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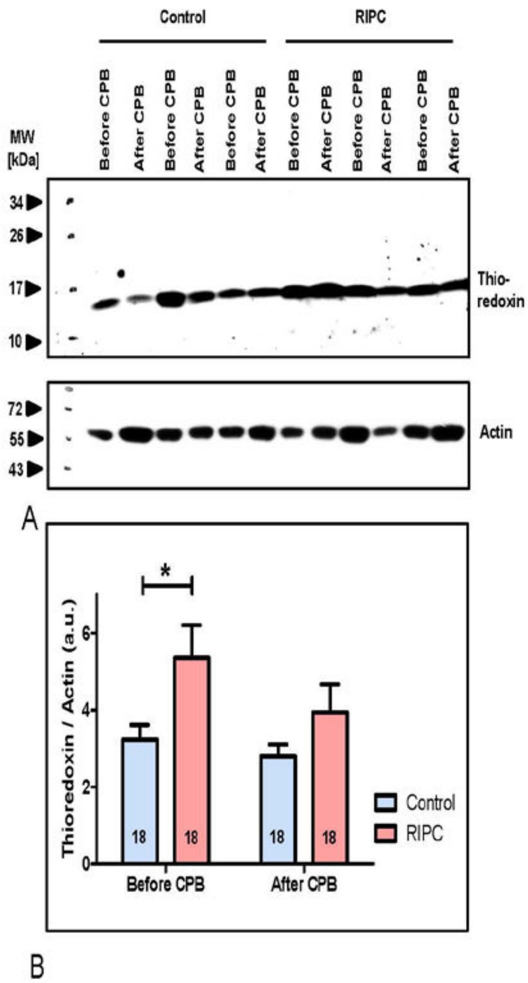

Figure 3: Semiquantitative evaluation of thioredoxin protein expression. A: Representative Westernblotting experiment performed with cardiac tissue samples of 3 control and 3 RIPC patients. B: Evaluation of the relative protein expression levels of thioredoxin in control and RIPC patients. Numbers in the columns display the numbers of patients employed in the respective experiment. MW, molecular weight; kDa, kiloDalton; a.u., arbitrary units; columns display the mean; bars denote SEM; *, P<0.05.

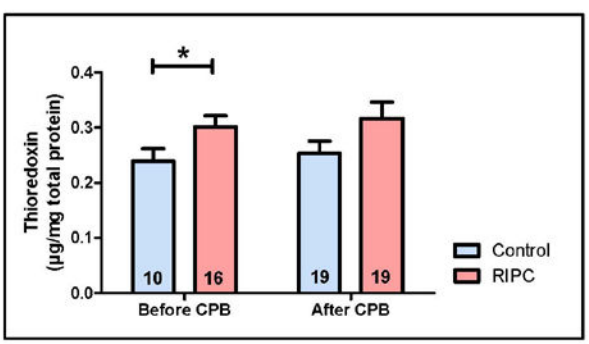

Figure 4: Quantification of thioredoxin protein expression by ELISA. The amount of thioredoxin protein is increased in tissue from RIPC patients that was obtained before CPB. Numbers in the columns display the numbers of patients employed in the respective experiment. Columns display the mean; bars denote SEM; *, P<0.05.

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HEMODYNAMIC CHANGES INDUCED BY CONTINUOUS CUIRASS NEGATIVE PRESSURE IN PATIENTS WITH FONTAN CIRCULATION

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INTRODUCTION: Early extubation in patients with Fontan circulation is generally advocated because spontaneous respiration increases systemic venous return and cardiac output[1,2]. However there are patients who need positive pressure ventilation because of delayed recovery from anesthesia due to residual opioids or sedatives, hypothermia, etc. after the Fontan procedure. Continuous cuirass negative pressure (CNPV) has been shown to attenuate the negative effects of positive pressure ventilation on circulation in adult cardiac patients[3]. Thus we hypothesized CNPV would augment cardiac output in patients with Fontan circulation as shown in normal circulation. We hereby examined the effect of CNPV in combination with positive pressure ventilation on hemodynamics after the Fontan procedure.

METHODS: With approval of institutional review board and adherence to the Declaration of Helsinki, adult patients who underwent the Fontan operation between Dec 2009 and Dec 2013 were included in the study. All patients were transferred to the ICU with their trachea intubated and received positive pressure support (PS; 5 cmH2O) with positive end-expiratory pressure (3-5 cmH2O) under spontaneous breathing postoperatively. Synchronized intermittent mandatory ventilation was provided to avoid hypercapnia if necessary (3-8 /min). Continuous cuirass negative pressure ventilation (−10-15 cmH2O) was started three hours after the admission to the ICU. CNPV was continued for 12-24 hours after the extubation. Cardiac index (CI) and central venous oxygen saturation (ScvO2) were monitored by FloTrac sensor and PreSep oximetry catheter (Edwards Lifesciences, CA, USA) continuously through the surgery and postoperative period. CI and ScvO2 were compared between pre- and post-CNPV periods. Data were analyzed with Kruskal-Wallis H-test followed by Mann-Whitney U-test with Bonferroni correction where applicable. P value less than 0.05 was considered significant.

RESULTS: Five patients were included in the study. Mean CI before and after CNPV were 1.9 ± 0.3 and 2.5 ± 0.2 (L/min/m2), respectively. Accordingly, ScvO2 increased after the initiation of CNPV significantly (52 ± 2 vs. 65 ± 4 %). These hemodynamic changes may indicate CNPV augments cardiac output and improves oxygen delivery.

CONCLUSIONS: CNPV augmented cardiac output even in combination with positive pressure ventilation and improved oxygen delivery. Continuous cuirass negative pressure ventilation is effective to increase cardiac output and to improve oxygen delivery in patients with the Fontan circulation.

REFERENCES:

1. Ann Thorac Surg 2008; 86: 576-82.
2. Eur J Cardio-thorac Surg 2001; 20: 114-9.
3. Ann Thorac Surg 2008; 85: 1355-60.