



## ***Surgical implantation of permanent pacemaker***

### ***A case of Team Integration***

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## History

- ▶ 65 y old lady end stage renal failure secondary to diabetic nephropathy.
- ▶ The patient had been haemodialysis-dependent for four years & was dialysed through a left radiocephalic AV fistula.
- ▶ She is morbidly obese with atrophy of both Lower limbs .

## History

- ▶ She started to have marked shortness of breath of sudden onset and dizzy spells few days before presentation.
- ▶ All Lab was accepted apart from mild hyperkalemia that was corrected.
- ▶ Her ECG showed.....

## ECG at presentation



The patient required a  
permenant pacemaker (VVI)

Due to presence of left sided fistula, a right sided approach was attempted.

She had numerous previous cannulations of the right subclavian for dialysis.

Many trials to gain vascular access ...but in vain !!!!



Dye injection



## What is this??

### REDUCING TUNNELED HEMODIALYSIS CATHETER MORBIDITY

## Hemodialysis Catheter-Associated Central Venous Stenosis

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## Central vein stenosis

- ▶ Exact mechanism is unknown.
- ▶ Possible mechanisms include:  
Turbulent flow, vascular injury, contact of catheter with vessel wall (less with RIJ catheters), infection & inflammation.

Risk increases with number & duration of catheter placement.

## Central vein stenosis

▶ Pathologically:

Endothelial denudation, vein wall thickness, smooth muscle proliferation, focal attachment of catheter to vessel, thrombus formation & fibrosis.

▶ Clinically:

Well developed collaterals usually abolish the symptoms.

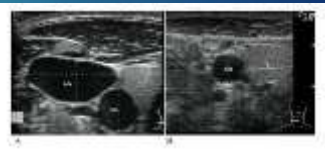
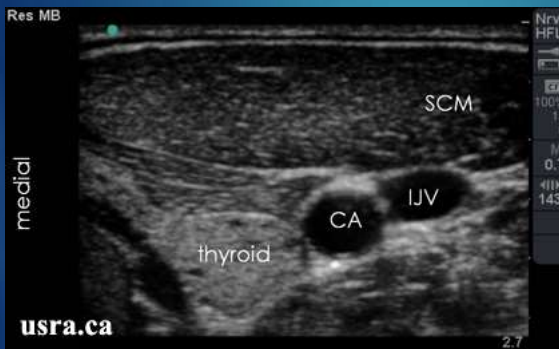
Symptomatic cases manifest as edema of the upper extremity , face, neck or breast with or without dialysis access dysfunction.

The procedure was  
postponed

# Team Integration



# Doppler vein mapping



## Doppler vein mapping

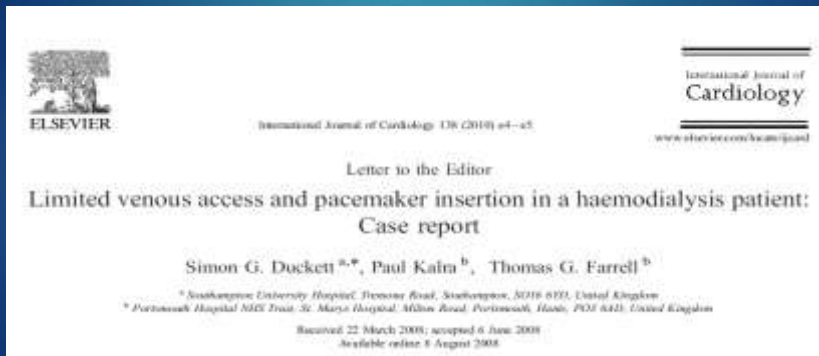


## Planning

- ▶ Possible approaches:
- ▶ Epicardial approach (Expertise , lead durability & surgical morbidity & healing).
- ▶ Femoral vein approach (special equipment & expertise, high risk of infection & associated PVD).



## Planning



## Planning

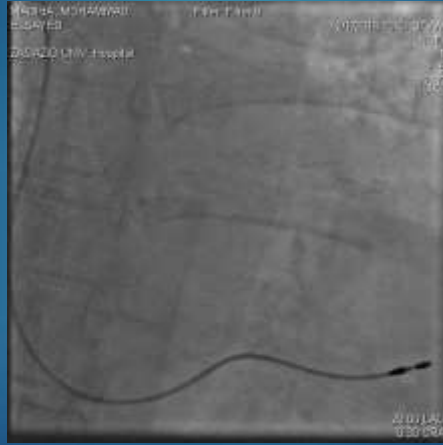
- ▶ Left cephalic approach: (Obsolete).
- ▶ Internal jugular approach with lead tunneling.

# The second trial

## confirming the route



## Inserting the lead



## Lead tunneling



## Lead tunneling



## Lead tunneling

### Tunneling the Lead

Follow these steps if tunneling the lead:

1. Allow slack on the lead for strain relief on the lateral side of the suture sleeve near the venous entry site when securing the leads to body tissue. This will prevent lead dislodgment caused by the weight of the pulse generator or upper extremity movement.

**WARNING:** Use caution handling the lead terminal when the Connector Tool is not present on the lead. Do not directly contact the lead terminal with any surgical instruments or electrical connections such as PSA (alligator) clips, ECG connections, forceps, hemostats, and clamps. This could damage the lead terminal, possibly compromising the sealing integrity and result in loss of therapy or inappropriate therapy.

2. Remove the stylet and Connector Tool.

**NOTE:** A compatible tunneling tip is recommended for use with this lead if the pulse generator is implanted away from the vein insertion site. Refer to the instructions for use for the tunneling tip and/or tunneler kit if one is being used. When using a compatible tunneling tip, do not cap the lead.

3. Cap the lead terminal if a tunneling tip and/or tunneler kit is not used. Grip the terminal pin with a hemostat, or equivalent.

**WARNING:** Do not contact any other portion of the lead terminal, other than the terminal pin, even when the lead cap is in place.

4. Gently tunnel the lead subcutaneously from the vein insertion site to the implant pocket.

**CAUTION:** Tunnel the lead from the chest area to the pulse generator implant site. Do not tunnel the lead from the pulse generator implant site to the chest area because this can damage the electrodes or lead body or both by permanently stretching the lead.

## Lead tunneling

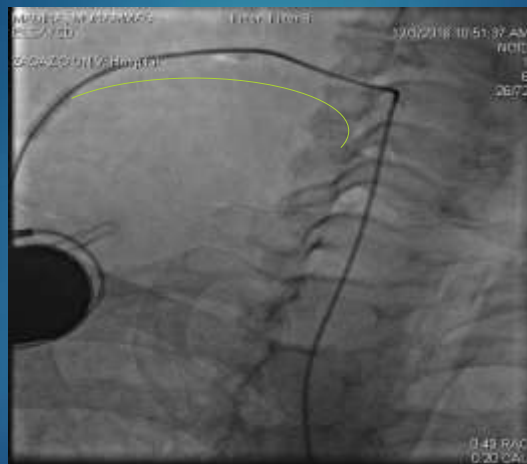
**CAUTION:** When tunneling the lead, take precautions not to place excessive tension on the lead. This can cause either structural weakness and/or conductor discontinuity.


**CAUTION:** After tunneling, re-evaluate the lead to verify that no significant change in signals or damage to the lead has occurred during the tunneling procedure. Reattach the Connector Tool and repeat the steps in Evaluating Lead Performance.

**NOTE:** If the tunneling procedure must be delayed, cap the lead terminal and form a temporary pocket for the coiled lead. Capping the terminal protects it and prevents body fluids from entering the lumen of the lead.

5. Reattach the lead terminals to the pulse generator and evaluate lead signals with the pulse generator as previously described.

## Final result





*Seminars in Dialysis*

Review

**Cardiovascular Implantable Electronic Device Leads in  
CKD and ESRD Patients: Review and Recommendations for  
Practice**

Theodore F. Saad,\* Dirk M. Hentschel,† Bruce Koplan,‡ Haimanot Wasse,§ Arif Asif,\*  
Daniel V. Patel,\*\* Loay Salman,\* Roger Carrillo†† and Jeff Hoggard,‡‡  
ASDIN Clinical Practice Committee Workgroup

## Recommendations

- ▶ All patients with advanced CKD and ESRD warrant preservation of peripheral and central veins that may be required for creation of arteriovenous access.
- ▶ Prior to placement of a CIED in patients with Stage 4 or 5 CKD and ESRD, the cardiac device specialist, nephrologist, and primary care physician should carefully review the benefits and risks of CIED therapy particular with that patient, anticipated vascular access requirements, ESRD treatment modality, and overall prognosis.

## Recommendations

- ▶ In patients with Stage 4 or 5 CKD or ESRD who do not yet have arteriovenous access and require CIED therapy, a thorough venous assessment including venography or Doppler ultrasound vein mapping should be performed prior to placement of CIED leads. Transvenous CIED leads should be placed contralateral to the side of anticipated arteriovenous access.

## Recommendations

- ▶ Epicardial leads should be considered in CKD and ESRD patients who require a new CIED or replacement of existing transvenous CIED leads.
- ▶ The combination of long-term venous hemodialysis catheters and CIEDs should be avoided due to the excessively high risk for bloodstream infection and central vein stenosis.

## Take Home Messages

- ▶ Insertion of VVI pacemaker may be challenging.
- ▶ Central vein stenosis is to be considered especially in patients with renal failure & those undergoing device upgrading & re-implantation.
- ▶ Lead tunneling is a good option for those with CVS
- ▶ Team integration and cooperation is the secret of success .

