

Effect of blood pressure management during aortic coarctation repair on tissue oxygen saturation measured by near-infrared spectroscopy

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Background

This study compares the effects of three commonly used blood pressure regulating agents on tissue oxygen saturation of the brain and peripheral tissues, during aortic coarctation repair in children, with the use of near-infrared spectroscopy. Based on the reported adverse effect of sodium nitroprusside (SNP) on tissue oxygen saturation, we wanted to explore the hypothesis that the alteration in tissue oxygen saturation occurring with SNP would not be present with sevoflurane and nitroglycerin (NTG).

Methods

- 30 children with isolated aortic coarctation were randomized to sevoflurane, SNP or NTG for blood pressure control during aortic cross-clamping.
- Bilateral regional cerebral oxygen saturation (rS_cO_2), renal oxygen saturation (S_rO_2) and muscle oxygen saturation (S_mO_2) were continuously recorded (INVOS 5100, Somanetics Corporation, Troy, MI).
- Changes in tissue oxygen saturation, rate of decay and area under the curve (AUC) were compared between treatment groups. Relationships between changes in tissue oxygen saturation and changes in blood pressure were evaluated by correlation and linear regression analysis.

Results

- There were no significant differences between treatment groups for rS_cO_2 .
- Treatment with SNP resulted in a significantly larger and faster decrease of S_rO_2 and S_mO_2 compared to NTG (Table and Fig 1).
- Linear regression analysis showed a lower dependence between mean arterial pressure and rS_cO_2 for NTG (Fig 2).

	Sevo group	SNP group	NTG group	p-value between groups
Max change in S_rO_2 (%)	-43 19	-59 13*	-33 22	0.028
Max change in S_mO_2 (%)	-55 19	-64 17*	-34 25	0.014
Decay rate S_rO_2 (%/min)	-5.6 3.1	-7.7 2.7*	-3.9 3.0	0.034
Decay rate S_mO_2 (%/min)	-6.2 2.4	-9.3 3.7*	-3.9 2.7	0.003

* $p < 0.05$ from NTG

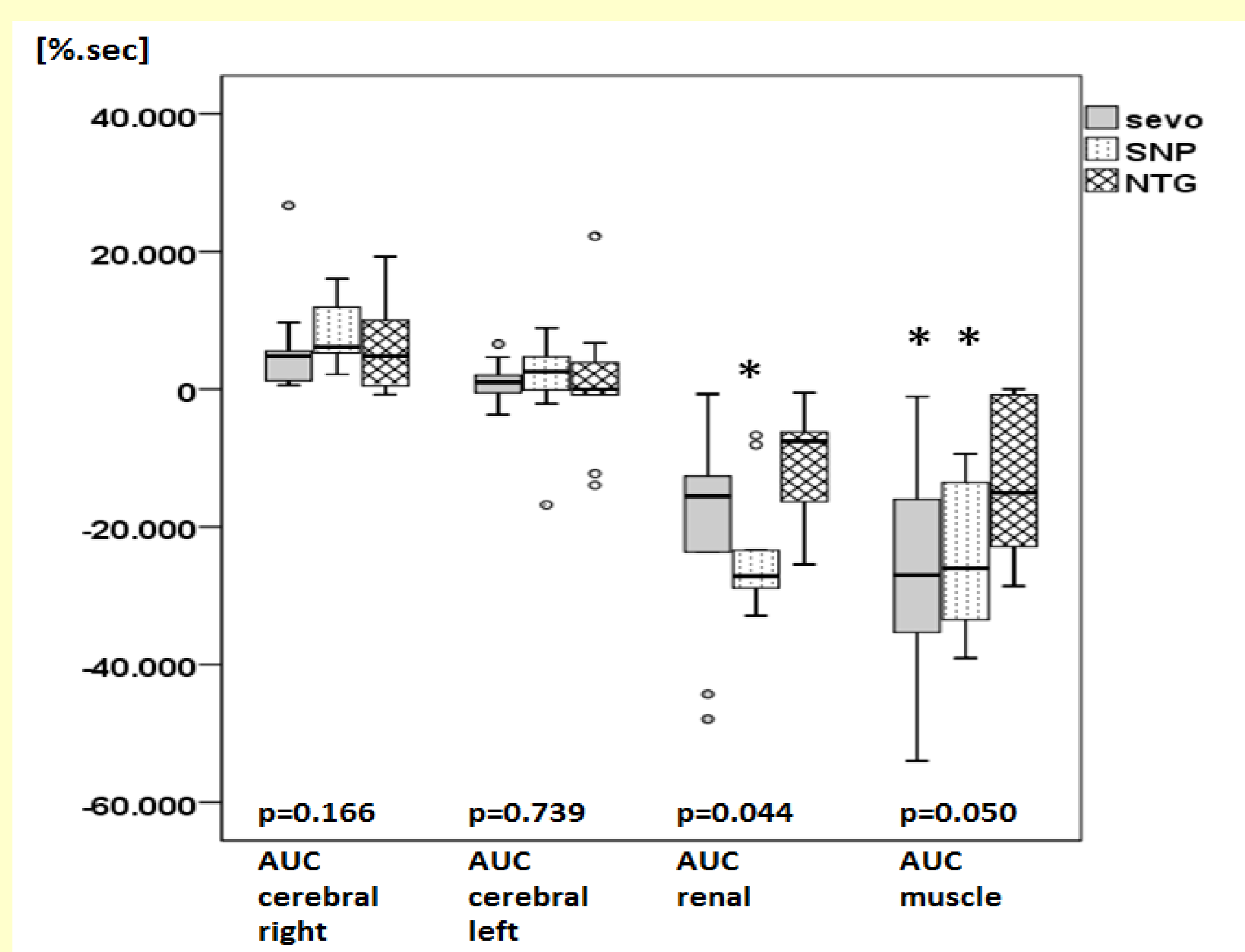


Fig 1. Area under the curve (AUC) for tissue oxygen saturation during aortic cross-clamping, indicating a significantly larger decrease in renal and muscle saturation in the SNP group compared to the NTG group (* $p < 0.05$ from NTG)

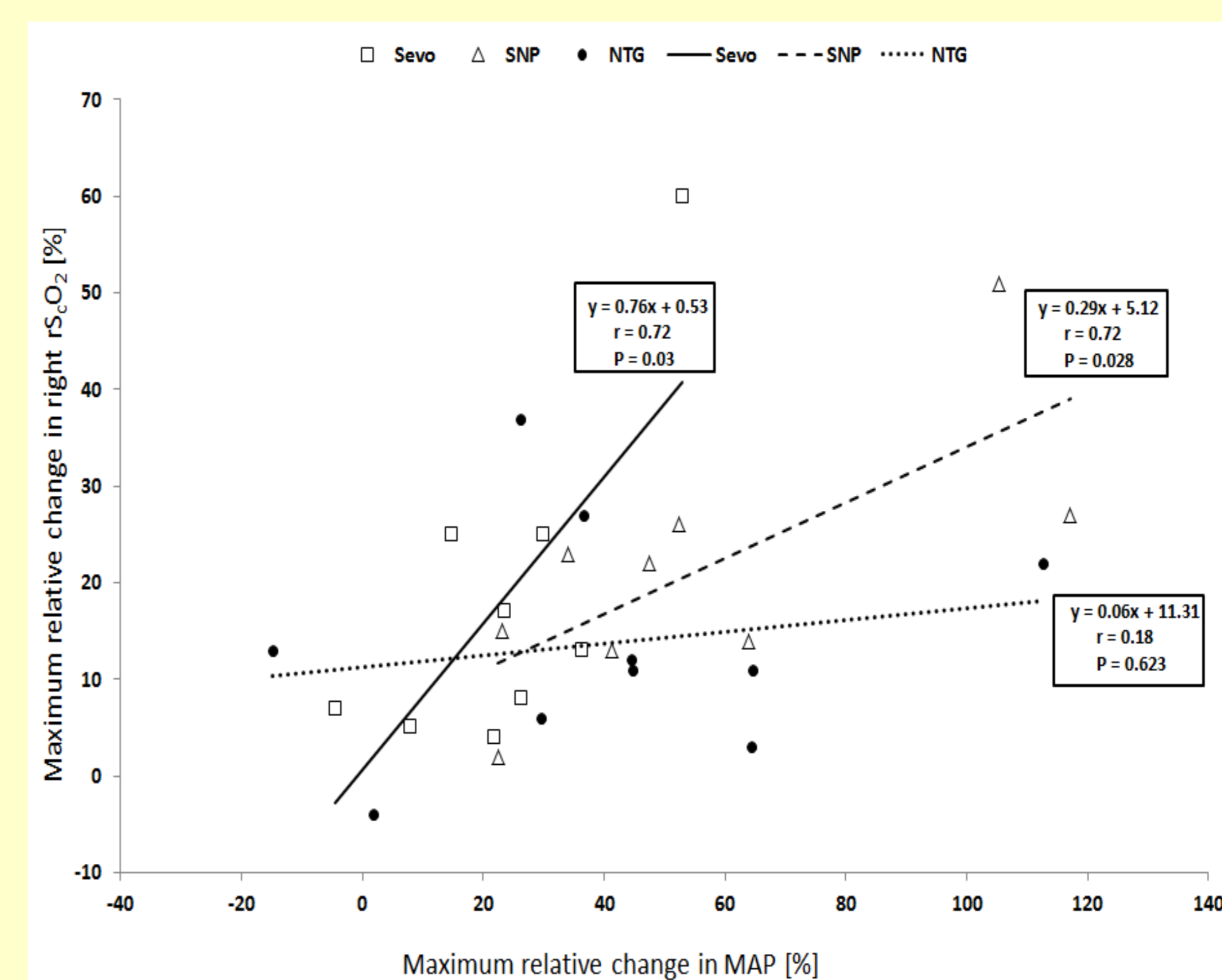


Fig 2. Linear regression plot showing lower dependence between right cerebral oxygen saturation and MAP in the NTG group

Conclusion

This study confirms the hypothesis that SNP promotes impaired peripheral tissue oxygenation.

Our data suggest that nitroglycerin might be preferable to sodium nitroprusside for blood pressure control during procedures involving aortic cross-clamping.