



# Assessing Different Pacing Modes by Echo derived measures of Cardiac Function and Blood Pressure Measurements

---

By Celine Coffey



# Introduction

---

- Aim :

*To Compare **Pacemaker Modes** using **Echo***



# Reasons for this study

---

## Pacemaker Mode

- Physiological v Non Pacing Addressed
- Negative effects of Right Ventricular Pacing addressed
- Potential Clinical Implication to programming from finding best mode

## Echo

- Accessible
- Limited time frame for study
- Cardiac Output has been used to assess Mode previously
- Opportunity to use novel measurements to assess mode



## Pacemaker Mode

---

- Only Two Types of Pacemaker
- Physiological or Non Physiological
- If lead in atrium AV synchrony can be restored=Physiological Pacing



# Physiological vs Non Physiological

---

- Andersen et al =

↓ mortality ↓ stroke ↓ atrial fibrillation

- PACE, CTOPP, Pac-a -Tach, Most Trial =

↔ mortality ↓ stroke ↓ atrial fibrillation

- Mattioli et al =

↓ stroke ↓ atrial fibrillation

- **General Conclusion:** ↔ mortality ↔ heart failure but ↓ atrial fibrillation ↓ thromboembolism



# Deleterious effects of Right Ventricular Pacing

---

- **Danish study**

*AAI v VVI mode. Over 8 years*

↓ AV block, ↓ Heart Failure severity

○ thrombolytic events, ↓ Atrial Fibrillation ↓ morbidity

- **The Most pacemaker study**

for each 1% increase in Ventricular Pacing = increase in risk of 1% of Atrial Fibrillation

- **MADITT II trial ICD (sub-study)**

*< 50% paced v > 50% paced*

new/worsened Heart Failure, more VT and high cumulative VP was an independent predictor of Heart Failure/death

- **The DAVID ICD trial**

- Unnecessary pacing of the RV in Heart Failure patients resulted in worse outcomes



# Method

---

- 15 Pts
- SSS (Intact AV conduction)
- Consent
- Pacemakers checked for normal function and intrinsic assessed
  
- VVI programmed to a rate of 10 above intrinsic e.g. own intrinsic 50bpm.....paced at 60ppm.
- Rate constant throughout study so no heart rate variability for Cardiac Output Measurement
- VVI Mode for 5 minutes
- Echo Measurements made and BP taken



## Method Contd

---

- DDD Mode with a short AV delay to promote pacing (AP-VP)
- This Mode for 5 minutes
- Echo Measurements made and BP taken
  
- DDD Mode with a long AV delay to promote intrinsic(AP-VS)
- This mode for 5 minutes
- Echo Measurements made and BP taken
  
- Pt returned to original optimal PM settings



# Echo Measurements-some Novel

---

- Cardiac Output
- TAPSE
- Tissue Doppler Imaging

*All measures of  
Systolic Function*




# Why Compare Systolic Function?

---

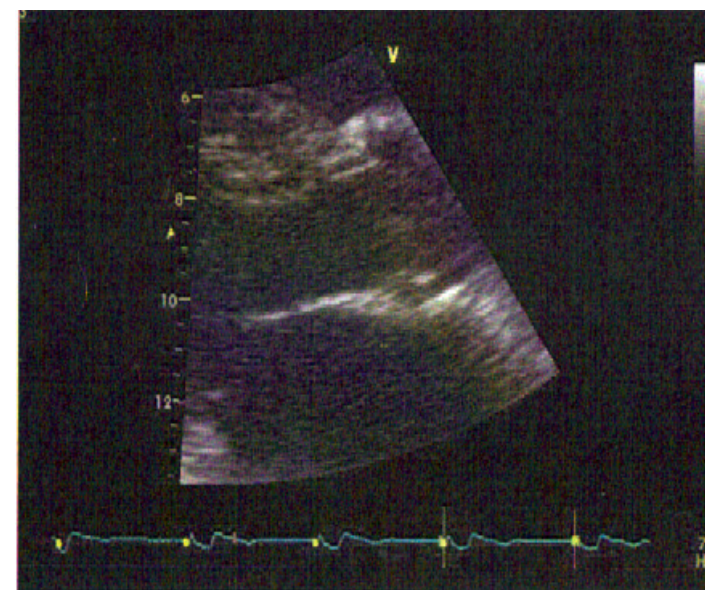
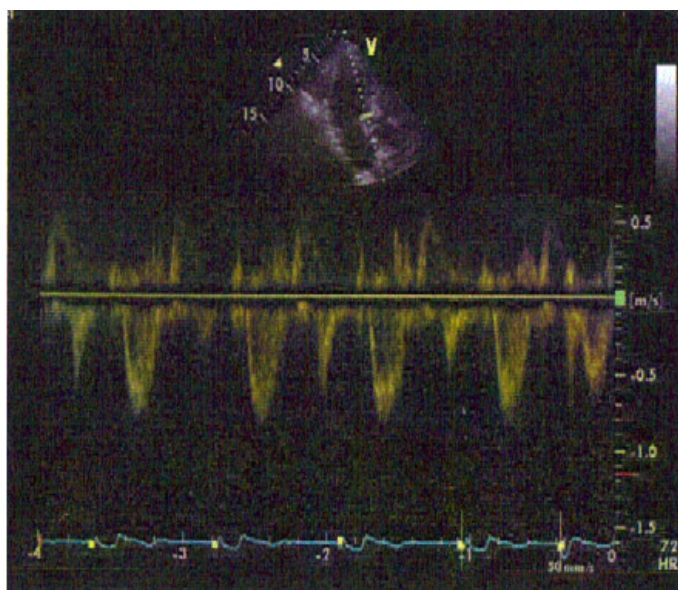
- How well the heart contracts.
- *"the degree of systolic dysfunction is a potent predictor for a wide range of cardiovascular disease"*

*Text book of Clinical Echocardiography*

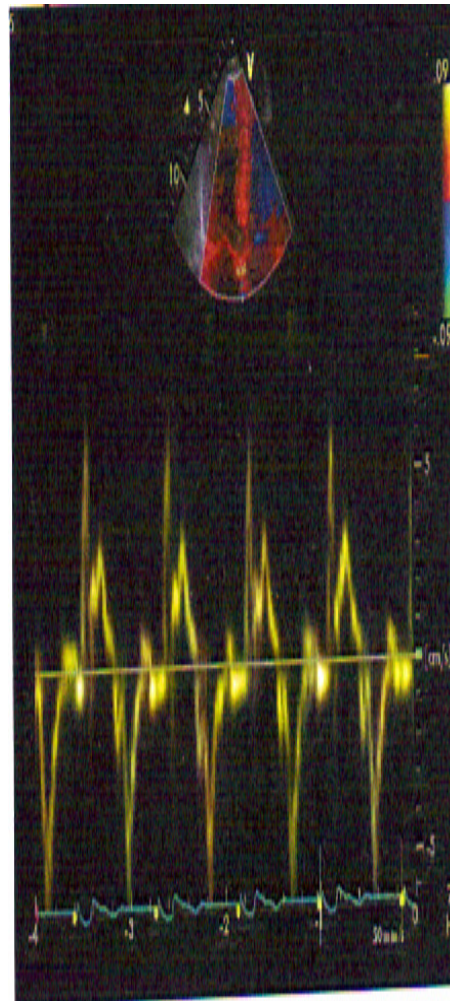
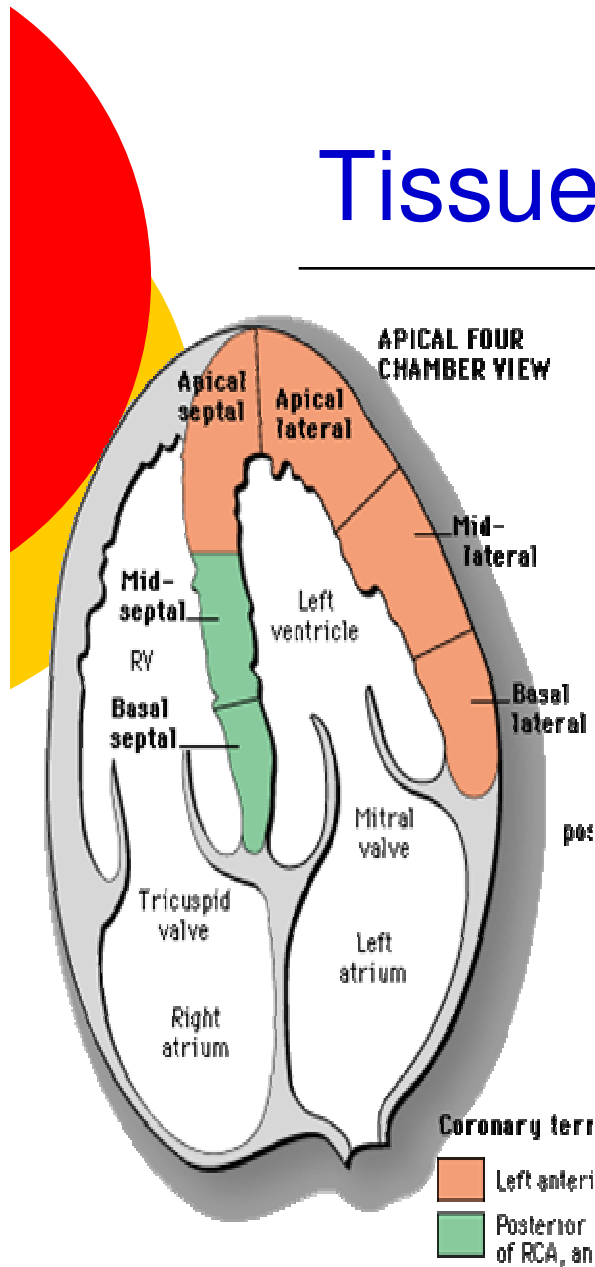
# Cardiac Output

- "Amount of blood pumped in 1 minute by the ventricle"
- Left ventricular function.
- Blood flow  peripheral tissues.

***Cardiac output = LVOT (VTI)  $\times$   $\pi$  (the diameter (LVOT))<sup>2</sup> / 4 X HR***



# Tissue Doppler



- Left ventricular **global** function.

Apical 4 chamber = septum and lateral wall

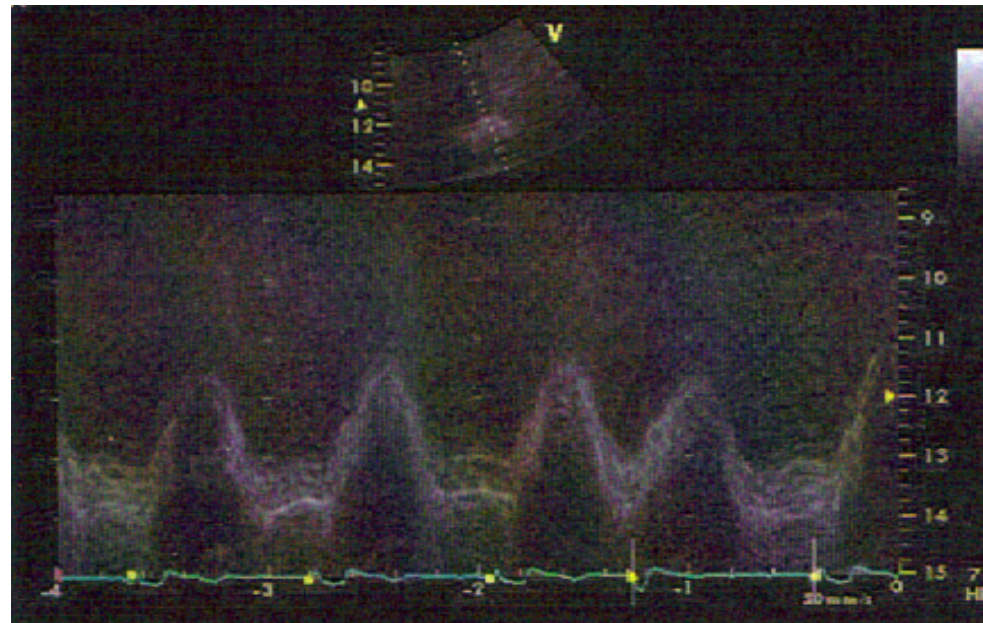
Apical Long Axis View = Anterior Septum and Posterior Wall

Apical 2 chamber = Anterior and Inferior

# T.A.P.S.E

---

- Right Ventricular function.
- M-mode through tricuspid valve annulus



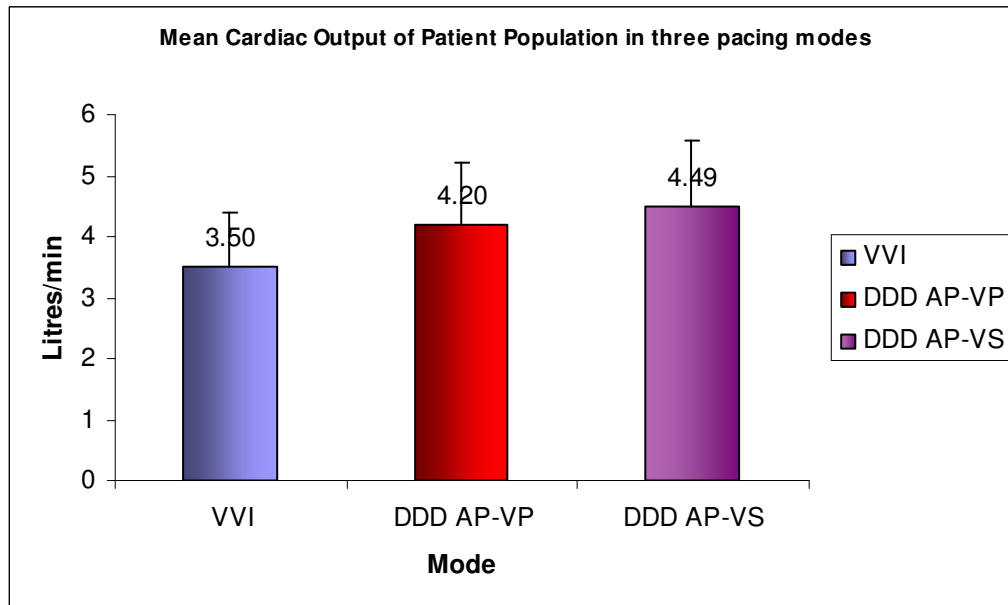
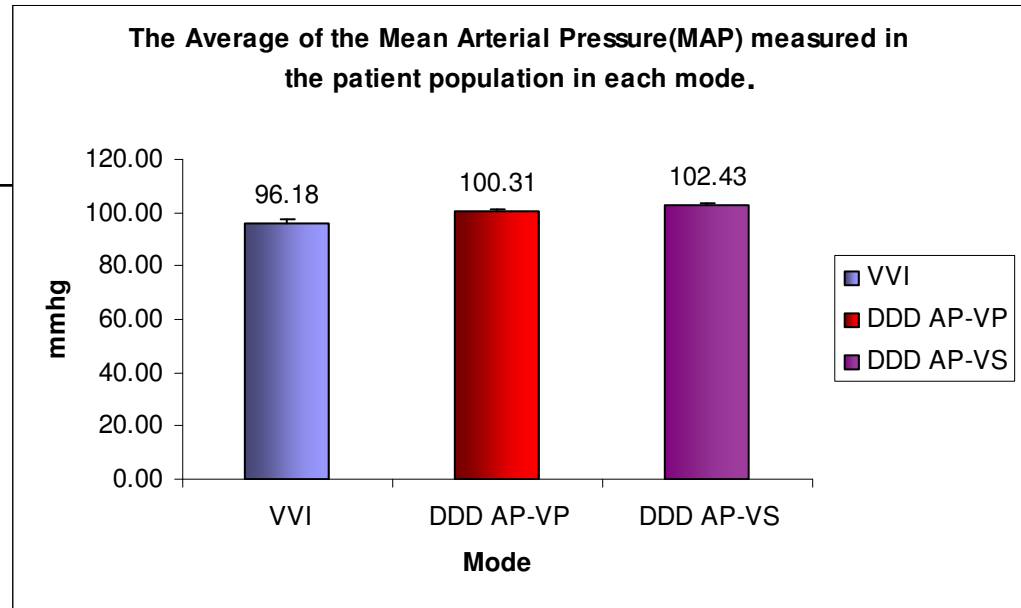


# Blood Pressure Measurements

---

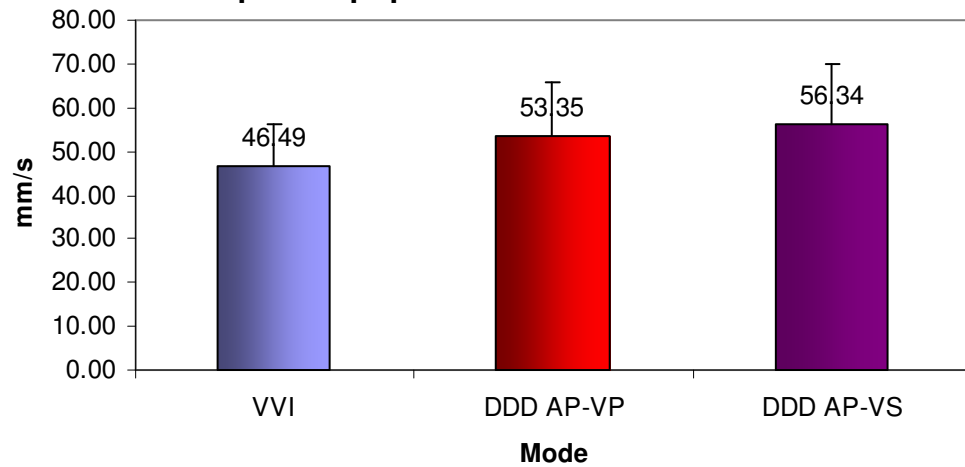
- Valuable assessment of haemodynamic response
- Mean Arterial Pressure = Diastolic Pressure + (Systolic - Diastolic Pressure )/3

# Results

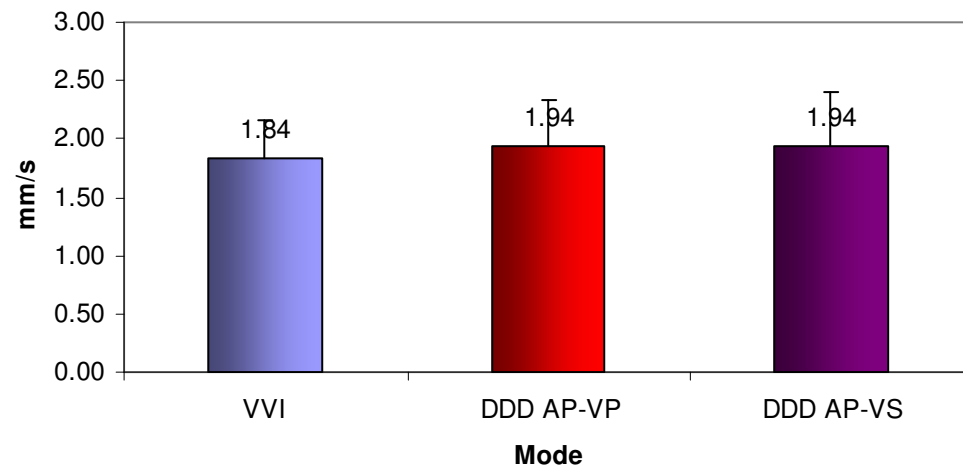


# Results

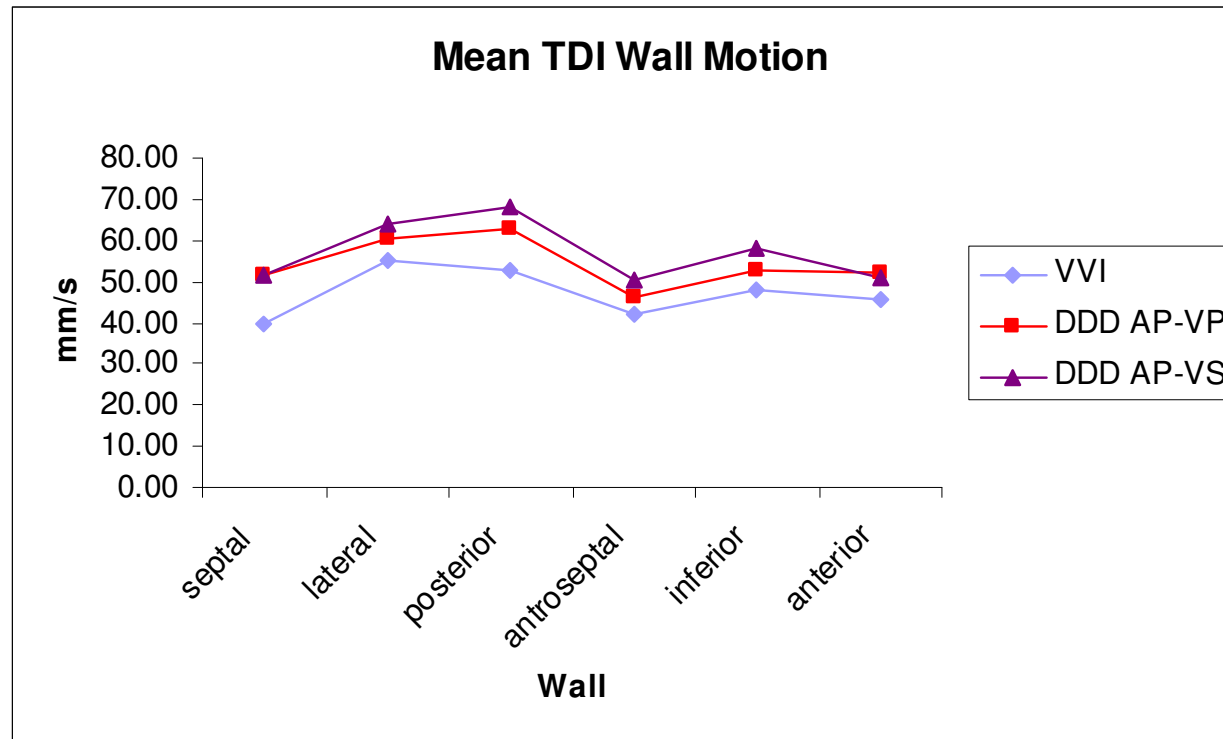
The Average Velocities of Six Walls measured in the patient population in each mode.



TAPSE in Modes



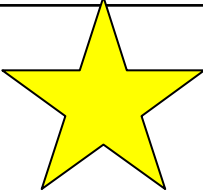
# Results





# Discussion and Conclusion

---

- DDD mode AP-VS best mode!
  - Backs up the Argument for Physiological Pacing
  - Backs up the Argument for Reducing Ventricular Pacing
  - Shows that PM induced first degree heart blocks can be positive
  - Clinical Application: Lengthen AV delays in patients with intact AV conduction but as always make sure TARP covers retrograde conduction
- 



# Acknowledgements

---

- Many thanks to my DIT Supervisor Maurice Goodman.
- Thanks also to all the staff in the Cardiology Department in UCHG especially Brenda Barry.