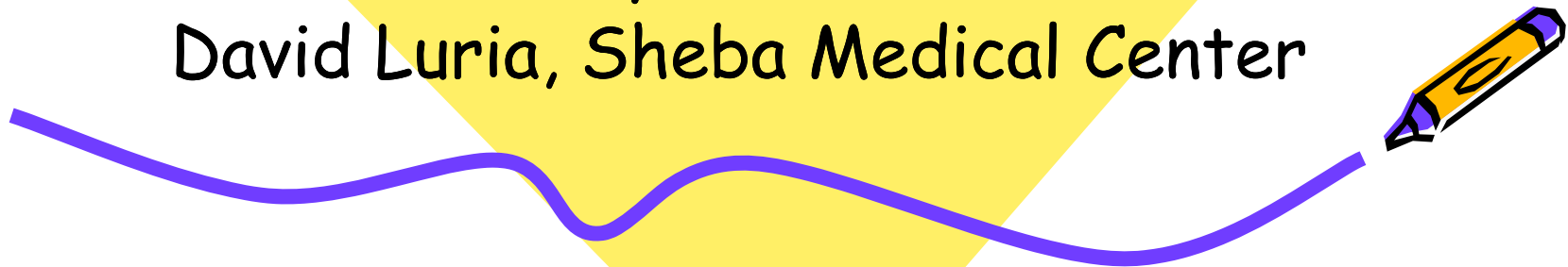


Missing beats

Nadav Hayman, Medtronic
David Luria, Sheba Medical Center



Patient description



בדיקות עזר:
סיכום דיון:
 בת 63

4 שנים לאחר MVR ו MAZE. עדיין סובלת מהפרעות קצב אשר בשנת 2006 בוצע צריבה של CTI בקצב סינוס אך לאחר מכך נזקקה לשתן DC עקב פרפורי רפרופי מטופלת ב PROPAFENONE - ללא אריתמיה סימפטומטית מספר ארועים של SYNCOPES במשך שלוש שנים: באבחנה של SSS הושתל קוצב DDD (כעבור חודש הוצאה קוצב עקב זיהום מקומי). לאחר השתלה עדיין מספר נפילות עם עיבוד הכרה לזמן קצר וחבלות נרחבות, המטומות כולל תוך מוחי.

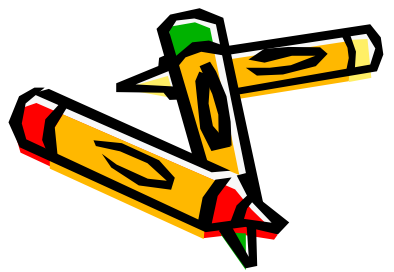
שבדיקת קוצב תקנה לחלותין ללא הפרעות קצב במשך חודש אחרון (למעט APC) אקג: קצב סינסיטלי, קיצוב חדרי אקו: EF= 45%, היפוקינטיה ספטלית ואפיקלית, תפקוד תקין של מסתם

בדיקה גופנית:

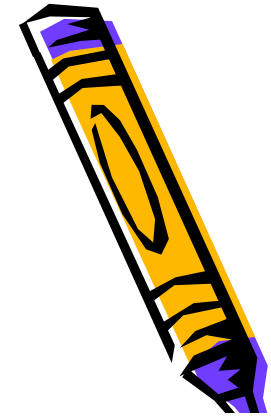
אמדנים:
 גובה 160 משקל BMI: 28.13 : 72
 דופק לדקה: 83 לחץ דם: 126 / 78

מערכות:

ממצאים	בדיקות
לא נשמעה אוושה מעל הקרוטידים	האזנה לקרוטידים
לא גודש ווריד צווארי	ווריד הצוואר
לא הרמה או רטט	הרמה, רטט
קולות תקינים של מסתם תותב	האזנת לב
נשימה בעיית, ללא חרחורים או צפזופים	האזנת ריאות
לא רגישות וללא הפטומגליה או מיימת	הפטומגליה/מיימת
לא בצקת בגפיים התחתונות	בצקת בגפיים התחתונות
דפקים פריפריים שווים ותקינים	דפקים פריפריים
CSM תקין ללא סימני CSH	ממצא נוסף



... IPG programming



Pacemaker Model: Medtronic Adapta ADDR01
 Serial Number: PWB623128
 Software SW003 7.0
 Copyright (c) Medtronic, Inc. 2005

Permanent Parameters Report Page 1

Modes	
Mode	AAI<=>DDD
Mode Switch	On
Detection Rate	175 bpm
Detection Duration	No Delay
Linked Flutter Search	On

Sensors	
Upper Rate	60 ppm
Lower Tracking Rate	130 ppm
Upper Sensor Rate	130 ppm
Lower Rate	95 ppm

AV	
AV	220 ms
Adapted AV	200 ms
Adaptive AV	Off

Refractory/Blanking	
PVARP	Auto
Minimum PVARP	250 ms
PVAB	180 ms
Ventricular Refractory	230 ms
Vent. Blanking (after A. Pace)	28 ms
PMT Intervention	On
PVC Response	On
Ventricular Safety Pacing	On

Rate Response	
Optimization	On
ADL Response	3
Exertion Response	3
ADLR Percent	2.0%
Activity Threshold	Medium/Low
Activity Acceleration	30 sec
Activity Deceleration	Exercise
High Rate Percent	0.2%
ADL Rate Setpoint	9
Upper Sensor Rate Setpoint	24

Pacemaker Model: Medtronic Adapta ADDR01
 Serial Number: PWB623128
 Software SW003 7.0
 Copyright (c) Medtronic, Inc. 2005

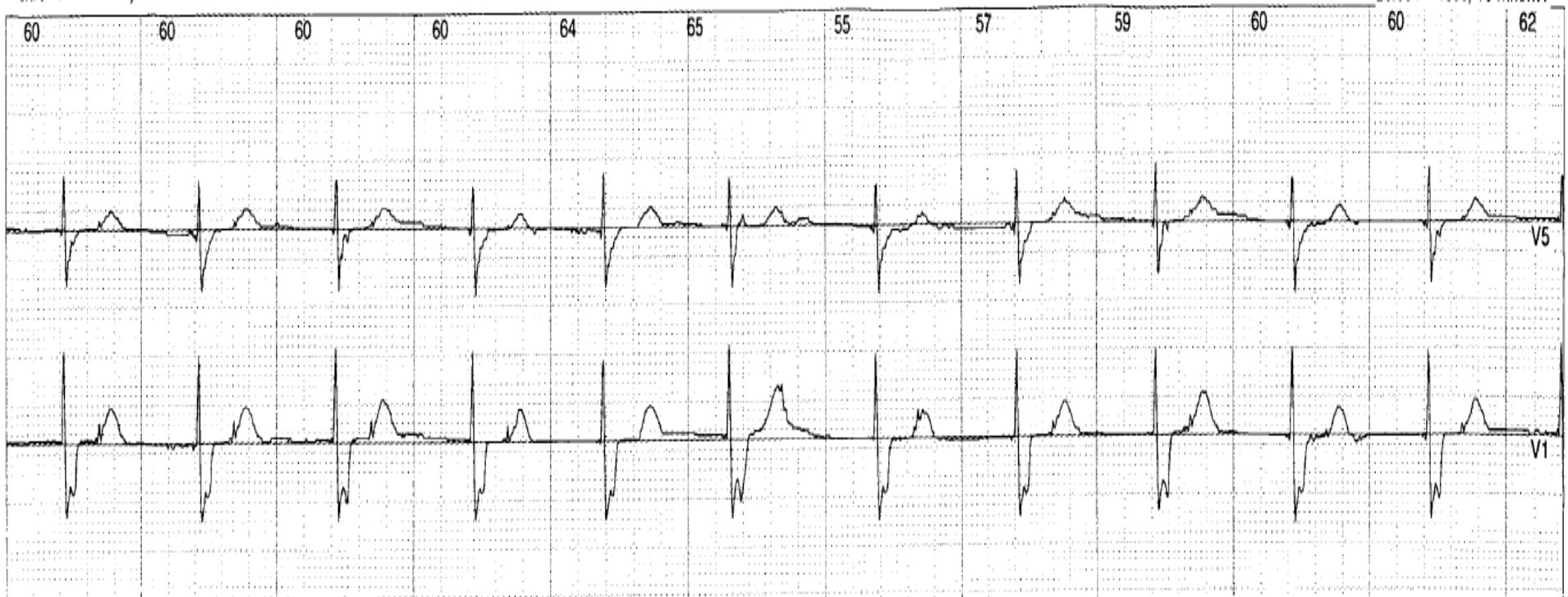
Permanent Parameters Report Page 2

Atrial Lead	
Amplitude	2.250 V
Pulse Width	0.40 ms
Sensitivity	0.50 mV
Sensing Assurance	On
Pace Polarity	Bipolar
Sense Polarity	Bipolar
Lead Monitor	Monitor Only
Maximum Impedance	4,000 ohms
Minimum Impedance	200 ohms
Monitor Sensitivity	8
Capture Management	Adaptive
Amplitude Margin	2x
Min. Adapted Amplitude	2.000 V
Capture Test Frequency	Day at ...
Capture Test Time	1:00 AM
Acute Phase	Off
Acute Phase Complete	01/21/08

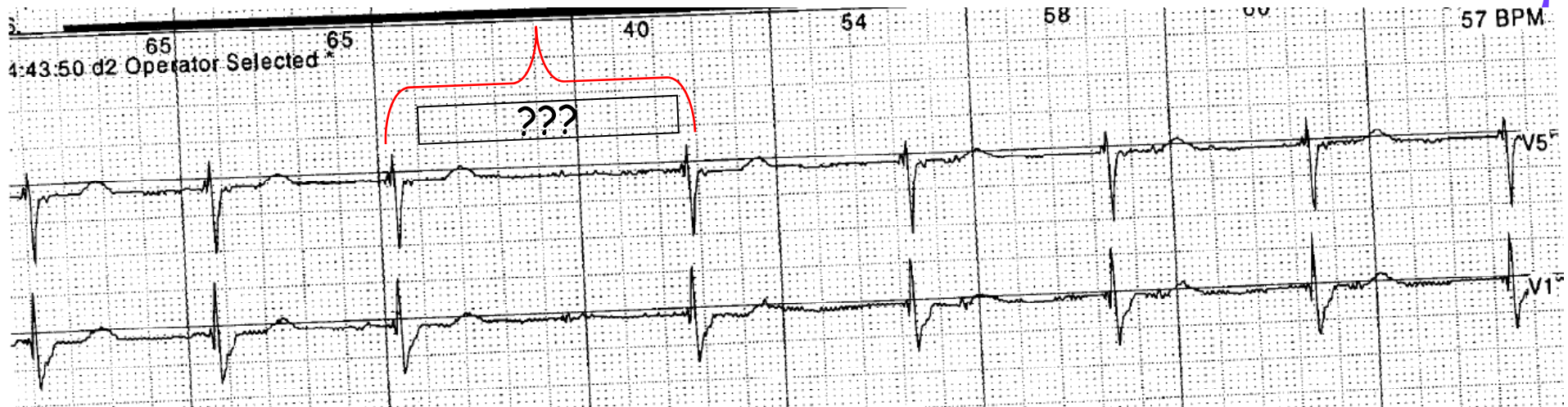
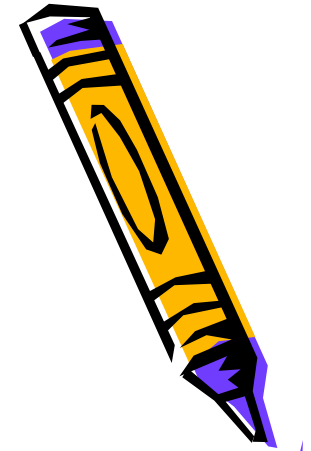
Ventricular Lead	
Amplitude	2.500 V
Pulse Width	0.46 ms
Sensitivity	2.80 mV
Sensing Assurance	On
Pace Polarity	Bipolar
Sense Polarity	Bipolar
Lead Monitor	Monitor Only
Maximum Impedance	4,000 ohms
Minimum Impedance	200 ohms
Monitor Sensitivity	8
Capture Management	Adaptive
Amplitude Margin	2x
Min. Adapted Amplitude	2.500 V
Capture Test Frequency	Day at Rest
Acute Phase	Off
Acute Phase Complete	01/21/08
V. Sensing During Search	Adaptive



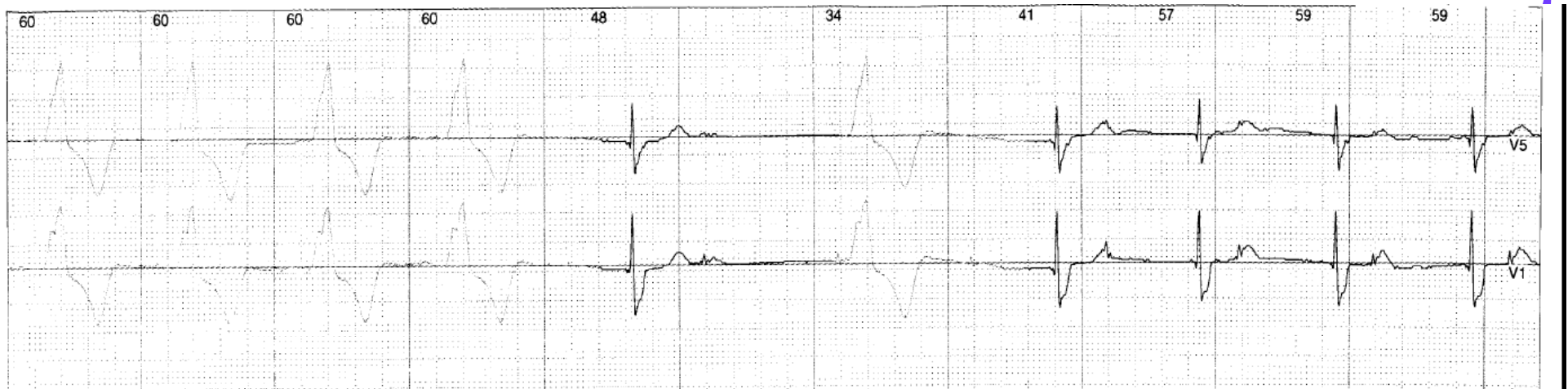
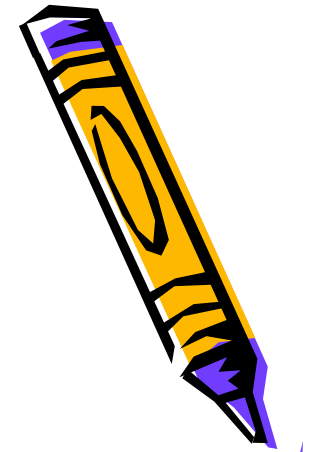
Holter Testing



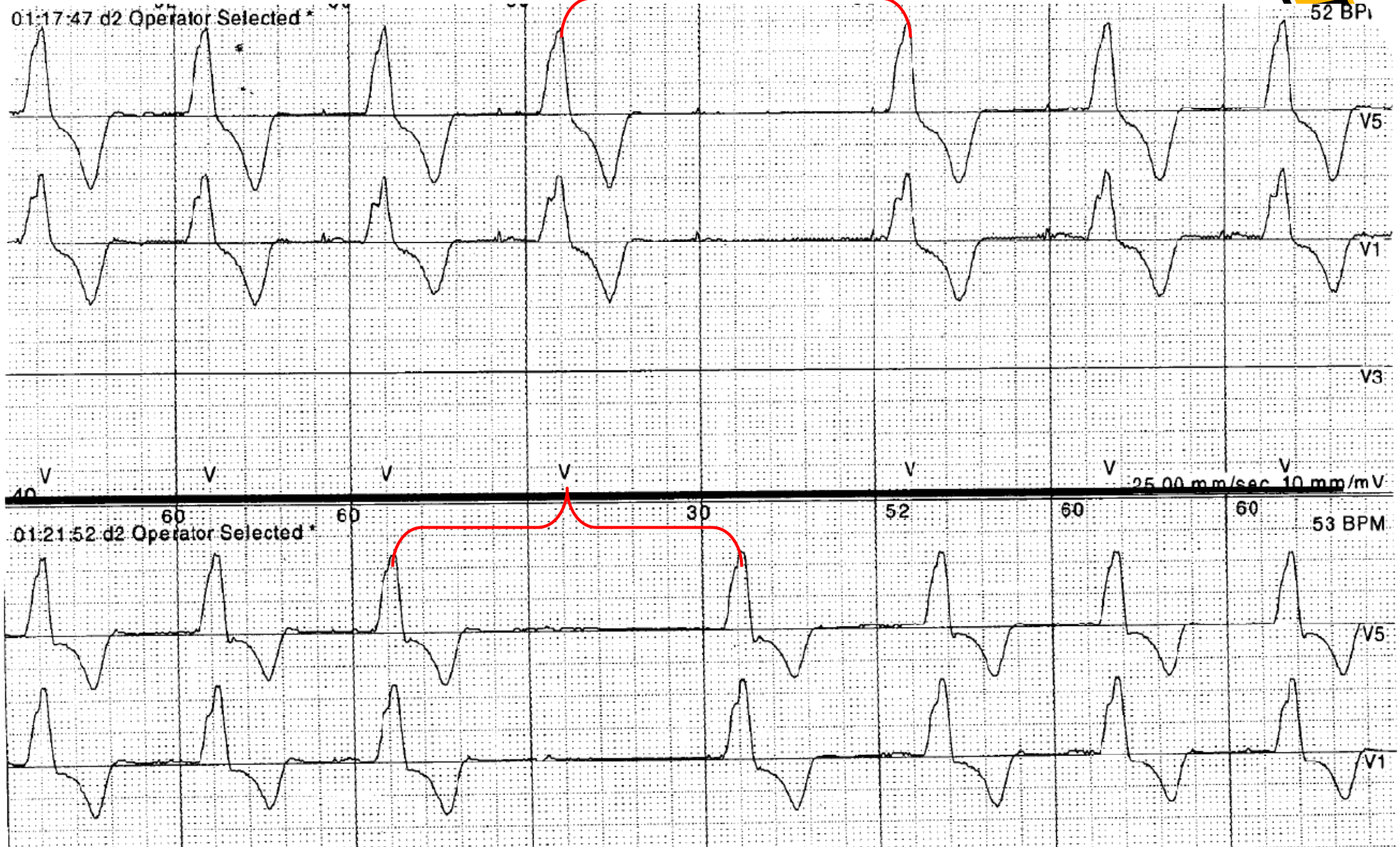
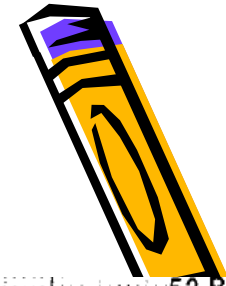
What's that ???



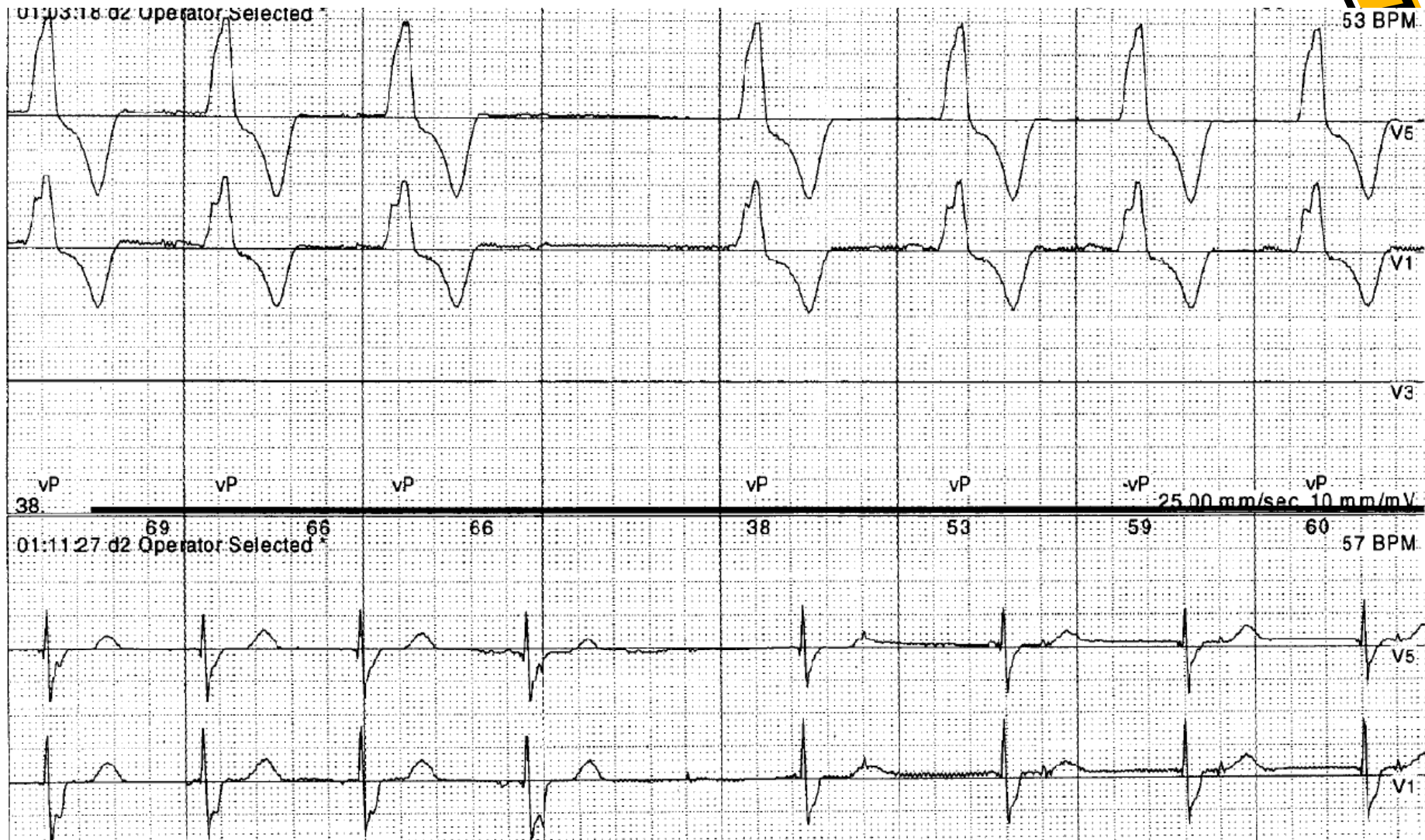
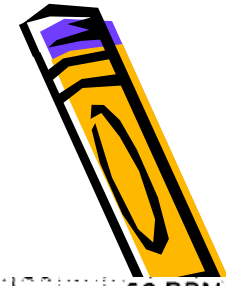
More



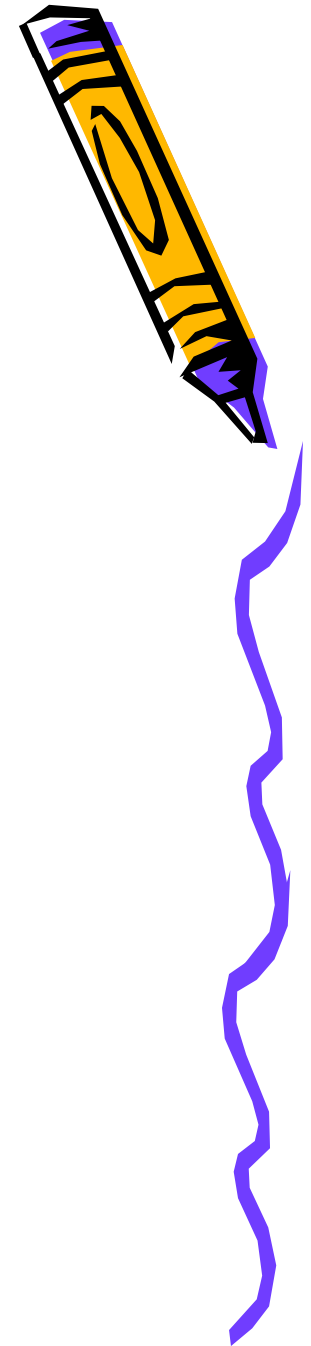
Missing beats



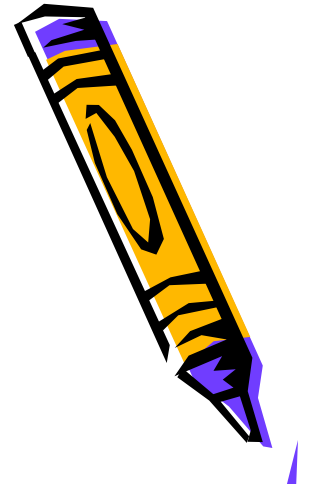
Last snapshot for now... do you have any idea ?



The hint is ...to think



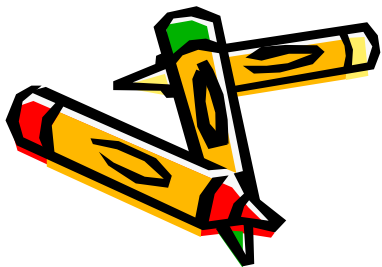
First what's the rhythm ?



AP

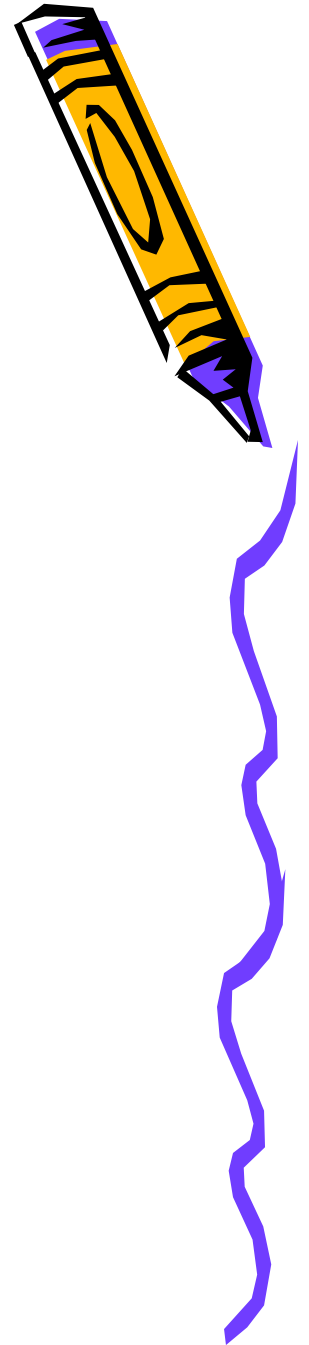
VS

But ... that's one
Long AV Delay!!!



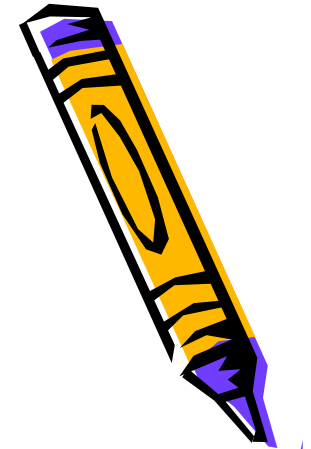
More hints

- The Pacemaker is Medtronic ADAPTA DR ...
- Basic pathology leading to IPG implantation was SSS
- And the mode is
- Managed Ventricular Pacing = MVP

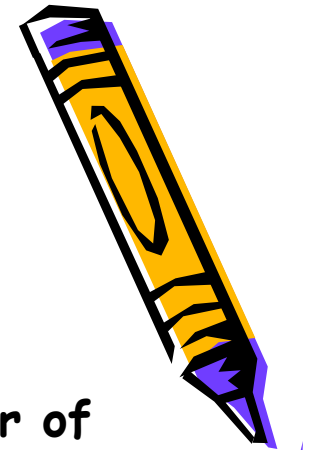


Managing Ventricular Pacing - Clinical Need

- Optimal left ventricular pumping function requires a normal electrical activation sequence derived from the synchronized participation of the distal components of the specialized conduction system (the main bundle branches and their ramifications)¹⁻³
- Majority of patients (~77%) with SND, including those with CHF, have intact AV conduction and narrow QRS duration (normal ventricular activation)⁶
- Conventional RV apical pacing mimics LBBB, results in prolonged QRS durations and ventricular desynchronization, and has adverse effects on ventricular structure and function^{6,7}
- "Forced" ventricular desynchronization due to RV apical pacing, may increase risk of atrial fibrillation, heart failure, and death^{1,4-6}

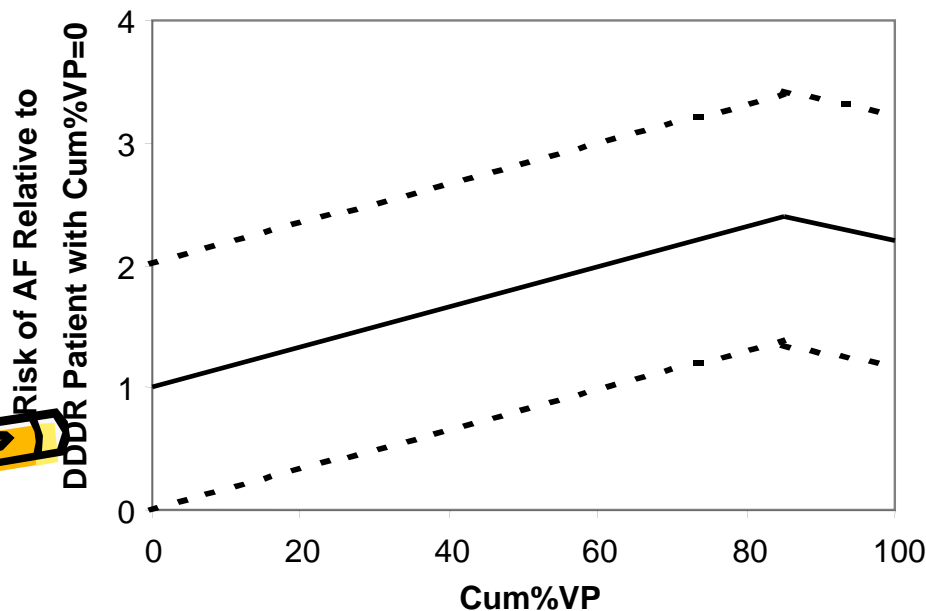


Relative Risk Relationships



MOST Sub-Study⁶: Cumulative %V-Pacing May be a Predictor of AF

- Risk of AF increased linearly with cumulative %V-pacing, up to ~80-85% in both DDDR and VVIR groups
- Risk of AF is increased by 1% for each 1% increase in Cumulative %VP in DDDR group



Dashed lines represent 95% confidence boundaries.



⁶Sweeney MO, et al. *Circulation* 2003;23:2932-2937.

MVP



Case1.avi

Case3.avi

Beat-to-beat AV conduction checks;
Unacceptable AV ratio (AV block)

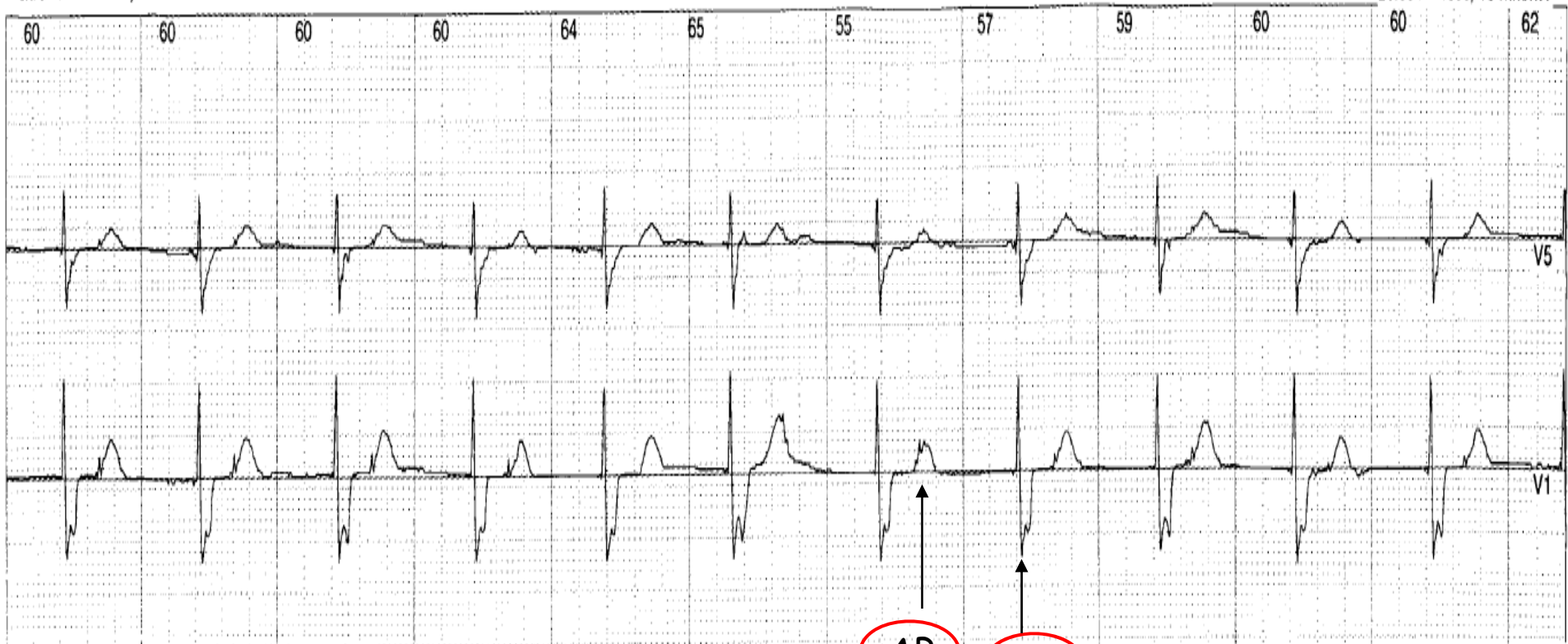
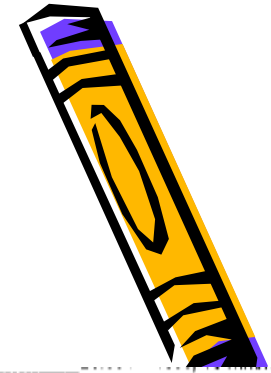
AAI/R

DDD/R

Conduction restored?

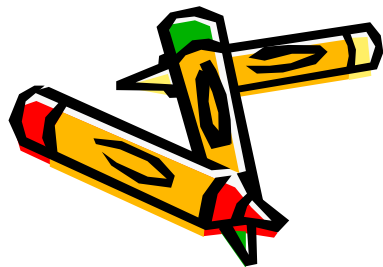
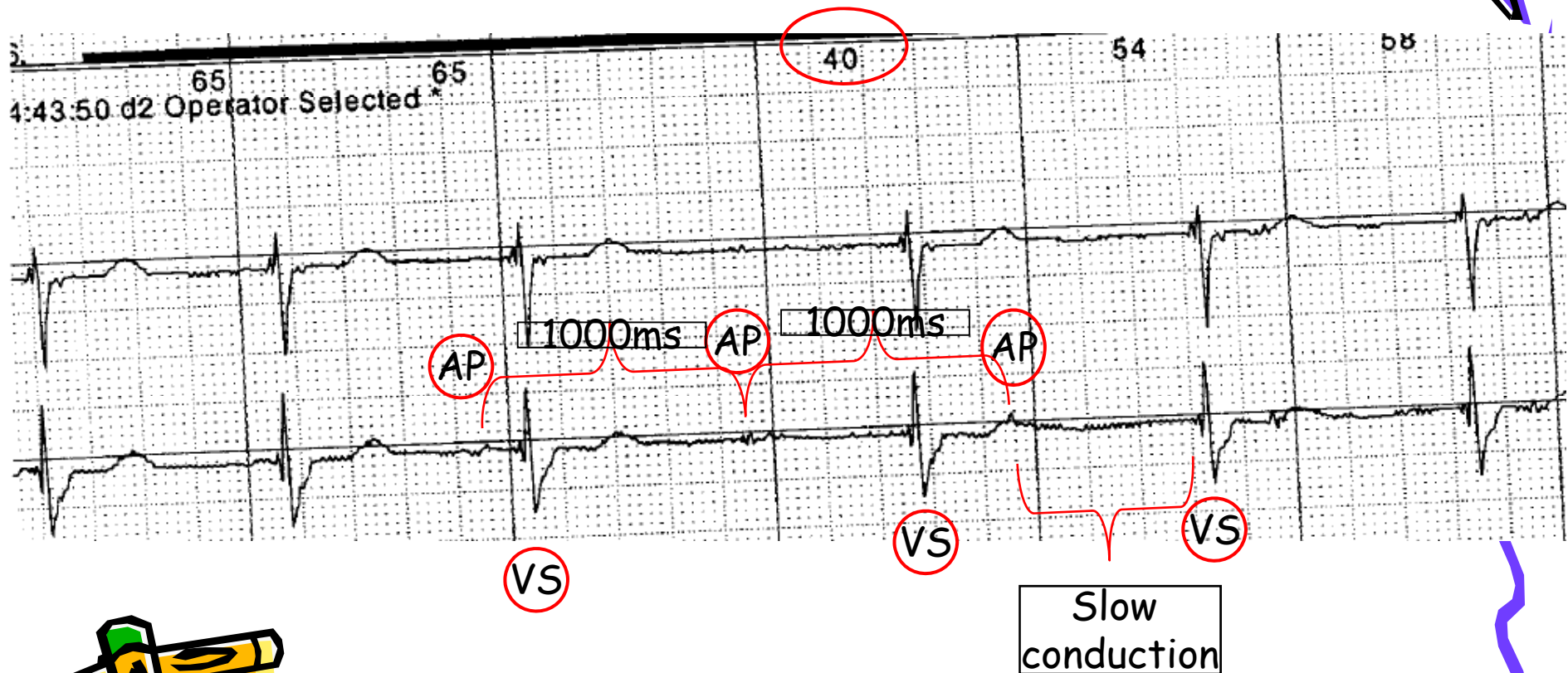


So... its AAI mode with slow AV node conduction

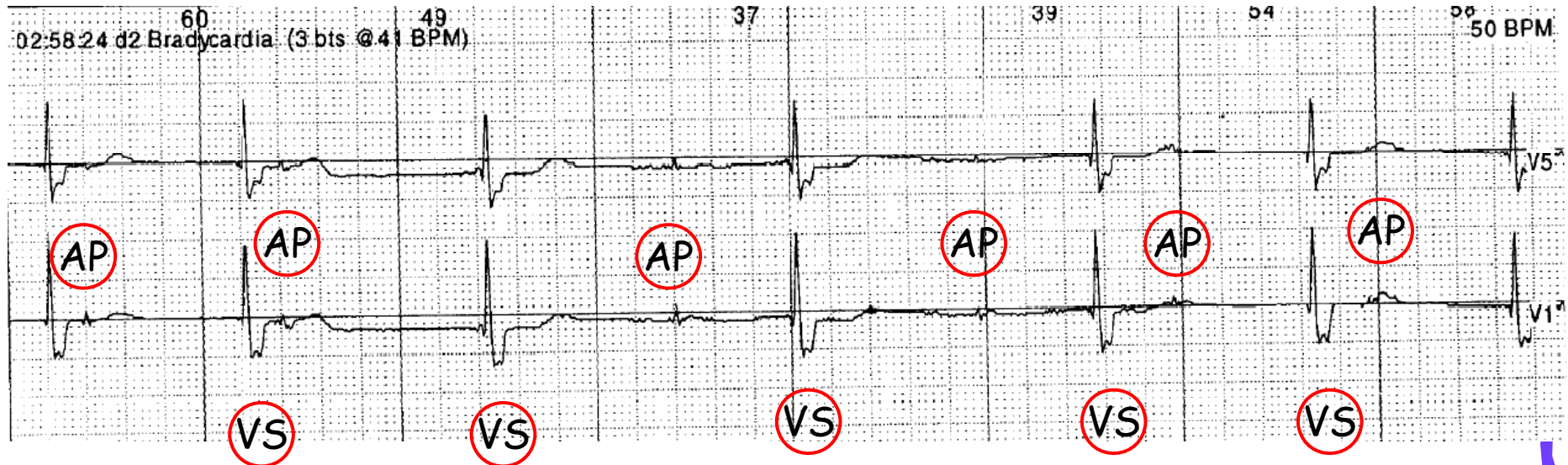
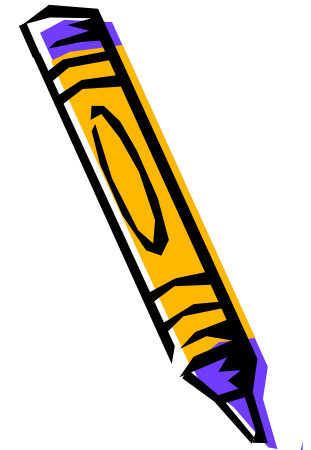


AAI ..No AV Delay ... just waiting for VS after AP/AS
the interval may be the lower rate interval or sensor
rate interval (AAI/R) .

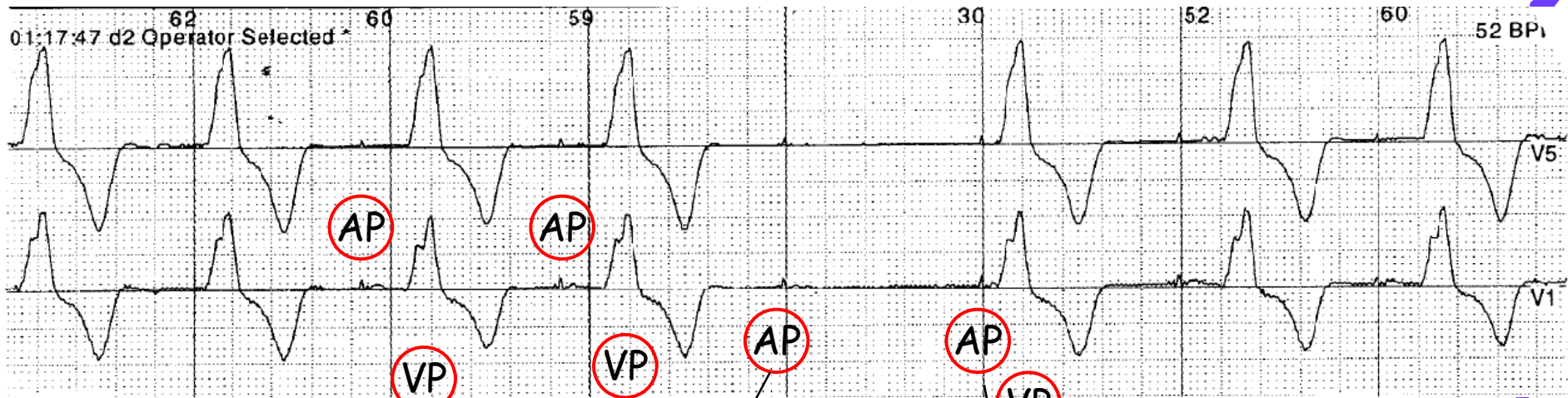
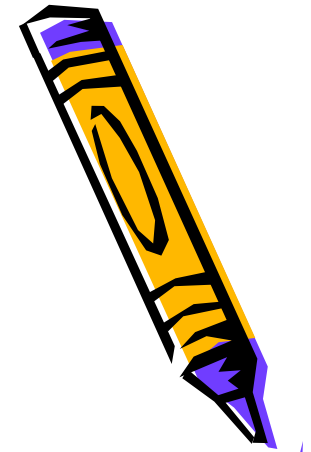
That's way the rate may go down to half lower rate



Up to half lower rate
A-A pacing interval=1000MS



if there is block → DDD after 1 min
conduction check
no conduction stay in DDD

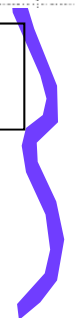
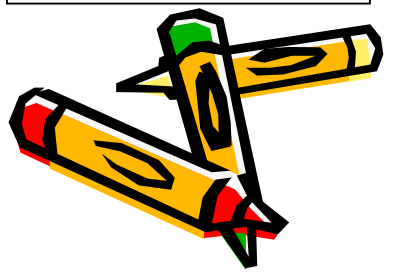


DDD

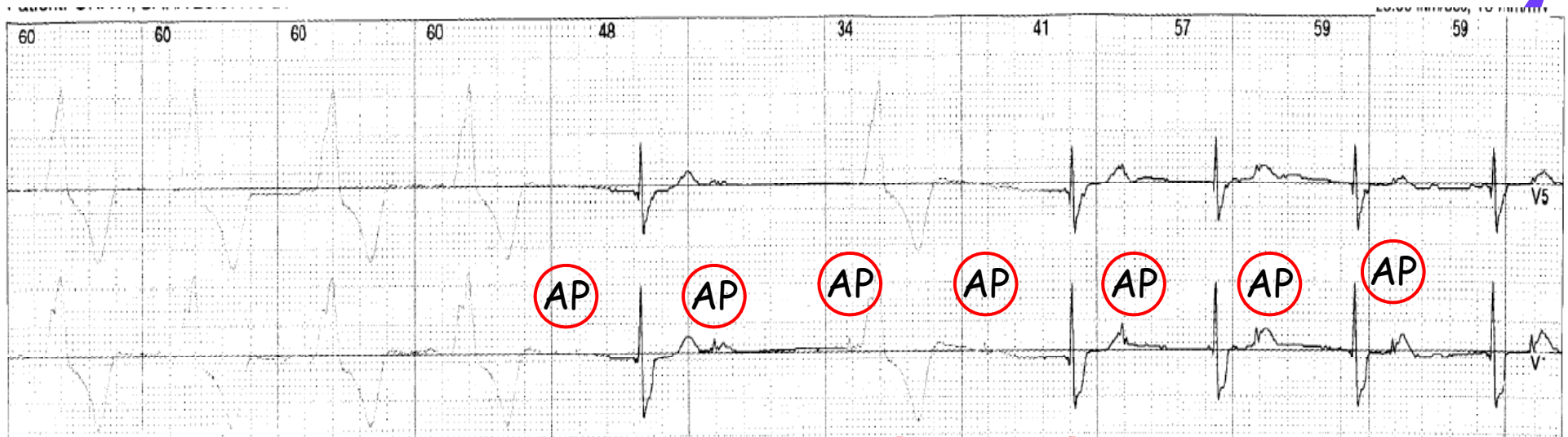
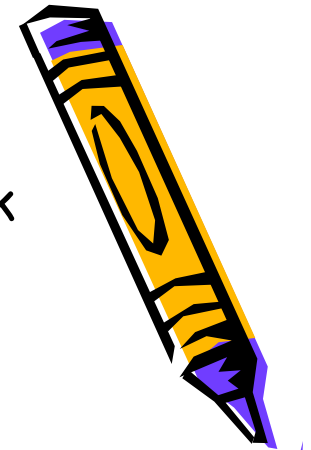
DDD

Conduction check

No conduction AP + Backup VP After 80 ms



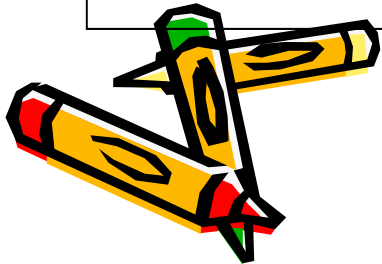
- Now this is all ...DDD after 1 min if one conduction check (AP-VS) went well -> MVP.
 - 1 Block and backup VP
- after that the conduction is OK so.. Stay in MVP Mode.



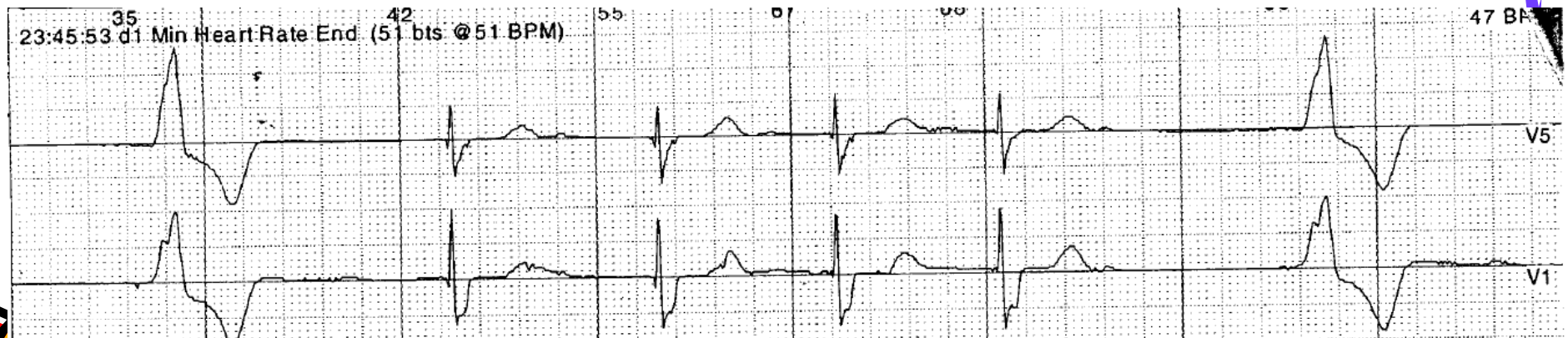
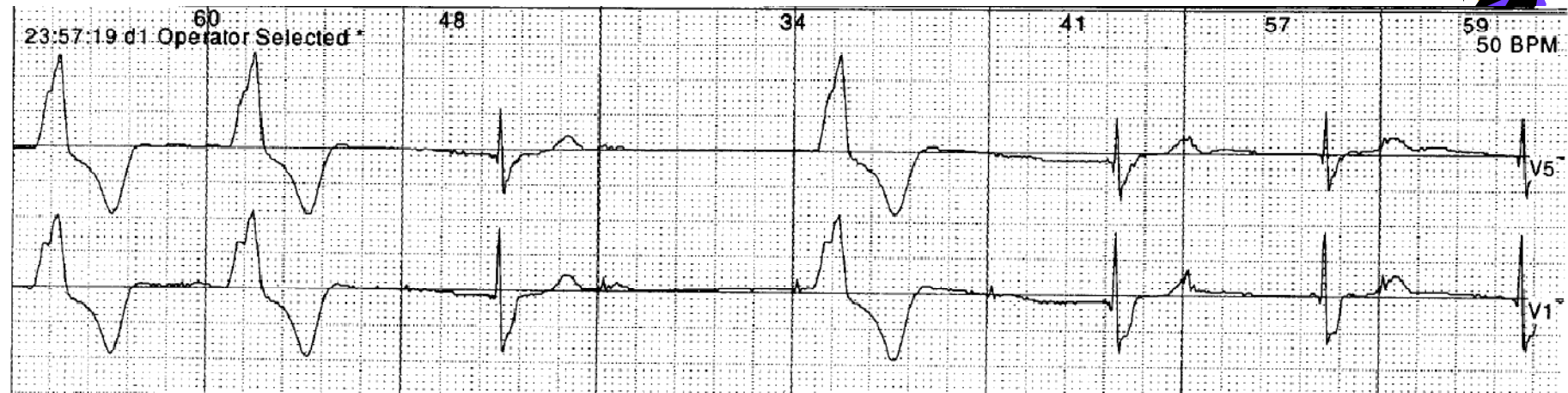
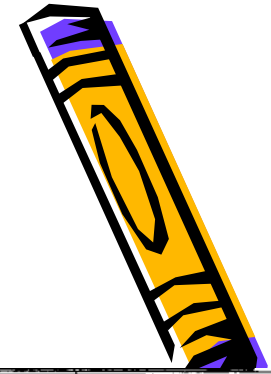
DDD mode

DDD → AAI

Stay in MVP mode



And more that now we understand ...



Summary

- MVP is often misinterpreted as pacemaker malfunction on holter monitoring (LOC or oversensing)
- Just taking caliper and measure the A-A interval and knowing the lower rate will help to understand if there is 1:1 conduction
- Hints to MVP:
 - Long AV Delay more then 600ms → MVP
 - Short AV (80MS) with VP BACKUP → MVP

