



# OTHER VASCULAR ACCESS

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***„Junior Training Course on  
Cardiac Catheterization and Interventions“***

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Pediatric Heart Centre Vienna

# GETTING ACCESS



Orlowski JP:Am J Dis  
Child 1984;138:803

## Patient

- Obesity, Low body weight

## Vessel

- Closure, Anatomy

## Target

- Hypomochlion, Artificial valves

# ACCESS

## Venous

- ▣ V. femoralis
- ▣ V. jugularis interna
- ▣ V. subclavia
- ▣ V. umbilicalis
- ▣ Transhepatic
- ▣ Transthoracic
- ▣ RV-Punction
- ▣ Translumbal

## Arterial

- ▣ A. femoralis
- ▣ A. brachialis
- ▣ A. axillaris
- ▣ A. carotis
- ▣ A. radialis
- ▣ A. umbilicalis
- ▣ Transapical
- ▣ Transseptal
- ▣ Transbronchial

# JUGULAR VEIN

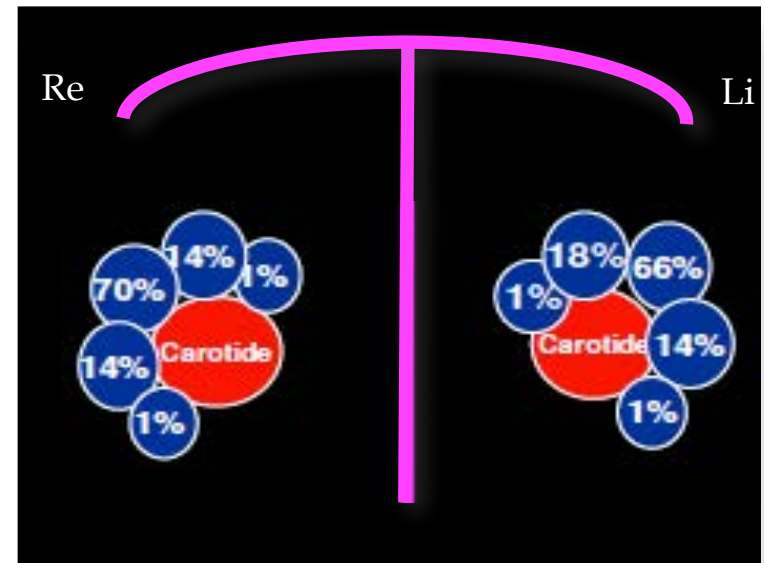
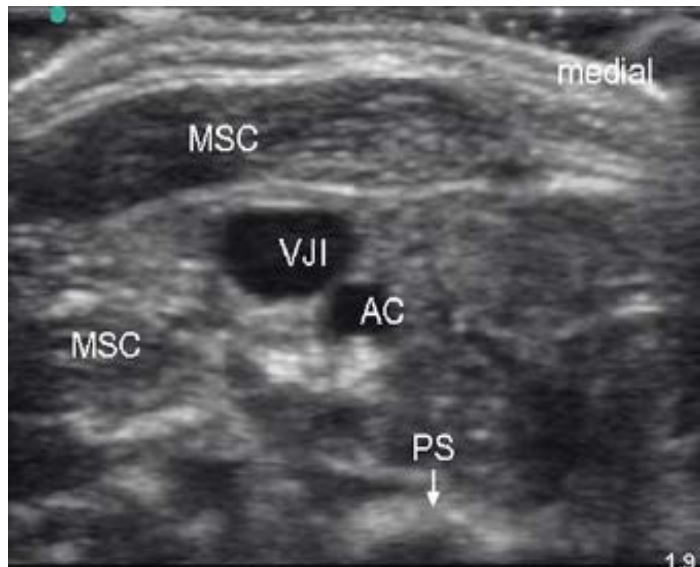
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- ▣ Endomyocardial biopsy
- ▣ Closure of muscular VSD
- ▣ Recanalisation in SVC-obstruction
- ▣ Diagnostic (Glenn), PAP
- ▣ .....

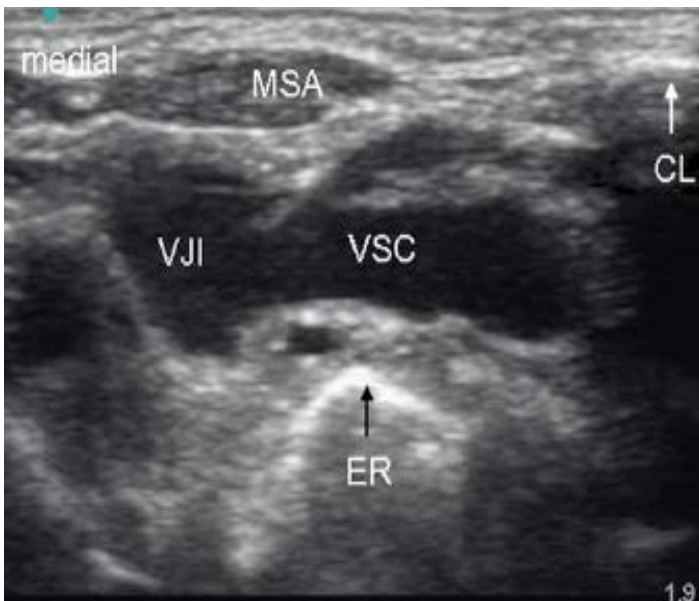
# JUGULAR VEIN



- ▣ Trendelenburg position
- ▣ Underlay shoulders with towel
- ▣ Neck/head tilt-chin lift
- ▣ Head 15-45° to contralateral side
- ▣ Skin tension



# SUBCLAVIAN VEIN

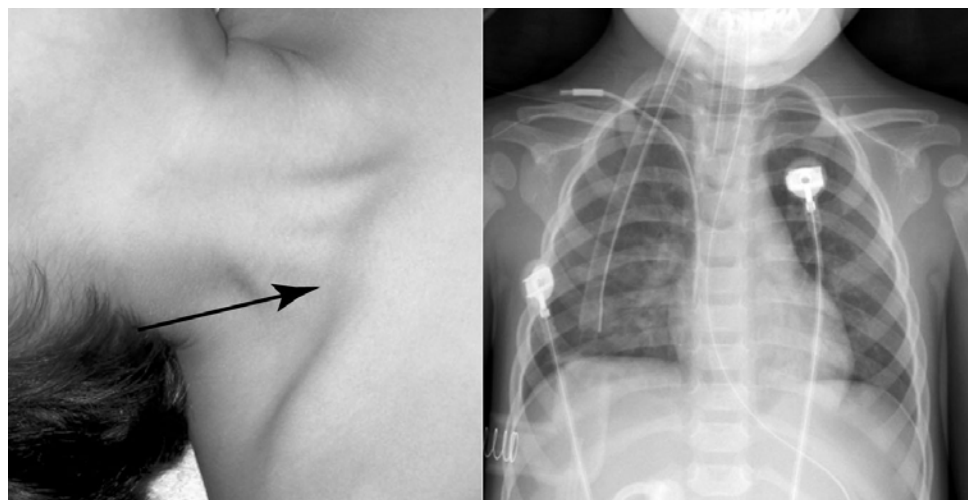


## Infraclavicular

- ▣ Moderate Trendelenburg position
- ▣ Underlay shoulders a bit
- ▣ Head a bit to contralateral site
- ▣ Vein is positioned in infants more cranial than in older children
- ▣ Sliding sign in ultrasound

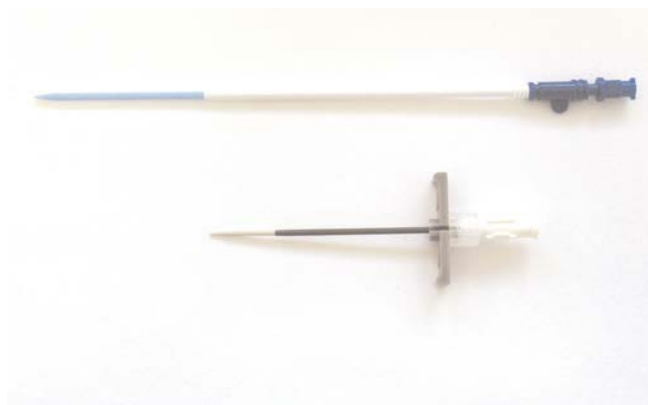
# SUBCLAVIAN VEIN

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## Supraclavicular

- ▣ Lateral to the Sternocleidomast. muscle
- ▣ 45° angle sagittal plane
- ▣ 15° angle coronal plane
- ▣ Pleura and artery are posterior
- ▣ Lower risk of puncturing pleura or subclavian artery



# RISKS / COMPLICATIONS

## Puncture

- ◆ Hematoma
- ◆ Hemothorax
- ◆ Pneumothorax
- ◆ Chylothorax
- ◆ Mediastinum
- ◆ Nerve palsy
- ◆ Embolism
  - ◆ Air
  - ◆ Catheter

## Catheter

- ◆ Thrombosis
- ◆ Embolism
- ◆ Perforation
  - ◆ Heart
  - ◆ Vessel
- ◆ Arrhythmia

## Management

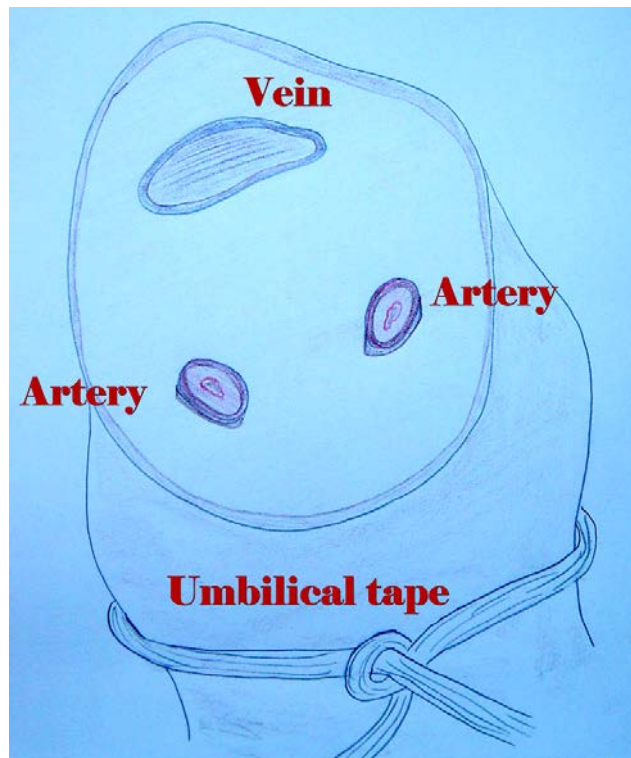
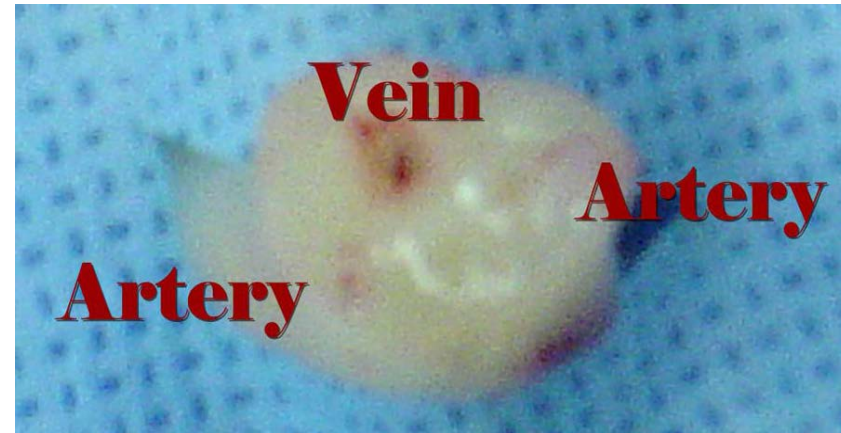
- ◆ Thrombosis
- ◆ Embolism
- ◆ Arrhythmia
- ◆ Infektion
- ◆ Endocarditis
- ◆ Chest tube

**Who punctures should be able to handle the complications !**



# UMBILICAL VEIN

- ▣ tip directed to the right shoulder
- ▣ distance shoulder-umbilicus x 0,6
- ▣ tip of the introducer above the diaphragm but below the RA and beyond the D. venous



# UMBILICAL VEIN

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## Complications

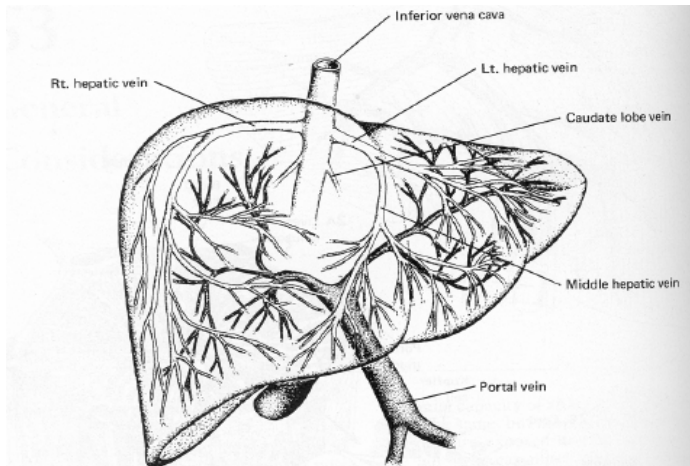
- ▣ Infection
- ▣ Vessel perforation
- ▣ **False lumen**
- ▣ Liver abscess /-necrosis
- ▣ Air embolism
- ▣ **Portal vein thrombosis**
- ▣ Arrhythmia
- ▣ Bleeding

## Contraindications

- ▣ Omphalitis
- ▣ Peritonitis
- ▣ NEC

# TRANSHEPATIC

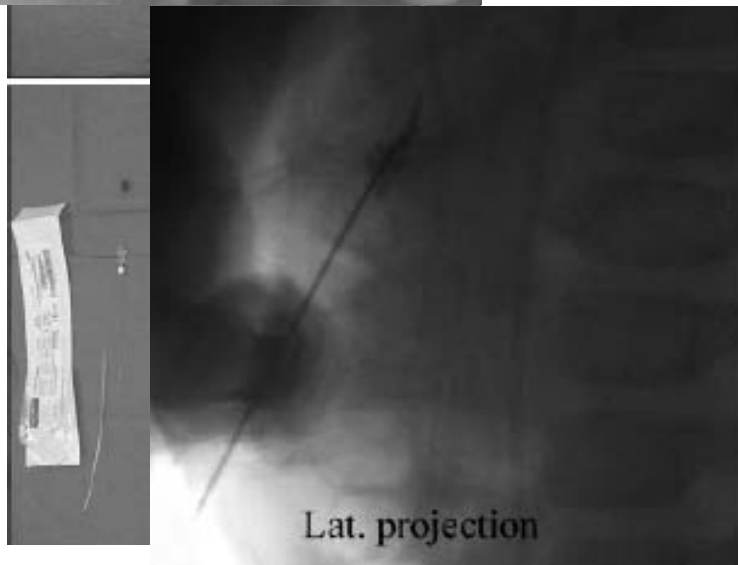
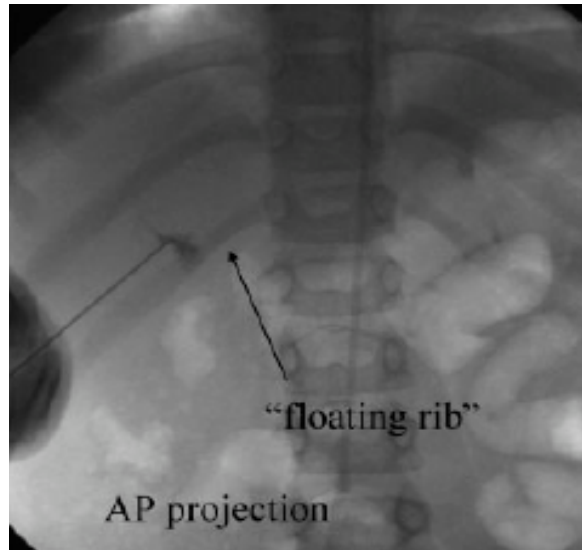
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- ▣ Infant: subcostal  
Target: Hilus
- ▣ Child: intercostal  
Target: peripheral hepatic vein

# TRANSHEPATIC

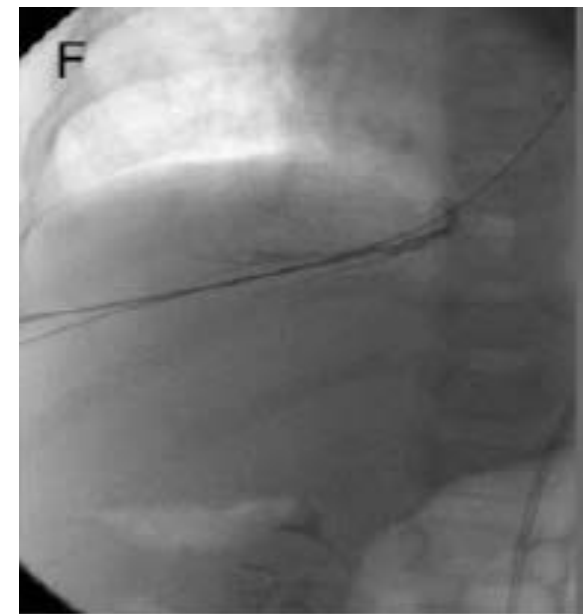
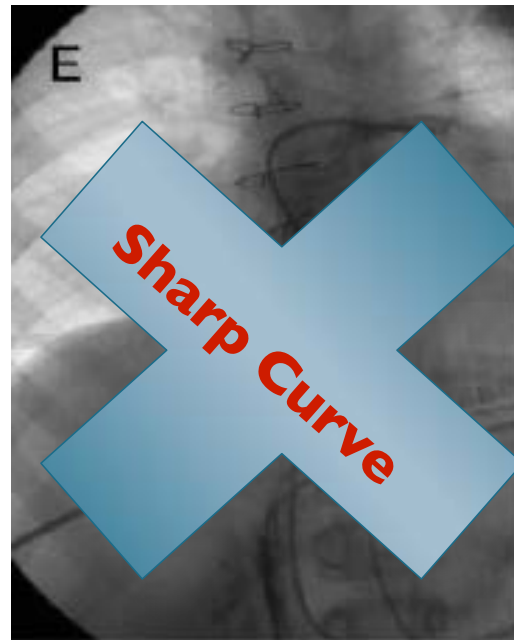
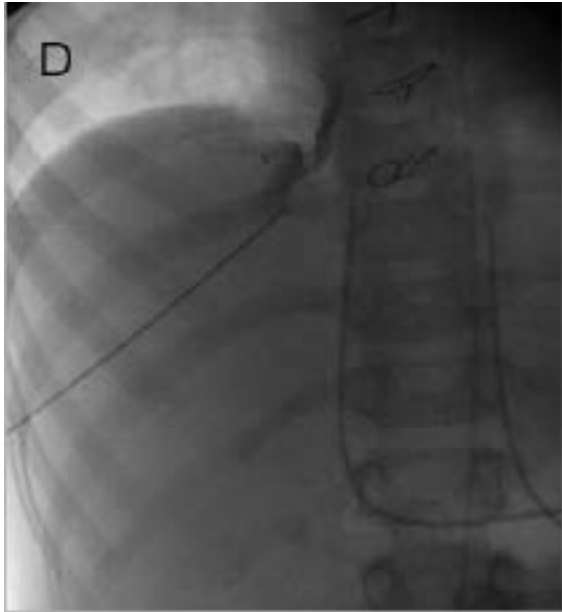
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- ▣ Medial to anterior axillary line
- ▣ Below costal arch
- ▣ Superior
- ▣ Posterior
- ▣ Medial
- ▣ Direction: left shoulder

# TRANSHEPATIC

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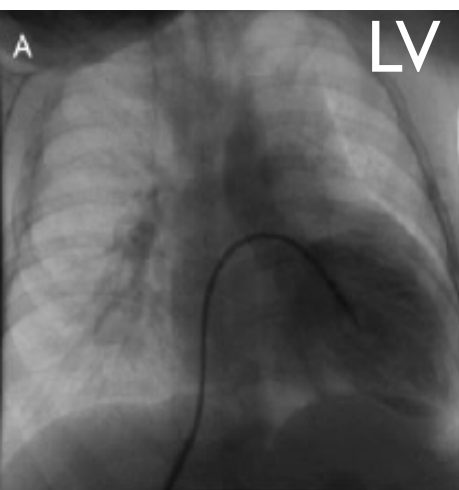
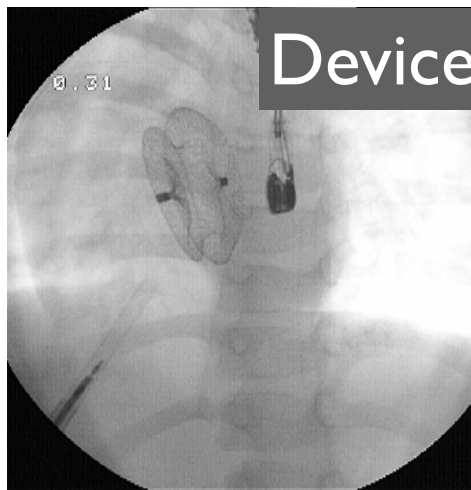
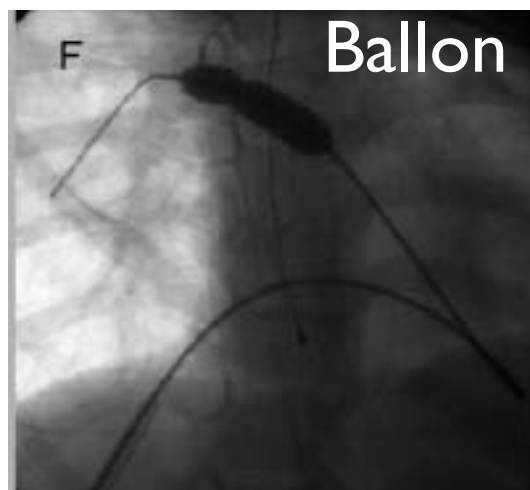
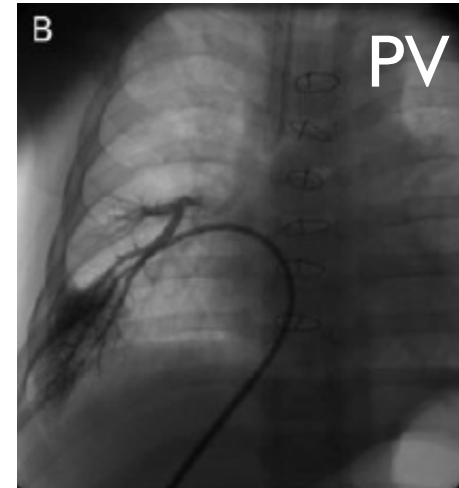
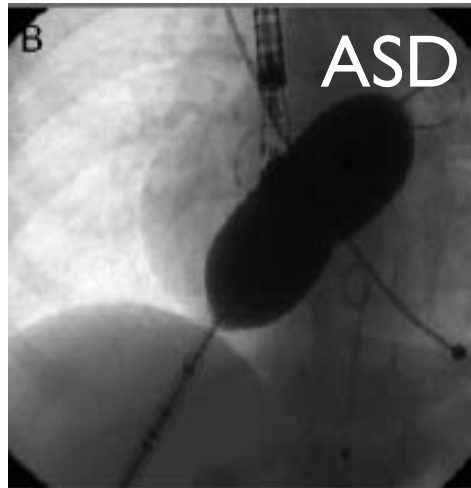
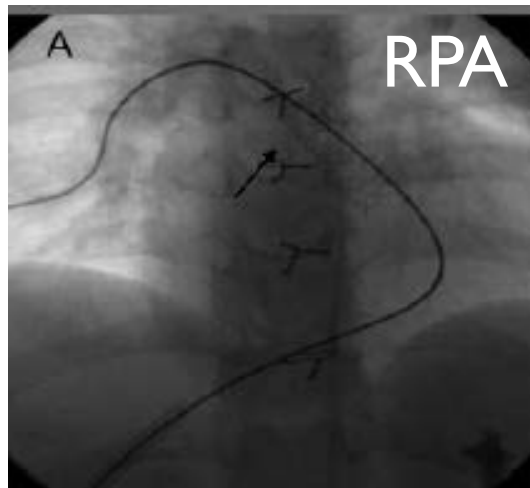


Secure sheath !

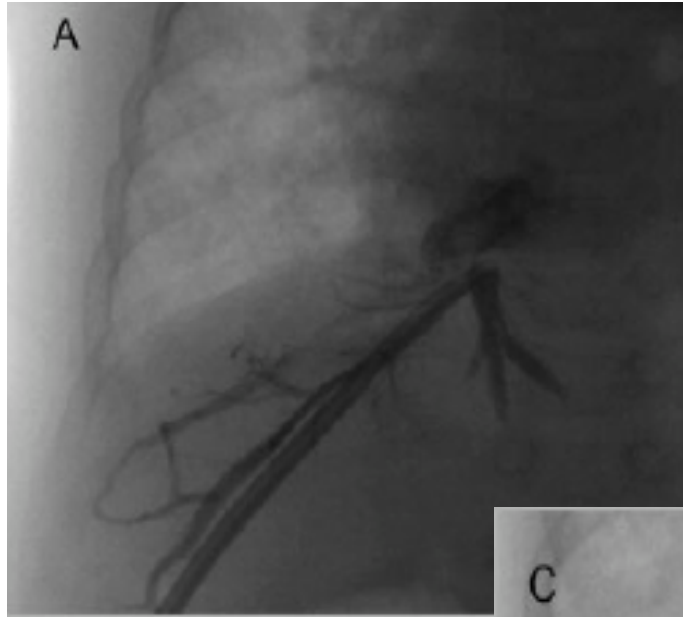
Second 0,014" wire

# TRANSHEPATIC

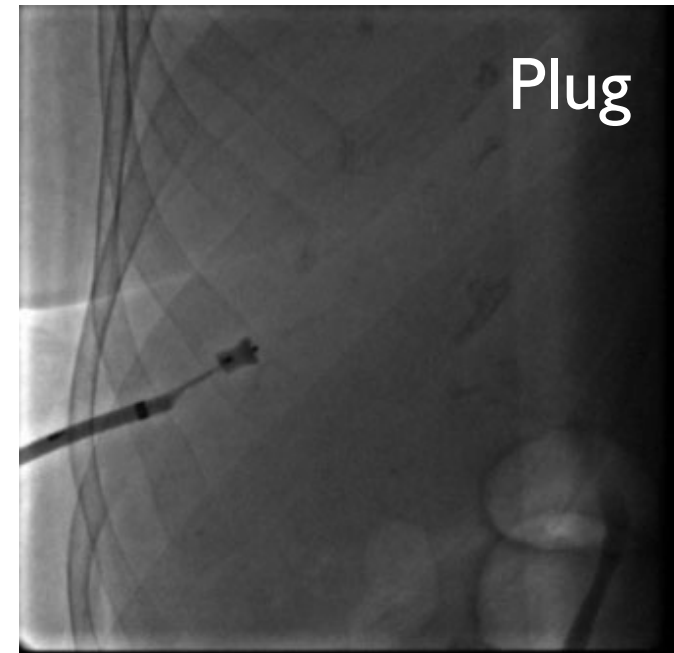
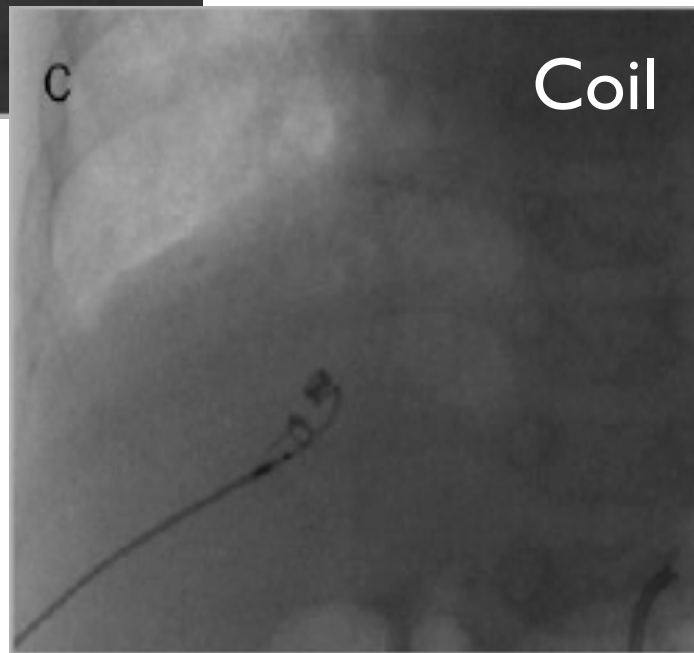
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# TRANSHEPATIC

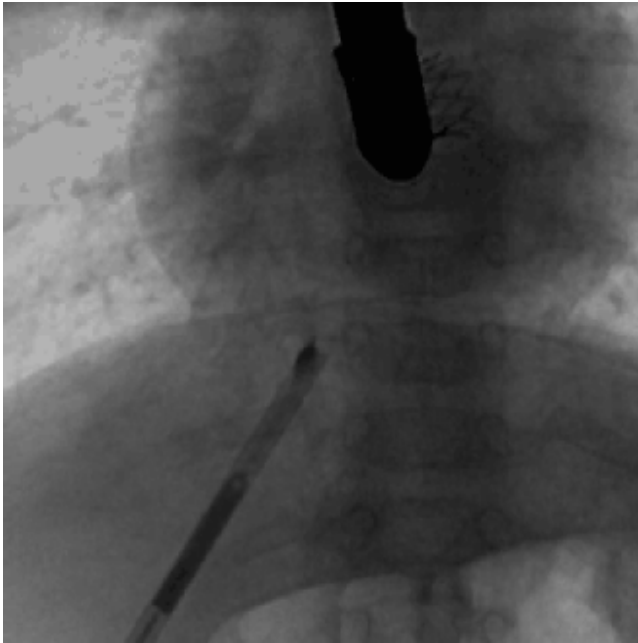


Closure of  
puncture site

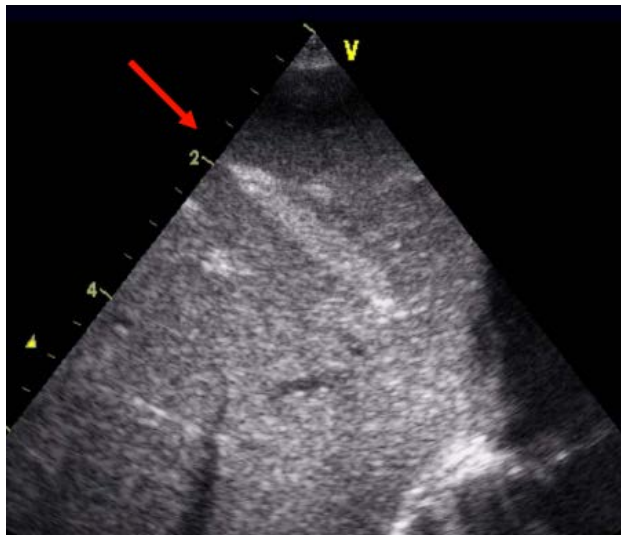


# TRANSHEPATIC

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IVC-Hypertension (Fontan)  
Coagulation disorder  
Big sheath  
Infant



Gelfoam (Spongostan®)



# TRANSHEPATIC

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- ▣ Intra/retroperitoneal bleeding
- ▣ Pneumothorax
- ▣ Pleural effusion
- ▣ Perforation of gall bladder
- ▣ Portal vein thrombosis
- ▣ Liver abscess

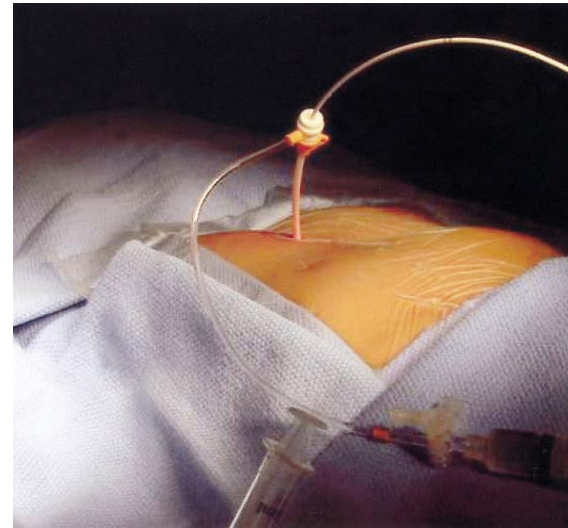
A yellow teardrop-shaped graphic with a white border, containing the text "< 5%" in red. This graphic is positioned to the right of the list of complications, likely indicating that the overall complication rate for these conditions is less than 5%.

< 5%

# TRANSTHORACIC

## HOW TO .....

- ▣ Breath hold
- ▣ Coronary angiography
- ▣ Subxiphoidal
- ▣ Right subcostal
- ▣ Apical
- ▣ TTE
- ▣ 18 Gauge lumbar needle
- ▣ Skin suture

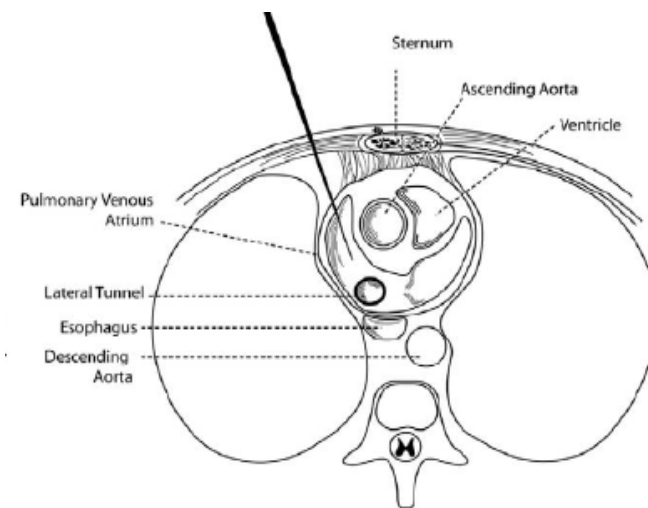
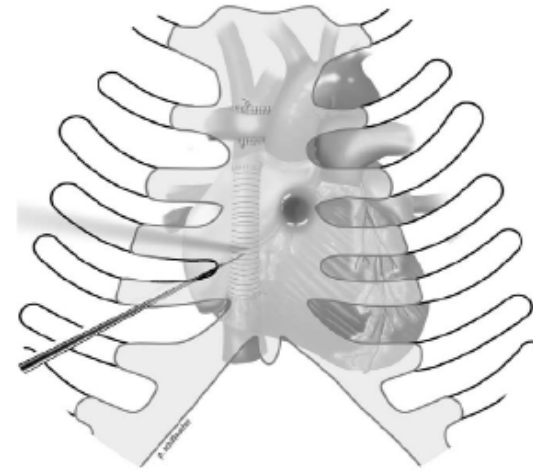


VSD-Closure  
Paravalvular Leak  
RVOT-Stenosis  
PA- and PV-Stenosis  
Hepatic Vein Closure

# TRANSTHORACIC

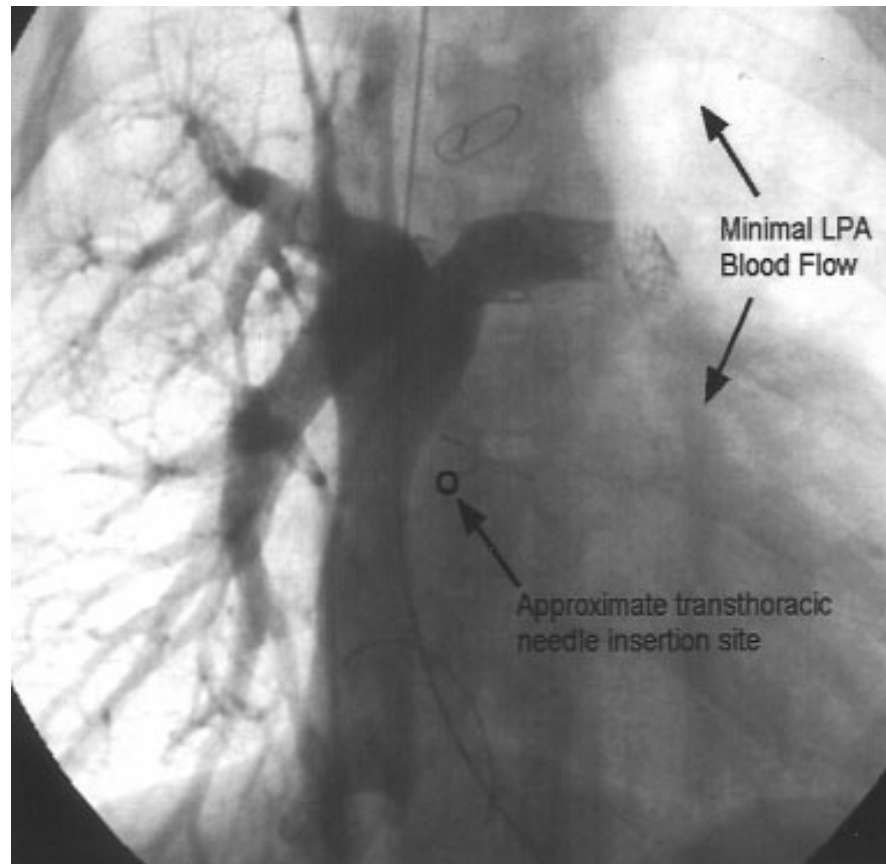
## HOW TO .....

- ▣ Parasternal between right mammary artery and sternum
- ▣ Expiration
- ▣ Landmarks

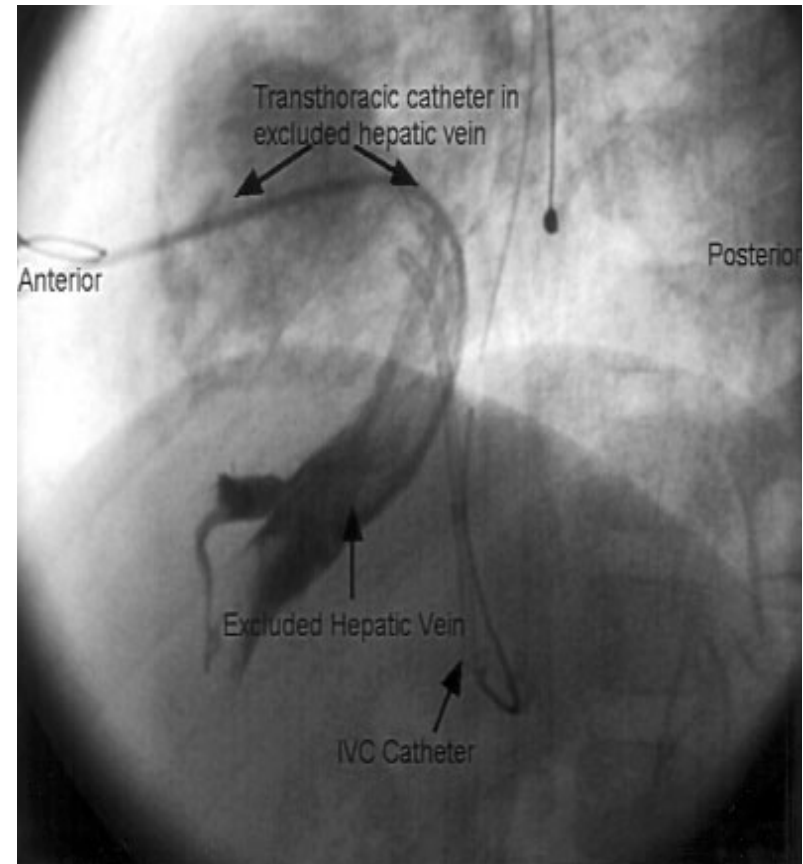


# TRANSTHORACIC

## PUNCTURE SITE



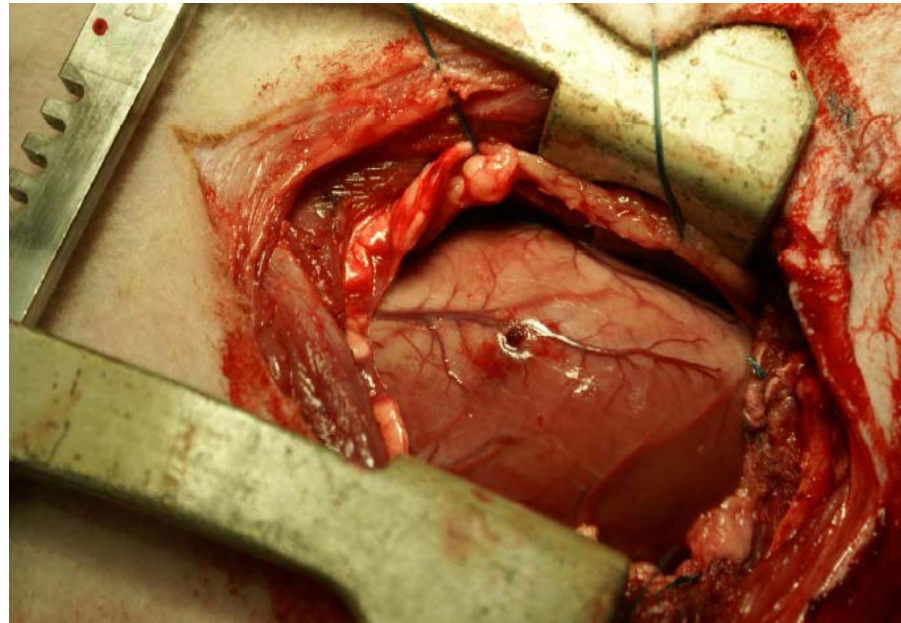
## HEPATIC VEIN



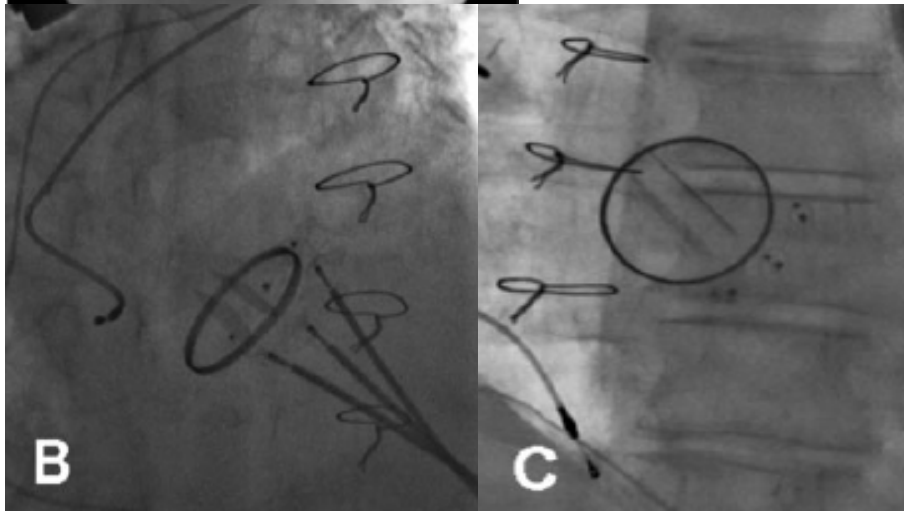
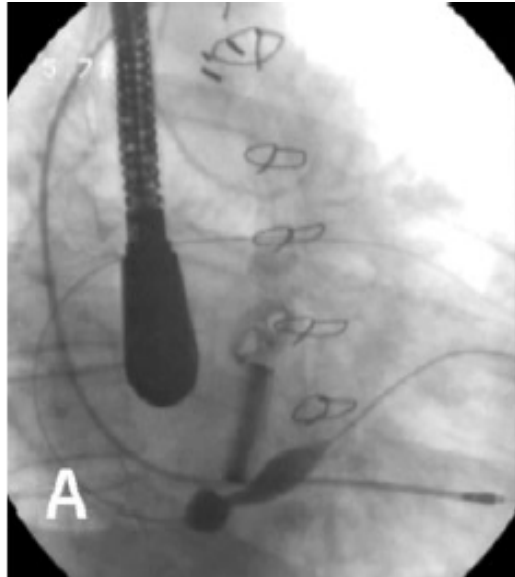
# TRANSTHORACIC / APICAL

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Blind puncture ?.....



# TRANSAPICAL - LV



Percutaneous

Mini thoracotomy

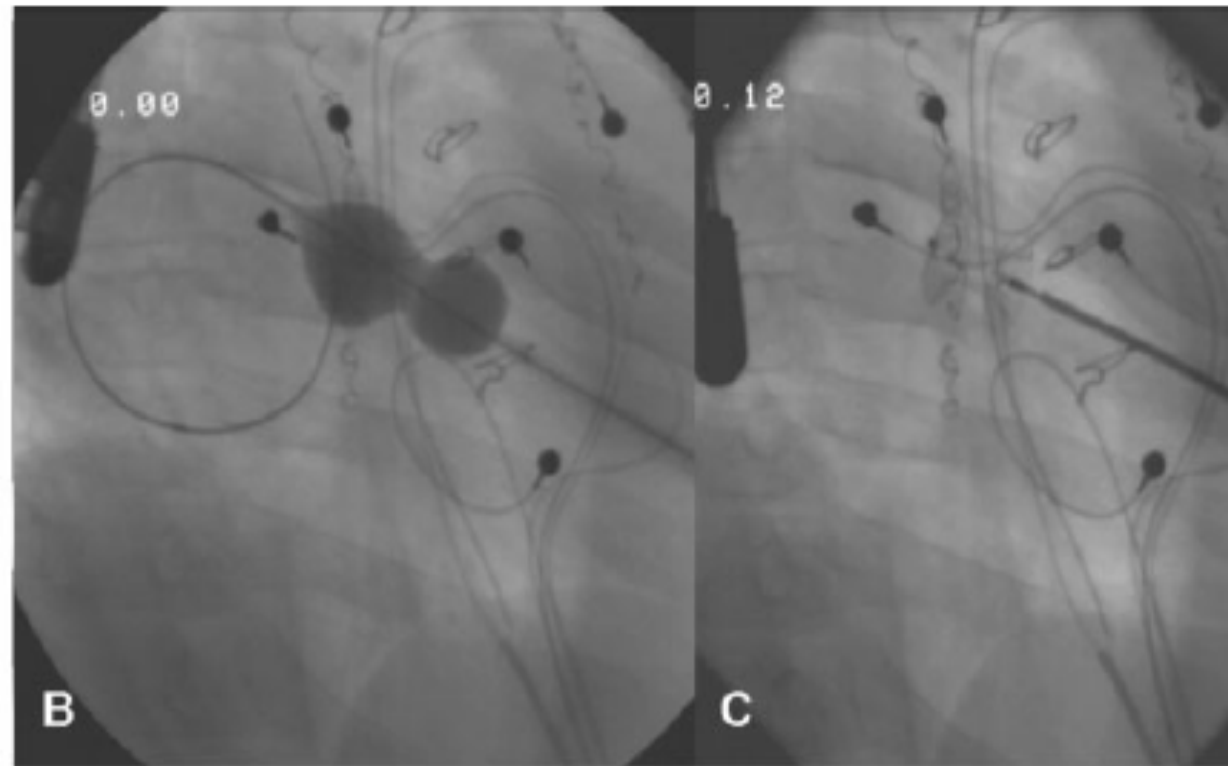
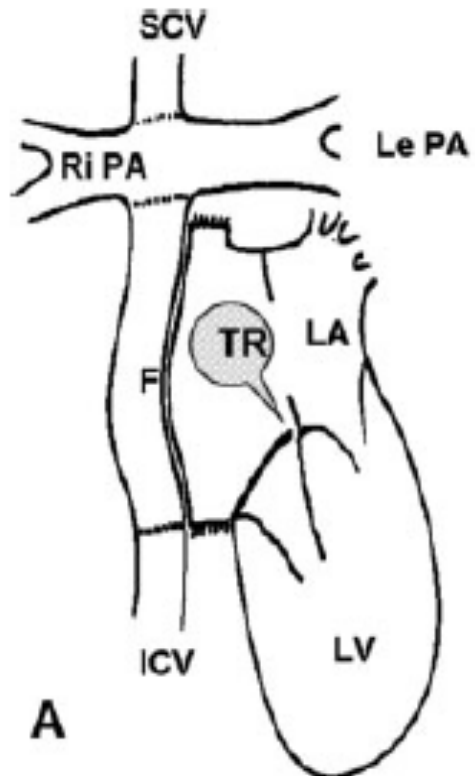
Aortic valve

Paravalvular leak

Patch-leak

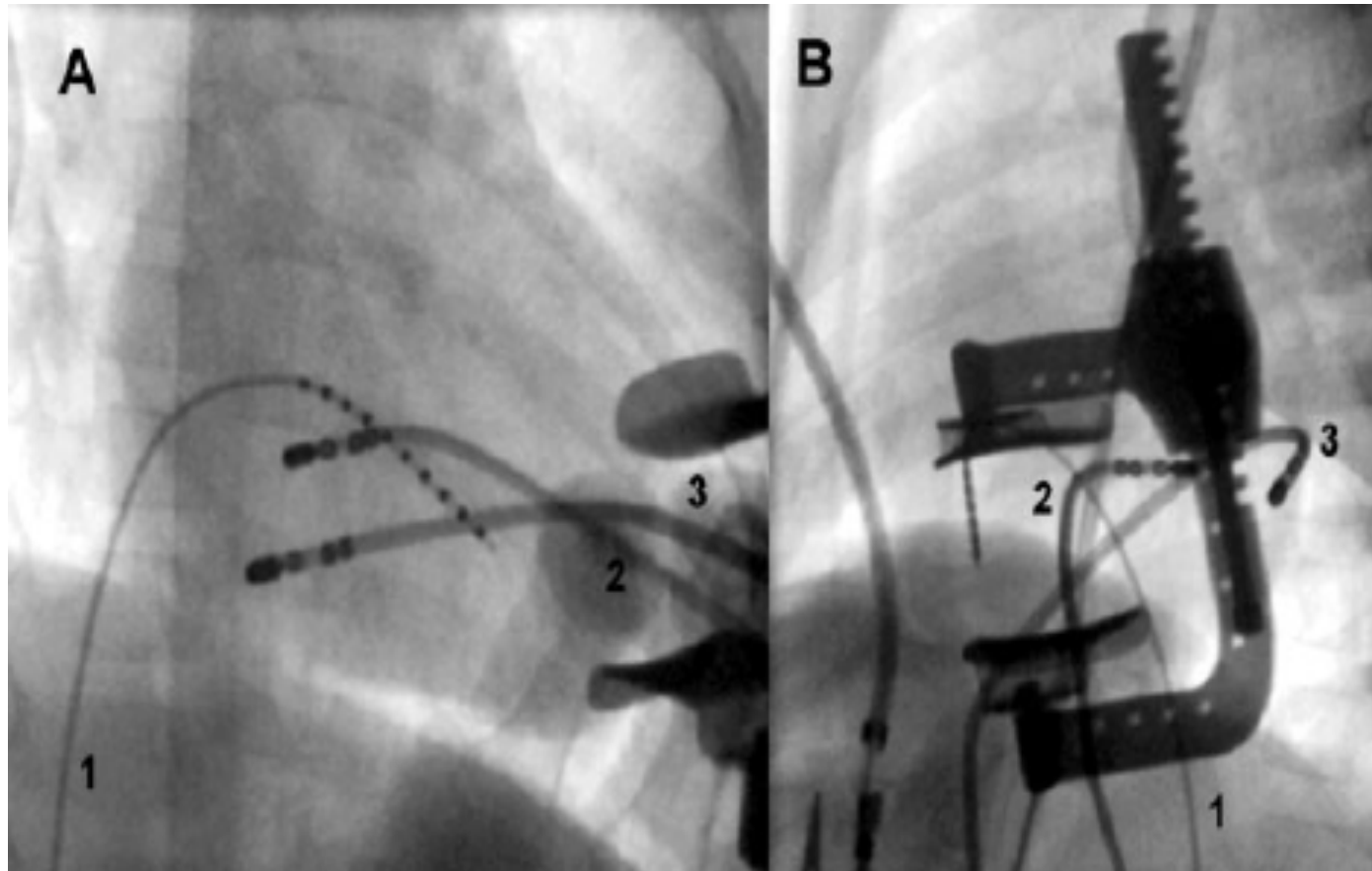
Elektrophysiologie

# TRANSAPICAL - LV



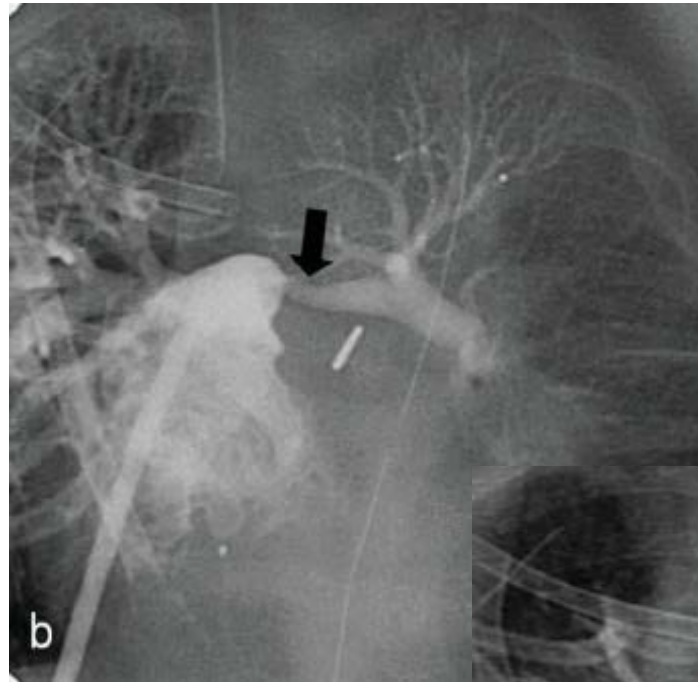
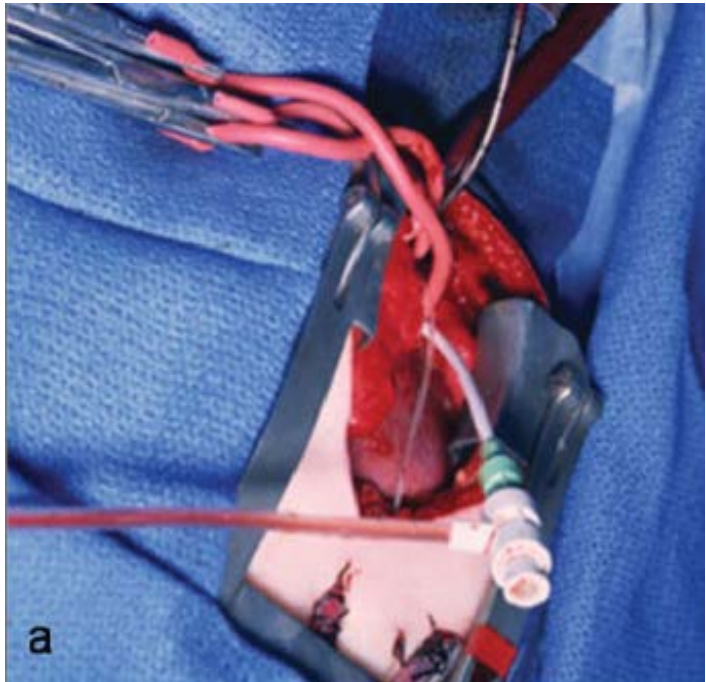
# TRANSAPIKAL - LV

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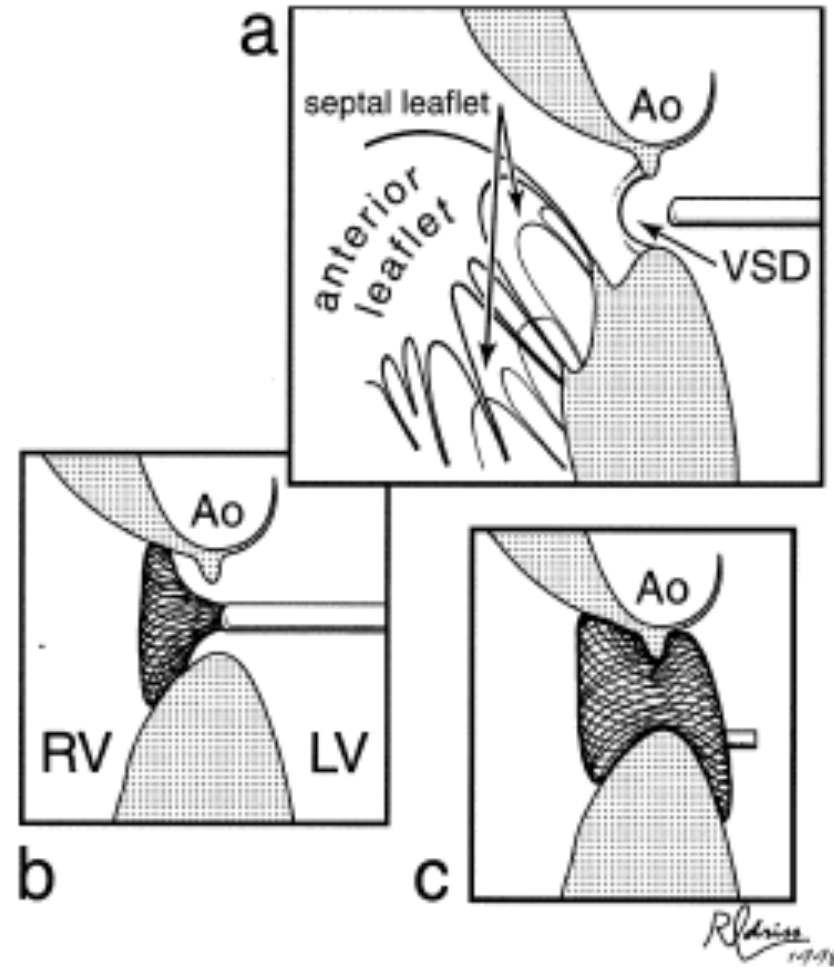
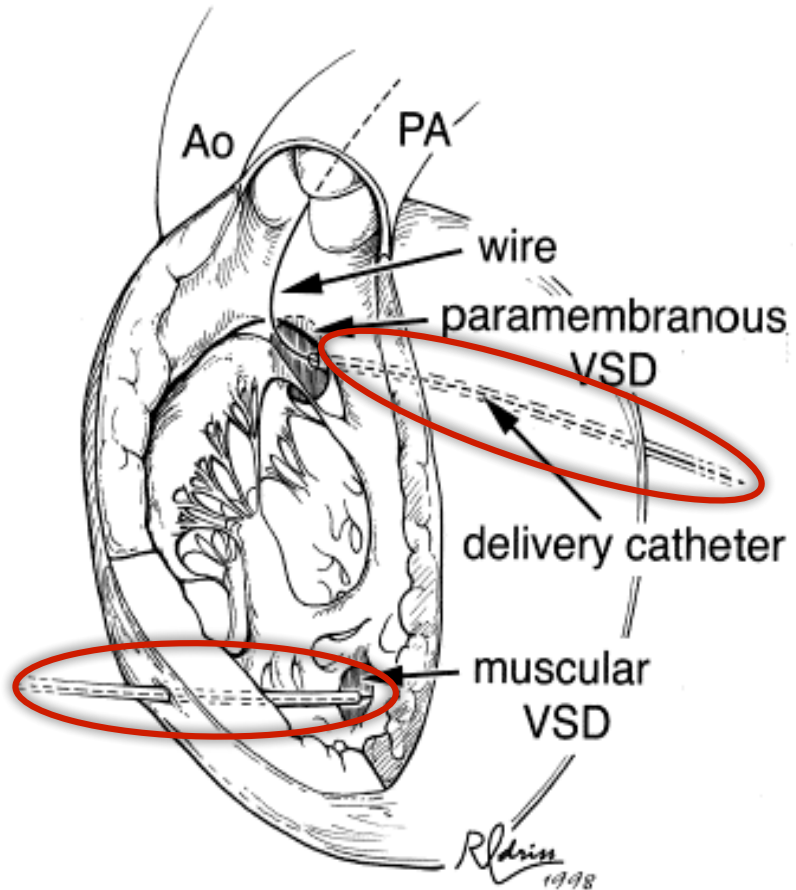


# OPEN CHEST - RVOT/PA



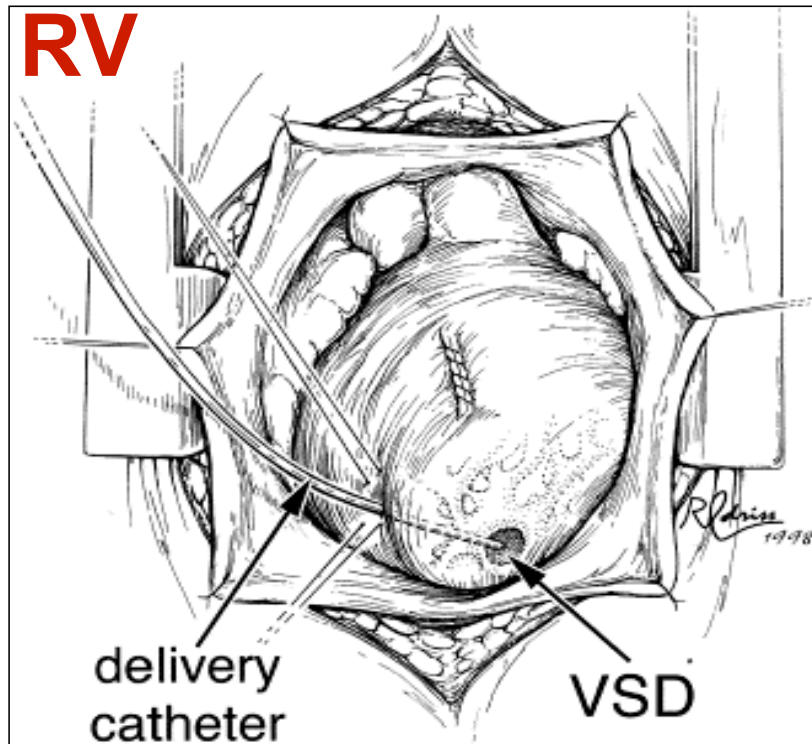
Pulmonary valve / Stent  
Pulmonary arteries / Stent  
Arterial duct / Stent

# PERVENTRICULAR

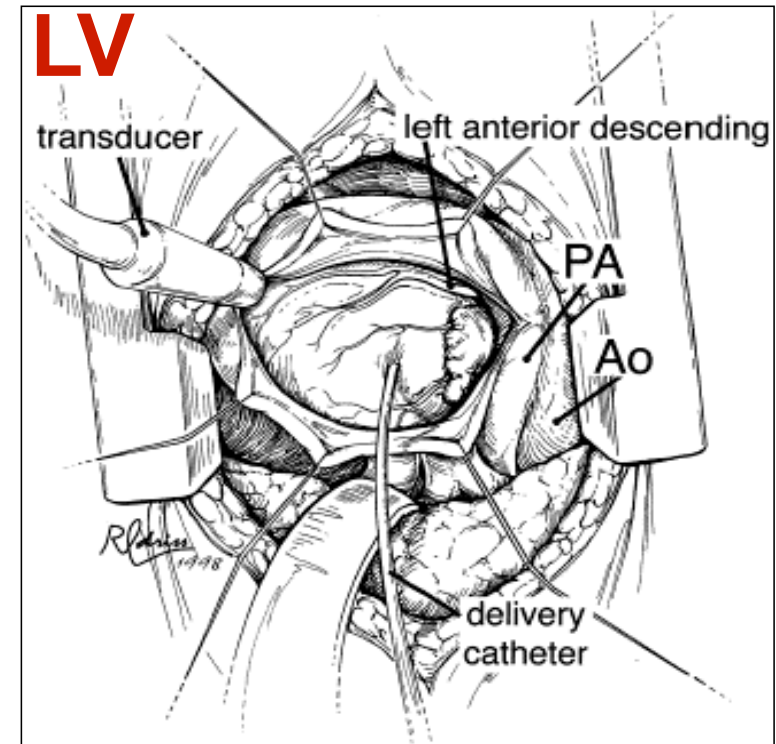


# PERVENTRICULAR

## MUSCULAR VSD

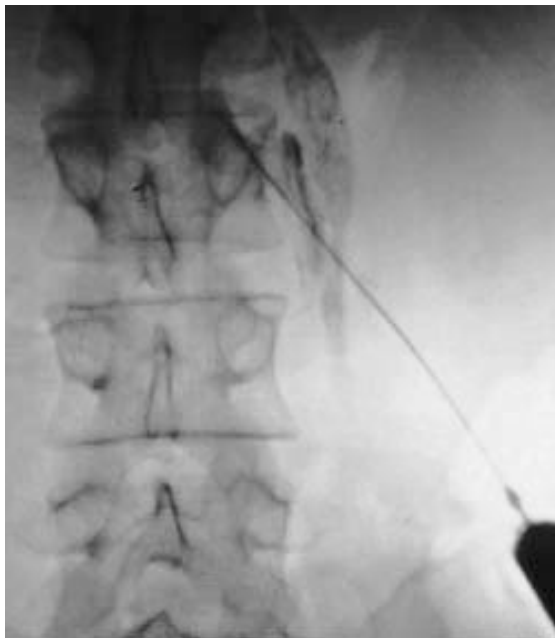


## MEMBRANOUS VSD



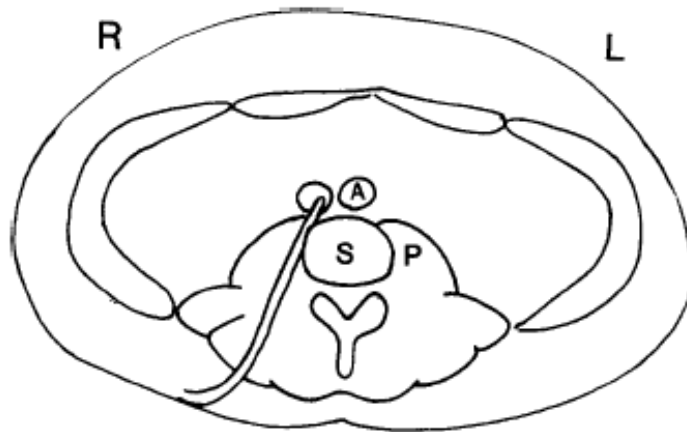
# TRANSLUMBAR

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- ▣ Prone position
- ▣ 25° –right side ↑
- ▣ 10 cm cephalad to right iliac crest
- ▣ 10 cm lateral to spine
- ▣ 45° - horizontal angle

# TRANSLUMBAR



PA-Stent  
Central venous line  
Hämodialysis catheter

## Infants

- ▣ L3/L4
- ▣ 6 cm lateral to spine
- ▣ 1-2 cm ventral to vertebral body
- ▣ 18 gauge Turner needle (10 cm)

# AXILLARY ATERY

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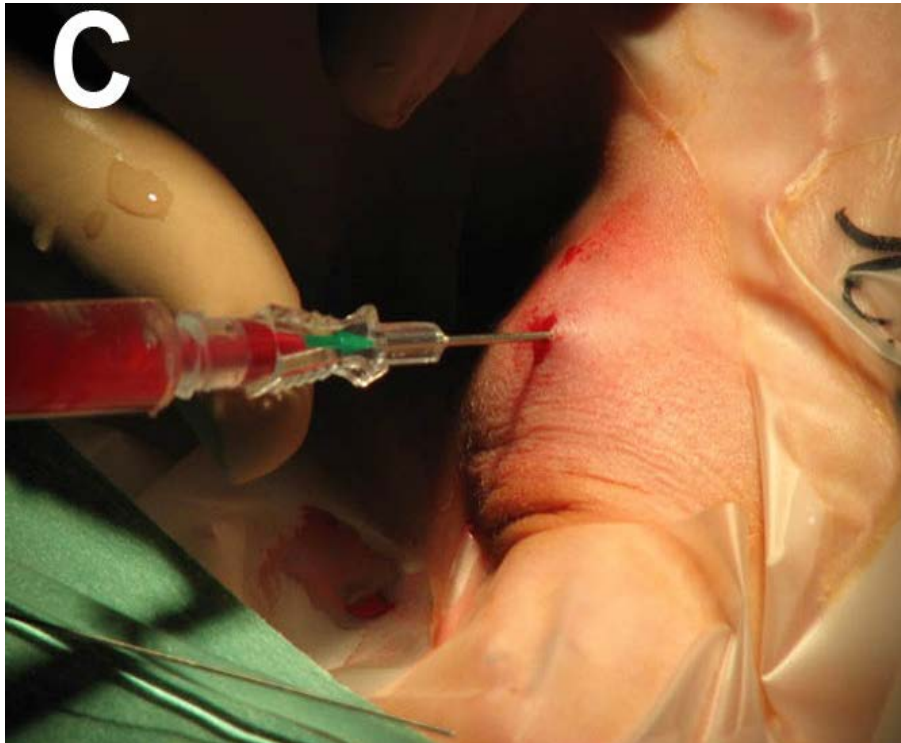


Arm: 120-140°  
Head to contralateral side



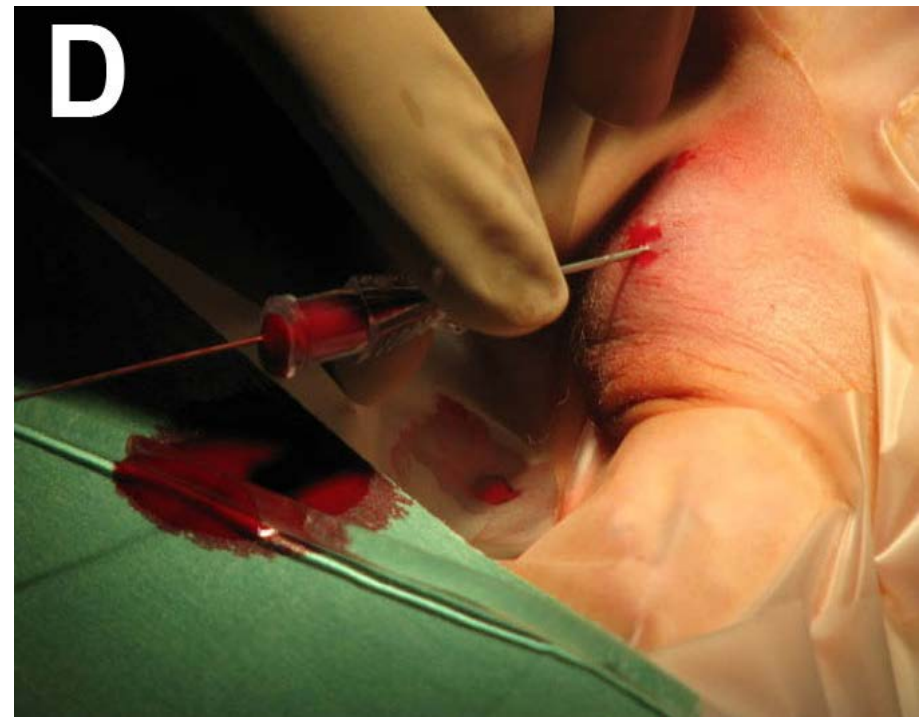
# AXILLARY ARTERY

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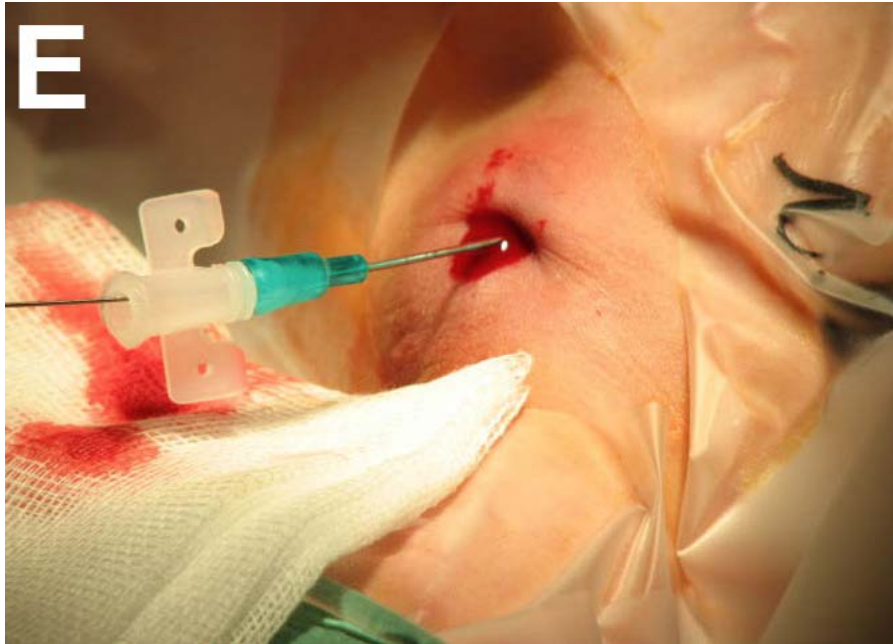


21 G needle

0,014 floppy wire



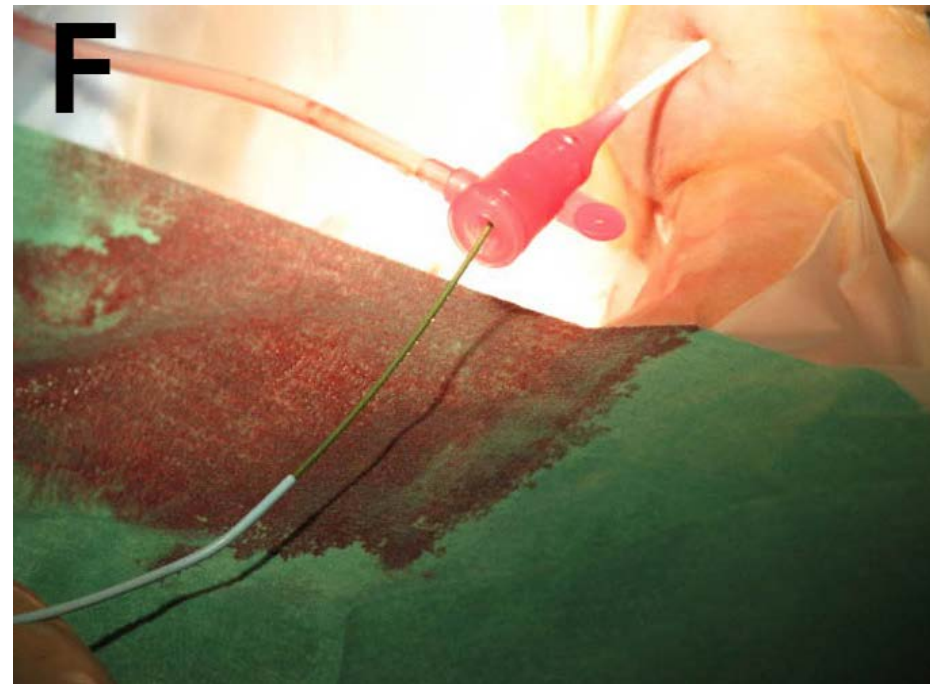
# AXILLARY ARTERY



Leader Cath (Vygon)

Intravascular ?.....

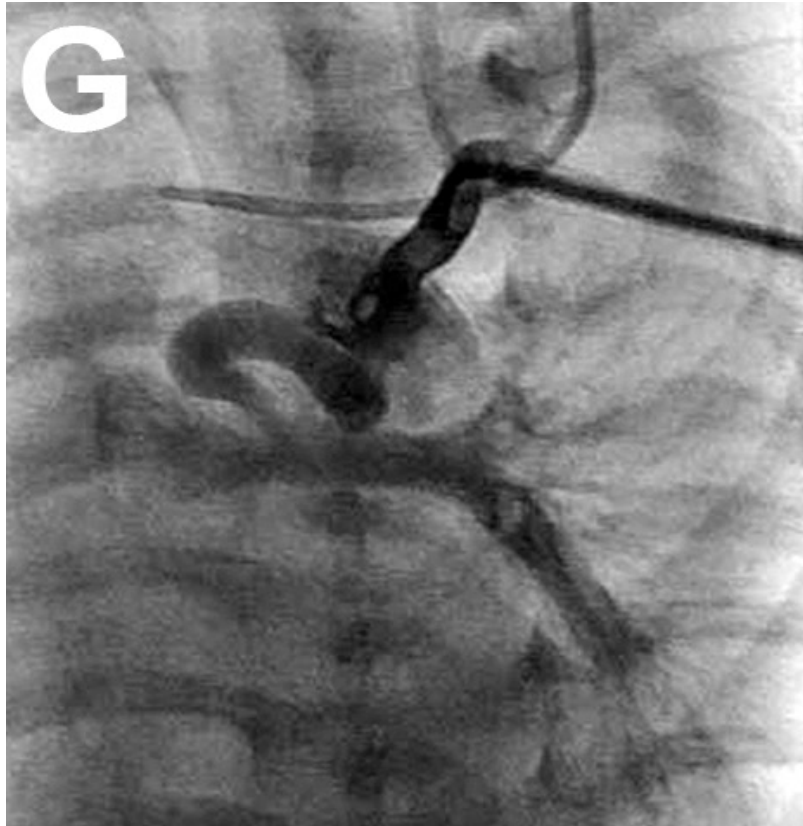
4 F short sheath







# AXILLARY ARTERY

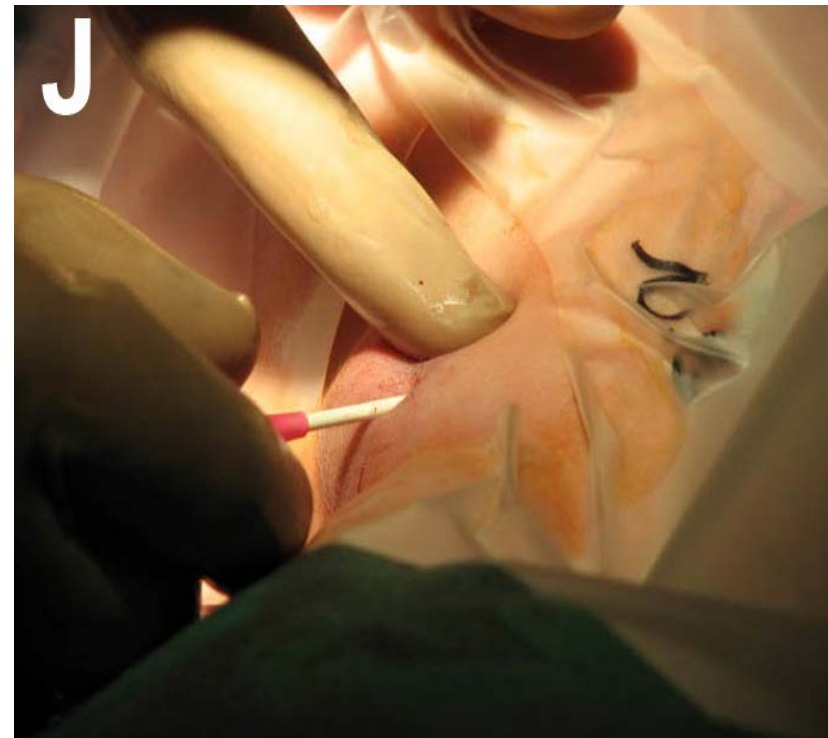


# AXILLARY ARTERY

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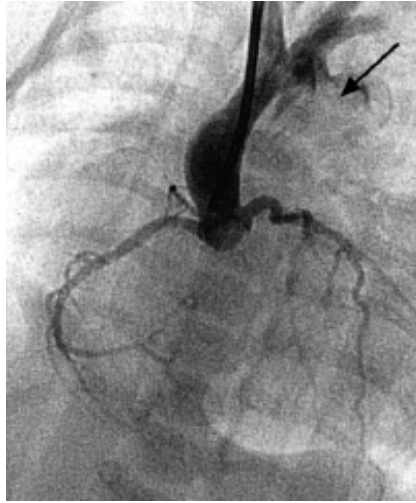


Hematoma  
Bleeding  
Nerve palsy  
Dissection  
Aneurysm



# CAROTID ARTERY

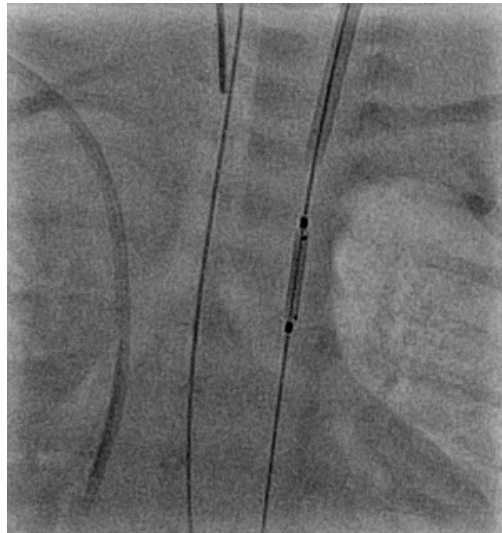
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Aortic valve stenosis

Aortic coarctation

**Cave: Truncus bicaroticus**



# TRANSCARPAL

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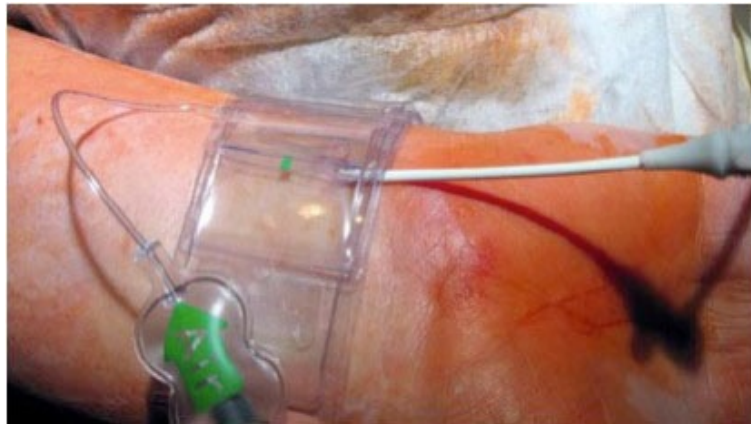
A. radialis  
A. ulnaris

Complications ↓

Patient comfort ↑

Mortality ↓

Hospital stay ↓



Allen Test !!!

# COMPLICATIONS



3,8 %



# VESSEL RECANALISATION

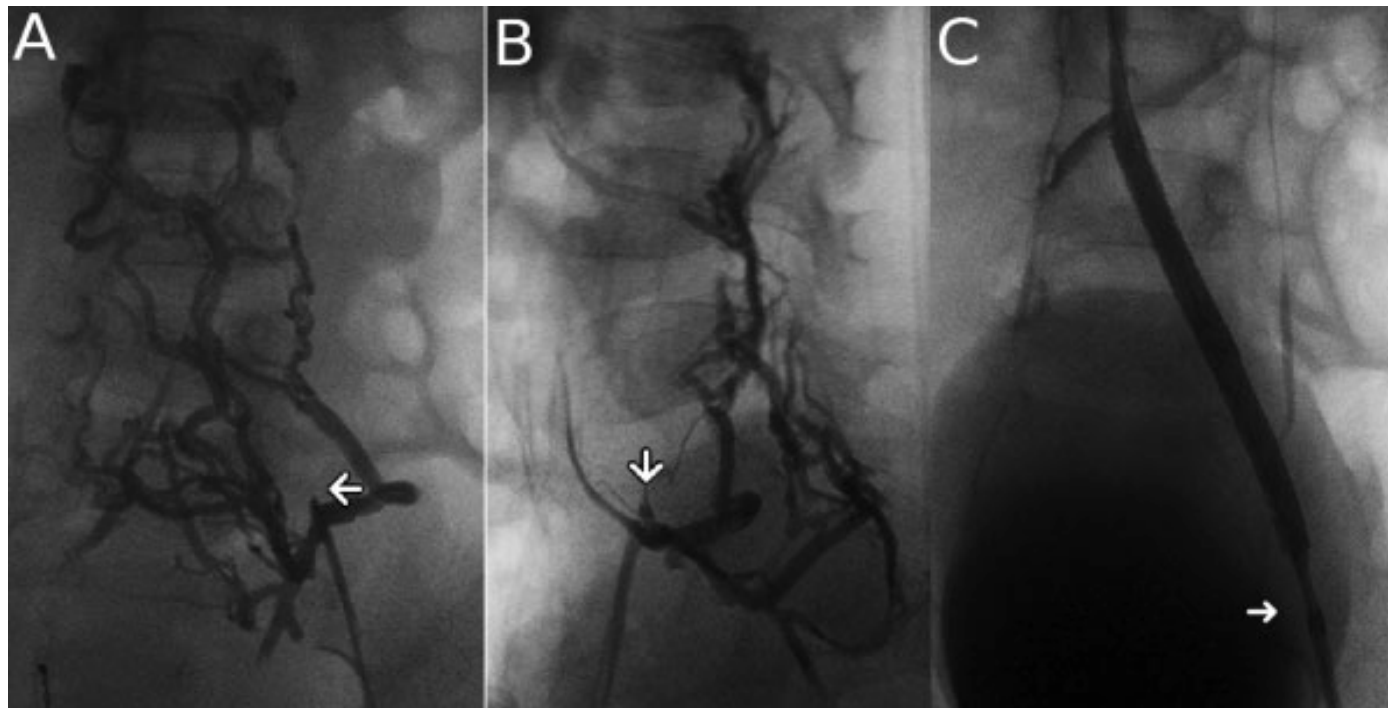
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## THROMBECTOMY

- ▣ Clot buster
- ▣ Angio-Jet

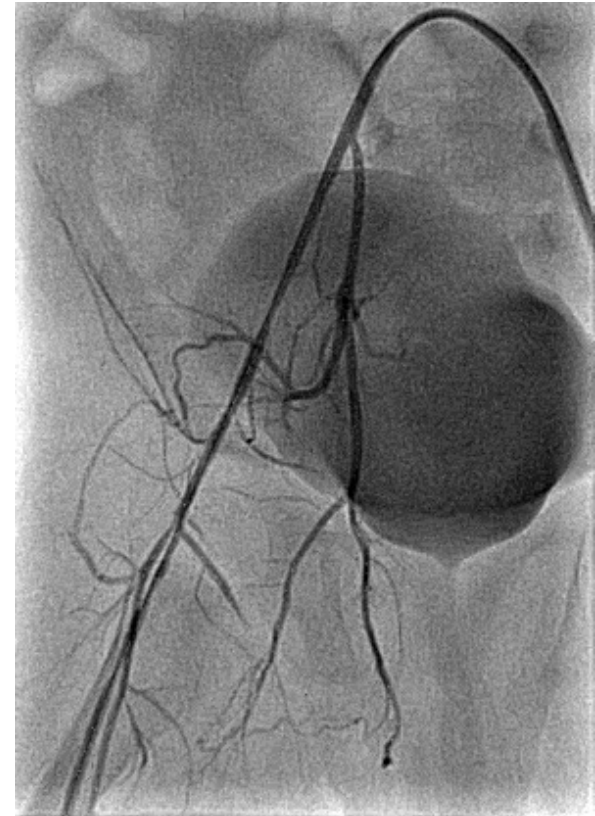
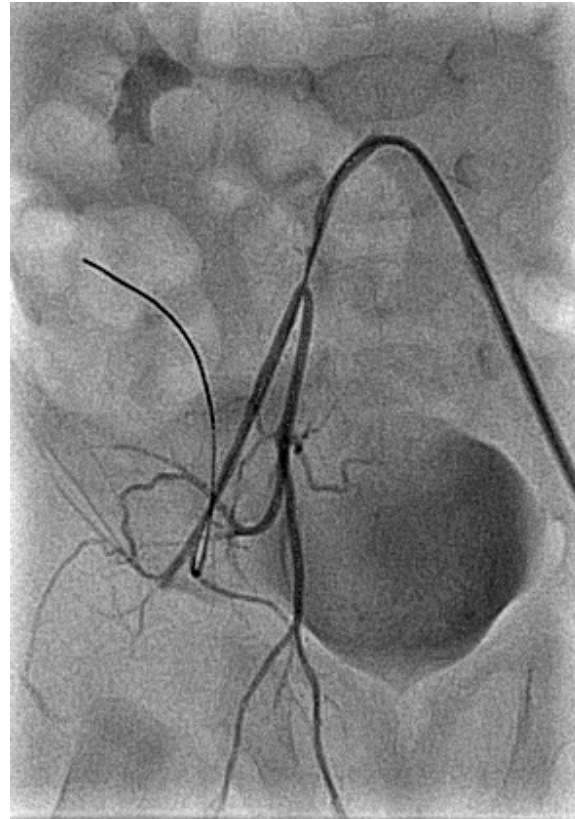
## TECHNIQUE

- ▣ Femoral cross over
- ▣ A. radialis



# MANAGING COMPLICATIONS

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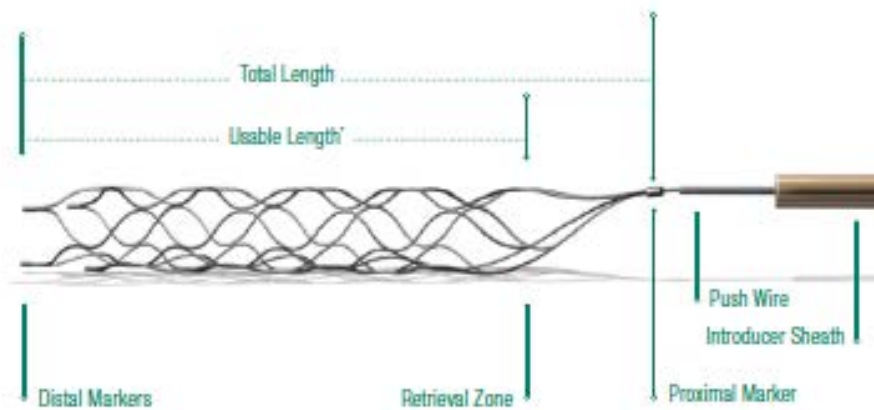


**CROSS OVER-TECHNIQUE  
BALLOON ANGIOPLASTY**

# THROMBECTOMY



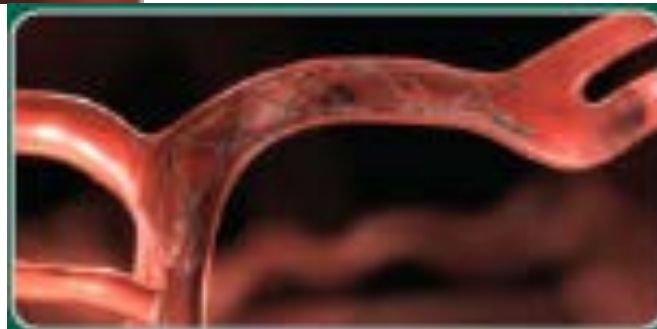
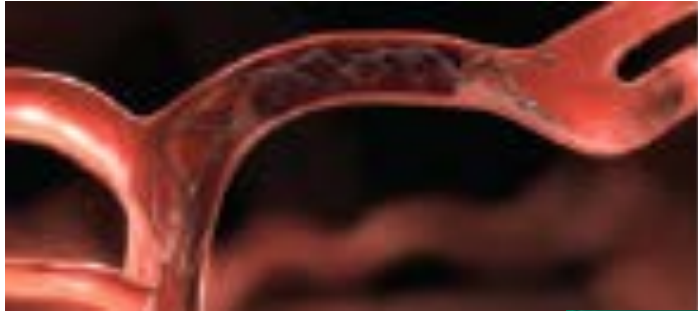
## Device Details





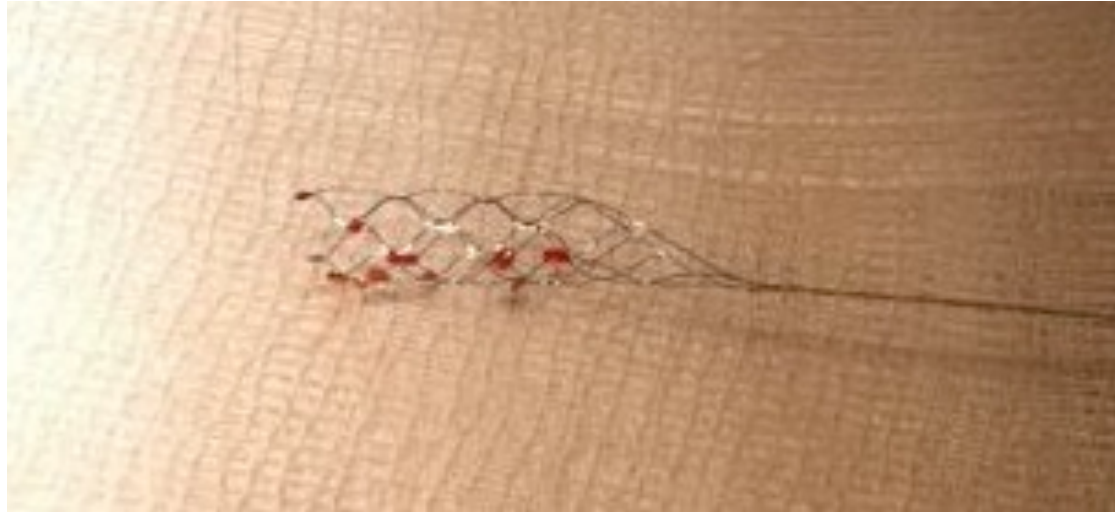
# MECHANISM

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# THROMBECTOMY

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STRAIGHT FORWARD !!!!

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