COAGULOPATHY OF TRAUMA & TRANSFUSION

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1

DESCRIBE

Describe the impact, incidence, and consequences of trauma related hemorrhage

REVIEW

Review the pathophysiology of acute blood loss and massive transfusion

IDENTIFY

Identify the anesthetic implications and interventions for coagulopathy

2

TRAUMA

- 1 in 10 deaths, worldwide
- Leading cause of death in people < 45 y/o
- HEMORRHAGE…
- Accounts for most deaths in patients with *potentially survivable injuries*
- Over 90% of *potentially survivable* US combat deaths

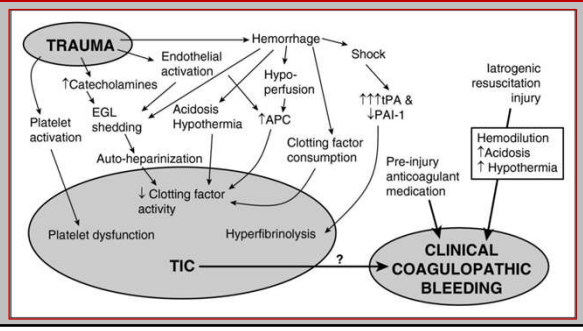
3

COAGULOPATHY

- PRESENT IN ~30% OF TRAUMA PATIENTS *IMMEDIATELY* AFTER INJURY
- ASSOCIATED WITH ↑ MULTI-ORGAN FAILURE, ↑ ICU ADMISSION, ↑ DEATH
- WHEN PRESENT ON ARRIVAL TO E.D., 4 – 6x ↑ MORTALITY

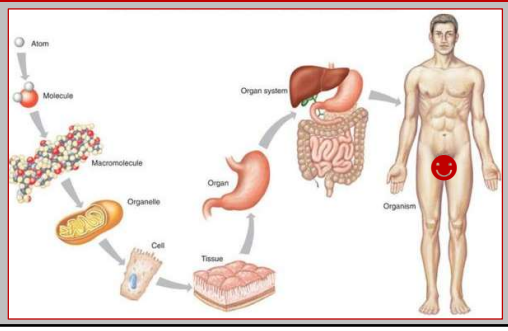
4

COAGULOPATHY



5

BLOOD

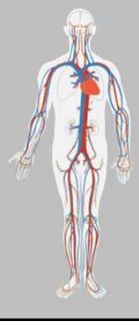


6

BLOOD

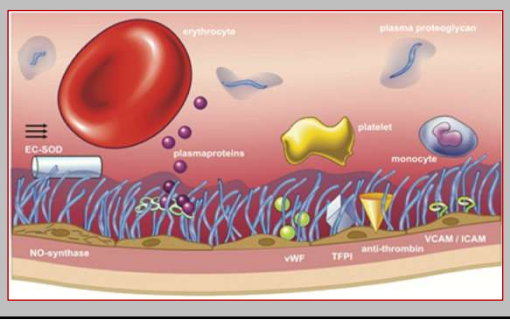
CARDIOVASCULAR SYSTEM:

- PROVIDE O_2 NUTRIENTS TO TISSUES
- CLEAR WASTE PRODUCTS
- PHYSICAL CONDUIT TO CONNECT ORGANS



7

ORGAN SYSTEM



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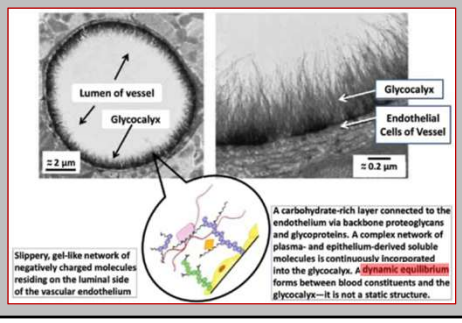
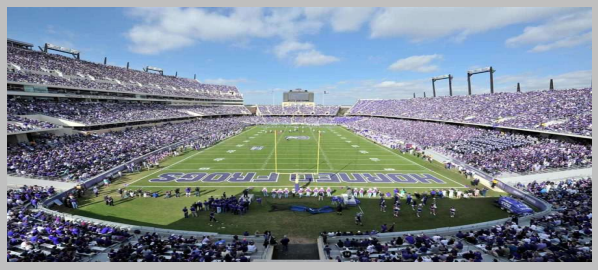
ORGAN SYSTEM



9

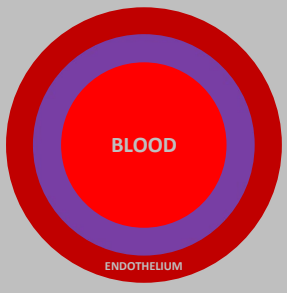
ORGAN SYSTEM



ENDOTHELIUM: 4,000 – 7,000 m^2

10

ORGAN SYSTEM



11

ORGAN FAILURE

IF IT FUNCTIONS, IT CAN FAIL…

BLOOD FAILURE

12

ORGAN FAILURE

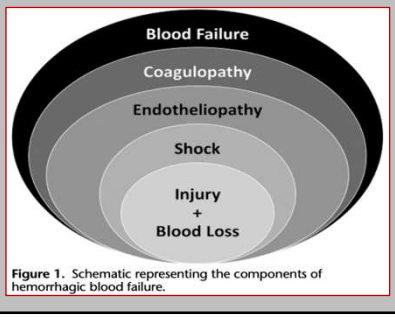


Figure 1. Schematic representing the components of hemorrhagic blood failure.

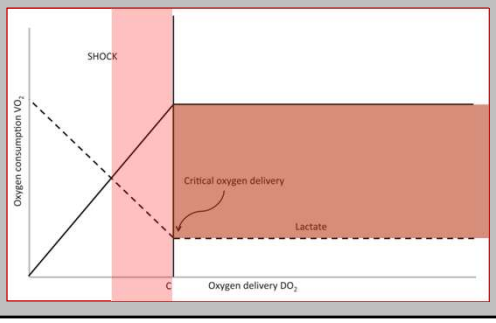
13

OXYGEN DEBT

- Mismatch between OXYGEN DEMAND (VO_2) and OXYGEN DELIVERY (DO_2)
- DO_2 function of CARDIAC OUTPUT, O_2 SATURATION, HGB CONCENTRATION
- Transition into ANAEROBIC METABOLISM
- Depth of O_2 debt continues to increase over time
  - ✓ Restoration to baseline VO_2/DO_2 ratio may be insufficient
  - ✓ Ability to physiologically "repay" debt DECREASES OVER TIME
- Consequences of ACCUMULATED DEBT
  - ✓ Increased reperfusion/inflammation injury
  - ✓ MODS
  - ✓ ENDOTHELIOPATHY → COAGULOPATHY → BLOOD FAILURE

14

OXYGEN DEBT



15

RECOGNIZING BLOOD FAILURE

16

RECOGNIZING BLOOD FAILURE

OXYGEN DEBT

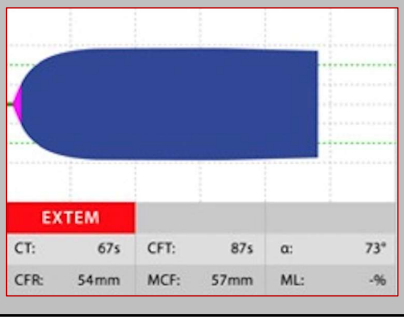
TACHYCARDIA, ALTERED MENTAL STATUS
BASE DEFICIT
SERUM LACTATE

COAGULOPATHY

CONSPICUOUS BLEEDING
CONVENTIONAL COAGULATION ASSAYS UNRELIABLE!
VISCOELASTIC TESTING (ROTEM, TEG), FIBRINOGEN

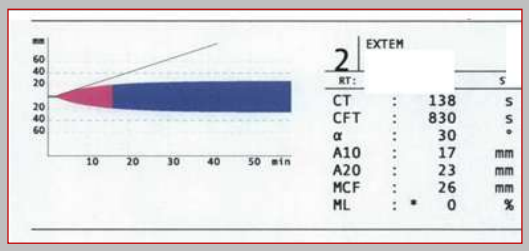
17

VISCOELASTIC TESTING



18

VISCOELASTIC TESTING



19

PREVENTING BLOOD FAILURE

20

PREVENTING BLOOD FAILURE

$DO_2 = CO + SaO_2 + HGB$

21

PREVENTING BLOOD FAILURE

22

PREVENTING BLOOD FAILURE

PERMISSIVE HYPOTENSION

LACTIC ACIDOSIS

SBP 90-100

LACTATE 2-4
BD > -10

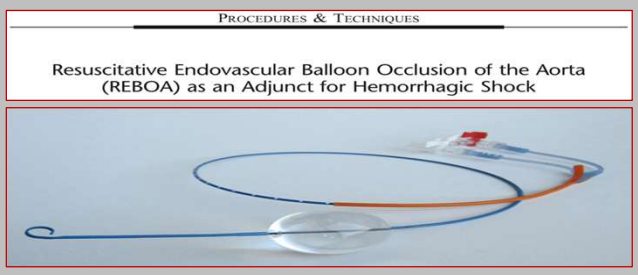
23

PREVENTING BLOOD FAILURE

DAMAGE CONTROL RESUSCITATION

24

PREVENTING BLOOD FAILURE



25

PREVENTING BLOOD FAILURE

26

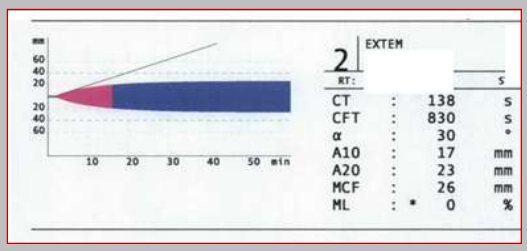
TREATING COAGULOPATHY

MTP

BETTER?

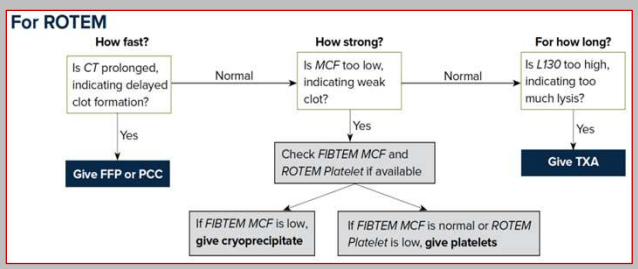
27

TREATING COAGULOPATHY



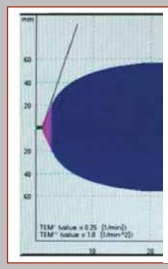
28

TREATING COAGULOPATHY



29

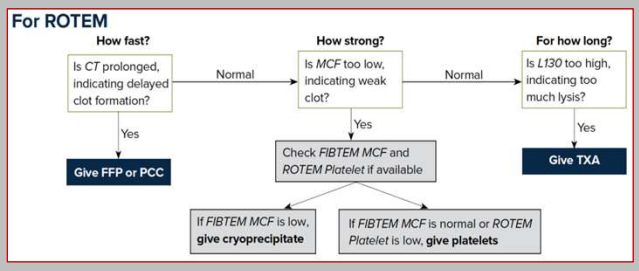
TREATING COAGULOPATHY



EXTEM	2020-08-24 10:52		
CT	76	s	38-79
CFT	96	s	34-159
α	76	°	63-83
A5	39	mm	34-55
A10	50	mm	43-65
MCF	56	Mm	50-72
ML	100	%	<15
LI30	5	%	94-100

30

TREATING COAGULOPATHY



31

TREATING COAGULOPATHY

CLINCIAL RANDOMISATION OF AN ANTIFIBRINOLYTIC IN SIGNIFICANT HAEMORRHAGE-2

The CRASH-2 trial: a randomised controlled trial and economic evaluation of the effects of tranexamic acid on death, vascular occlusive events and transfusion requirement in bleeding trauma patients

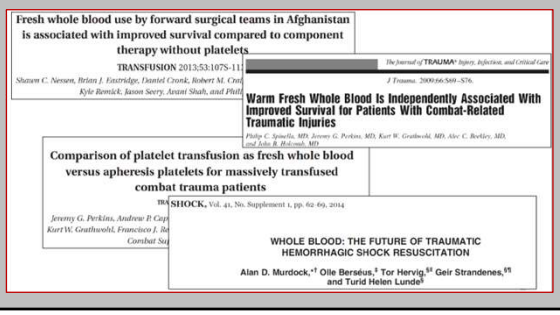
32

TREATING COAGULOPATHY

LOW-TITER GROUP O WHOLE BLOOD

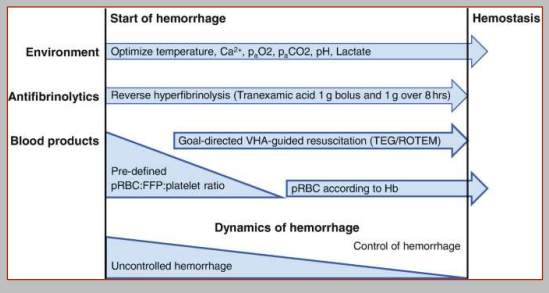
33

TREATING COAGULOPATHY



34

ANESTHESIA PARADIGM



35

REFERENCES

Bjerkvig C, Strandenes G, Eliassen H et al. "Blood failure" time to view blood as an organ: how oxygen debt contributes to blood failure and its implications for remote damage control resuscitation. *Transfusion*. 2016;56:S182-S189. doi:10.1111/trf.13500

White N, Ward K, Pati S, Strandenes G, Cap A. Hemorrhagic blood failure. *Journal of Trauma and Acute Care Surgery*. 2017;82(6S):S41-S49. doi:10.1097/ta.0000000000001436

36

QUESTIONS

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37