



SNS COLLEGE OF ALLIED HEALTH SCIENCES
SNS Kalvi Nagar, Coimbatore - 35 Affiliated to Dr MGR
Medical University, Chennai



DEPARTMENT OF CARDIO PULMONARY PERFUSION
CARE TECHNOLOGY

COURSE NAME :CARDIOPULMONARY BYPASS AND ITS COMPLICATIONS
STERILE TECHNIQUES AND SURGICAL ASEPSIS MAINTENANCE

III YEAR

UNIT : COMPLICATIONS DURING BYPASS

TOPIC : INADEQUATE ANTICOAGULATION



INTRODUCTION



- Heparin is an anticoagulant.
- It is composed of highly sulfated polysaccharides located in mast cells.
- Heparin has the highest charge density
- The action of heparin is rapid and neutralized by protamine.

PRODUCTION OF HEPARIN

- Commercial heparin most often derived from pig intestinal mucosa and lung heparin from cattle lung (bovine lung heparin).

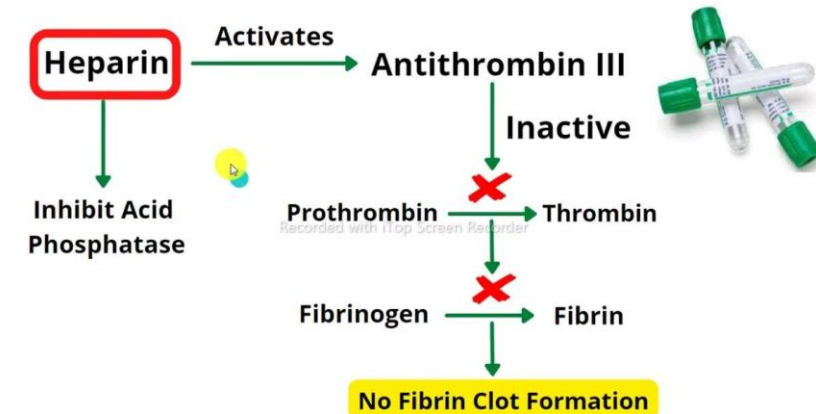




HEPARIN MECHANISM OF ACTION



- Heparin binds with anti thrombin III to prevent thrombin formation.
- Anti thrombin III is glycoprotein found in plasma
- Heparin binding with AT III leads to increase in the ability of AT III to inhibit thrombin to 10000 times or more
- Longer heparin chains effectively inhibits IIa and Xa
- Shorter heparin chains inhibit factor Xa
- Heparin is also associated with the second help factor, cofactor II is a glycoprotein that causes inhibition of thrombin.





MOLECULAR WEIGHT & HALF LIFE FOR VARIOUS ANTICOAGULANTS



Molecular weight

- Unfractionated heparin = 3000 to 30000 Daltons
- Low molecular weight heparin = 5000 Daltons
- Lepirudin = 6979 Daltons
- Argatroban = 508 Daltons
- Bivalirudin = 2180 Daltons

Half life

- Unfractionated heparin 60 to 90 mins
- Low molecular weight heparin twice the Unfractionated heparin
- Lepirudin 80 mins
- Argatroban 45 to 55 mins
- Bivalirudin 25 mins



HEPARIN DOSAGE



- Adult heparin dosage = $3 \times$ weight in kg
- Paediatric heparin dosage = $4 \times$ weight in kg
- Circuit = 1mg/ weight in kg
- Patient systemic circulation = 3mg/ weight in kg





MONITORING OF ANTICOAGULATION STATUS



- Activated clotting time is a functional assay of anticoagulation
- ACT(normal) = 110 to 120 secs
- During cannulation = 300 secs
- During CPB = > 480 secs
- After 3 to 5 minutes from heparin administration take an arterial sample for ACT
- Monitor the ACT every 30 min during CPB.





Causes and Management



Causes	Management
Heparin induced thrombocytopenia	Addition/ administration of platelet in post-op period
Cartridge error	Check cartridge and fill the blood in appropriate level and check the Kaolin powder in cartridge. Do appropriate technique for Cartridge placement
ACT machine	Check the ACT machine before checking ACT result
Use of hem concentrator	Monitor ACT for every 20mins. Adequate amount of heparin should be administered
Use of uncoated tubing's	Usage of heparin coated tubing usage of phosphoryl coated tubing's maintain ACT>600 secs



Causes and Management



Causes	Management
Heparin resistance	Alternatives of heparin like, Desi Rudin-direct thrombin inhibitor ,Bivalirudin -Half life=25mins, Lepirudin=direct thrombin inhibitor
Heparin rebound	Protamine Administration -1.0 to 1.2 mg of protamine for each 100U of heparin
Inadequate Heparin dosage	3mg/kg-systemic circulation 1mg/kg-circuit Calculation: Adult=20×pt.wt Paediatric=30×pt.wt
Anti-thrombin III deficiency	Fresh frozen plasma (1000-2000)



REFERENCES



- Principles of Cardiopulmonary Bypass – Sunit Ghosh
- The Manual Of Clinical Perfusion –D.Mark Brown

THANK YOU