An important reason for bleeding complications remains the extracorporeal circulation, which induces activation of coagulation factors and platelets and necessitates anticoagulation with heparin which cannot totally prevent this activation.

At this time, the therapy for perioperative hemostatic abnormalities is based mainly on the administration of blood components (fresh frozen plasma - FFP and platelet concentrates) and desmopressin or blood derivatives like prothrombin complex concentrate (PCC) and fibrinogen.

Desmopressin stimulates the release of factor VIII:C and von Willebrand factor, both of which are released from the endothelium. This agent cannot be recommended in routine cardiac surgery at this time, but it might be effective in aspirin-treated patients where a reduction of blood loss and a decrease in blood requirement has been reported.

The prophylactic use of antifibrinolytics such as aprotinin and tranexamic acid has been demonstrated to significantly reduce blood loss. It is obvious that the question of safety of antifibrinolytic agents is of enormous importance. In the future, recombinant activated factor VIIa might prove to be a therapeutic option in patients with otherwise intractable bleeding.

**Table: Methods for blood conservation with Cardiac Surgery**

**SKILFUL SURGERY**

**BLOOD-SAVING METHODS**

- **General methods**
  - off-pump coronary artery bypass grafting
  - minimal access surgery
  - maintaining normothermia (deleterious effect of hypothermia on platelet function)
  - choice of fluid replacement and profound hemodilution
  - controlled (hypo)tension

- **Specific measures**
  - autotransfusion techniques
    - preoperative autologous donation (PAD)
    - acute normovolemic hemodilution (ANH)
    - intraoperative platelet rich plasmapheresis (PRP)
    - intraoperative cell salvage (ICS)
    - reinfusion of shed mediastinal blood (SMB)
    - retrograde autologous priming of the CPB circuit (RAP)
  - pharmacological means
    - vasopressin analogues (DDAVP – desmopressin)
    - antifibrinolytics
      - the naturally occurring serine protease inhibitor aprotinin
• the synthetic protease inhibitor nafamostat mesilate
• the synthetic lysine analogues
  o epsilon-amino-caproic acid (EACA)
  o tranexamic acid
• recombinant activated factor VII (rFVIIa)
• recombinant erythropoietin (rEPO)

CAREFUL MANAGEMENT OF BLOOD COAGULATION

Therapy for hemostatic abnormalities
  FFP
  Fibrinogen
  Platelets
  RBCCells
  rVIIa

CAREFUL PREOPERATIVE EVALUATION OF HEMOSTASIS
  (Laboratory)

CAREFUL MONITORING OF ANTICOAGULATION WITH HEPARIN,
HEPARINE REVERSAL WITH PROTAMINE, AND HEMOSTASIS
  (Bedside)
  ACT
  Thrombelastography (TEG)
  Platelet Function Analyzer (PFA)
  CoaguChek