“Beyond gastrointestinal bleeding – Tips and tricks for emergency coil embolisation in various locations”

Prof. Dr. med. Boris Radeleff
Sana Klinikum Hof GmbH
Disclosure

Speaker name: Boris Radeleff

I have the following potential conflicts of interest to report:

- Consulting: BSCI, Cook
- Employment in industry
- Stockholder of a healthcare company
- Owner of a healthcare company
- Other(s)

I do not have any potential conflict of interest
Goal of the embolisation due of a bleeding is to induce a thrombosis to occlude a bloodvessel by decrease of a blood-flow and thrombosis.

The choice of the embolic agent depends on bleeding localisation, severity and coagulation function.
Embolication Technique

P. Landwehr et al. Radiologe 2008

**Choice of the embolisation agent:**

- **Effect of embolisation:** permanent vs. temporarily
- **Status of coagulation:** plus glue/Lipiodol
- **Depth of embolisation:** arterioles, pre-capillary, venous
- **Indications:** curative, palliative, pre-operative, EM
- **Alternatives:** stentgraft, balloon-occlusion → OP?

**Individual experiences of the IR with the embolisation agents**
Metallic Coils

Occlusion: medium to small arteries (Micro/Makro, Nester)

Advantages: available, easy to handle, safe (detectable)

Disadvantages: expensive, need working coagulation

Effect: permanent

Varias: 0.018“/0.035-0.038“

Multiples types, fibered? (Polyester, Dacron)
## Metallic Microcoils

<table>
<thead>
<tr>
<th>Microcoil Type</th>
<th>Specification</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VortX™-18 Diamond Shaped Fibered Platinum Coil</strong></td>
<td>4 mm/3.7 mm</td>
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<td>M0013822031 M0013822041 M0013822051 M0013822061</td>
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<td><strong>Multi-Loop-18 Fibered Platinum Coil</strong></td>
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<td><strong>Figure 8-18 Fibered Platinum Coil</strong></td>
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<td><strong>Complex Helical-18 Fibered Platinum Coil</strong></td>
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<tr>
<td>M0013120221 M0013120331 M0013120441 M0013120551</td>
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</tbody>
</table>
Microcoils: Pushable Coils

Courtesy: Terumo
Microcoils: Pushable Coils

1. „Jet-technique“ with 1 ml syringes

2. Coil pusher

Courtesy: Boston Scientific
Why Detechable Coils?

Very important: release technique

Courtesy: Boston Scientific
Instant Detachment System

Detach coil using Instant Detacher

Concerto™ Detachable Coil; Quelle: Covidien/ev3
Instant Detachment System

Detach coil using Instant Detacher

Concerto™ Detachable Coil; Quelle: Covidien/ev3
Electrolytic Detachment

Source: Terumo
Goal: dense packing of the coils $\Rightarrow$ lower recanalisation rate (risk of rebleeding)

Large vessel: start with larger coils, „anchor-method“, detachable coils or device (Amplatzer Plug)

Alternative: „Scaffolding technique“

Source: Cook
Basic Embolisation Technique

1. Frontdoor only

2. Frontdoor & Backdoor
Basic Embolisation Technique

1. Frontdoor only

2. Frontdoor & Backdoor
Case: Haematoma of the abdominal wall

70 year male patient: patient after large abdominal-OP. / daily injection of unfractionated heparin (UFH) into the abdominal wall

Clinical background:
HB-drop, increase of abdominal girth

Question:
Bleeding? ➔ emergency CT
a-b. Active arterial bleeding in the m. rectus abdominis re.
c. 3D curved MPR shows the feeding artery coming from the AIE (weiße Pfeile)
d. haematoma in the m. rectus abdominis re. and pelvic region
Case: Haematoma of the abdominal wall

Question: which vessel is bleeding?

1. A. circumflexa ilium profunda
2. A. epigastrica inferior
3. A. hypogastrica inferior
4. A. thoracica interna
Anatomy A. epigastrica

Black arrowhead:
to cranial and lateral rising: the A. circumflexa ilium profunda

White arrowhead:
to cranial and medial rising: the A. epigastrica inferior.
Case: Haematoma of the abdominal wall

**Question:** is the emergency embolisation of the A. epigastrica inferior a good indication?

1. Yes (I will do that)
2. Yes (but I won‘t do that, because never down before)
3. No, bad indication
4. Operative solution is the right choice
- puncture **contralateral** groin & sheath
- 4F Uniflush/Cobra-catheter and 0.035 Terumo for going crossover
- 4F-Berenstein-catheter and 2,4F microcatheter
- recanalisation of the right Arteria epigastrica inferior
DSA in 25° RAO for identification of the bleeding branch rising of the right arteria epigastrica inferior. Recanalisation and placement of the mikrocatheters distal of the bleeding.
- Application of 7 x microcoils (1x 2/5 and 6 x 4/4) till total occlusion distal and proximal of the bleeding (backdoor/frontdoor occlusion)
- DSA using the 4F Berenstein-catheter: no bleeding anymore
A 61 year old female patient: patient after abdominal-OP (gastrectomy, oesophageal-jejunostomy, sigma-resection, peritonectomy, HIPEC, severe complications post-operative)

Clinical background: PSA of the 8. intercostal artery (due prior thoracical drainage)

Question: Bleeding? ➔ emergency-CT
Case: Haematoma of the abdominal wall II
Case: Haematoma of the abdominal wall II
Case: Haematoma of the abdominal wall II
Case: Haematoma of the abdominal wall II
Case: Haematoma of the abdominal wall II

**Question:** no stability at all, now spasm!, only very low limited blood flow now... What to do?

1. Quit (and thoracatomy)
2. Embolisation from central (prox. intercostalart.)
3. Go ahead trying (break the spasm)
4. Try the embolisation via collaterals
Case: Haematoma of the abdominal wall II
Case: Haematoma of the abdominal wall II

3 x 2/5 pushable Microcoils
0.1 ml 1:5 Histoacryl/Lipiodol
Case: Haemoptysis - BAE

Question: how is the definition for a severe haemoptysis (in ml) for the indication of a BAE?

1. 200–250 ml/24 h
2. >250 ml/24 h
3. >100 ml/24 h over several days/wks
4. <100 ml/24 h over much longer time intervals
Definition of a severe haemoptysis is:

1. 200–250 ml/24 h
2. >250 ml/24 h
3. >100 ml/24 h over several days/wks
4. <100 ml/24 h over much longer time intervals
Case: Haemoptysis - BAE

Individual indications depending on:

• Rate of occurrence & severity of the haemoptysis

• Clinical condition of the patient

• Localisation & number of bleeding spots / disease

• Is the patient a good candidate for surgical resection?

• Trias out of haemoptysis, bronchoscopy & CT

Contra: aspergilloma, thoraxtraumata, bleeding pulmonalartery
In the angio: look for the tracheal bifurcation (red arrow) and search here for the bronchial arteries
Where are the bronchial arteries??

Fig. 1 Four main types of bronchial artery anatomy. Type I: one right bronchial artery from right intercostobronchial trunk (ICBT), two left bronchial arteries (40.6%). Type II: one on the right from ICBT, one on the left (21.3%). Type III: two on the right (one from ICBT and one bronchial artery), two on the left (20.6%). Type IV: two on the right (one from ICBT and one bronchial artery), one on the left (9.7%). Adapted from Ref. 51.
Is this a bronchial artery?
Is this a bronchial artery?
What should we embolise?

What is a pathological bronchial artery ➔ depiction of an active arterial bleeding is very rare!

- Dilated, multilobulated, ectatic vessels
- Microaneurysmata (>2 mm)
- Parenchym-“Blushs“
- Abnormal shunts
Bronchialartery of Hell
Bronchial artery of Hell: Re-Angio after 3 days
Bronchialartery of Hell

**Question:** the bronchial artery is dissected— we are in the wrong lumen ...

What do to now?

1. Quit and conservative management
2. Lung resection of the left upper lobe
3. Central embolisation with glue/lipiodol
4. Expansive coiling of the wrong lumen
Bronchial artery of Hell: Re-Angio after 3 days
BAE Results I

Technical results: 77- 100%

Immediate clinical success: 62,5%-100%
(defined as no re-bleeding in the first 24 hrs after BAE)

Midterm clinical success in next months: 77- 98%
- 94% Swanson et al 2003
- 98% Crimaschi et al 1999
- 91% Rabkin et al 2001
- 77% Mal et al 2005

Kim et al Radiology 2996;11:776
Eurvilaichit et al Med Assoc Thai 2000
Ong et al. Intensive Care Med 2003
Barben J. et al. Radiology 2002
**BAE Results II**

**Re-bleeding:** 10-52%

- Incomplete embolisation (not the correct feeder artery!)
- Bleeding from a pulmonal artery
- Recanalisation of the embolised vessel(s)
- Development of new collaterals
- Progression of the underlying disease

Hayakawa et al. CVIR 1992
Every May ...
Traumatic pelvic fractures

Life-threatening: unstable fracture of the pelvis & haemodynamic instability

Massive pelvic bleeding (5 - 20%)

Blood loss  Shock-related complications  (ARDS, MOF‘s)

Mortality: 18 – 40%

1 Miller PR J Trauma 2003;54:437-443
3 Smith W J Othop Trauma 2007;21:31-37
4 Starr AJ J Orthop Trauma 2002;1:553-561
Traumatic pelvic fractures

Life-threatening: unstable fracture of the pelvis & haemodynamic instability

Massive pelvic bleeding (5 - 20%)

Early hemostasis, because „bleeding to death“ is the most important treatable cause of death

Hemodynamically unstable pelvic fractures. Injury. 2009
No correlation between arterial bleeding and fracture-morphology and/or -classification $^{1,2}$

Fractures of the posterior column, ISG, sacrum: associated with arterial bleedings $^{3,4,5}$

1. Sarin EL J Trauma 2005;58:973-977
5. Young J AJR 1990;155:1169-1175
Instable pelvic fractures &
Haemodynamic instable patients &
Arterial bleeding in the MDCT &

..., but treatment of venous bleedings (more common) first

In case of persistent haemodynamic instability, arterial embolisation

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1 Fu CY Am J Em Med 2013 Oct;31(10):1432-6
2 Westhoff J Unfallchirurg 2008;111:821-828
3 Constantini W Am J Surg 2010;200:752-758
4 Tötterman A Acta Othop 2006;77:462-468
5 Slater S Eur J Radiol 2010;74:16-23
Case 1: car accident, 24 years, male

- instable pelvic ring fracture & transverse process of the right 5th lumbar vertebrae
- haematoma around the symphysis & testes / penis base, perivesical, periprostatic
Case 1: car accident, 24 years, male

- Bleeding branches from the A. pudenda interna; superselective recanalisation
Case 1: car accident, 24 years, male

- Embolisation: 9 x pushable microcoils // Cave: A. dorsalis penis was preserved

5 x 2/10 and 4 x 4/4 Complex Helical-18
Case 2: traffic accident 84 years, female

- instable pelvic ring fracture bilateral! Additional bladder rupture
- Left pubis: active arterial bleeding
Case 2: traffic accident 84 years, female

- active arterial bleeding little side branch left AII
- No stasis after coiling ➔ glue bolus

2 x 2/10 & 2 x 4/4 Microcoils / 0,2 ml Histoacryl/Lipiodol 1:1
Böses Büsi
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