

Angioinvasive Treatment Arterial Occlusion and Stenosis

Methods of interventional radiology

- PTA (percutaneous transluminal angioplasty);;
- stent placement;;
- stent-graft or graft-stent placement;
- local fibrinolysis

Percutaneous transluminal angioplasty (PTA) is an invasive therapeutic method that uses a special **catheter with a “balloon”** to enter into the lumen of a blood vessel behind the stenosis, which is subsequently **dilated** by expanding the balloon (mechanically). The dilation may be followed by **a stent implantation** or a stent-graft placement (stenting). The causes of vessel stenoses or occlusions include arteriosclerosis, fibromuscular dysplasia, conditions following repetitive microtraumas, etc.

PTA is used in extremity arteries, renal arteries (PTRA, percutaneous transluminal renal angioplasty), coronary arteries (PTCA, percutaneous transluminal coronary angioplasty), supra-aortic arteries, in venous stenoses and occlusions and in AV-shunts for dialysis.

Indications

A widespread indication for **PTA** is the treatment of short circular stenoses.

- **Extremity arteries** – PAD (Peripheral Arterial Disease) stages IIB – IV, improving blood flow before a scheduled bypass, bypass stenoses.
- **Supra-aortic arteries** – signs of upper limb and brain ischemia (carotid stenosis, vertebrobasilar insufficiency).
- **RVHT – renovascular hypertension** in patients with atherosclerosis or fibromuscular dysplasia
- **PTCA** – stable angina pectoris unresponsive to therapy, unstable angina pectoris, AIM, stenosis of aorto-coronary bypass.
- **Veins** – stenosis of an AV-shunt for dialysis, superior vena cava syndrome.

Contraindications

Absolute and relative **contraindications** need to be distinguished:

1. **absolute** – unstable patients, hemodynamically insignificant stenoses, bleeding diathesis;
2. **relative** – an exceedingly long stenosis.

Procedure

1. Coagulation tests (INR, APTT, platelet count).
2. Prior to the procedure, an antiaggregant drug is administered (acetylsalicyc acid, Anopyrin) as well as a calcium channel blocker (nifedipine in order to prevent vasospasm).
3. Prevention of an anaphylactic shock in case of allergies to contrast media (antihistamines, corticosteroids).
4. Vessel puncture (mostly femoral artery).
5. Heparinization.
6. Visualization of a specific segment of the arterial network, insertion of a guidewire into a stenosis site and placement of a catheter over the guidewire.
7. Balloon expansion, dilatation of a lesion (the balloon should be left inflated for 1–2 minutes).
8. Control angiography.
9. After the procedure of heparinization, i.e. two days, at least six months afterwards, antiaggregation (antiplatelet) therapy is administered (acetylsalicyc acid, Anopyrin®).

Complications

- General complications (related to the administration of contrast media) – an anaphylactic reaction, renal failure.
- Puncture site-related complications – hematoma, pseudoaneurysm, arteriovenous fistula.
- Complications in PTA site – dissection, spasm, peripheral embolism, a rare complication is represented by an artery rupture.

Stents

- Stent is a reinforcement of a tubular organ, which serves the purpose of maintaining translucency and passability of a narrowed or an occluded tubular structure.

Indications

- failed PTA (restenosis, dissection...);
- primary stent placement – cases of pelvic, coronary and renal artery occlusion and internal carotid artery occlusion with surgical intervention contraindications.

Contraindications

1. hypercoagulation conditions (an increased risk of stent thrombosis);
 2. an extreme winding of access vascular network or network in stent placement site.
- Stents can be divided into **self-expandable** and **balloon-expandable**.
 - After the procedure, heparin and antiaggregants are administered.
 - Complications – the same as in PTA, in addition, stent thrombosis is possible as well as its migration, intimal hyperplasia (stent stenosis). In comparison with PTA, stents involve a smaller risk of restenoses and in financial terms, they are comparable with bypasses (However, bypasses are better than stents in terms of longterm passability).

Stent-grafts

A **stent-graft** is an endovascular prothesis, a combination of a stent and a synthetic vascular prothesis, which is inserted endoluminally, unlike typical vascular protheses, which are implanted surgically.

Appearance

- **Grafted-stent** – consists of a stent surrounded by a plastic liner;
- **stented-graft** – stent reinforces only the ends of an endovascular

prothesis.

Indications

- aneurysms;
- pseudoaneurysms
- dissecting aneurysms;
- arterial and venous ruptures;
- AV fistula.

Local fibrinolysis

- Local fibrinolysis is indicated in relatively recent arterial and venous thromboses (including bypass occlusion, AV shunts for dialysis, angiography complications and PTA).
- Consists in application of fibrinolytic drugs into the location of thrombosis (streptokinase, urokinase, tPA)
- **Contraindications:**
 - hemorrhagic diathesis;
 - critical limb ischemia (it is impossible to wait several hours before fibrinolysis takes effect);
 - acute gastroduodenal ulcer;
 - post-surgery conditions, postpartum conditions, post-abortion conditions CMP, sepsis, malignant tumors.
- In case of AIM, fibrinolysis can be performed if the time period from the onset of symptoms does not exceed three hours.
- **Method of placement:**
 - A catheter with a final (continual thrombolysis) or a lateral (pulsatory thrombolysis) opening is inserted into a thrombus and firinolytics are administered. The treatment is complemented by repeated angiographies.
 - A thrombolysis is mostly followed by PTA or a stent placement, or alternatively endarterectomy (thrombosis of the occlusion) or a bypass.
- **Complications:**
 - Bleeding, peripheral embolisation of a dissolved thrombus, allergic reation to thrombolytics.

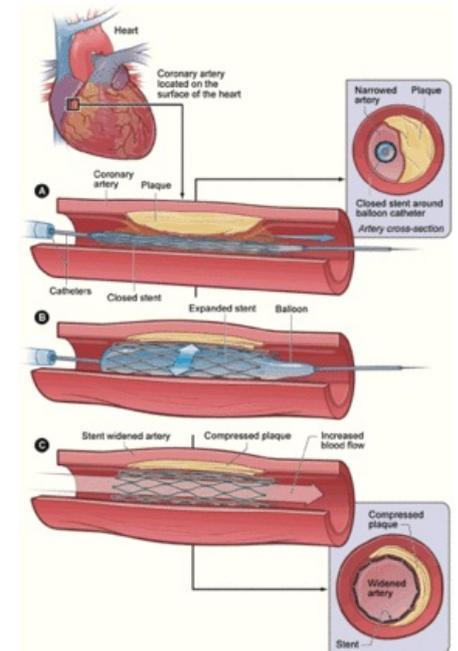
References

Related articles

- Acute arterial occlusion
- Ischemic heart disease
- Bypass

References

- ZEMAN, Miroslav, et al. *Special surgery*. 2nd edition. Prague: Galén, 2006. 575 pp. ISBN 80-7262-260-9 .



Principle of stent placement

▪

Source

- BENEŠ, Jiří. *Study materials* [online]. © 2007. [feeling. 14.5.2010]. <<http://jirben2.chytrak.cz/materialy/chira/cevni.doc>>

▪

External sources

Principle of stent placement na video: Coronary Angioplasty Stent Placement (<http://www.orlive.com/shawneemission/videos/coronary-angioplasty-stent-placement?view=displayPageNLM>)