

Goal-directed coagulation and transfusion algorithm of the Institute of Anesthesiology, Kantonsspital Lucerne

Basic conditions:

Volume: Fluid therapy with balanced crystalloid solution (balanced Gelatin solution may be considered)

Always: Temperature $\geq 35^{\circ}\text{C}$ + pH ≥ 7.2 + Ionized Calcium $\geq 1.15\text{mmol/L}$ + Hematocrit ≥ 0.21

Patient history: something known about medication or coagulation disorders? Consider Desmopressin $0.3\mu\text{g/kg}$ in case of platelet-inhibitors intake. Antagonize heparin with protamine 1:1.

Diffuse microvascular bleeding (> 50% Bloodvolume):

Extem spindle-shaped + Aptem normal: Hyperfibrinolysis \rightarrow 2g Tranexamic acid (15-30mg/kg)

Fibtem-MCF $\leq 7\text{mm}$: 1-2g Fibrinogen (max. 3x2g, after that factor XIII 15U/kg); Target value: MCF $\geq 7\text{mm}$ (fibrinogen $\geq 1.5\text{-}2.0\text{ g/L}$)

Laboratory:

Hematocrit, platelet count, prothrombin time, INR, activated partial thromboplastin time, fibrinogen concentration, Rotem (Extem, Intem, Fibtem, Aptem), factor XIII, Anti-Xa, thrombin time

Ongoing bleeding (5-10 Liters)

Extem/Intem: CT prolonged (Extem $>80\text{s}$, Intem $>240\text{s}$): Prothrombin complex concentrate 500-2'000U (according to bodyweight and INR)

Extem/Intem: CT normal (Extem $<80\text{s}$, Intem $<240\text{s}$) + MCF $<40\text{mm}$: Factor XIII 1250U (15U/kg) if Fibtem-MCF stays $\leq 7\text{mm}$ despite fibrinogen administration. Target value factor XIII $\geq 60\%$ (if $\leq 40\%$ \rightarrow 20U/kg / if $\leq 50\%$ \rightarrow 15U/kg). Further administration of fibrinogen, as long as Fibtem-MCF $\leq 7\text{mm}$

Extem/Intem: MCF $< 40\text{mm}$ although Fibtem-MCF $>10\text{mm}$ + Tc $< 50'000/\text{mm}^3$: 1 Platelet concentrate

Other potential measures:

Arterial ligation, cloths compression, aorta clamping, embolization, hysterectomy

Further ongoing bleeding (>10 Liters)

FFP: 15ml/kg ($\sim 4\text{U}$) \rightarrow for factors XI and V

If prognosis isn't infaust and temperature, pH, platelet count and fibrinogen target-values are achieved: rFVIIa: $90\mu\text{g/kg}$ ($\approx 7.2\text{mg}$) – once repeatable after 30min.

If further ongoing diffuse bleeding, contemplate von Willebrand factor concentrate 2000U (20-30U/kg factor VIII)

Trauma patient (age $<50\text{yrs}$ + not infaust prognosis + Temperature $>35^{\circ}\text{C}$ + diffuse bleeding) or uterine atony (Extem-MCF $<25\text{mm}$ + Fibtem-MCF $<4\text{mm}$ + Extem-CT $>90\text{s}$ or at the extreme, possible to give without laboratory):

2g Tranexamic acid + 4g Fibrinogen + 1'000U Prothrombin complex concentrate + 4 erythrocytes concentrates (blood group 0 negative) + 1250U factor XIII