Image Guided Fetal Cardiac Intervention

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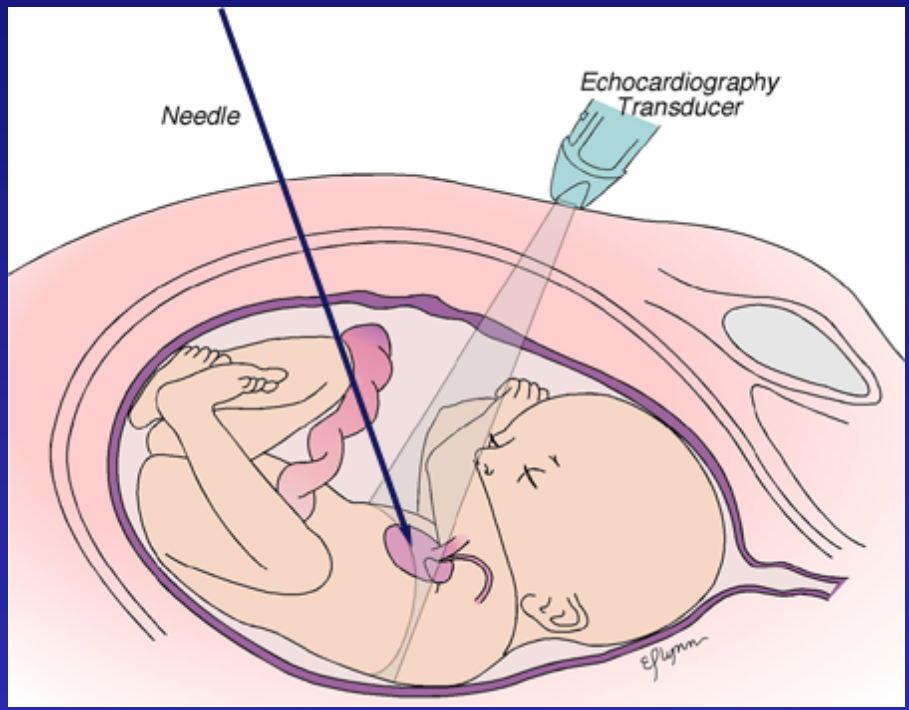
Supported by EB003052

Prenatal interventional therapy of congenital heart disease

- Physiologic rationale
- Current procedural approach
- Clinical outcomes
- Technical problems

Modeling sequence of interventional challenges



1. Targeting & navigation
2. Tool visualization
3. Haptic feel & target stability

Targeting and navigation:

F Lin MS, J Triedman MD, P Dupont PhD

- ***Problem:*** Establishment of global frame of reference for imaging and intervention
- ***Problem:*** Trajectory planning
- Electromagnetic navigation (Flock of Birds, Ascension Technology)
- 3D real-time U/S imaging (Philips Medical)
- Development and testing of integrative GUI

Tool visualization:

J Huang PhD, G Marx MD, R Cleveland PhD

- ***Problem:*** Artifact caused by acoustic properties of tools under medical insonation
- Optimization of passive solutions (geometric, surface and material properties)
- Inverse solutions based on properties of artifact
- Active ultrasound localization

Haptic feel and target stability

M Heverly BS, P Dupont PhD, L Bergersen MD,
J Triedman MD

- ***Problem:*** Displacement and deformation of fetal target with needle insertion
- Frequency domain modeling of mechanics of needle / tissue interaction
- Design of tools / robotic techniques to optimize efficiency of puncture