

SHORT ABSTRACT

When Do I Call the Interventional Radiologist? Role in the Management of Hemorrhage

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The simple answer to this question is: always.

There should be a very low threshold to involve and the interventional radiologist in any kind of suspected bleeding, though only the following types of bleeding are suited for treatment by interventional radiology (IR):

- Arterial bleeding, as most embolization procedures are performed from an arterial approach. Venous bleeding can only in rare instances be treated by IR. It is therefore very important to differentiate arterial from venous bleeding when the clinical picture fails to do so. Computed tomography angiography (CTA) is extremely useful for demonstrating the presence of arterial bleeding.
- Localized or focal bleeding where closing one or a few vessels will stop it. Indeed, diffuse or multifocal bleeding is much more difficult to treat, as many vessels or a whole vascular territory have to be treated, making the procedure more difficult and increasing the chance for complications. In addition to this, diffuse bleeding is more difficult to show on imaging.
- The bleeding rate has to be high enough to be detectable on CT and/or angiography; this is usually the case when there are clinical signs of bleeding such as a decrease in blood pressure or increase in heart rate. It has often been stated that a transfusion requirement of at least three units of packed red blood cells per 24 hours enter this clinical criteria. However, this is of little practical value, since bleeding is often intermittent and cannot be accurately predicted from clinical parameters. A bleeding rate of 0.5–1.5 ml/min is likely in most cases to be visualized by CTA and angiography. A different situation exists when an underlying vascular abnormality is shown on imaging, e.g. a false aneurysm. In such cases treatment can be performed without actually showing ongoing bleeding.
- Bleeding in the presence of a normal or sufficient coagulation status, as the effect of embolotherapy depends to some extent on the coagulation proper-

ties of the patient. IR works less well in patients who have abnormal clotting, e.g. as a result of coagulant use, loss of coagulation factors, or hypothermia.

The most common and validated indications for IR treatment in the management of hemorrhage are:

- Traumatic bleeding of liver, spleen, kidneys, pelvis, and less frequently head and neck, chest, and extremities (success rate 70–90%).
- Post-partum hemorrhage in patients with uterine atonia (success rate > 90%).
- Gastro-intestinal (GI) hemorrhage. The most common causes are bleeding ulcers in the upper-GI tract (success rate 60–80%, re-bleeds 5–30% success rate) and diverticular bleeding in the lower-GI tract (success rate 70–90%, re-bleeds 5–30%).
- Hemoptysis, which is usually from the bronchial arteries and most often occurs in patients with chronic bronchial disease, e.g. cystic fibrosis (success rate > 70%, re-bleeds > 30%).
- Bleeding from liver, bile ducts, and pancreas, e.g. in necrotizing pancreatitis or post-surgery (success rate 70–90%, re-bleeds 5–30%).
- For arterial bleed anywhere in the body, IR treatment should at least be considered.

The role of CTA:

- CTA has established itself as a standard diagnostic procedure before IR treatment of hemorrhage.
- The so-called “contrast-blush” corresponds to the active bleeding on angiography.
- Other findings on CTA useful for planning IR treatment include false aneurysms, “cut-off” vessels, and hematoma with its location, size, and density (“sentinel clot”).
- The sensitivity of CTA and angiography for detecting active bleeding are roughly equal. Therefore, CTA can be used to triage patients for IR treatment.
- CTA provides a vascular roadmap, which makes angiographic treatment easier and more efficient by showing the exact anatomy (including anatomic variations), thus saving time and contrast.

Principles of embolization:

- Embolization can be performed from the groin (common femoral artery) in almost all cases.
- Appropriate infrastructure is required with 24/7 availability of an interventional team and availability of all embolization materials. The angiography suite should be equipped to allow the management of hemodynamically unstable patients.
- Embolization is preferably performed on the basis of CTA findings, so the location of the bleeding is

known beforehand.

- The most commonly used embolization materials are standard 4/5 Fr. angiography catheters, co-axial micro-catheter systems, coils, particles, and gelfoam. Glue is used less frequently.
- The way embolization is performed, including the degree of selectivity, is dictated by time pressure and the clinical (hemodynamic) status of the patient.

Competing Interests

The author has no competing interests to declare.

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