

Chapter 13

Some thoughts and remarks on endovascular and REBOA complications

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We mentioned in different parts of this manual that you should anticipate problems and complications. When using endovascular methods, you should always have in the back of your mind thrombosis, dissection and vessel perforation as well as access vessel bleeding. Whenever you puncture a vessel, you are performing an invasive manoeuvre and disrupting the normal anatomy. In many cases, the damage is minimal, and if you manage the access site well, it will heal. When you puncture and when you bail-out, make sure the vessel is functional – by palpation, US, Doppler, or any other means. Always check the distal status of your access vessel and have a **high level of suspicion**. If you have a feeling that there is no flow in the femoral artery (thrombosis or dissection), go with your gut feeling and do what must be done (open exploration). Until recently, REBOA has meant using big sheaths (12Fr usually). In bleeders, the vessels are empty and the vessel lumen has probably been occluded for some time. This is a great location for thrombus formation. So, after every REBOA, you should think about these issues and be pro-active. Thrombus formation has been reported (personal communication) even with the low-profile systems that are coming up now.

Tips:

- » You did a vessel puncture for access, didn't you? Think about complications like bleeding, thrombosis and dissection. Always keep strict control of your access site in the immediate postoperative period.
- » Do you feel that there is something wrong, and the flow in the femoral artery (or any other access) is not ok? Act, investigate and repair. These patients have no margin of error.



When you perform a hybrid or endovascular treatment, bear in mind target organ perfusion as well as potential vessel injury due to balloons, endo-grafts or any other products. Control angiography, if possible, is always a good option. Did you deploy a stent graft? Did you use ABO? Do a control angiography and see with your own eyes the flow in the vessel on the screen in front of you!

Another way to check your endovascular repair is CTA. This will give you information on the vessels, target organ perfusion, bleeding, hematoma formation, and other injuries. Yes, with CTA you will inject 100–150cc of highly concentrated contrast media that might cause more damage to the kidneys. It is a problem, but think about what you need to know now and avoid more severe problems like vessel occlusion, perforation or other injuries.

We mentioned before that REBOA may cause ischemia and reperfusion injuries. So, when you are done in surgery, the problems are not over yet. “It’s not over until it’s over”. Anticipate ACS, intestinal ischemia, leg ischemia, hypercalemia, acidosis etc. Intensive unit admission and a pro-active approach are



Figure 1



Figure 2



Figure 3

Figure 1: A trauma patient with severe atherosclerosis and stenosis of the iliac vessels. Any puncture and attempt at access in these patients may cause occlusion and increase the risk of ischemia.

Figure 2: Iliac thrombosis on the right side. Access may be challenging, and further steps should be taken to solve the problem.

Figure 3: Hematoma in the inguinal region after elective angiography. Needed open exploration to solve the problem.

highly recommended, at least for 24-48 hours. The majority of patients with a high injury score (ISS or other) will stay days in the ICU, but even if you have a patient with a fast-bleeding solution and fast recovery, let him or her stay in the ICU until you are sure that everything is under control. Strictly monitor the distal-extremities status, general status, all surgical wounds, intra-abdominal pressure, and access sites. Some of us perform control of the extremities hourly during the first 24 hours. Treating the patient with anticoagulation of different sorts might be beneficial but should be individualized.

Another issues in the puncture method for CFA access. Avoid high puncture and if you are not sure and the patient become hemodynamically unstable, act and exclude retroperitoneal bleeding.

We would recommend re-assessing your patient after any endo or hybrid procedure. At times, minimally invasive procedures may cause “invisible” problems. A high level of suspicion is needed as well as great clinical experience. Use all the tools you have and rely on your clinical judgment to confirm your results. Did you solve all the problems? Did you cause other problems? Did your REBOA cause intestinal ischemia? Is the SMA or iliac artery OK? Is the leg perfusion OK? Ischemia-reperfusion injury? You have just put great effort into stopping the bleeding. Make sure the patient is in the best postoperative place available, and make sure things are getting better. If you don't, you will get a call in one or two hours, or in the middle of the night, with the on-call doctor claiming (correctly) that the left leg is cold and there is no Doppler signal.

So, endo or hybrid procedures carry risks as well. Consider what to use and make sure you detect complications on time. Forget the words “it's ok”-

It's not over until it's over and the patients walk out of your hospital...

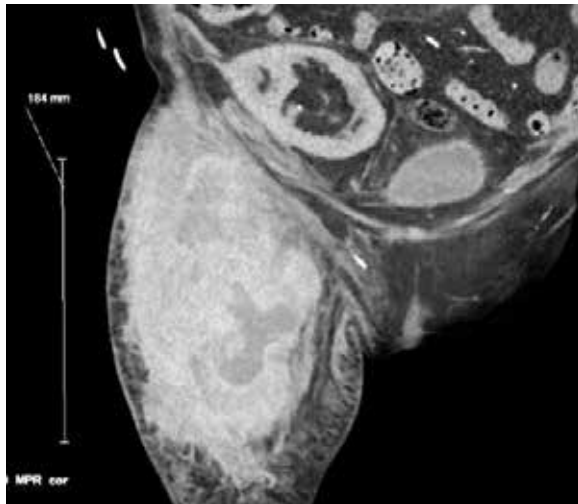


Figure 4: A huge hematoma 2-3 weeks after a simple endovascular heart procedure. Pseudo-aneurysm and rupture.



Figure 5: Removal of REBOA and sheath. Note thrombus on the balloon. Might cause some serious problems.