Reduced Antithrombin-III-Activity (AT-III-a) in Patients with Thrombus Formation after Fontan-Operation

Introduction:
There exists a considerable risk for early postoperative thrombus formation (epTF) after Fontan-operation inside the extracardiac conduit (ECC) or the pulmonary arteries (PA). Probable reasons are low blood flow, a rough surface after surgery, but also disorders of the coagulation system are possible promotive factors. It can occur in the early postoperative period, despite anticoagulation with heparin.

Methods:
In a retrospective study we analyzed the AT-III-activity (AT-III-a) before and after Fontan-operation in n=29 consecutive patients without and n=6 with epTF during the first day after surgery.

Results:
The preoperative AT-III-a was normal in both groups (100%±11.4%) without any difference among both groups (p=0.16).

Immediately after Fontan-operation AT-III-a was slightly reduced in both groups (77%±10%), again without a significant difference (p=0.54).

Six to eight hours after the operation we observed a major decline of AT-III-a in patients with epTF (56.2%±10.9%), while it fell only marginally in patients without (74.3±11%). This difference was significant (p=0.014).

There was also a difference among patients with and without epTF in the 1st (62.2±12.7% vs. 71.2±14.9%) and 2nd (50.5±14.3% vs. 64.0±10.4%) postoperative day, but these dissimilarities were not significant.

In all patients with epTF we failed to reach a therapeutical aPTT (60-80 sec) during the first postoperative day, despite high doses of heparin.

Conclusions:
AT-III-a is severely reduced in patients with epTF after Fontan-operation, but only slightly in patients without. Obviously this reduction plays an important role in the pathogenesis of epTF, because it is impossible to reach a therapeutical effect of heparin in the absence of AT-III.

Thus, AT-III-a has to be controlled and if needed AT-III has to be substituted, to attain a sufficient early postoperative anticoagulation.

Argatroban, which is inhibiting thrombin directly and – in contrast to heparin - independent from AT-III, may be an alternative to AT-III substitution.