Interventional Angiography: An emerging sector closely related to several surgical specialties.

Interventional Angiography and Radiology is an emerging sector that is closely related to several surgical specialties. At the CHUS this sector benefits from an excellent institutional support, modern equipment, and a team whose expertise in vascular interventions is well recognized. In addition to interventions related to peripheral angioplasty, thrombolysis, oncological interventions, and drainages, the interventional angiography sector is actively involved in the treatment of acute pathologies such as traumas, haemorrhages, and aortic emergencies.

The CHUS distinguishes itself through its specialty in interventional angiography, one of its many emerging specialties. The sector is set up with state-of-the-art equipment. One of three rooms – the blue room – contains an angiography device coupled with a multidetector CT scan. This combination, unique in the province of Quebec, is used to guide complex interventions or rapidly take care of cases with trauma or aortic aneurysm rupture (which require a diagnostic CT scan followed by an endovascular intervention in the same room).

Multiple procedures are performed each day in both angiography rooms at the CHUS. Those procedures are minimally invasive, guided by fluoroscopy, and generally performed through percutaneous puncture while the patient is awoken, which avoid the need for major open surgery.

About 2,500 patients have angiography each year. One-third of the patients have lower limb angioplasty or, in some cases, visceral or carotid artery angioplasty. This volume of endovascular procedures is one of the most important among all Canadian health establishments. Angiography and vascular surgery specialists work together every day. Other activities related to angiography consist of various vascular or non-vascular procedures.
**Angiography procedures comprise:**

- Pancorporal diagnostic angiography - through catheter or non-invasive (angioCT or angioMRI with 3D reconstruction)
- Angioplasty / arterial and venous stenting
- Endovascular repair of:
  - Abdominal, thoracic aortic aneurysms (including fenestrated endoprostheses)
  - Dissections or aortic ruptures
- Thrombolysis / mechanical thrombectomy (arterial, venous, hemodialysis access)
- Transcatheter embolization of:
  - Intestinal or post-traumatic haemorrhages
  - Hemoptyosis or epistaxis
  - Uterine fibroma
  - Varicoceles
- Neurointerventions (embolization of cerebral aneurysms, CVA thrombolysis, etc)
- Chemoembolization of brain (with or without opening of the blood-brain barrier) or hepatic tumours
- Radiofrequency of hepatic tumours or others
- CVC, Port-o-cath, PICC
- Nephrotomies and double-J
- Drainage and biliary stenting
- TIPS and transjugular hepatic biopsy
- Inferior vena cava filters
- Percutaneous gastrostomies; oesophageal, duodenal, or colonic stenting
- Percutaneous vertebroplasty

**Clinical Case Examples:**

**Aneurysms**
The endovascular treatment of abdominal or thoracic aorta aneurysms has been performed at the CHUS since 1998 and excellent results were obtained. Those interventions are performed by a team of vascular surgery and angiography specialists whose large experience in this field is recognized throughout Canada. Patients eligible for this treatment have an endoprosthesis coated with an impervious membrane brought to the aneurysm where it is installed, which remove it from the blood circulation and reduce the risk for rupture. This treatment is performed through one or two little inguinal incisions, which avoid the need for major open abdominal or thoracic surgery.

Angiographies showing an aortic aneurysm (arrows) before and after (picture at right) the treatment by coated endoprosthesis.
**Brain aneurysms**

For some types of brain aneurysms, a microcatheter can be brought inside the lesion where microcoils are released into the aneurysm to thrombose it, avoiding intracranial surgery.

![Angiographies showing a brain aneurysm (yellow arrow) treated by microcoil embolization (red arrow). Picture at right shows the disappearance of the aneurysm.](image)

**Embolization**

In angiography, the intentional blocking of a vessel using a catheter is called embolization. This procedure is often performed to stop major traumatic, intestinal, or tumoral haemorrhages. Coils (metallic spirals) or particles can be injected through the catheter directly into the bleeding artery.

![Coils and Particles](image)

**Treatment of intestinal haemorrhage by embolization**

Patient with shock induced by an important duodenal haemorrhage is shown through angiography (black arrow). The artery was embolized by coils (red arrows), which stopped the bleeding.

**Trauma**

Important polytrauma with thoracoabdominal lacerations and hypotension due to a road traffic accident. The CT scan performed in the blue room shows two lacerations (pseudoaneurysms – yellow arrows, pictures A and B) of the thoracic aorta and an important splenic trauma with active extravasation (yellow arrows, picture C) at 12:20 pm.

![CT scans showing trauma injuries](image)
Follow-up after two years:
The control angioCT scan (with 3D images using Vitrea software) of the patient shows that both prostheses are set at the right place (yellow arrows) with no evidence of complication.

12:45 pm - 1:20 pm
The patient being hemodynamically unstable due to splenic bleeding, we quickly performed a spleen embolization (picture D).

1:30 pm - 2h55 pm
An endovascular repair of the aorta was performed afterwards in collaboration with the surgery team by installing coated endoprostheses through the two laceration zones.

The patient’s condition improved during the postoperative stage.

Research
Our team is actively involved in several research projects and sponsored studies. We are also interested in conducting innovative teaching and research activities in collaboration with the members of the Department of Surgery.

Conclusion
Interventional Angiography is an emerging sector at the CHUS that is closely related to several surgical specialties. This great collaboration facilitates and improves patient management in case of elective treatments or emergency situations.