CARDIOLOGY 2023

SURGICAL TECHNIQUES FOR PULMONARY ARTERIAL REHABILITATION IN PULMONARY ATRESIA WITH AORTO-PULMONARY COLLATERALS

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February 25, 2023

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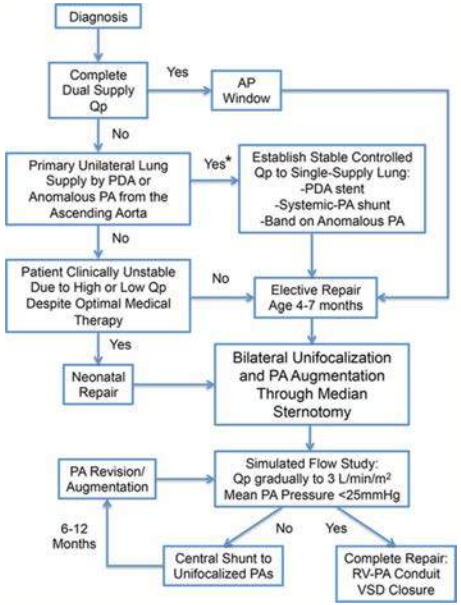
- I have no relevant disclosures



Holly Bauser-Heaton. Circulation: Cardiovascular Interventions. Programmatic Approach to Management of Tetralogy of Fallot With Major Aortopulmonary Collateral Arteries, Volume: 10, Issue: 4, DOI: (10.1161/CIRCINTERVENTIONS.116.004952)

SOURCE OF PULMONARY BLOOD FLOW

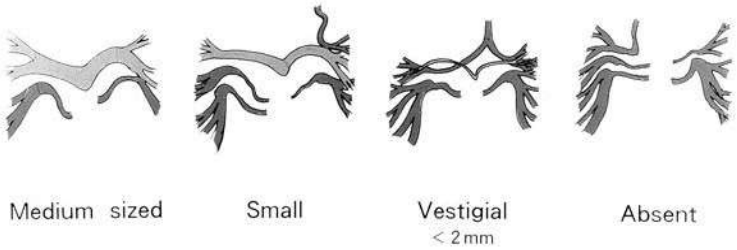
- Pulmonary atresia /Near Pulmonary atresia
  - Ductal dependent supply
  - Major aortopulmonary collateral arteries
  - Ductal dependent and aortopulmonary collateral arteries
  - Antegrade flow/ aortopulmonary collateral arteries

SPECTRUM OF AORTOPULMONARY COLLATERAL ARTERIAL DISTRIBUTION

- Confluent diminutive central (mediastinal) pulmonary arteries supplying all / near all segments with collateral inflow

- Confluent central (mediastinal)pulmonary arteries supplying some lung segments/ remainder lung segments supplied by aortopulmonary collaterals

- Absence of true central pulmonary arteries/ lung segments supplied by aortopulmonary collaterals



DESIGNATED FATE OF AORTOPULMONARY COLLATERAL

- Lung segment is only supplied by AP collateral –
  - unifocalization/ incorporation the collateral into the pulmonary circulation
- Lung segment is supplied by AP collateral and native (mediastinal)pulmonary artery
  - Ligate the collateral
  - Unifocalization / incorporation if
    - Stenosis upstream
    - Diminutive connections
    - Addition of native tissue to facilitate growth / reconstruction

OBJECTIVES OF SURGERY

- Incorporation of blood supply to all segments of the lungs into the antegrade pulmonary circulation by the unifocalization procedure
- Complete repair with closure of the VSD and placement of a conduit from the right ventricle to unifocalized pulmonary arteries
- Goals of achieving normal or near nor mal pulmonary artery pressures
- Early unifocalization independent of symptoms status

NEONATAL/ EARLY INFANCY INTERVENTION

- Central pulmonary with good arborization
- Ductal origin of the left pulmonary artery
- Aortopulmonary collaterals with significant over circulation
- Aortopulmonary collaterals with significant cyanosis

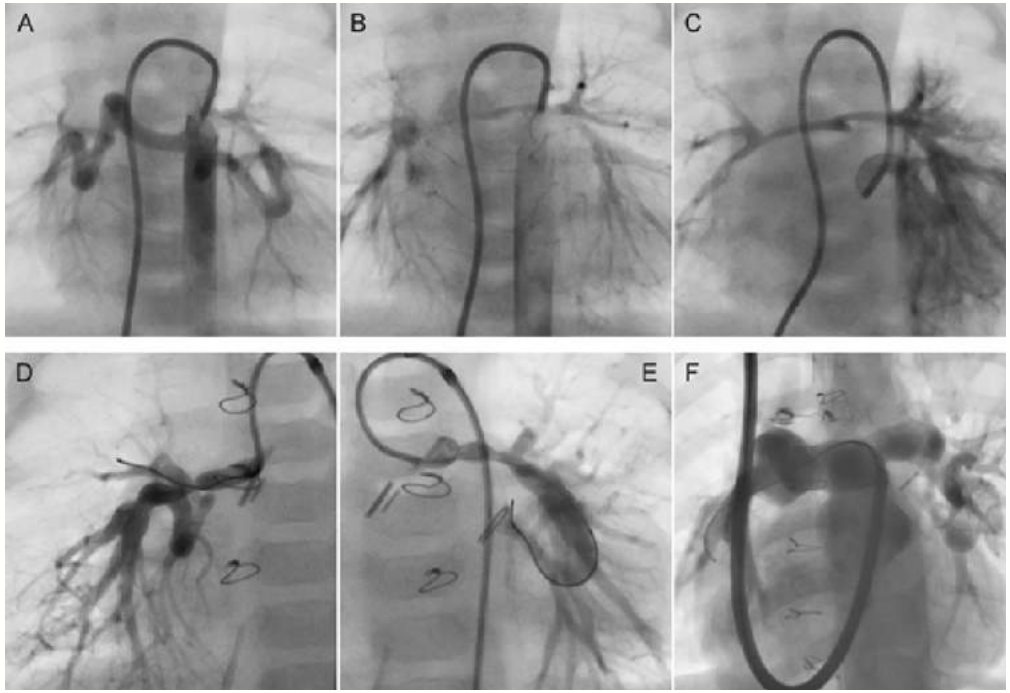
AORTOPULMONARY WINDOW

- Presence of centrally confluent true pulmonary arteries 1.0 to 2.5 mm in diameter, with well-developed peripheral arborization pattern (central pulmonary arteries all (18)or near all (>15)

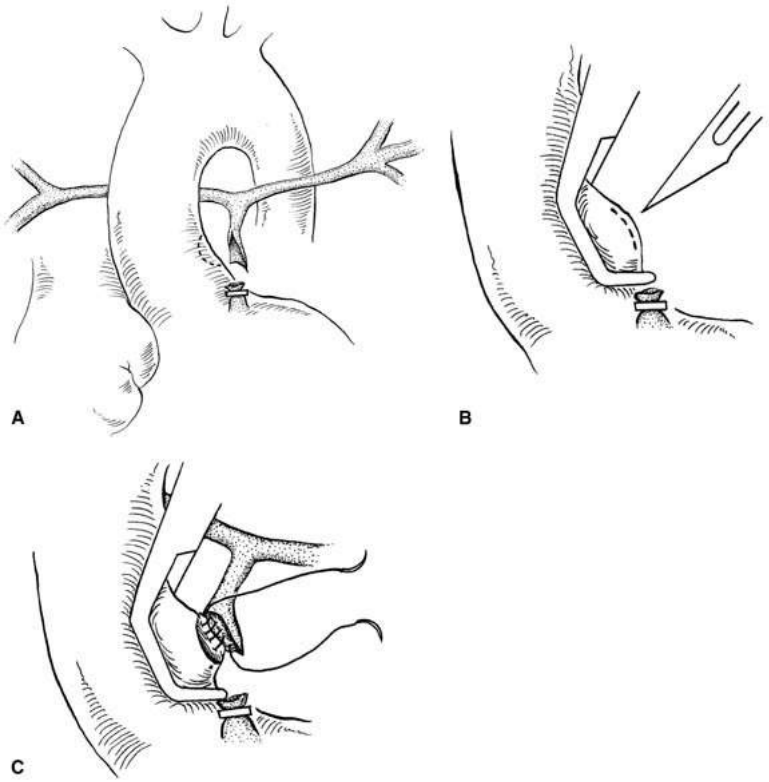
- Multiple hypoplastic aortopulmonary collateral vessels, most of which communicated with the true pulmonary arterial system;

- Procedure performed independent of the presence of marked cyanosis.

AORTOPULMONARY WINDOW



AORTOPULMONARY WINDOW



AORTOPULMONARY WINDOW

- First, the tissue-to-tissue anastomosis greatly reduces the risk of thrombosis.

- Second, the aortopulmonary window is less likely to result in distortion of the branch pulmonary arteries, which by definition are markedly diminutive at the time of this operation.

- Finally, the central location of the aortopulmonary window usually results in balanced blood flow distribution to the right and left branch pulmonary arteries.

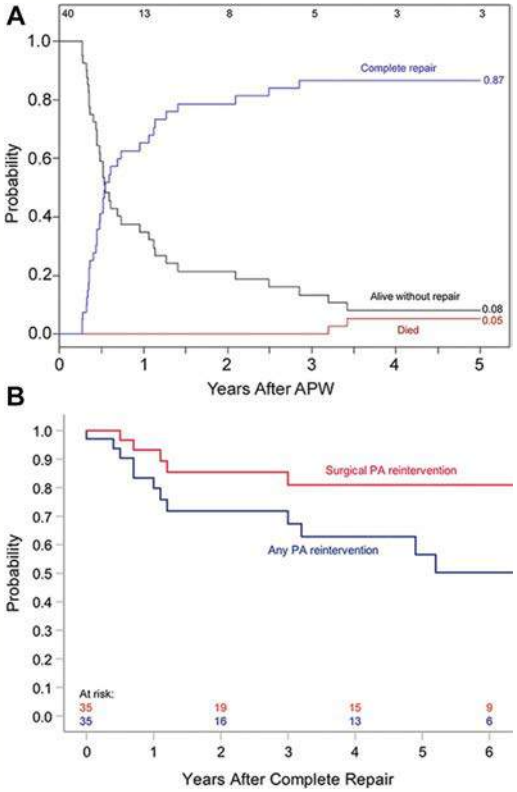
AORTOPULMONARY WINDOW

- Occlude large MAPCAs especially in the setting of relatively high pulmonary blood flow.

- MAPCAs were the sole supply to a portion of lung,

- MAPCAs thought to be dual-supply did not have a robust communication with the PA system,
- Augment the pathway to a particular lung territory if the native PA supplying it did not grow or develop stenosis after APW.

AORTOPULMONARY WINDOW



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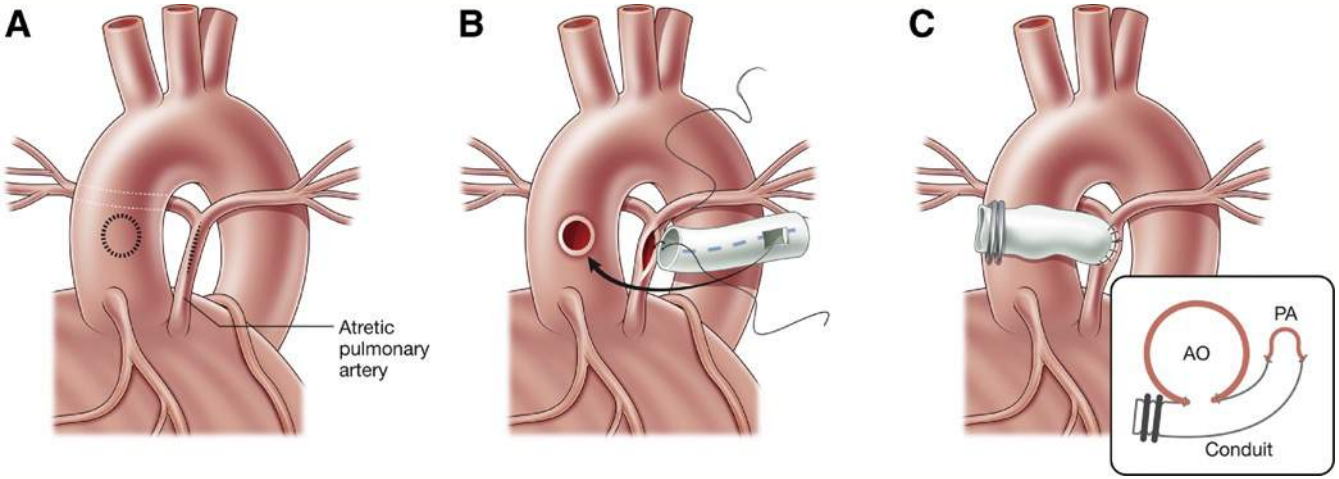
CENTRAL SHUNTS

- Patients who have confluent central branch pulmonary arteries exceeding the size limit of 2.5 mm, (near pulmonary atresia/ vestigial valve remnants present)

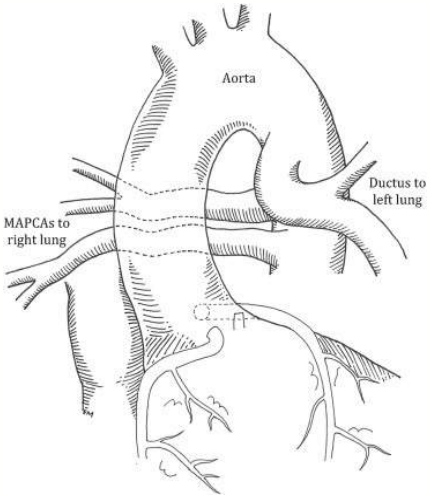
- Prosthetic shunt will regulate flow and pressure and lessen the possibility of excessive pulmonary blood flow or a reperfusion injury to the lung, or both.

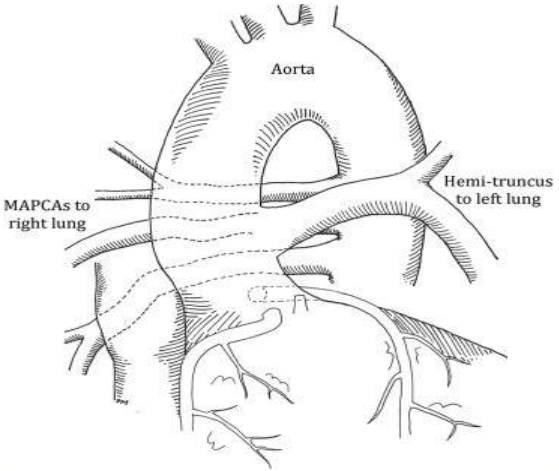
CENTRAL GORE-TEX SHUNT (LAK'S MODIFICATION)



MAPCAS/ DUCTAL DEPENDENT PULMONARY ARTERY

- Ductal origin to unilateral lung or hemi truncus/ MAPCAS contralateral lung





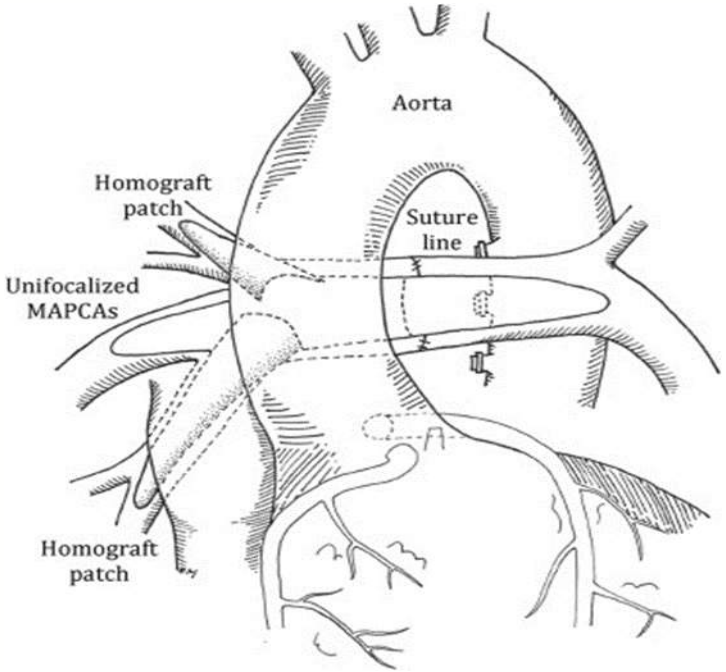
MAPCAS/ DUCTAL DEPENDENT PULMONARY ARTERY

- Adequately sized right sided MAPCAs

- Complete repair

- Early Infancy

- Prolonged Hospitalization

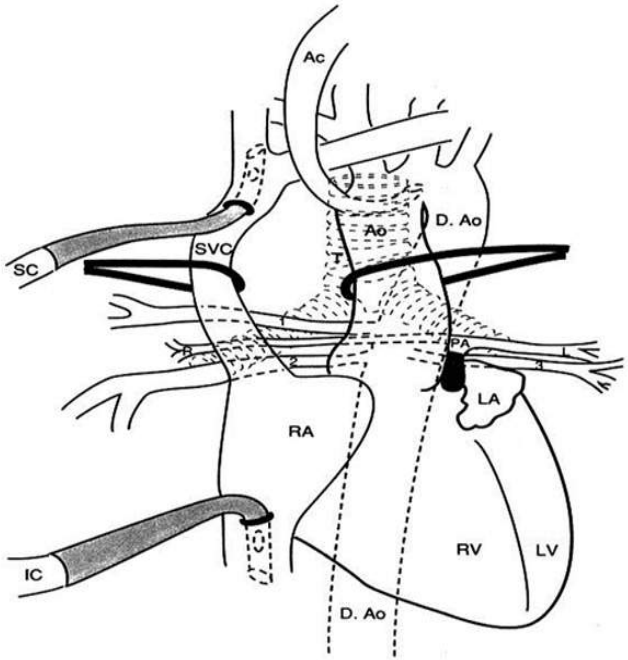


MAPCAS / DUCTAL DEPENDENT PULMONARY ARTERY

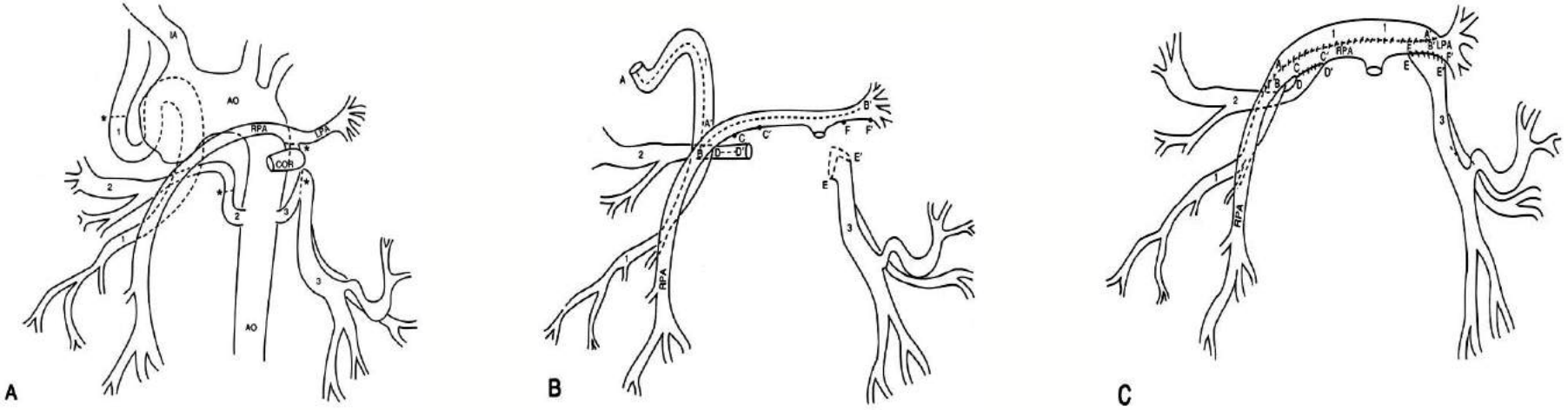
- Small right sided MAPCAs
- Palliative Options – Ductal Stent vs Surgical Shunt to unilateral lung
    - Loss of potential viable proximal pulmonary artery tissue
- Palliative Options- Right sided MAPCAs unifocalization to central shunt

UNIFOCALIZATION PROCEDURE

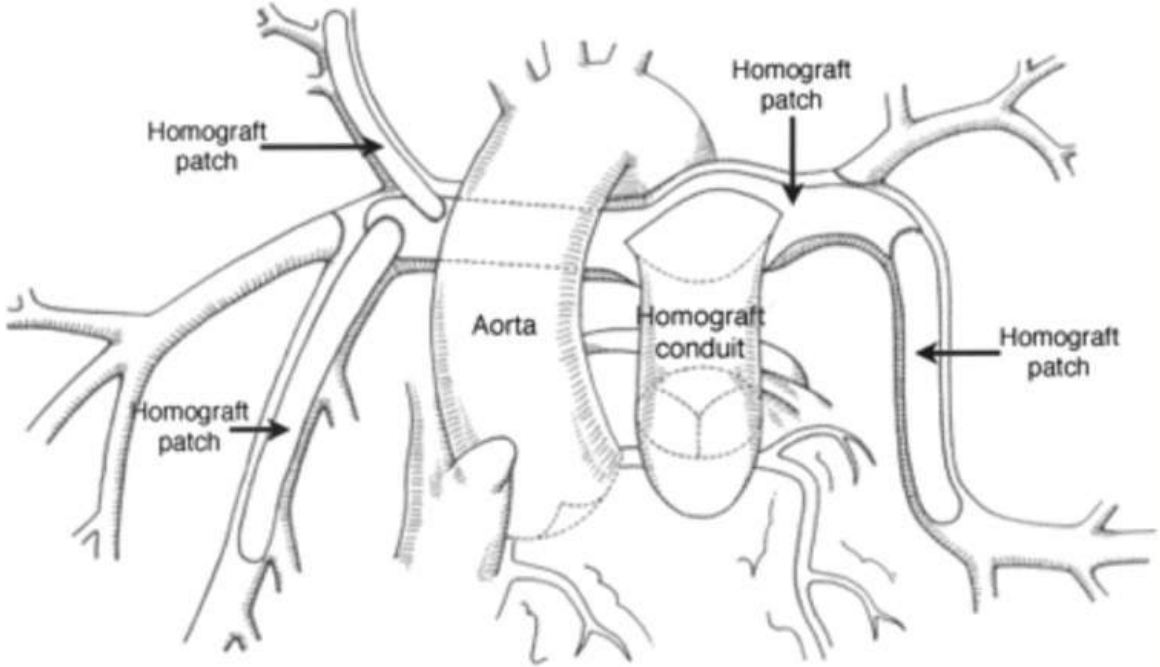
- Transverse sinus approach
- Tracheobronchial angle / dome of left atrium
- Identification/ control of individual MAPCAs
- Mobilization of MAPCAS
- Wide opening of pleura posterior to phrenic



UNIFOCALIZATION PROCEDURE

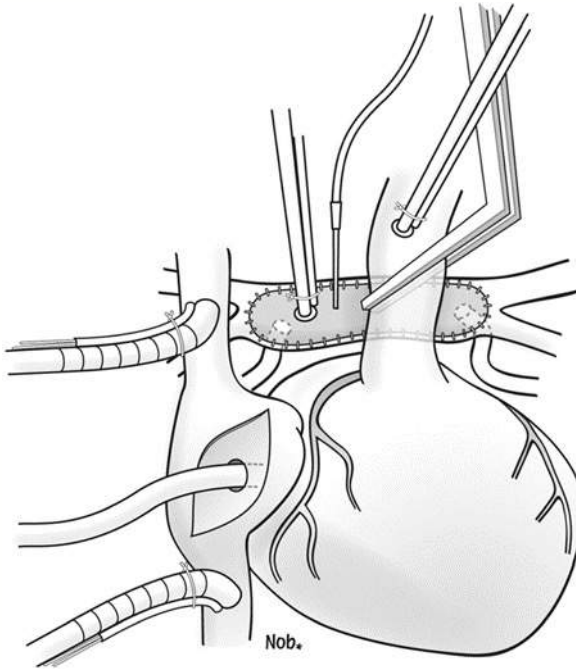


UNIFOCALIZATION PROCEDURE



PULMONARY FLOW STUDY

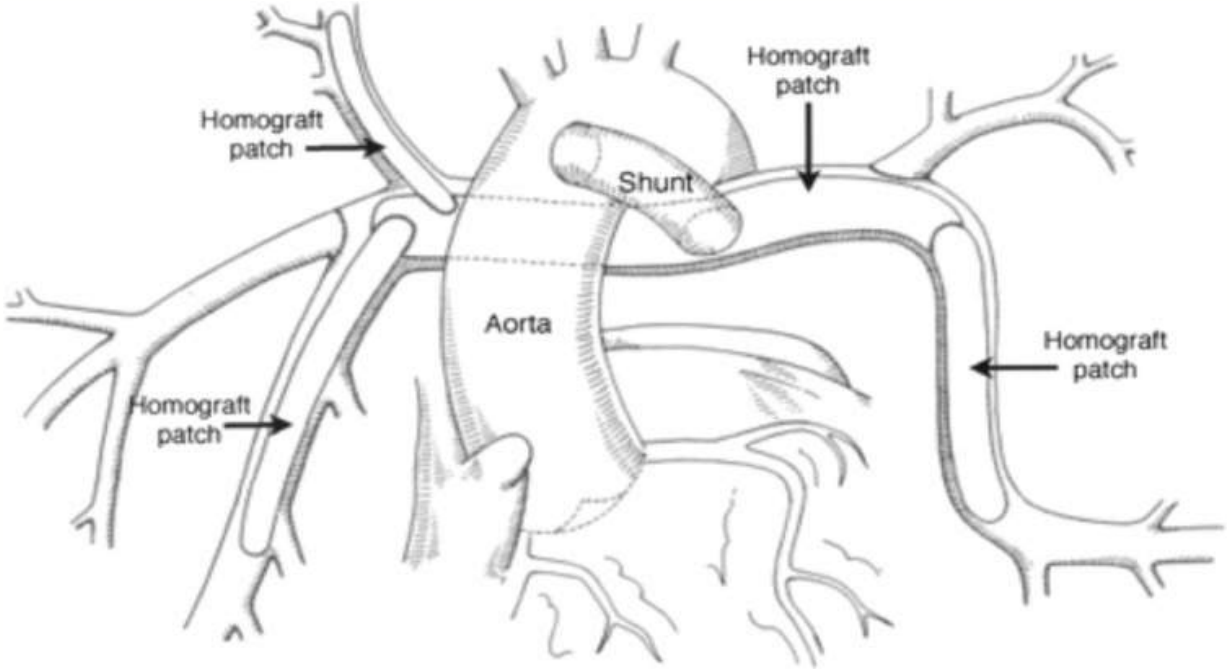
- Assess pulmonary vascular resistance following unifocalization
- 3 liters (2.5)/ min/m2 to the pulmonary bed
- Acceptable pressure in the PA bed 25mmHg (30)
- Venting of the left atrium / gentle ventilation



PULMONARY FLOW STUDY

- Saturations >85 %
- Saturation < 82% and older children

UNIFOCALIZATION PROCEDURE



CENTRAL SHUNT VS RV PA CONDUIT

- Tethering /proximal stenosis
- Uncontrolled pulmonary blood flow
- Right ventricular dysfunction
- Pseudo aneurysm of the RV

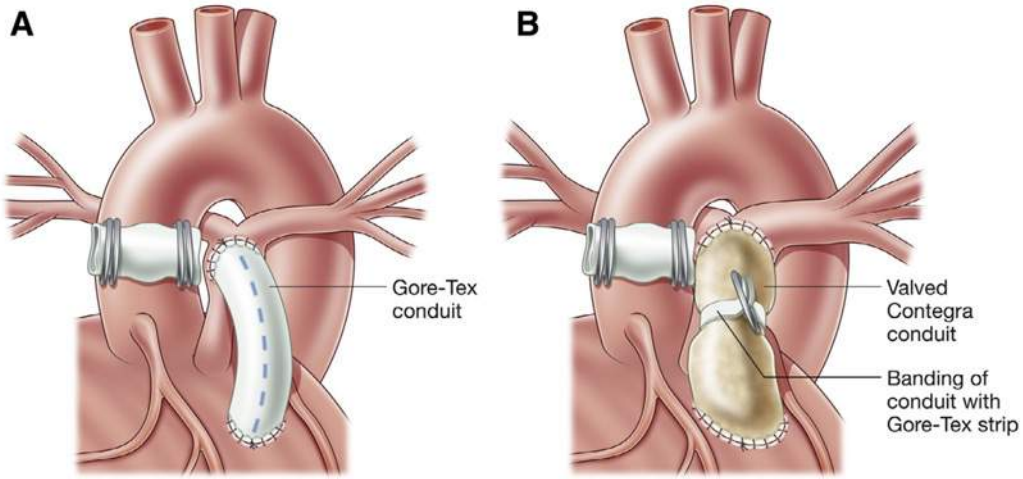
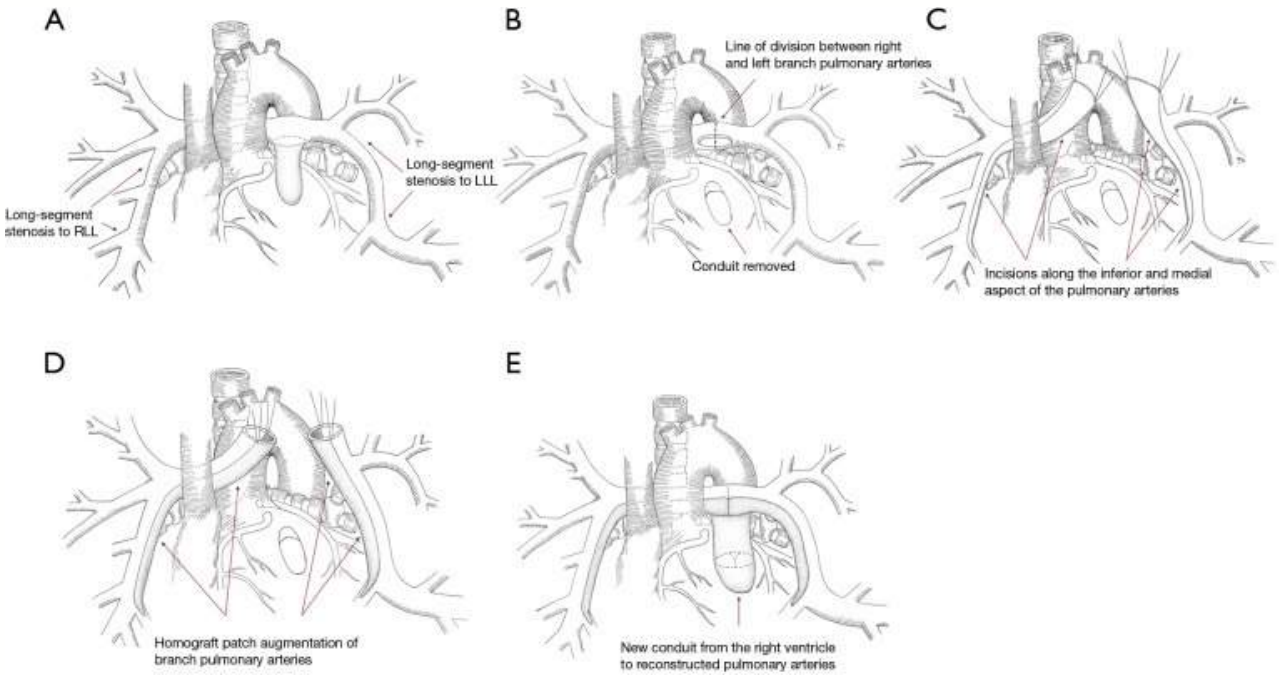
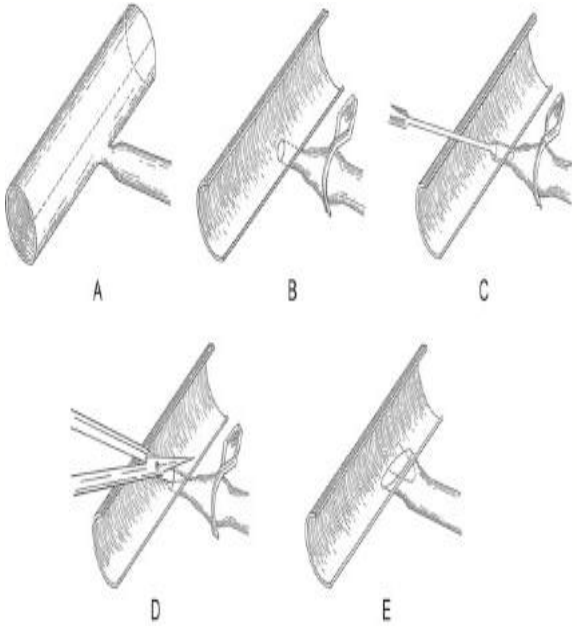


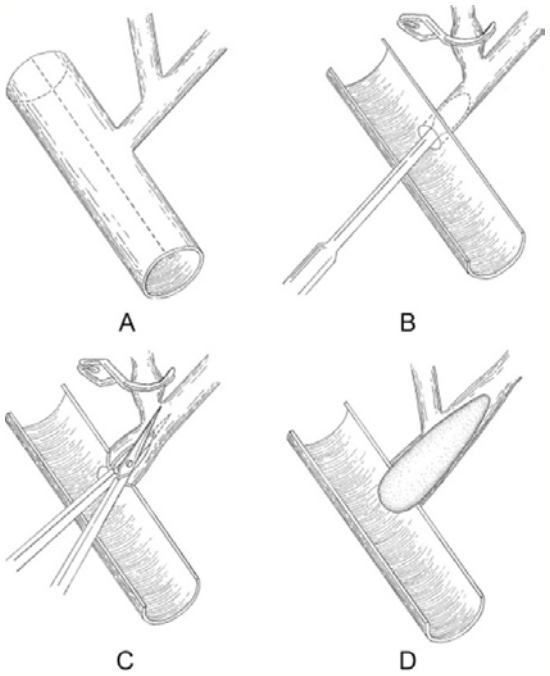
Figure 4 Right ventricle to pulmonary artery conduit implantation.

UNIFOCALIZATION REVISION



SEGMENTAL ARTERY REHABILITATION





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IDEAL STATE

- Complete Repair
- Survival/ Quality of Life
- Normal pulmonary pressures

Comments/ Thank you