Late coronary complications after arterial switch operation and their treatment

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Collaborating partners

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Arterial Switch Operation (ASO)

"Heart Disease in Infants, Children and Adolescents"
Moss and Adams. 5th Edition. Volume 2
Asymptomatic survivors

May have:

• Myocardial perfusion defects

• Reduced global myocardial CFR (PET)

• Occluded coronary arteries

• Risk of sudden deaths
Asymptomatic survivors

- Myocardial perfusion defects
- Reduced global myocardial CFR (PET)
- Occluded coronary arteries
- Increase risk of sudden deaths
## Coronary follow-up after ASO, literature review

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Patients</th>
<th>Finding</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanel RE</td>
<td>1995 AmJC</td>
<td>616 ASO</td>
<td>Stenosis 4</td>
<td>Coronary angio evaluation after ASO is needed</td>
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<tr>
<td></td>
<td></td>
<td>366 Angio</td>
<td>Occluded 5</td>
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<td>12 finding (3%)</td>
<td>Fistula 2</td>
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<td>Sten &amp; Fist 1</td>
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<tr>
<td>Legendre A</td>
<td>2003 Circul</td>
<td>1304 ASO</td>
<td>Stenosis 9</td>
<td>- Coronary angiography Long term follow-up is needed</td>
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<td></td>
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<td>324 Angio</td>
<td>Occlusion 13</td>
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<td>22 Finding (7%)</td>
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<tr>
<td>Raisky o</td>
<td>2007 EJCTS</td>
<td>713 ASO</td>
<td>Stenosis 12</td>
<td>Sequential coronary evaluation using angiography or</td>
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<tr>
<td></td>
<td></td>
<td>290 Angio</td>
<td>Occlusion 7</td>
<td>Multislice CT is necessary</td>
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<td></td>
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<td>34 Finding (11%)</td>
<td>15 mild stenosis</td>
<td></td>
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<tr>
<td>Hausdorf G</td>
<td>1995 AmJC</td>
<td>4</td>
<td>Angioplasty</td>
<td>- Balloon Angioplasty is adequate therapy</td>
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<td>- Balloon over-expansion is necessary</td>
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<tr>
<td>Kampmann C</td>
<td>2005</td>
<td>7</td>
<td>Angioplasty</td>
<td>- Angiographic follow-up is necessary</td>
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<td></td>
<td></td>
<td></td>
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<td>- PTCA with balloon over-expansion is needed</td>
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### A worrisome finding is:

- Asymptomatic patients may have severe coronary stenosis or occlusion
- No evidence based treatment options are available
Points need to be resolved

Follow-up after ASO

- Age of the follow up?

- Type of investigation:
  - Coronary angiography?
  - Multislice CT?
  - MRI?

- Should it be sequential if findings are normal and how frequent?

- Treatment option of coronary complication?
  - Stenting?
  - Surgery?

After treatment (stenting)?
  - Guidelines for anti-thrombosis prophylaxis need to be defined

Aspirin and Clopidogrel (Plavix)?
  - Dose?
  - How long?
Our Experience
Patient Population

N = 279 ASO

1980 - 2007
Operative complications

- Five early coronary complications
  - Congestive heart failure
  - Myocardial infarction
  - Reoperation was not indicated

- Operative mortality was 4% (12/279)

- All mortalities were before 1996
Late mortalities, 4 patients

One died 40 days after operation. Had single coronary artery. **Autopsy:** tight stenosis of coronary ostium

One was premature (31 gestational weeks, 1475 gm) Died at 8 months **Autopsy:** LPA stenosis, no coronary pathology

One died at 9 months due to LV failure and coarctation **Autopsy:** no coronary pathology

One died of non cardiac cause (RTA)
Aim of the study

To report late coronary complications after ASO and their treatment
Patient Population

N = 81/ 279

- Selective coronary angiogram
- Mean age 8.6 years (range 1-18)
Result of follow-up angiogram (n = 81)

6 pat (7%) asymptomatic patients with coronary complications
4 pat (5%) All have stress ECG changes and need intervention
Follow-up angiogram of 81 patients (n = 81)

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- **6 pat (7%)** asymptomatic patients with coronary complications
- **4 pat (5%)** All have stress ECG changes and need intervention

LCA ostial stenosis with good collaterals

Type A: Normal
Follow-up angiogram of 81 patients (n = 81)

6 (7%) asymptomatic patients with coronary complications
4 (5%) All have stress ECG changes and need intervention

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Conus branch stenosis with good collaterals

Type A: Normal
Type B: Single coronary artery
Follow-up angiogram of 81 patients (n = 81)

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Operated for subvalvular aortic stenosis and RVOT obstruction at 6 months
Developed re-stenosis of RVOT; re-operated at 3 years
Developed gradual increased pulmonary regurgitation and VES
LCA ostial occlusion at coronary angiogram
Operated with RV-PA conduit and coronary ostioplasty at 16 years

Type A: Normal
Type B: Single coronary artery
### Follow-up angiogram of 81 patients (n = 81)

- **6 (7%)** asymptomatic patients with coronary complications
- **4 (5%)** All have stress ECG changes and need intervention

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- LCA ostial stenosis at coronary angiogram
- Balloon dilation at 5 years; insignificant dissection
- Instant coronary artery recoil after dilation
- Stented at 9 years

**Type A:** Normal  
**Type B:** Single coronary artery
### Follow-up angiogram of 81 patients (n = 81)

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LCA ostial stenosis at coronary angiogram, stented

Type A: Normal
Type B: Single coronary artery
Type C: Two coronary orifices originating close to each other
Type D: Cx CA from RCA

6 (7%) asymptomatic patients with coronary complications
4 (5%) All have stress ECG changes and need intervention
## Follow-up angiogram of 81 patients (n = 81)

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LCA ostial occlusion at coronary angiogram, stented

Type A: Normal
Type B: Single coronary artery
Type C: Two coronary orifices originating close to each other
Type D: Cx CA from RCA

6 (7%) asymptomatic patients with coronary complications
4 (5%) All have stress ECG changes and need intervention
Obstruction or stenosis of coronary arteries after ASO do occur in asymptomatic patients with uncomplicated postoperative course.

Coronary follow-up after ASO is indicated for all patients, probably before puberty when physical activities increases significantly.

Coronary stenting is adequate option of treatment.

Guidelines for anti-thrombotic prophylaxis after stenting of this patient category need to be defined.
THANK YOU