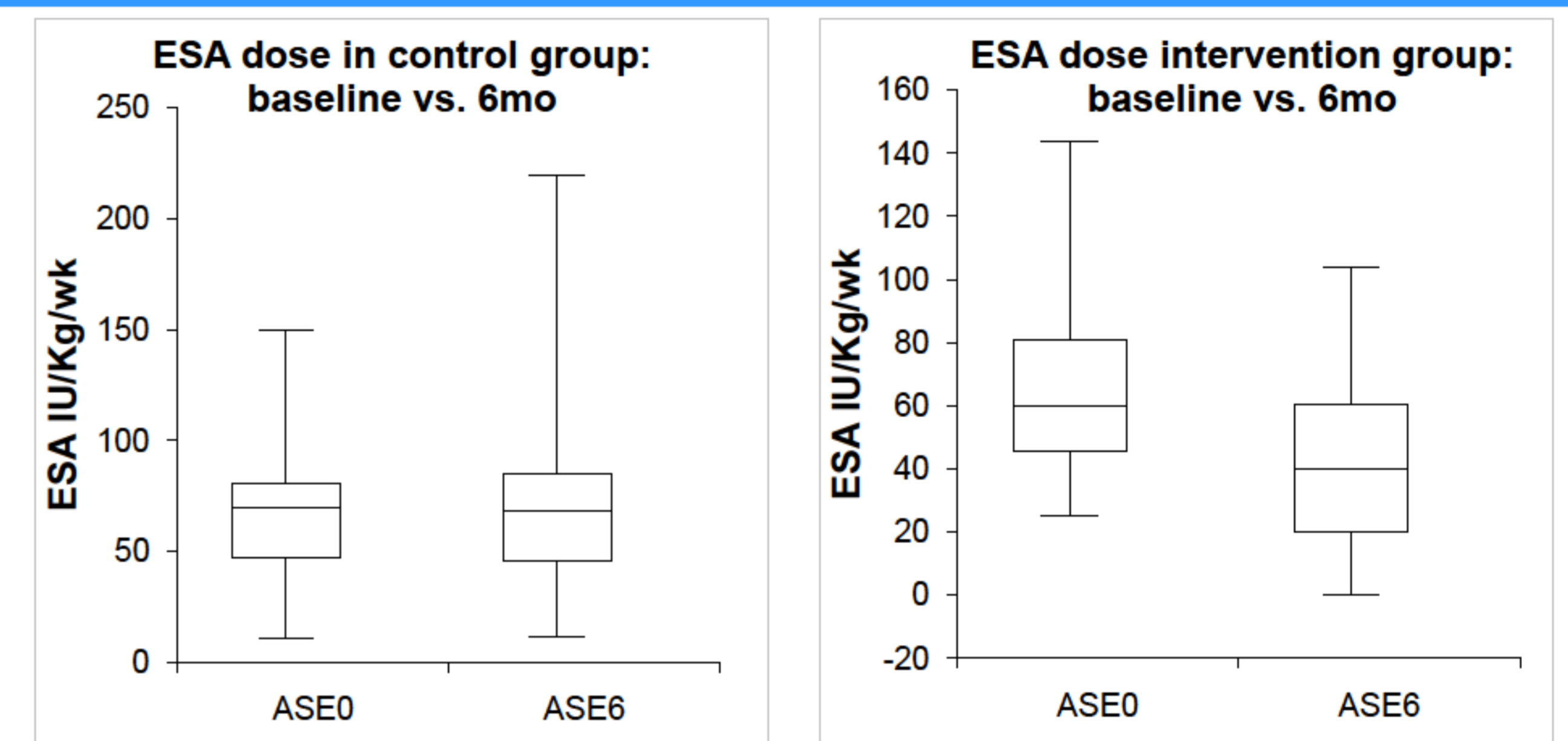
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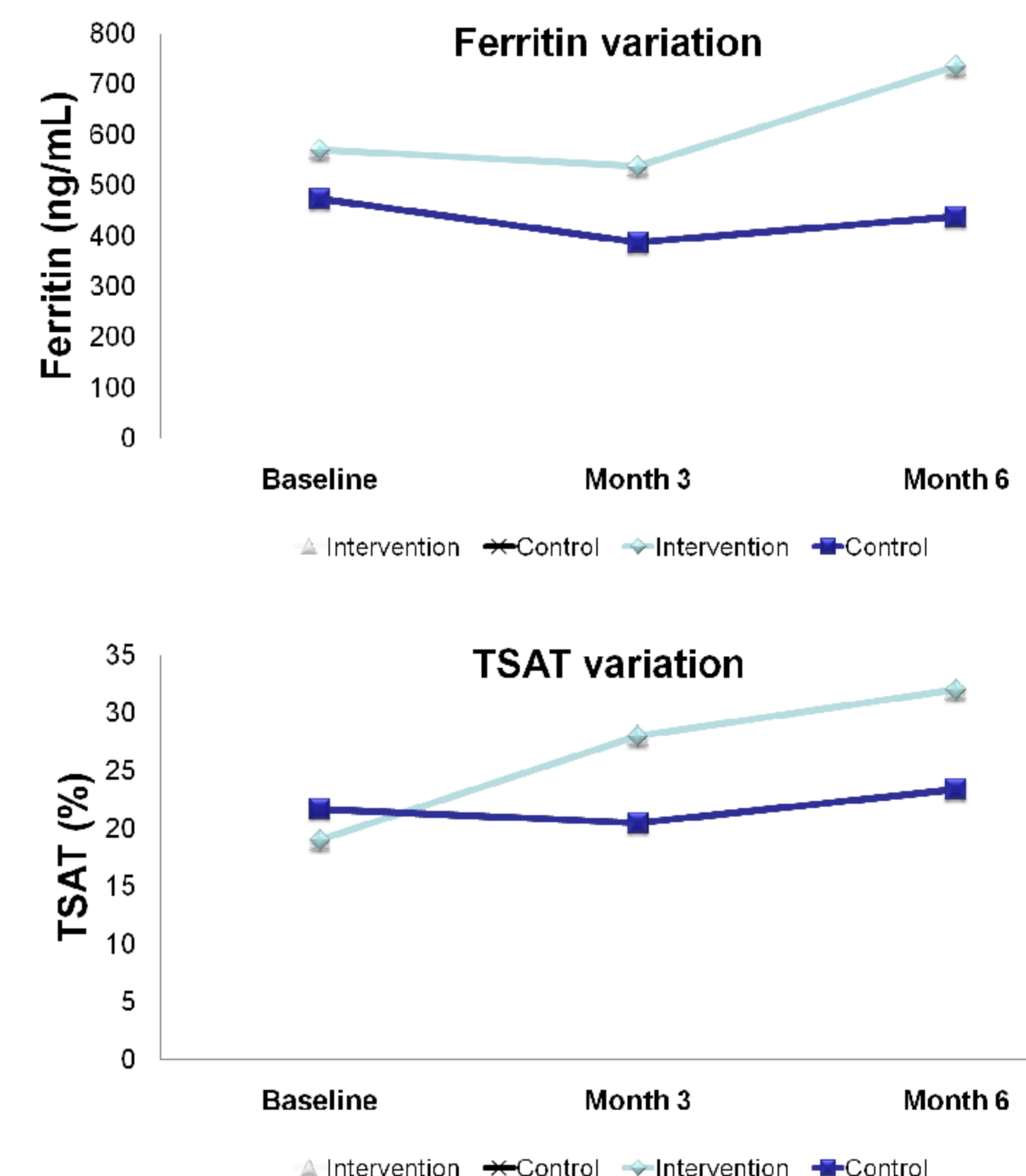
## Hematologic response



## ESA Requirements



## Response of iron status



## ERI determinants: A binomial logistic regression model

Variable	B	SE	Wald	p	Exp(B) (95%CI)
Control	1.33	0.68	3.77	0.05	3.81 [0.98-14.7]
Serum Calcium	-10.31	4.34	5.41	0.20	0.00 [0.00-0.19]
Constant	20.18	0.39	4.61	0.03	5.82

Dependent variable: ERIs 3<sup>rd</sup> quartile 7.65

Variables introduced at step 1: group (intervention vs control), gender, primary kidney disease, age, BMI (body mass index), serum ferritin, TSAT (transferrin saturation), total serum calcium, serum phosphates, eKt/V, monthly iron dose, CRP (C reactive protein).

Cox and Snell R<sup>2</sup> = 0,17; (p = 0,004)

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