

SCA 52

THE EFFECT OF DIFFERENT HEPARIN PREPARATIONS AND ACTIVATORS ON ACTIVATED CLOTTING TIME

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Background: Traditionally, an activated clotting time (ACT) of 400 seconds is accepted as adequate anticoagulation to go on cardiopulmonary bypass. This is based on the original recommendation to maintain a minimum ACT of 300 seconds; as there were no detectable clots in the cardiopulmonary bypass oxygenator circuit at ACT values higher than this. However, there is a three to six-fold variation in heparin effect and a four-fold variation in heparin half-life. Neither total heparin dose nor total cardiopulmonary bypass time can accurately predict anti-Xa heparin levels at the end of cardiopulmonary bypass. With the introduction of new heparins and activators, their effects on ACT are not well defined. Despite these, ACT is used world wide to monitor anticoagulation during cardiopulmonary bypass.

Objective: To conduct an in-vitro comparison of bovine and porcine heparins on 3 activators (celite, kaolin and MAX-ACT) using ACT.

Methods: After intuitional ethics committee approval and informed written consent, blood was obtained from 10 patients undergoing elective CABG surgery. Exclusion criteria included consumption of anti-platelet agents, recent heparin infusion, and pre-existing coagulopathies. After discarding the initial 10 ml, 9 ml of blood was drawn from the central venous line for baseline ACTs using Celite-activated tubes, Kaolin-activated tubes and MAX-ACT tubes (containing cocktail of celite, kaolin and glass particles as

activators) (Helena Laboratories, Beaumont, TX) according to manufacturer's recommendations. The ACT tests were run on Actalyke Model A2P (Helena Laboratories, Beaumont, TX). Subsequently, another 10 mls of the patient's blood was heparinised in-vitro with either the bovine (CP Pharmaceuticals Ltd, UK) or porcine (Leo Pharmaceuticals, Denmark) heparin in a blinded manner, and incubated in a heated water bath at 37°C. The dose of heparin given was calculated to achieve a concentration of 4 units/ml blood. ACT tests were performed on the heparinised blood after 3 minutes. All tests, including baseline ACTs, were done in duplicate. Data were tabulated using a statistical software package (SPSS™ 11.0, Chicago, IL, USA). Analysis was performed with Student's t-test or ANOVA as appropriate. Results were presented as mean values. $P < 0.05$ was considered significant.

Results: 10 patients were recruited into the study. MAX-ACT tubes had shorter ACT tests than Celite and Kaolin-activated tubes (353 vs. 578 vs. 529s, $P < 0.05$) with porcine heparin. All three types of tubes did not differ in ACT tests with bovine heparin (486 vs. 569 vs. 330s, $P > 0.05$). There was no difference between porcine and bovine heparins in any of the ACT tests.

Conclusion: Adequate heparinisation is required before patients can go on cardiopulmonary bypass during CABG. We have demonstrated that there was no difference in the efficacy of the bovine and porcine heparins. However, the MAX-ACT tubes produced significantly lower ACT test times when porcine heparins were used for heparinisation. Caution must be exercised to avoid over-heparinisation of patients when these tubes are used, which may lead to post-operative bleeding and re-exploration.