Introduction:
Especially extracorporeal cardio pulmonary bypass (CPB) is known to induce severe inflammation. Postoperative inflammation is associated with a sepsis like syndrome including endothelial barrier disruption, volume depletion and hypotension. Sphingosine-1-phosphate (S1P) is a signaling lipid regulating permeability and vascular tone. In septic humans decreased serum-S1P levels could be identified as marker for sepsis severity. We addressed three main issues: (1) Are serum-S1P levels affected by cardiac surgery? (2) Are potential alterations of serum-S1P levels related to changes of acute-phase proteins, S1P sources or carrier? (3) Is the invasiveness of the surgery a factor that may influence serum-S1P levels?

Methods:
46 elective major cardiac surgery patients were prospectively enrolled in this study. Serum samples were drawn pre-, post- procedure and on day 1 and day 4 after surgery. We analyzed S1Pand its potential sources: Red blood cells (RBC) and platelets. We further quantified levels of other inflammatory markers and documented other clinical parameters.

Results:
Median serum-S1P levels in all patients before the procedure were 0.77 (IQR 0.61-0.99) nmol/ml. Serum-S1P levels decrease after surgery, whereas all other inflammatory markers increase. Serum-S1P levels dropped by 58% in the on-pump and 31% in the off-pump group. Changes of serum-S1P levels are associated with S1P sources and carriers: albumin, HDL and vWF:AG activity. Patients with a full recovery of their serum-S1P levels after surgery compared to their individual baseline presented with a lower SOFA score (P>0.05) and shorter ICU stay (P<0.05).

Conclusion:
Serum-S1P levels are disrupted by open heart surgery and levels might be negatively affected by endothelial injury or loss of S1P sources. Low serum-S1P levels may contribute to prolonged ICU stay and worse clinical status. Future studies may investigate the beneficial effects of S1P administration during cardiac surgery.