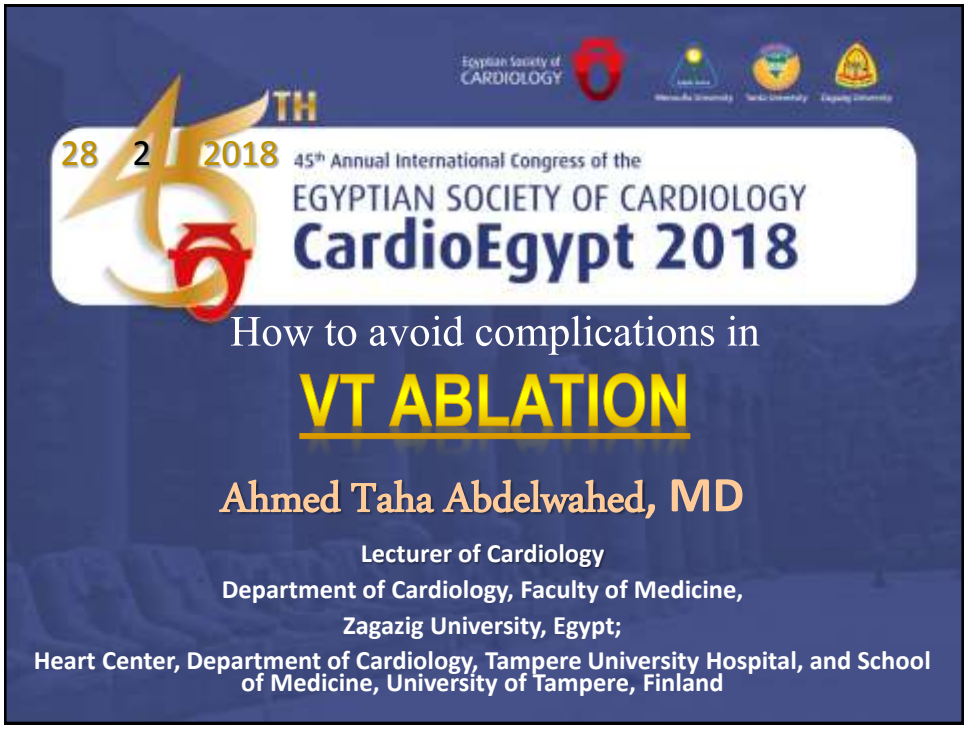


# Introduction

- Currently only Implantable Cardiac Defibrillators (ICD) have consistently shown prognostic benefit in the treatment of malignant ventricular arrhythmia. However poorly controlled ventricular arrhythmia can result in decompensated cardiac function in addition to recurren ICD discharge which causes significant morbidity.
- However the complexity of cases varies significantly depending on factors :

❑ **Etiology**

❑ **Co-morbidity**

❑ **Presentation**

- The risks of the procedure are largely influenced by **case setting**

# procedural complications

- 3 main complications
- **Vascular injury 2%:**
- **-> during access**
- **->during ablation**
- **Thrombo-embolism 1.3%:**
- **->during left ventircular ablation**
- **-> during access of left side**
- **Cardiac tamponade 0.3 – 4%:**
- **->during access**
- **->during ablation.**



| Complication Type* | Stevenson n=231 | Tanner n=63 | Bohnen n=250 | Pelcl n=473 |
|---|---|---|---|---|
| Death | 7 (3%) | 0 | 1 (0.4%) | 0 |
| Perforation | 1 | 3 (5%) | 4 (1.4%) | 3 (0.6%) |
| Tamponade | 1 | 0 | 4 | 2 |
| Haemopericardium | 0 | 3 | 0 | 1 |
| Thromboembolic Event | - | - | 3 (1.2%) | 4 (0.8%) |
| Stroke/TIA | - | - | 2 | 3 |
| DVT/PE | - | - | 1 | 1 |
| AV Block | - | - | - | 5 (1%) |
| Vascular Access | - | - | 5 (2%) | 22 (4.7%) |
| Retroperitoneal Bleed | - | - | 1 | - |
| Pseudoaneurysm | 4 (1.7%) | - | 1 | 12 |
| Femoral AVF | - | - | 1 | 3 |
| Groin Haematoma | - | 1 | 3 | 7 |
| Bleeding | 7 (3%) | - | - | - |
| Heart Failure | 6 (2.6%) | - | 1 | - |
| Other | | | | 3 (0.6%) |
| Device Lead dysfunction | 1 | 1 | - | 1 |
| CPR Intraprocedure | - | - | - | 2 |
| Pericarditis | 1 | - | - | 0 |
| COPD exacerbation | 1 | - | - | - |

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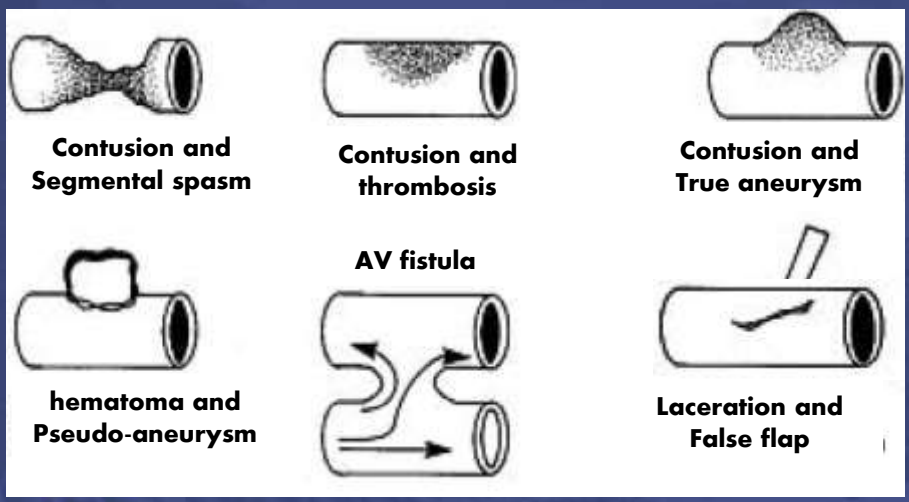
# Vascular injury



# Vascular injury during access

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# VT in non-structural heart

How to avoid complications….



## complications

- It is almost safe…. But still there are some risks
- Conductive system: LBBB, AVN or RBBB.
- Localized pericarditis, or perforation..
- Thrombo-embolic during ablation of left side.
- Damage to the coronary arteries

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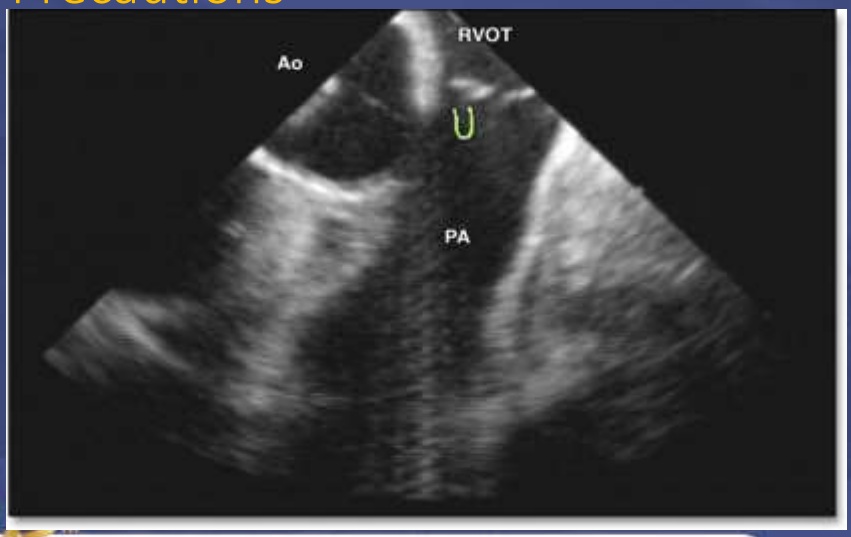
## Precautions






# VT in structural Heart Disease

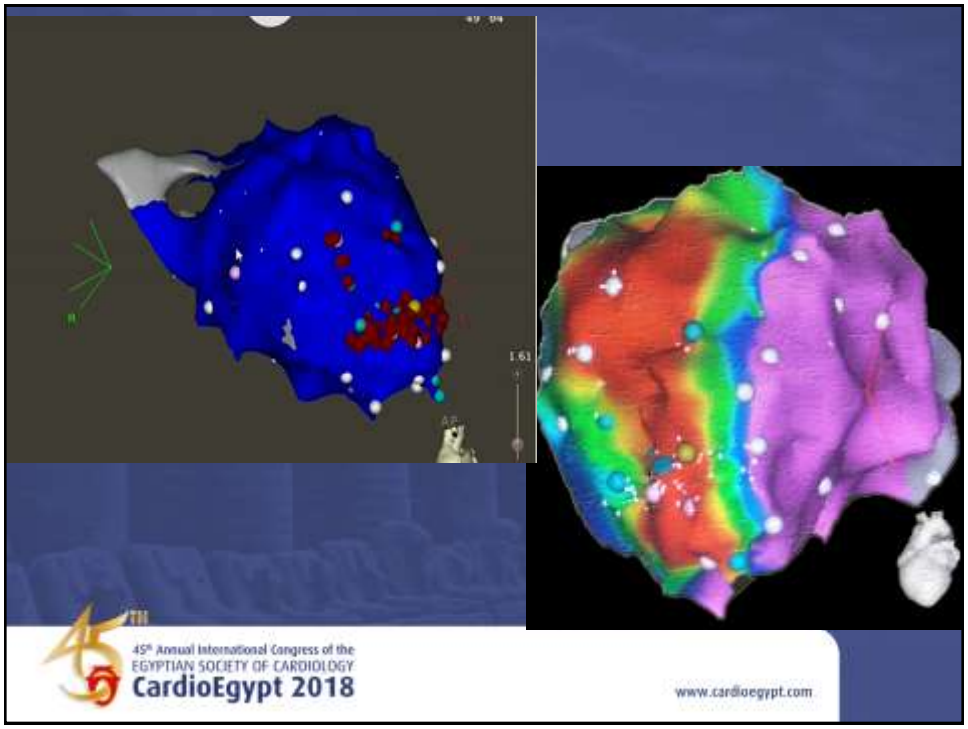
## complications

- Thromboembolism
- Air embolism
- Cardiac tamponade
- Valve injury
- Myocardial ischaemia
- Heart failure



## Precautions

- Flushing of all introduction system before during and post insertion of catheters.
- Energy titration especially in thin walled-structures Limiting RF power to achieve impedance decrease of <18 ohm with open irrigation.
- ECMO can be alternative in case of severely depressed LV function.
- Other approach for mapping: substrate alternative to activation mapping.
- Smart touch catheters, RMT catheters.




# Epicardial ablation

Transthoracic pericardial approach “Dry Pericardial puncture”

Transvenous epicardial approach

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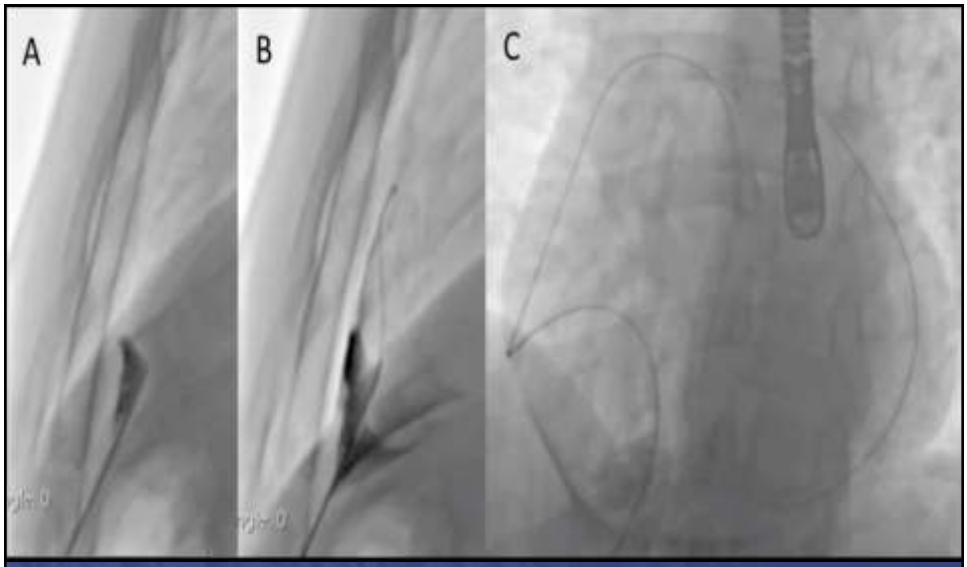
## Transthoracic pericardial approach

- complication during access:
  - Inadvertent puncture of a cardiac vessel or chamber.
  - pericardial bleeding Rv puncture or epicardial vessel puncture.
  - Intra-abdomenal bleeding: liver injury or vessels of Diaphragm.
  - Aspirated pericardial air: will be collected in the apical zone -> will hunder the effect of external DC. ”impedance”



## Dry pericardial access

- There is risk for complication must be accepted.
- systemic anticoagulation with heparin should not be administered or must be reversed if already administered before the epicardial access.
- Anatomy orientation
- Anatomy facilitation: CT/MRI / ECHO
- Fluoroscopy: 2 views with 90° angle AP/lateral.
- 2 common techniques:
  - **Contrast dye**
  - **Guide wire probing**




Pericardial access using dye technique

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Pericardial puncture using soft wire probing technique

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## Transthoracic pericardial approach

- Complications during mapping and ablation:
- **Pericardial effusion**
- **Damage to the epicardial vessels**
- **Damage to the pherenic nerve**
- **Damage to the lungs**
- **Pericarditis**



## Precautions

- lower external irrigation flow rates, such as 1 mL/min during mapping and 10–17 mL/min during ablation.
- Maintain a distance of more than 5 mm between the coronary artery and distal electrode of the ablating catheter at every point of the cardiac cycle.
- prior coronary angiography.
- cryothermal ablation
- Pacing maneuvers @ high output of 20 mA at a pulse width of 2 ms to ensure lack of phrenic nerve capture.
- conscious sedation
- interposing a sheath, balloon

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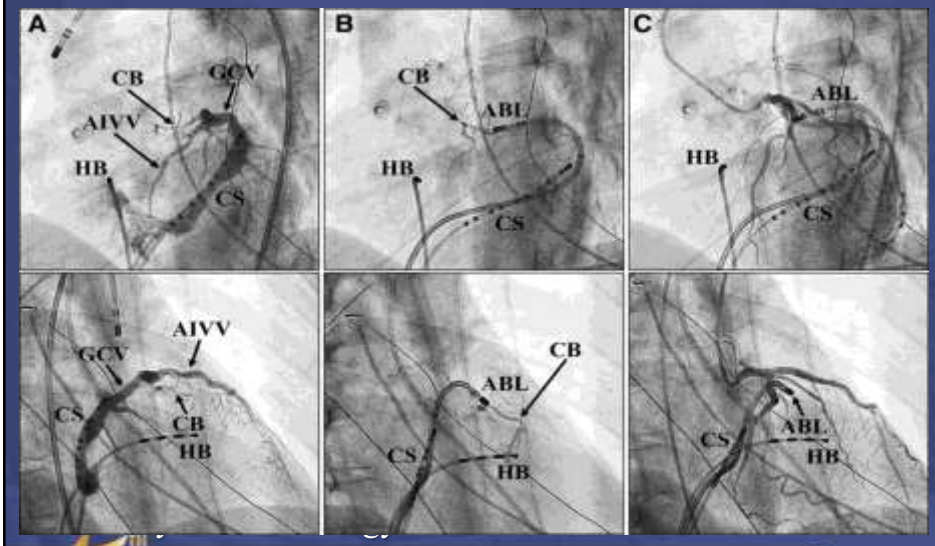
## Trans-venous epicardial approach

- Here the ablation Cather is introduced and manipulated through the coronary venous system through coronary sinus.
- Complication that can result:
  - **extravasation**
  - **perforation**
  - **stenosis or occlusion**
  - **thrombus formation within the vessel**
  - **Injury of nearby coronary arteries.**
  - **Phrenic nerve injury.**



## Precautions



- Anatomically, the CVS usually runs below the coronary arteries, but rarely over them.
- Ablation should not be performed over the coronary arteries.
- it may be safe:
  - ❖fat with high impedance lying between them
  - ❖cooling effect from the blood flow through the coronary artery.
- prior CA is strongly recommended to determine a safer area for the radiofrequency ablation: > 5mm distance @ every point of the cardiac cycle,
- CA during ablation.



## *Take home message*

- The risks of the procedure are largely influenced by **case setting**
- Good anatomy orientation.
- New techniques and advanced tools will be conservative for risk of complications.
- Alternative solutions and different plans should be prepared prior to engaging the procedure.
- Imaging and visualization with integration of multimodality can lessen the risk.


Z.A.S.U
Zagazig University - Faculty Of Medicine - Arrhythmia Service Unit
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