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DEBATE:
COARCTATION STENTING VS. SURGICAL REPAIR
IN PATIENTS >4 YEARS OF AGE






NO DISCLOSURES

Into the Lion's Den...





"You expect the lions and the death, but the booging from the crowd is just hurtful."
 cardiologists



Stent v. Surgery

- What would you choose for your patient or your own child?

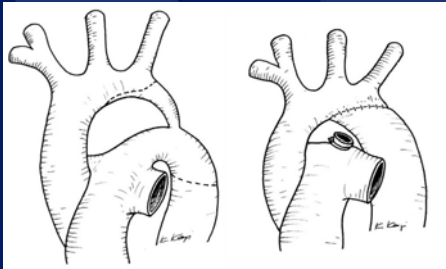



Debate Parameters

- >4 years old
- Appropriate lesions only
- Current approaches only
 - Stenting
 - Extended Resection and End-to-End Anastomosis

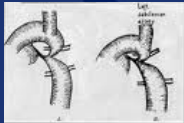

Extended Resection



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Limitations

- Differing lengths of follow-up
- Differing endpoints
- Differing techniques

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Outcomes

- Procedure Results
 - Reintervention
 - Residual gradient
 - Complications
- Incidence of late hypertension
- Other Procedure-related Issues

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PROCEDURE RESULTS

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Surgical Results

Kaushal S, et al. ATS 2009

- 157 patients, median age 23 days
- Extended resection
- No early or late deaths
 - Tabbutt S. JTCVS 2008
 - Prospective, multi-center
 - 118 patients, age <6 years
 - No mortality

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Surgical Results

Kaushal S, et al. ATS 2009

- Mean F/U 5.0 +/- 4.3 years
- Reinterventions – 6/157 (3.8%)
 - 2 balloon angioplasties
 - 1 surgical revision
 - 3 arch reconstructions

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Surgical Results

Kaushal S, et al. ATS 2009



- Complications
 - Infection – 4%
 - Temporary recurrent nerve palsy – 3%
 - Chylothorax – 3%



Surgical Results

Wright G, et al. ATS 2005



- 83 infants, median age 21 days
 - 49% presented in shock
 - Seizure – 4
 - NEC/Laparotomy – 1
- Extended resection
- One early death (1/83, 1.2%)
 - Alveolar capillary dysplasia
 - No CoA on post-op cath



Surgical Results

Wright G, et al. ATS 2005



- Mean F/U 4.5 +/- 3.1 years
- One late death (1/82, 1.2%)
 - Pneumonia
 - No residual CoA
- Reinterventions – 3/82 (3.7%)
 - 3 balloon angioplasties



Surgical Results

Wright G, et al. ATS 2005



- All surviving patients
 - Asymptomatic
 - Not on any antihypertensive medications
 - Gradient < 15 mm Hg



Surgical Results

Wright G, et al. ATS 2005



- Complications
 - Seizures – 2 (2%)
 - Chylothorax – 2 (2%)
 - Recurrent nerve injury – 1 (1%)
 - Bronchial compression – 1 (1%)



Surgical Results

Compilation of 5 studies


- 535 patients, all < 1 year old
- Need for reintervention – 3.4%



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- 302 patients, 34 centers
- Wt. >10 kg
- Median wt. 58 kg (11-156)
- Median age 15 years (2-63)



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- Procedural Failure
 - Reintervention
 - Moderate or severe obstruction on imaging
 - Clinical gradient > 20 mm Hg



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- No early or late deaths
- Median F/U of patients with >1 year of F/U – 1.1 years (3.6 mo-4.8 years)
- Discharge
 - Procedural success 96%



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- Intermediate F/U
 - >3 months
 - Procedural success 86%
- Long-term F/U
 - >18 months
 - Procedural success 77%



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- Reintervention
 - Prior to D/C – 1/304 (0.3%)
 - Intermediate – 11/302 (4%)
 - Long-term – 26/302 (11%)
 - Overall – 36/302 (12%)
- Late gradient > 15 mm Hg – 17%



Stent Results

Holzer, R (CCISC). Cath & CV Interven. 2010


- Complications
 - Stent migration (acute) – 3% (9)
 - Femoral artery injury – 1% (3)
 - Dissection (acute) – <1% (1)
 - Aneurysm – 1% (3)
 - “So far, all...small...have not required...intervention”
 - Chessa M, et al. Eur Heart J.2005
 - 100% rupture by 15 years



Stent Results

Forbes, TJ (CCISC). Cath & CV Interven. 2007


- 565 procedures, 34 centers
- Age > 4 years
- Median wt. 56 kg (3.8-145)
- Median age 15 years (4-4.9)

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Stent Results

Forbes, TJ (CCISC). Cath & CV Interven. 2007

- Early deaths - 2
- Success (Short-term)
 - Gradient < 20, no surgery, no permanent disability – 97.9%
 - Gradient < 10 mm Hg – 92.2%


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Stent Results


Forbes, TJ (CCISC). Cath & CV Interven. 2007

- Complications – 14.3%
 - Intimal tears – 8
 - Dissections/Rupture – 9
 - Aneurysm – 6
 - Femoral artery injury – 13 (2%)
 - CVA – 4 (0.7%)*
 - Stent migration – 28 (5%)*

*Decreased in later era

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LATE HYPERTENSION

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Late Hypertension

- Unknown for stenting – comparison not possible
- Arterial compliance is normal for extended resection
- Arterial compliance is not normal for stenting
- Decreased arterial compliance is associated with hypertension

Kenny D, et al. ATS 2010

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OTHER PROCEDURE-RELATED ISSUES

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Surgical Scar





Aortic Diameters

- Median adult aortic diameter (isthmus) – 24.3 mm
- Acceptable diameters
 - Female ~16 mm
 - Males ~18 mm



Aortic Diameters


Steinberg C, et al. Cath & CV Diagnosis 1992

- Average of diameter at isthmus and diaphragm (angio)
- 4-year-old – 9 mm
- 8-year-old – 11.5 mm
- 13-year-old – 14.7 mm
- 16-year-old – 16.5 mm



True Reintervention Rate


- 100% for most pre-teens!



Femoral Artery Diameter

Steinberg C, et al. Cath & CV Diagnosis 1992


- 11 French = 3.7 mm
- Normal Femoral Artery Diameter
 - 4-year-old – 7 mm
 - 6-year-old – 7.7 mm
 - 8-year-old – 8.5 mm



Femoral Artery Injury

Vermillion R, et al. Ped Cardiol

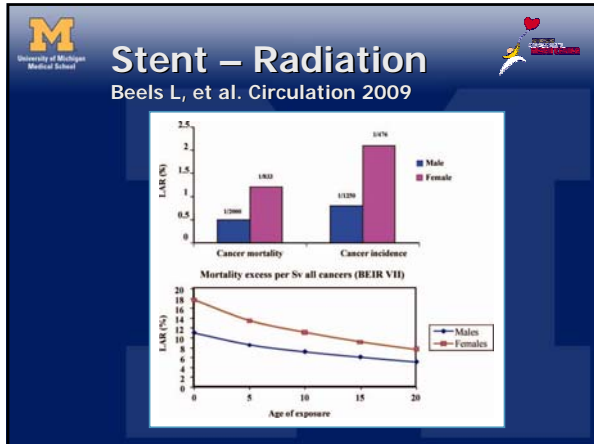
- 19 Children
 - BAV or CoA Dilatation
 - Median age 7.6 years
- Doppler of Femoral Artery
 - Mean 2.0 years after procedure
- 5 abnormal arteries (26%)
 - 2 stenosis
 - 3 occlusions



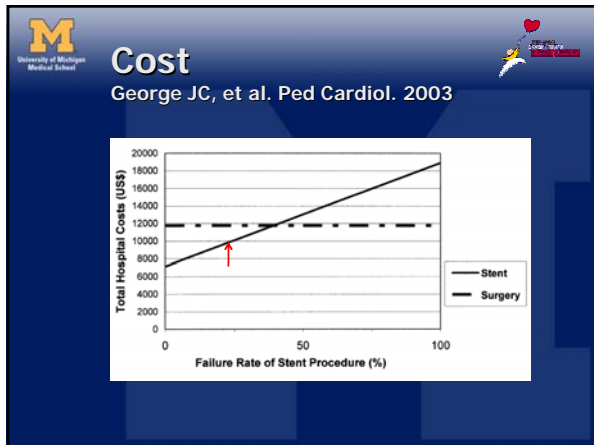
Radiation

Beels L, et al. Circulation 2009

- 49 Children
 - 17 Diagnostic Caths
 - 32 Interventional Caths
- Blood drawn pre- and post-cath
- γ -H2AX foci, representing DNA double-strand breaks
- Linear-no-threshold (LNT) model



- Cost**
George JC, et al. Ped Cardiol. 2003
- Surgery - \$11,769
 - Stent - \$7,145
 - Difference - \$4,624 (-39%)



- Stent v. Surgery**
- What would you choose for your patient or your own child?