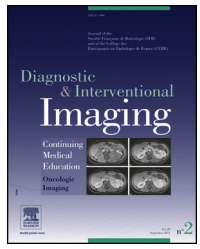
Diagnostic and Interventional Imaging (2015) **96**, 833—840



CONTINUING EDUCATION PROGRAM: FOCUS...

Post-procedure bleeding in interventional radiology

J. Mayer*, V. Tacher, L. Novelli, M. Djabbari, K. You, M. Chiaradia, J.-F. Deux, H. Kobeiter

Department of radiology, CHU Henri-Mondor, 51, avenue du Maréchal-de-Lattre-de-Tassigny, 94010 Créteil, France

KEYWORDS
Pseudoaneurysms;
Bleeding risk factors;
Interventional radiology

Abstract Following interventional radiology procedures, bleeding can occur in 0.5 to 4% of the cases. Risk factors are related to the patient, to the procedure, and to the end organ. Bleeding is treated usually by interventional radiologists and consists mainly of embolization. Bleeding complications are preventable: before the procedure by checking hemostasis, during the procedure by ensuring the accurate puncture site (with ultrasound or fluoroscopy guidance) or by treating the puncture path using gelatin sponge, curaspon®, biological glue or thermocoagulation, and after the procedure by carefully monitoring the patients.

With the development of interventional radiology in the field of oncology, bleeding complications have been observed. The incidence of vascular complications is between 0.5 and 4%, regardless whether the access is percutaneous or intravascular [1—3].

It is therefore important to know what the risk factors of post-interventional radiology bleeding are, where the bleeding sites are depending on the procedures, how to treat the bleeding and how to prevent it.

The goal of this review was threefold. First, we wished to analyze the different risk factors related to the patient, to the procedure, the lesion and the end organ. Second, we wanted to report the different types of bleeding, based on the intravascular and percutaneous access, and how to treat them. Third, we aimed to discuss how the bleeding risk can be anticipated and thus minimized using biological tests, ultrasound-guided puncture and percutaneous closure devices.

* Corresponding author.
E-mail address: jolymay@hotmail.com (J. Mayer).

http://dx.doi.org/10.1016/j.diii.2015.06.009

Risk factors

Risk factors are listed in Table 1.

Patient-related risks

Some of the risk factors are observed with the arterial access route: patients over the age of 65 years, women, patients at risk for cardiovascular disease (atherosclerosis, obesity, diabetes, arterial hypertension) and chronic renal failure.

Other risk factors are observed with both percutaneous and intravascular access routes: blood coagulation disorders and the use of anticoagulant and antiplatelet agents.

Procedure-related risks

In case of arterial access, complex and long procedures are risk factors for complications. Additional risk factors are the number of punctures, an inappropriate puncture site as well as a size of sheath introducer larger than 6 French. For common femoral punctures, a puncture site too high (above the inguinal ligament, i.e. external iliac artery) increases the risk of retroperitoneal hematomas while a puncture site too low (superficial or even profunda femoral artery) increases the risk of pseudoaneurysms. We will look at the methods available to improve arterial punctures [1—3].

A retrospective study including 9861 coronary interventions carried out by the New York Presbyterian/Columbia University Medical Center reported the following significant risk factors: patient's age above 70 years, chronic renal failure, the size of the introducer sheath (French size above 6), manual compression of the puncture site rather than a percutaneous closure system and a long procedure (longer than 1 hour) [4]. We will further discuss the use of percutaneous closure devices below when we'll discuss how to reduce bleeding complications.

In case of percutaneous access, the size of the needle (higher than 18 gauge) and the number of punctures are risk factors [3].

Tumor- and end organ-related risks

Hypervascular tumors may be predictive of complications, although this is still debated. In case of subcapsular involvement, the risk of bleeding is increased. Kidney and a cirrhotic liver also are risk factors for bleeding. Finally, ascites is also a risk factor [3].

Different types of bleeding

Bleeding during a percutaneous puncture or radiofrequency ablation

At the end of a procedure, blood may flow through the coaxial during the removal of the biopsy or radiofrequency ablation needle. It is possible to dab the blood with the foam tip of a biopsy needle that can sometimes be found in the biopsy set, or to push gelita-spon® (biodegradable embolization material) into the coaxial. It is possible to cut small strips of gelita-spon® and to push them towards the site with a syringe of sterile water or with the needle used for the biopsy or the radiofrequency ablation. Some experts, instead, use biological glue that has the advantage to mark the lesion [3].

Finally, some experts recommend to thermocoagulate the needle track after a radiofrequency ablation, although whether this decreases the bleeding risk remains a matter of debate.

Bleeding during endovascular procedure (hepatic chemoembolization)

During an interventional radiology procedure in oncology, complications such as pseudoaneurysms or extravasation of contrast medium may be observed. It is possible to treat these complications (coil embolization or curaspon® gelatin sponge) (Fig. 1) and to continue the procedure depending on the hemodynamic state of the patient. Indeed, the arterial vessels of oncology patients may have become weaker by the different treatments (chemotherapy including Sorafenib) [5] and by repeated endovascular procedures [6].

Bleeding after biopsy or radiofrequency ablation

After a biopsy or a radiofrequency ablation, pain and even acute bleeding may be observed. An enhanced scan obtained at arterial and venous phases can detect a possible pseudoaneurysm or active bleeding, which will be treated by endovascular embolization. In case of a pseudoaneurysm, it is possible to treat it with coils (Fig. 2) and also to place coils, according to the ''sandwich'' technique, distal and proximal to the aneurysm neck, thereby avoiding re-bleeding [7].

Table 1 Bleeding risk factors during procedures in interventional radiology.

Patient-related	Procedure-related	Tumor- and organ-related
Over the age of 65	Complexity/duration of procedure	Hypervascular tumor (under debate)
Female	Number of punctures	Subcapsular location
Cardiovascular risk factors	Inaccurate site of puncture	Kidney
Chronic renal failure	Introducer size above 6F	Cirrhotic liver
Hemostasis disorders	Needle size above 18G	Ascites
Anticoagulant/antiplatelet treatment		