RENAL ARTERY PTA

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PTRA/Stenting

• PTRA technical success rate > 90 %
• In some patients helps control hypertension
• In some patients can improve kidney function
• Serious complications rate < 3 %
PTRA – INDICATIONS (ATHEROSCLEROTIC)

• Difficult to control hypertension (3 drugs or more)

• Clinical success: 50 – 70 % (0 – 20 % cured)
ATHERO RAS  INCIDENCE

• Post mortem approx. 15 – 49 % in unselected individuals

• Hypertensive patients with PVD: RAS in 25 – 50 % (angiography)
ATHERO RAS PROGRESSION

• Stenoses > 60 % tend to occlude in 7 % in 3 years (Zierler, AJH, 1996)

• Stenoses > 75 % tend to occlude in 12 – 40 % (Sos, Circ., 1991)
ATHERO RAS PROGRESSION

- Stenosis > 60 %: estimated risk of >1 cm kidney length loss = 19 % / year
  (Strandness, Am. J. Kid. Dis., 1994)

- Stenosis 80 %: 53 % of them progression, 9 % occluded
  (Tollefson, J. Vasc. Surg., 1991)
ATHERO RAS PROGRESSION

  Pts undergoing cardiac catheterizations
  – progression in 11.1 % in 2.6 years

• Caps (Circ., 1998)
  Stenoses > 60 %: 49 % progression in 3 years
CONCLUSION (1)

• There is evidence of athero RAS progression

• Significantly stenosed RA is more prone to progression
CONCLUSION (2)

• The progression of stenosis to occlusion is relatively rare

• The tendency of athero RAS progression in an individual patient is unpredictable
CAUSES OF CLINICAL FAILURE

- Essential hypertension
- Vascular nephrosclerosis
- Parenchymal disease
- Restenosis / PTA failure
# PTRA vs. SURGERY

Weibull (J.Vasc.Surg., 1993)

Randomized study of 58 patients (no stents)

<table>
<thead>
<tr>
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<th>PTRA</th>
<th>surgery</th>
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<tbody>
<tr>
<td>Tech. success</td>
<td>83 %</td>
<td>97 %</td>
</tr>
<tr>
<td>Prim. patency</td>
<td>75 %</td>
<td>96 %</td>
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<tr>
<td>Sec. patency</td>
<td>90 %</td>
<td>97 %</td>
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<tr>
<td>Hypertension improvement</td>
<td>90 %</td>
<td>86 %</td>
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<tr>
<td>R. function improvement</td>
<td>83 %</td>
<td>72 %</td>
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<tr>
<td>Major complications</td>
<td>17 %</td>
<td>31 %</td>
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Weibull (J.Vas.Surg.1993)

Conclusion: PTRA is recommended as a first choice therapy for atherosclerotic renal artery stenosis
PTRA vs. SURGERY

- Balzer (J Vasc Surg 2009)
- 22 pts PTRA vs. 27 pts surgery (45 endarterectomy, 4 bypass)
- Clinical results equal, more restenosis in PTRA group (6 patients without stenting – 4 restenosis)
- Higher long-term mortality in surgical group
- Two stents misplacements

Conclusion: Surgery remains gold standard
HYPERTENSION

Treatment by PTRA vs. medical therapy

Plouin (Hypertension, 1998)
49 patients randomized to PTRA and medical therapy.

No difference in blood pressure.
Patients in PTRA group needed smaller number of antihypertensive drugs.
HYPERTENSION

PTRA vs. medical therapy
BC van Jaarsfeld et al.: 106 patients randomised. PTRA and medical therapy have both equal effect in hypertension control. PTRA reduces number of antihypertensive drugs.

HYPERTENSION

PTRA vs. medical therapy

Webster J et al.: 55 pts randomised for PTRA x medical therapy: In hypertensive patients PTRA results in a modest improvement in systolic BP compared with medical therapy. This improvement was confined to patients with bilateral RSA. No patient was „cured“, renal function did not improve, significant complications occurred.

(J Hum Hypertens. 1998, 12,: 329 – 35)
• 806 patients randomized either to PTRA or to medical treatment
• Conclusion: We found substantial risks but no evidence of a worthwhile clinical benefit from revascularization in patients with atherosclerotic renovascular disease
806 patients randomized either to PTRA or to medical treatment

Conclusion: We found substantial risks but no evidence of a worthwhile clinical benefit from revascularization in patients with atherosclerotic renovascular disease

Goodbye PTRA
ASTRAL (NEJM 2009)

Good bye PTRA
RIP
ASTRAL (NEJM 2009)

Good bye PTRA
RIP
BUT
Patients were eligible to participate if they had substantial anatomical atherosclerotic stenosis in at least one renal artery that was considered potentially suitable for endovascular revascularization and if the patient’s doctor was uncertain that the patient would definitely have a worthwhile clinical benefit from revascularization, taking into account the available evidence.
25 % of patients had normal renal function
15 % of patients had near normal renal function
AHT medication: 2.8 medications/patient
Average BP 150/75 mmHg
41 % of patients had < 70% stenosis
ASTRAL (NEJM 2009)

Let us wait for Corral Trial results
HYPERTENSION

Indications to PTRA:
Hypertension difficult to control (> three antihypertensive drugs) and/or
Renal function deterioration during antihypertensive therapy and/or
Confirmed progressive diminishing of kidney size
PTRA: INDICATION
ISCHEMIC NEPHROPATHY

• RAS is the cause of renal failure in 12 – 22 % of dialysed patients of the age > 50

• Approximately 50 % of these patients do not have hypertension when dialysed
PTRA: ISCHEMIC NEPHROPATHY – RESULTS

• Renal function improves in 15 – 60 %
• Renal function stabilizes in 16 – 67 %

• Realistic estimation: 40 – 50 % of patients with ischemic nephropathy and progressive renal function impairment can benefit from successful PTRA
PTRA RESTENOSIS RATE

• 10 – 44 % (realistic range 14 – 25 %)
• Correlation with the initial anatomic results
• Higher in ostial lesions → stents
• Decreases with improved technique and material
FMD PTRA
Approx. 20 - 30 % of all PTRA

- Technical success 90 – 100 %

- Clinical success (hypertension) > 90%

- More than 50 % of patients cured
FMD RAS

• Medial fibroplasia (60 – 70 %)
• Perimedial fibroplasia (15 – 25 %)
• Intimal fibroplasia (5 %)
• Medial hyperplasia (5 %)
FMD: MEDIAL FIBROPLASIA

- Aneurysms (string of beads) larger than anticipated artery diameter
- Most frequent in female adults, often bilateral
- Slow or no progression
- Often asymptomatic
FMD: PERIMEDIAL FIBROPLASIA

- Aneurysms (string of beads) smaller than anticipated artery diameter
- Most frequent in female adults, often bilateral
- Tends to progression, even to total occlusion
Complications of PTRA/stenting

Non-standard reporting. Serious complications rate reported: 0 – 41 %.

Most often reported complication:
Groin haematoma/puncture site trauma.
Complications of PTRA/stenting

30-day mortality: approximately 1 – 2 %

Less than 1 % in recent large series.

Usually related to RA rupture, cholesterol embolization, acute renal failure, massive puncture site bleeding.

!Some of the deaths reported are not likely to be related to PTRA!
Complications of PTRA/stenting

Conclusions:

Mean incidence of complications related to PTRA/stent is 5 – 10 %. Most of them are not life-threatening and do not result in loss of renal function.

The combined incidence of 30-day mortality, main RA occlusion, loss of a kidney and need for surgical salvage is less than 3 %.
TRANSPLANT RAS

• Incidence 3 – 15 % of recipients
• More frequent in cadaveric kidneys and kidneys from pediatric donors
• Caused by mechanical injury of donor/recipient artery
• Turbulent flow in the anastomosis
• Immunologically induced intimal proliferation
TRANSPLANT PTRA

- Technical success 80 – 90 %
- Clinical success 60 – 70 %

(complicated by rejection episodes)
PTRA IN CHILDREN

• RAS is most common cause of secondary hypertension in children

• FMD, arteritis, neurofibromatosis, congenital malformations, injury
PTRA IN CHILDREN

• Technical success 60 – 90 % (pressure resistant stenoses)

• If PTRA is successful, clinical benefit is > 90 %, > 60 % of children cured
PTRA/STENT IMPLANTATION

CONCLUSION

- High technical success rate
- Low complication rate
- Clinical benefit for hypertension treatment is unpredictable but in individual patients helps control BP
- In ischemic nephropathy can reverse progressive renal insufficiency
PTRA/STENT IMPLANTATION

CONCLUSION

• It should be performed by experienced team with well equipped cath-lab.
• Indication should be based on individual evaluation of clinical and morphological conditions.
• Only clinically symptomatic patients with hemodynamically significant stenosis should be treated.
• Close cooperation between interventional radiologist and nephrologist is necessary.