Resuscitation in Major Gastro-intestinal Bleeding

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How does GI bleeding present?

- Obvious
  - Haematemesis
  - Melaena
- Signs of compensated hypovolaemia
  - Tachycardia
  - Narrow pulse pressure
  - Cool peripheries
  - Prolonged capillary refill
  - Oliguria

How does GI bleeding present?

- Shock

  "a state of tissue hypoxia due to inadequate perfusion leading to organ failure"

- Signs of shock
  - Agitation/confusion
  - Hypotension
  - Oligo-anuric renal failure
  - Lactic acidosis
  - Tachypnoea
  - ARDS
  - Multi-organ failure

Principles of Resuscitation

1. ABC approach
2. Stop the bleeding
3. Maintain adequate circulating volume
4. Maintain adequate haemoglobin level
5. Minimise risk of further bleeding

In practice these things will often happen in parallel

Patients presenting with major upper GI bleeding

Data from Villanova *et al*

- Peptic ulcer 50%
  - 1/3rd gastric ulcer
  - 2/3rds duodenal ulcer
- Oesophago-gastric varices 25%
- Other 25%
  - Erosive oesophagitis/gastritis
  - Mallory-Weiss tears
  - Neoplasms

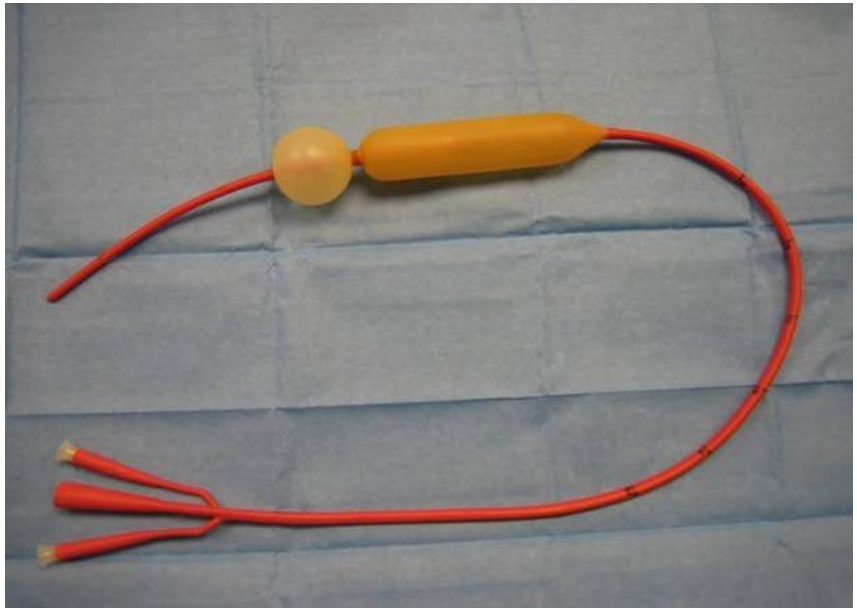
Identifying the source

- Endoscopy
  - Likely to need GA and airway protection if compromised
- Radiology
  - Contrast CT
  - Angiography

Stopping the bleeding

- Endoscopic treatment
- Radiological treatment
- Laparotomy

(Sengstaken-Blakemore tube)

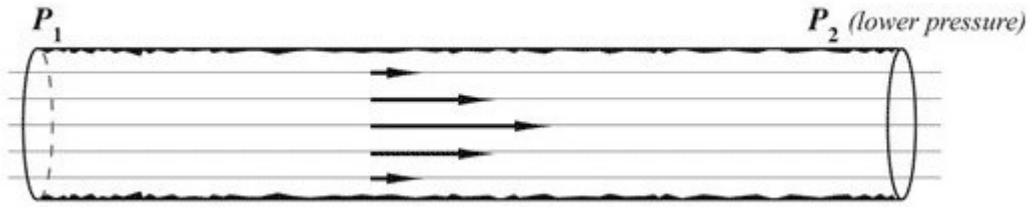


Maintain circulating volume

- **Adequate venous access**
- **Hagen-Poiseuille equation**

$$Flow = \frac{\pi}{8\eta l} \Delta P . r^4$$

ΔP = pressure gradient
r = radius of tube
η = viscosity
l = *length of tube*

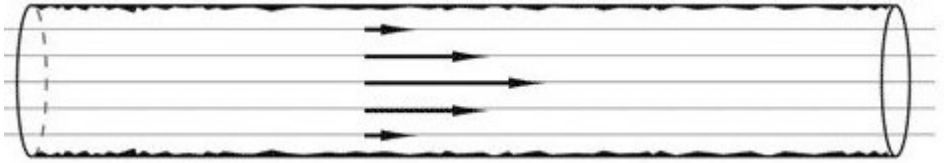


Maintain circulating volume

For a given pressure gradient:

If halve length of a tube – flow is doubled

If double the radius of a tube – flow increases by 16x



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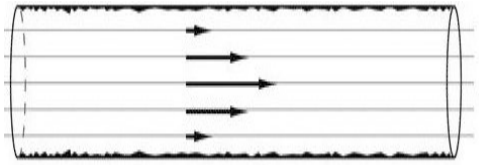

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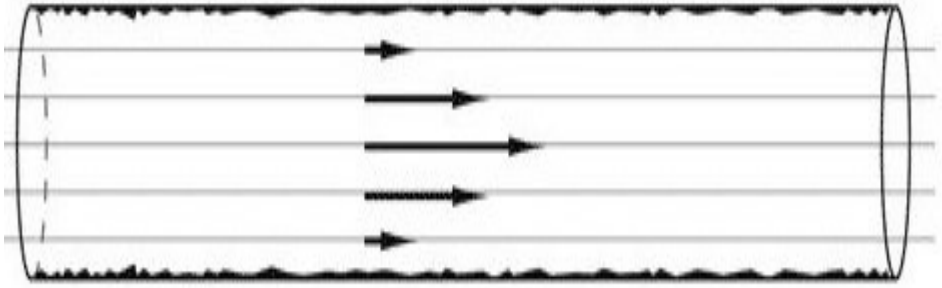

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Adequate venous access

Cannula size	Colour	Time to infuse 1000ml Normal saline under ideal circumstances
22 G	Blue	22 min
20 G	Pink	15 min
18 G	Green	10 min
16 G	Grey	6 min
14 G	Orange	3.5 min

i.e. For venous access in this situation – “short and fat” is best

Other ways to improve flow

- Increase pressure gradient
  - Raise bag
  - Squeeze bag
  - Use level 1 or rapid infusor system

Fluid resuscitation

- Crystalloid
  - Normal saline
  - Balanced crystalloid eg Hartmann's
- Colloid
  - Starch or gelatin
  - Saline or balanced
- Blood and blood products

Fluid resuscitation - crystalloids

- Need to replace lost blood with three times volume of crystalloid to maintain euvolaemia

Yunos et al JAMA Oct 2012

Chloride restrictive (Hartmann's) vs chloride liberal (Saline) intravenous fluid strategy in critically ill adults

Approximate halving of renal injury and need for renal replacement therapy in chloride restricted group

Fluid resuscitation - colloids

- Colloids theoretically preferred because stay in circulation for longer.
- Concerns
  - Lack of good evidence of benefit
  - Effect of osmotically active particles on kidneys, clotting, other organs
  - Risk of anaphylaxis
  - Cost

Fluid resuscitation - colloids

CHEST study

- 7000 ICU patients
- Colloid (starch in saline) vs crystalloid (saline)
- Mortality
  - 17% (crystalloid) vs 18% (colloid) (NS)
- Greater need for renal replacement therapy in colloid group
- More adverse events in colloid group

Blood and blood products

In acute hypovolaemia due to bleeding Hb will be preserved until fluid resuscitation with crystalloid/colloid leads to dilution

Blood – when and how much?

Villanova study

NEJM Jan 2013

921 patients with severe acute upper GI bleeding

Results

	Restrictive (transfuse when Hb < 70g/l)	Liberal (transfuse when Hb <90g/l)
No blood given	51%	14%
Died	5%	9%
Re-bleed	10%	16%
Adverse events	40%	48%

Blood – when and how much?

We can allow Hb to run at a lower level

BUT

Villanova study excluded massive haemorrhage

In these patients use clinical judgement
If blood is pouring out it will need to be replaced
Do not wait for Hb to hit 70g/l before transfusing

Minimise risk of further bleeding

- Close monitoring
  - Admit to critical care
- Endoscopic, radiological or surgical intervention
- Correct coagulopathy
  - Major haemorrhage packs are helpful
- Anti fibrinolytics
  - Tranexamic acid

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

*CRASH-2 trial collaborators**

Summary

Background Tranexamic acid can reduce bleeding in patients undergoing elective surgery. We assessed the effects of early administration of a short course of tranexamic acid on death, vascular occlusive events, and the receipt of blood transfusion in trauma patients.

Methods This randomised controlled trial was undertaken in 274 hospitals in 40 countries. 20 211 adult trauma patients with, or at risk of, significant bleeding were randomly assigned within 8 h of injury to either tranexamic acid (loading dose 1 g over 10 min then infusion of 1 g over 8 h) or matching placebo. Randomisation was balanced by centre, with an allocation sequence based on a block size of eight, generated with a computer random number generator. Both participants and study staff (site investigators and trial coordinating centre staff) were masked to treatment allocation. The primary outcome was death in hospital within 4 weeks of injury, and was described with the following categories: bleeding, vascular occlusion (myocardial infarction, stroke and pulmonary embolism), multiorgan failure, head injury, and other. All analyses were by intention to treat. This study is registered as ISRCTN86750102, Clinicaltrials.gov NCT00375258, and South African Clinical Trial Register DOH-27-0607-1919.

Findings 10 096 patients were allocated to tranexamic acid and 10 115 to placebo, of whom 10 060 and 10 067, respectively, were analysed. All-cause mortality was significantly reduced with tranexamic acid (1463 [14·5%] tranexamic acid group *vs* 1613 [16·0%] placebo group; relative risk 0·91, 95% CI 0·85–0·97; p=0·0035). The risk of death due to bleeding was significantly reduced (489 [4·9%] *vs* 574 [5·7%]; relative risk 0·85, 95% CI 0·76–0·96; p=0·0077).

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Minimise risk of further bleeding

CRASH 2 study – Lancet June 2010

Tranexamic acid in trauma

- Over 20,000 patients in 274 centres
- Many centres in low and middle income countries
- Results
  - Significant reduction in all cause mortality: 14.5% vs 16.0%
  - Significant reduction in bleeding mortality: 4.9% vs 5.7%
  - No increase in vascular occlusive events

CRASH-2 Post Hoc Analysis

Time to treatment	Risk of death (OR)
<1 hr	0.68
1-3 hrs	0.79
>3 hrs	1.44

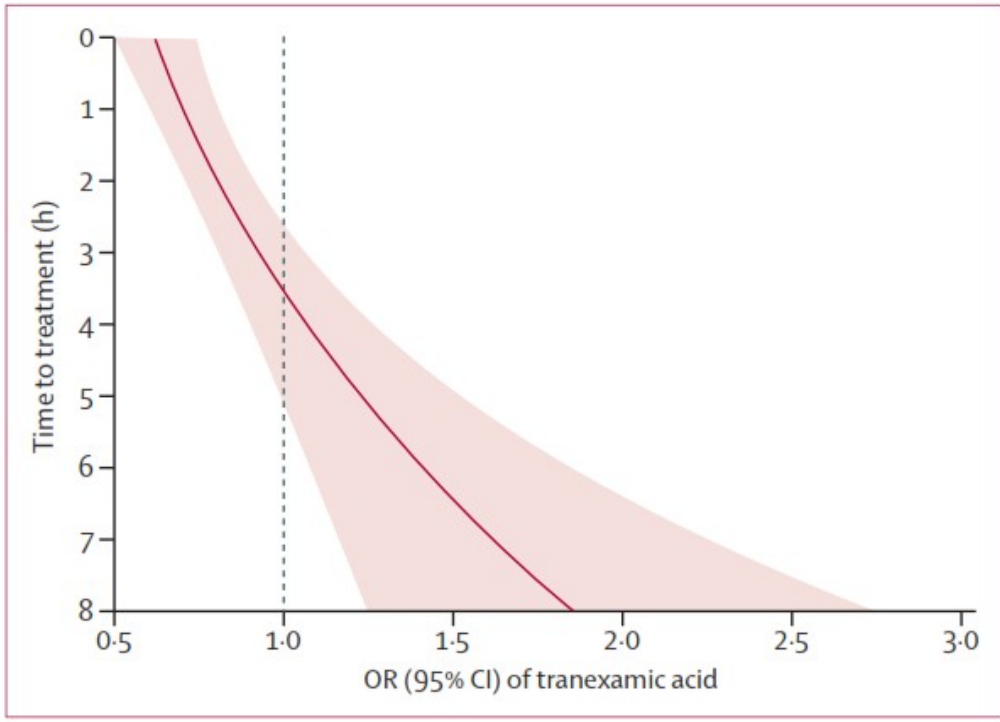

***Figure 2*: Effect of tranexamic acid on death due to bleeding by time to treatment**
Shaded area shows 95% CI. OR=odds ratio.

CRASH-2 Trial

Do the benefits seen in CRASH-2 translate to GI bleeding in UK?

- Different healthcare system
- Use of major haemorrhage packs
  - Liberal use of clotting factors
- Time of onset less clear cut in GI bleeding
- Inflammatory and fibrinolytic activation pathways may be different

? Potential for harm as well as benefit

Trials are on-going

Summary

- Don’t forget ABC
- Involve your friendly intensive care service
- Short and fat is good
- There is a lot of recent evidence to inform what we do

Thankyou