RUPTURED SPLEEN
SURGERY OR EMBOLISE?

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CHRISTCHURCH 2010
CAUSES OF SPLENIC INJURY

- BLUNT TRAUMA - mva
  - sports
- PENETRATING TRAUMA - gun, -knife, explosives
- SURGERY - gastrectomy, -colectomy, -pancreatectomy, laparoscopic upper GIT operations
- COLONOSCOPY
- DISEASES - glandular fever
  - malaria
  - portal hypertension
  - haematological abnormalities
motor vehicle crashes
rail crash
Snow sports
Sports injuries
Wallaby scrum practice
Victoria Splenic Injuries

- 2005-2007, 5 million people
- 318 splenic injuries, mostly young males, mva’s
- 186 conservative management
- 103 splenectomy
- 17 embolisation
- 12 splenorraphy

- Overall, 147 isolated splenic injury, 60% managed conservatively, 40% laparotomy

- Ref “Mikocka-Walus, et al., ANZJSurg March, 2010”
Conservative management

- Very successful in children, less in adults
- Majority can be observed
- Low grade injuries, 90% success with conservative observation
- High grade injuries, 70% fail
- Over 55 years higher failure
- More than 1 unit blood higher failure
- Vascular injury- CT blush - 80% failure
- Tranexamic Acid (CRASH-2 study)
SPLENORRAPHY

- Diathermy (max spray)
- Argon beam (in endoscopy)
- Packing
- Vessel ligation
- ?? Staplers
- Clotting agents
- Patience!
Useful clotting agents

- Oxidised regenerated cellulose  eg Surgicel
- Microfibrillar Collagen  eg Avitene
- Fibrin Glue  eg Tisseel

- Gelatin Sponges  eg Spongistan

- Floseal  (gelatin + thrombin )
Splenic artery embolisation

- Many elective uses since 1970’s
- Trauma use since 1980’s (Sclafani)
- AML preop
- ITP
- Before splenectomy
- Splenic artery aneurysm
- Thrombocytopenia
- Gastric variceal bleeding
- Portal hypertension with hypersplenism
- Portal-systemic encephalopathy
- Spontaneous rupture (viral)
Splenic embolisation

- SAE     Splenic Artery Embolisation
- PSAE    Proximal splenic artery embolisation
- SSDE    Superselective embolisation

- Coils
- Gelfoam
- Superglue (cyanoacrylate)
- microspheres
Patient selection for SAE

- Blunt injury or spontaneous bleed
- No other abdominal injuries
- Failed “conservative management”
- Active bleeding seen on CT
- Active bleeding on angiogram
- ? Higher grade injuries (IV, V) even if no active bleeding
- Haemoperitoneum

- Dropping Hb
- Tachycardia
- Pseudoaneurysms
- Other injuries making abdominal surgery unwise (head injury, multisystem injuries)
Case 1
the spotlighter

- Male, 36
- “spotlighting”
- Fell 4m
- RUQ tenderness and shock
Peritoneal blood, grade III splenic injury, active bleeding lower pole
Active bleeding
Splenic artery anatomy PSAE
Selective embolisation
Case 2
the boy racer

- Male
- Hooning car lost control and hit power pole side on
  rear passenger died pelvic #, femur #
- Front seat passenger isolated grade 4 splenic injury, bleeding
  seen
Car vs pole
Seurat spleen
embolisation complications

- Ongoing bleeding 3-27%
- Missed other injuries
- Splenic infarct
- Pancreatitis
- Abcess
- Pleural effusion
- Fever 50%
- Splenic atrophy
- Splenic cyst
- Femoral pseudo-aneurysms, av fistulas, from catheter
- Renal impairment from contrast
Splenic gas

- Gas seen on CT in 13 %, may be abcess, not always
- More common to see gas if use gelfoam
- Can get free gas if capsule not intact
- Air –fluid level suggests abcess
Splenic abcess

- Seen in 1-7% of post embolised spleens
- Air–fluid level
- Aspirate if not sure
- Drain
- May need splenectomy
Splenic infarction

- Common
- Proximal embolisation – 60 %, small, multiple, peripheral
- Selective embolisation - 100%, larger, single, near site

large ones cause fever
Acute pancreatitis after coiling
2 months after SAE
Splenic function

- Nakae (J Trauma 2009) immune function after splenic preservation (SAE, partial splenectomy, splenorrhaphy)
  - no discernable advantage over splenectomy in measured immune indices!

Tominaga (J Trauma 2009) immune function (SAE cf splenectomy)
  - CD8 level difference? Significance

still uncertain of immunological benefits of embolisation
Success?

- Rebleeding rate - not easy to find data, reported 3-27% probably low

- Complication rate – varies, up to 30 %, less than surgery

- Avoid risk of OPSI – probably
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Original Articles

Splenic Artery Embolization: Have We Gone Too Far?

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Abstract

Background: Splenic artery angioembolization (EMBO) has been promoted to increase the success rate of nonoperative management of splenic injuries. Our institutional clinical pathway calls for EMBO in the setting of ongoing splenic bleeding or contrast
The future??

- Embolisation should be considered more often
- Large centre trials on role in higher grade injuries
- Immune function studies
- Don’t forget prevention- road trauma strategies
SPLEEN INJURY SCALE

- I  Subcapsular, < 10 % area
  Capsular < 1 cm depth
- II Subcapsular, 10 – 50 %
  Intraparenchymal, < 5 cm
  Capsular tear, 1-3 cm depth, no trabecular vessel involved
- III Subcapsular, > 50 % surface area
  Ruptured subcapsular or parenchymal haematoma
  Haematoma > 5 cm
  Parenchymal tear > 3 cm depth or involves trabecular vessels
- IV Major laceration, segmental or hilar vessels, > 25 % devascularisation
- V Completely shattered spleen, hilar vessel injury, devascularisation
Splenic aneurysms
Traumatic aneurysms
OPS

- Children risk is 4.4%, 2.2% mortality (50%)
- Adults risk is 0.9%, 0.8% mortality (80%)

- Less for trauma

- Deaths due to;
  - Pneumococci 59%
  - E. coli 5%
  - Neisseria meningitidis 4%
  - Pseudomonas 3.6%
  - Haemophilus, Streptococci, Staphylococci, etc
VACCINATION

- PNEUMOVAC, HAEMOPHILUS B, MENINGOCOCCAL
- 2 weeks after traumatic splenectomy
- Check pneumococcal, haemophilus titres before & 2 weeks
- Revaccinate meningococcus 3-5 yrs, pneumococcus 5 yrs
- INFLUENZA vaccine yearly

- Amoxil 250 mg or phenoxyethylpenicillin 250 mg bd 2yrs
- Roxithromycin 150 mg daily, or erythromycin 250 mg if allergic
- Amoxil 3 g, or Erythromycin 2g stat if unwell
- Prophylaxis for malaria, dog bites
- Daily aspirin if high platelets, or dvt/pe risk
OXIDISED REGENERATED CELLULOSE

- ie treated COTTON
- Oxidation converts the hydroxyl groups into carboxylic acid, allows denaturation of blood proteins, initiates haemostasis
- Dissolved cotton extruded and woven

- Surgicel original
- Surgicel Nu-Knit
- Surgicel fibrillar
- Oxycel
- Interceed
MICROFIBRILLAR COLLOGEN

- Microfibrillar collagen agents
- Bovine collagen processed and purified into water insoluble acid salts that initiate platelet activation
- Can be particles, sheets and sponges
- Instat
- Helistat
- Avitene
- Superstat
- Actifoam
- Helitene
- Hemopad
- Novacol
FIBRIN GLUE

- Thrombin and fibrinogen mixed
- Were bovine, mainly human, some recombinant thrombin

- Tisseel ( + aprotinin-synthetic inhibitor of fibrinolysis)

- Evicel
TISSEEL
GELATIN SPONGES

- Purified pork or bovine skin
- Activates intrinsic coagulation pathway
- Absorbs 45 X its weight

- Gelfoam  powder ,sponge,
- Surgifoam
- **Spongistan**
- Surgiflo
- CoStasis
- Vitagel
- **Floseal**  gelatin + thrombin
Ruptured subcapsular haematoma
Coagulation