

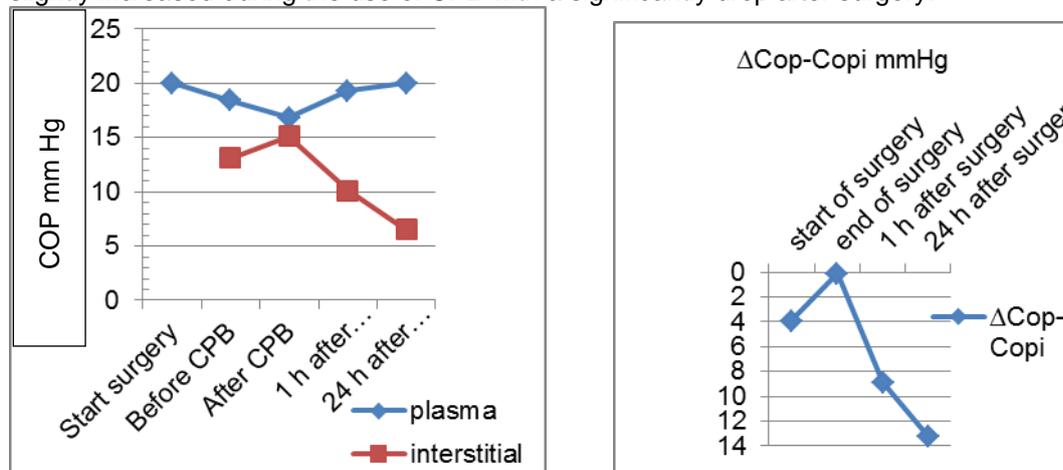
New insight in edema formation after Fontan surgery; the contribution of osmotic pressure in plasma and interstitium

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Introduction: Despite improved result of Fontan surgery, fluid balance and edema formation are major challenges. Fontan circulation is dependent on elevated central venous pressure, however, it may lead to fluid accumulation in the tissues. While increases in hydrostatic pressure will favour transmicrovascular filtration, fluid accumulation is restricted by safety factors to limit edema formation. We hypothesize that chronically increased hydrostatic pressure leads to adaptive changes in plasma and interstitial colloid osmotic pressures. In this study we have measured the colloid osmotic pressure (COP) of plasma and interstitial fluid in children undergoing TCPC procedure.

Methods: This study had a prospective, descriptive design. 11 children (age 2,8 -4,9 year) undergoing TCPC surgery were included. Interstitial fluid and blood samples were obtained during the procedure. Interstitial fluid was harvested by nylon wicks when the child was in general anesthesia. Before surgery two wicks were implanted subcutaneously. One wick was removed before start of cardiopulmonary bypass (CPB), second wick was removed at the end of surgery. A third wick was implanted at the end of operation and removed after one hour. A fourth wick was placed and removed 24 hours later. Blood samples were taken at wick removal. Plasma and interstitial fluid were measured by a colloid osmometer.

Results: Before the procedure plasma COP (mmHg) was $20,0 \pm 0,8$ and interstitial COP $14,1 \pm 1,1$. During surgery with the use of CPB the colloid osmotic pressure gradient was reduced with a subsequent increase in osmotic pressure gradient 24 hours after start of surgery. The plasma COP was slightly reduced throughout the procedure with a normalization after surgery while interstitial COP slightly increased during the use of CPB with a significantly drop after surgery.



Conclusions:

Fontan surgery with the use of cardiopulmonary bypass changes the colloid osmotic pressure gradient that may influence edema formation. The significant increase in gradient after surgery will favor transport of fluid into the capillaries and may be an important factor to counteract edema formation seen in these patients.