

Elettrocardiogramma in età pediatrica



Agata Privitera

AOU Policlinico Catania

Cardiologia Pediatrica

Presidio San Marco

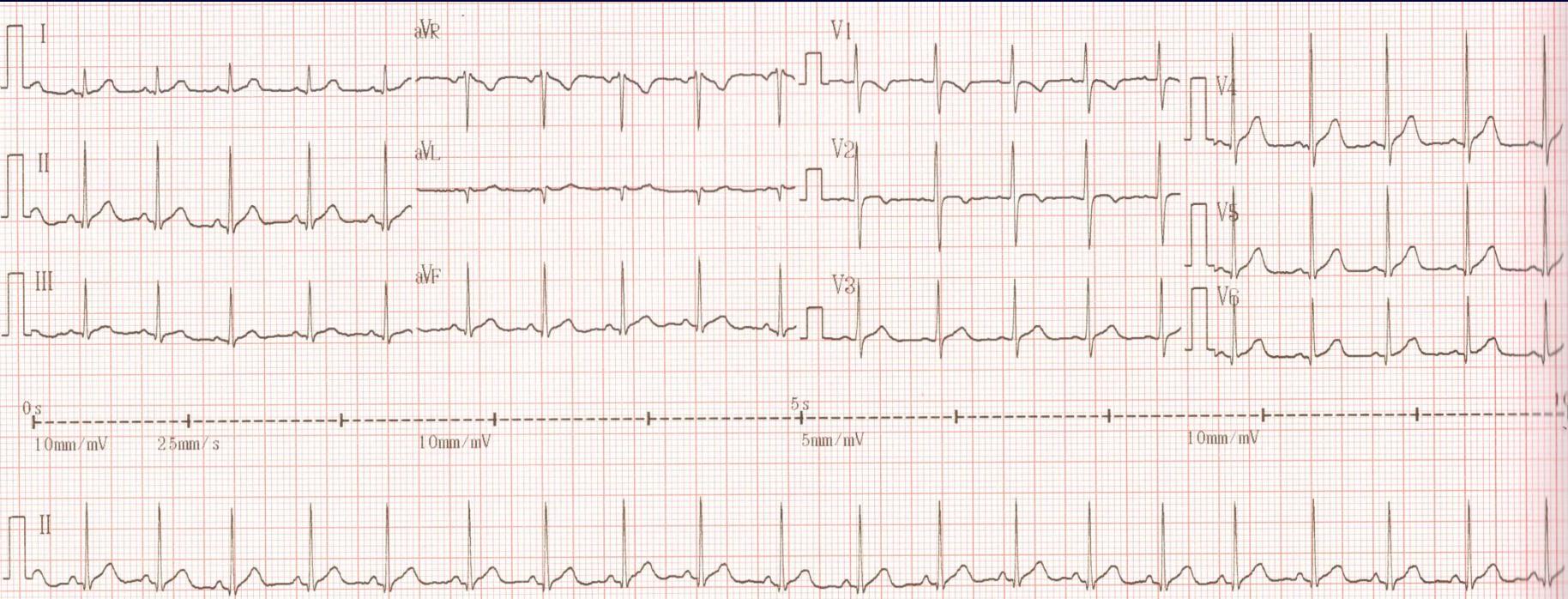
www.cardiologiapediatricact.com

Padova 30/01/2026

Obiettivi del Corso parte prima

- Riprendiamo conoscenze teoriche basi dell'Elettrocardiogramma (ECG)
- Peculiarità e come cambia un ECG in età pediatrica
- Varianti EC Grafiche normali in età pediatrica

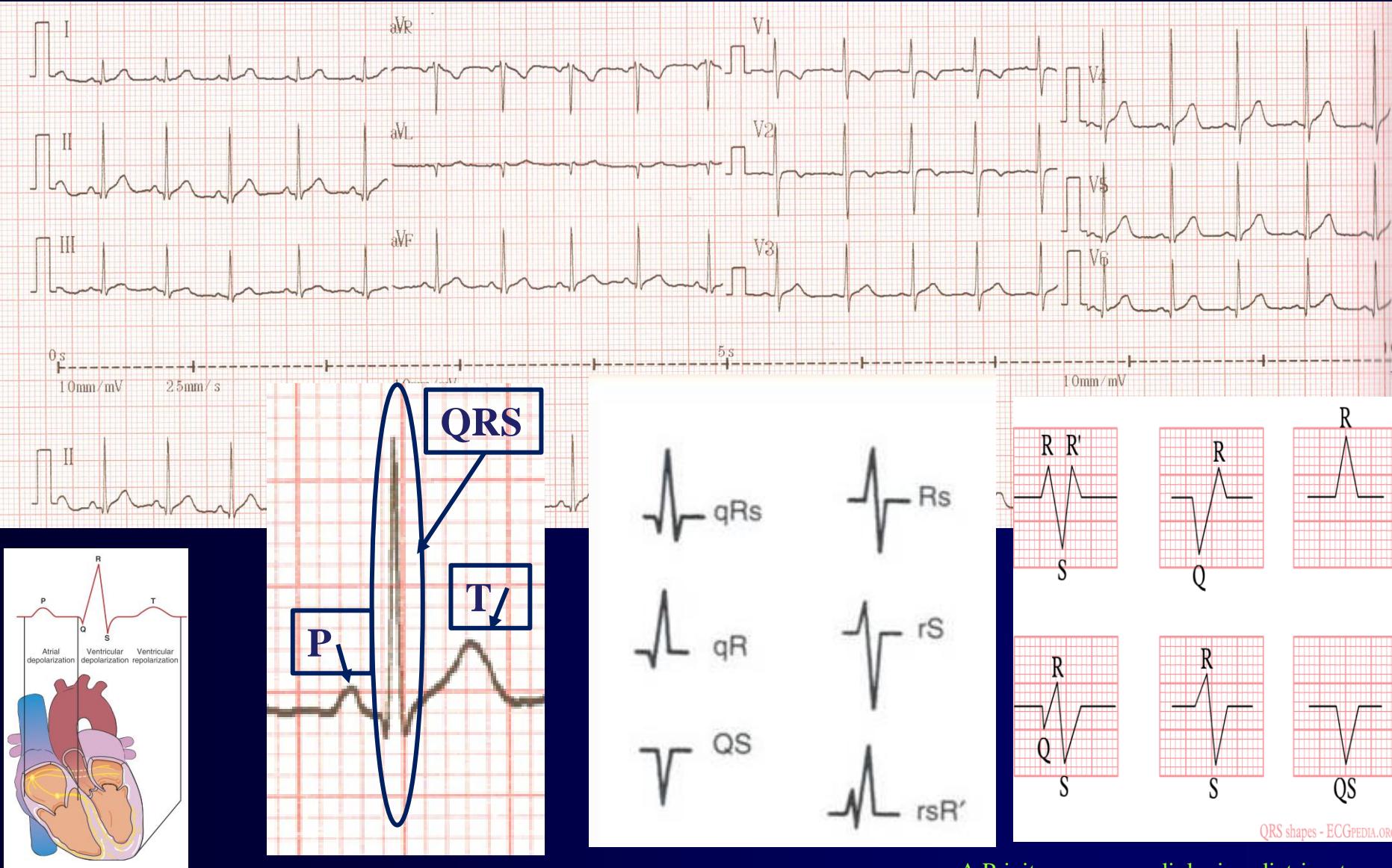
Elettrocardiogramma a 12 derivazioni



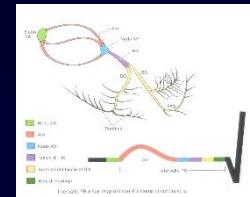
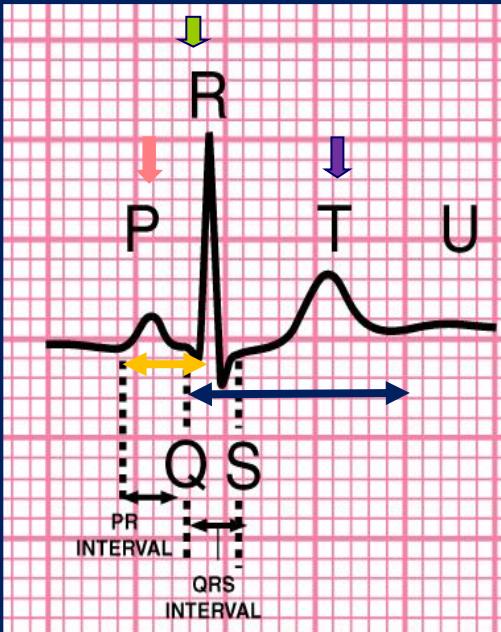
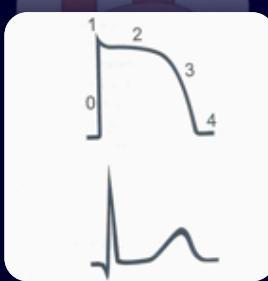
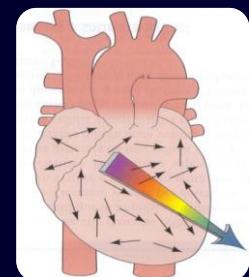
1. Ritmo e Frequenza Cardiaca
2. Asse Elettrico
3. Morfologia complesso QRS
4. Ripolarizzazione ventricolare
5. Tempi di conduzione: PR, QRS, QTc

Analizzeremo come cambiano questi parametri in età pediatrica

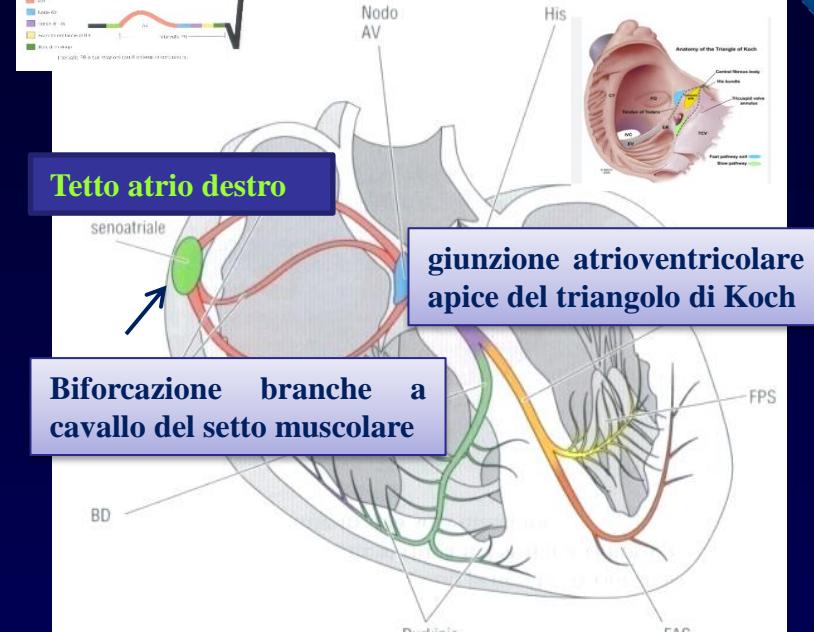
Elettrocardiogramma a 12 derivazioni



Elettrofisiologia

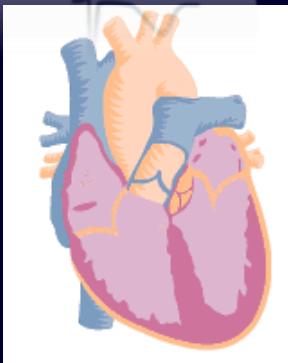


Tetto atrio destro



Biforcazione branchie a cavallo del setto muscolare

giunzione atrioventricolare
apice del triangolo di Koch



Il NSA depolarizza le cellule atriali dando origine all'onda P

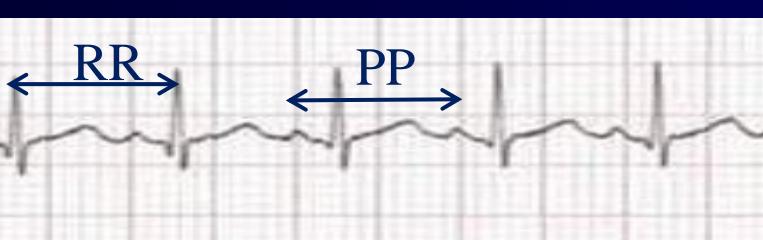
PR: tempo che intercorre che l'impulso dagli atri arrivi ai ventricoli

Le fibre del Purkinje depolarizzano le cellule miocardiche comune dando origine al complesso QRS

Tratto ST-T: ripolarizzazione ventricolare

Il tratto QT depolarizzazione e ripolarizzazione ventricolare

Ritmo Cardiaco



RR ciclo completo ventricolare diastole e sistole
PP ciclo completo atriale di diastole e sistole

ECG

Frequenza cardiaca (battiti/min)

<i>Age</i>	<i>Min.</i>	<i>5 %</i>	<i>Media</i>	<i>95 %</i>	<i>Max.</i>	<i>S.D.</i>
0-24 ore	85	94	119	145	145	16,1
1-7 giorni	100	100	133	175	175	22,3
8-30 giorni	115	115	163	190	190	19,9
1-3 mesi	115	124	154	190	205	18,6
3-6 mesi	115	111	140	179	205	21,0
6-12 mesi	115	112	140	177	175	18,7
1-3 anni	100	98	126	163	190	19,8
3-5 anni	55	65	98	132	145	18,0
5-8 anni	70	70	96	115	145	16,1
8-12 anni	55	55	79	107	115	15,0
12-16 anni	55	55	75	102	115	13,5

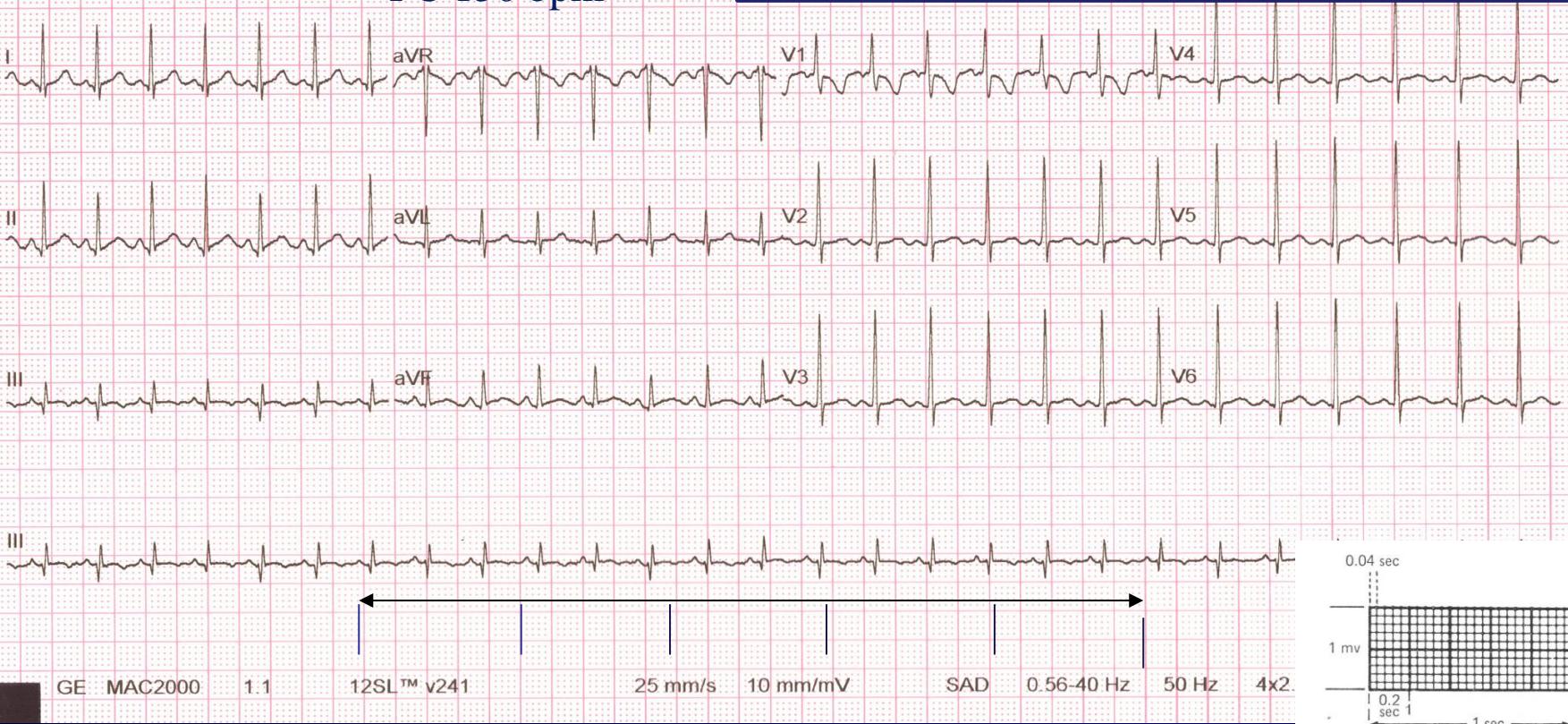
Elettrocardiogramma a 12 derivazioni

Frequenza Cardiaca

Range di normalità	sonno/attività
Neonato /lattante	90-180 bpm 80-220 bpm
1-2 anni	90-160 bpm 60-200 bpm
3-6 anni	90-140 bpm 60-200 bpm
6-12 anni	60-120 bpm 60-200 bpm

2 mesi

FC 150 bpm



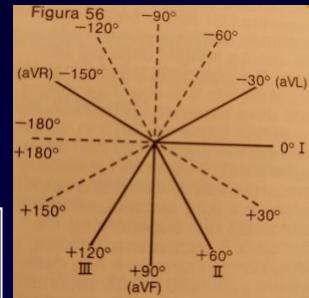
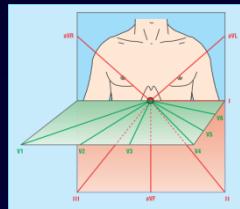
300/numero di quadrati grandi tra due onde R (60 sec/min = 300 box/min)

1500/numero di quadrati piccoli tra due onde R (60 sec/min = 1500 box/min)

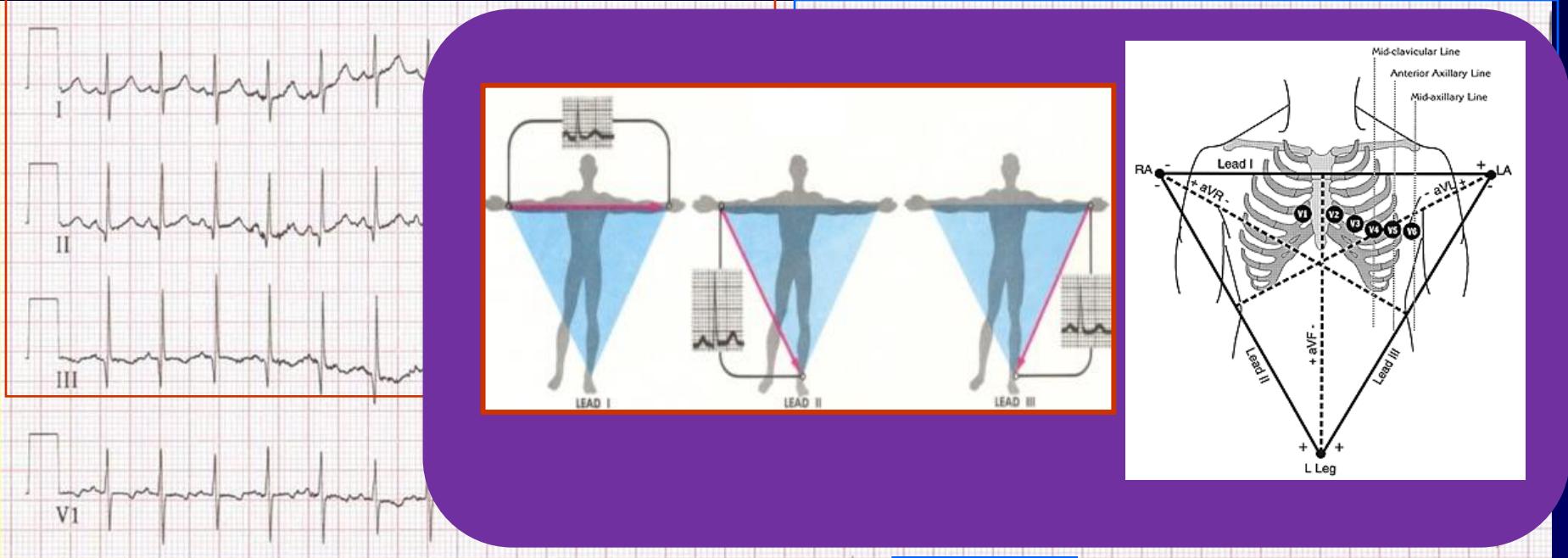
ECG di superficie

I potenziali elettrici del cuore vengono registrati mediante **elettrodi**

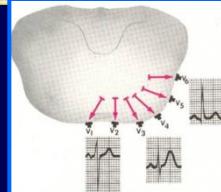
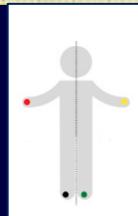
Gli elettrodi sono variamente orientati nello spazio secondo assi standardizzati che vengono chiamati **derivazioni**



Dodici derivazioni

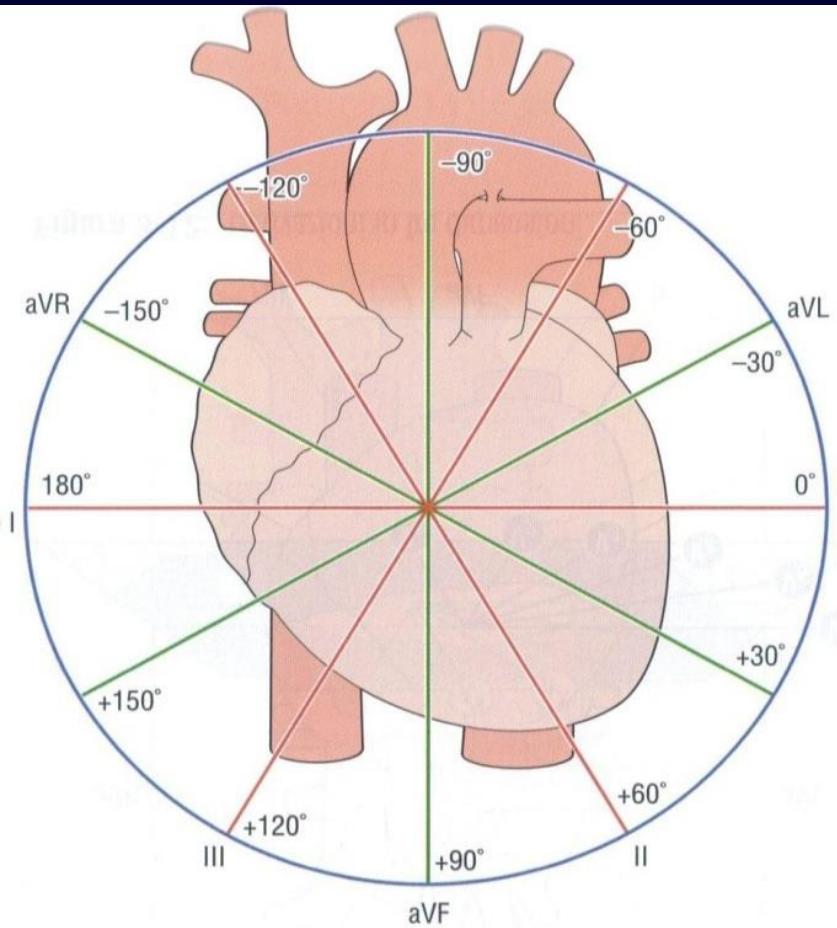
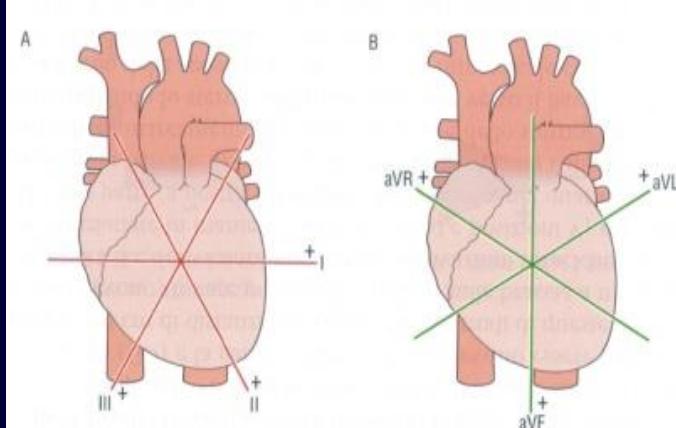
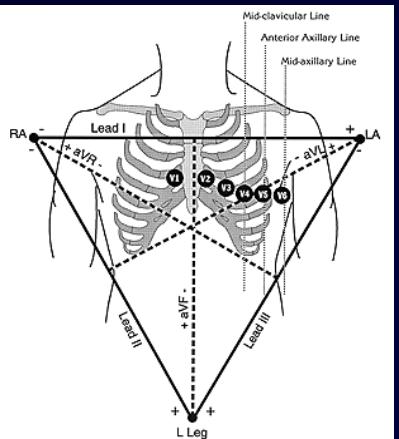
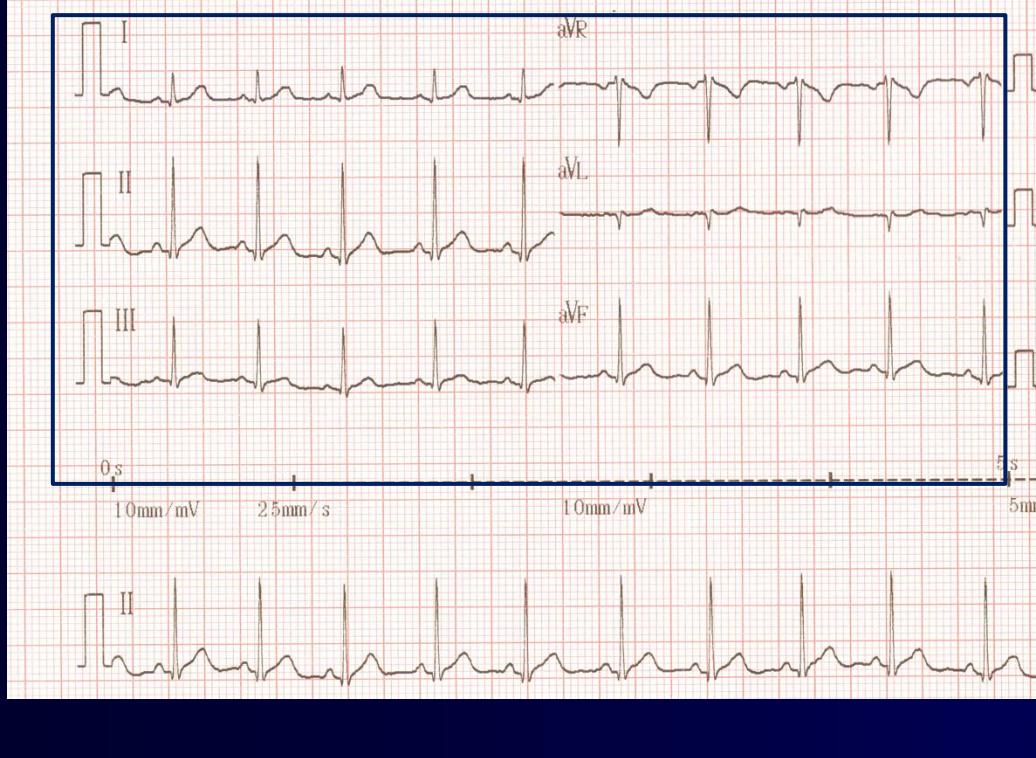


Sei **periferiche** registrate
su un piano frontale

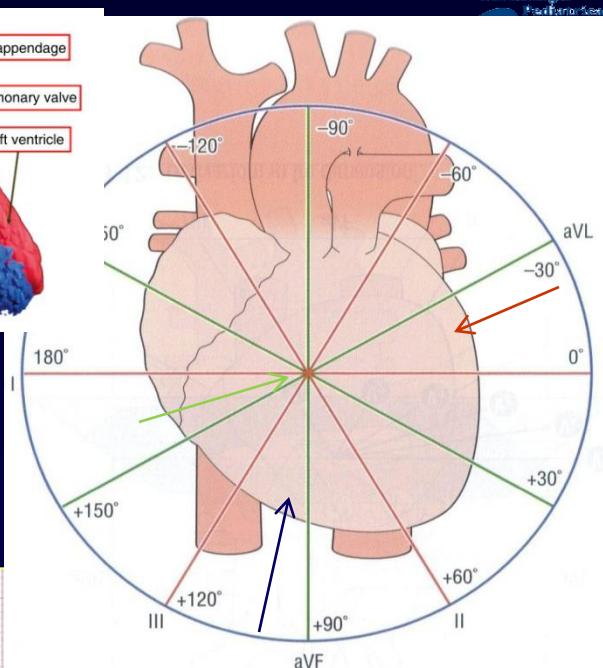
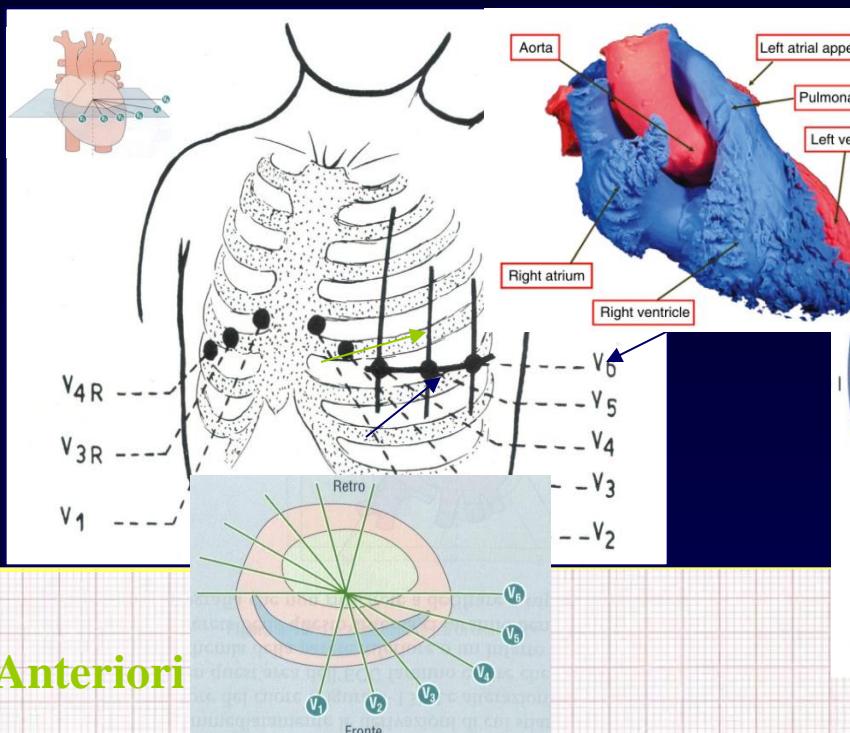
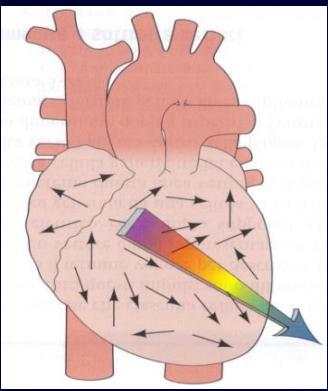


Sei **precordiali** registrati
su un piano orizzontale

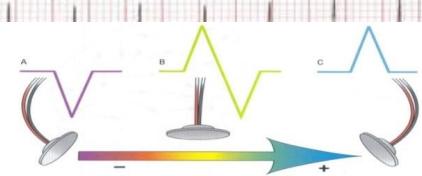
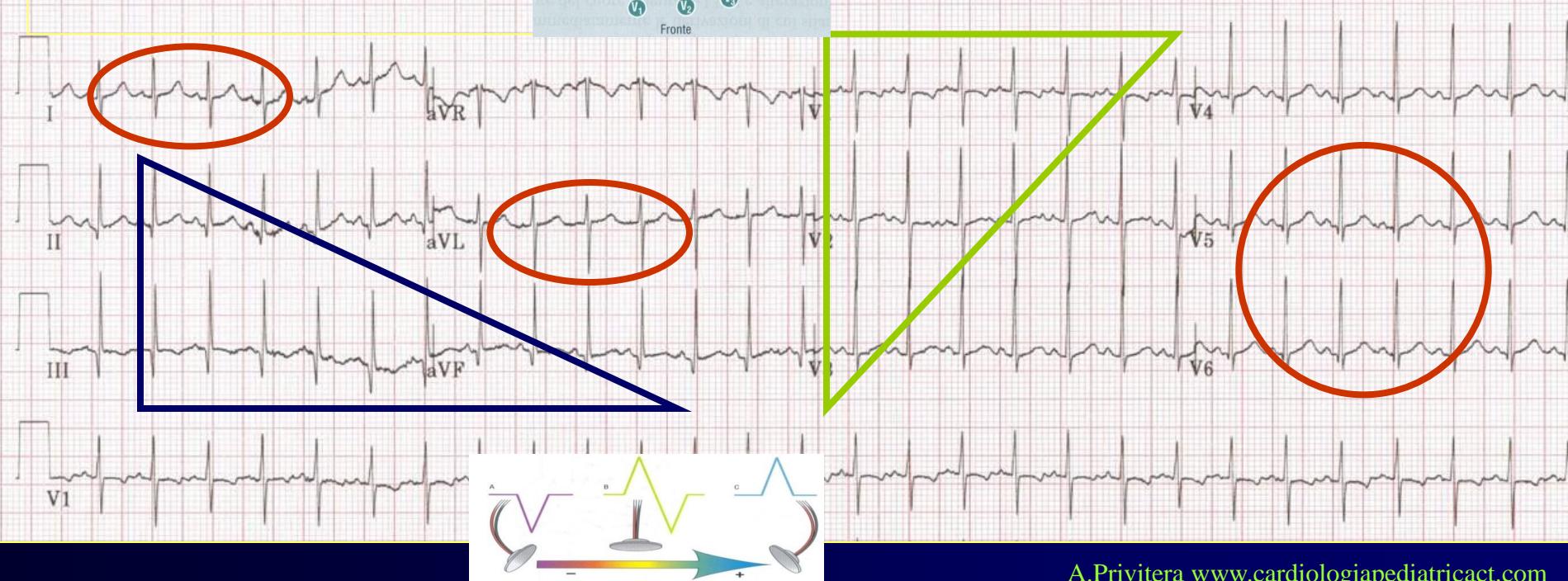
Elettrocardiogramma a 12 derivazioni



ECG

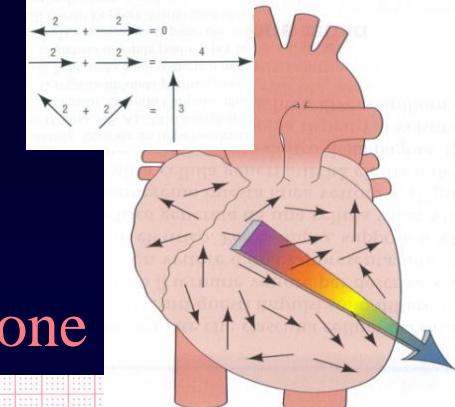


Derivazioni Laterali Inferiori Anteriori



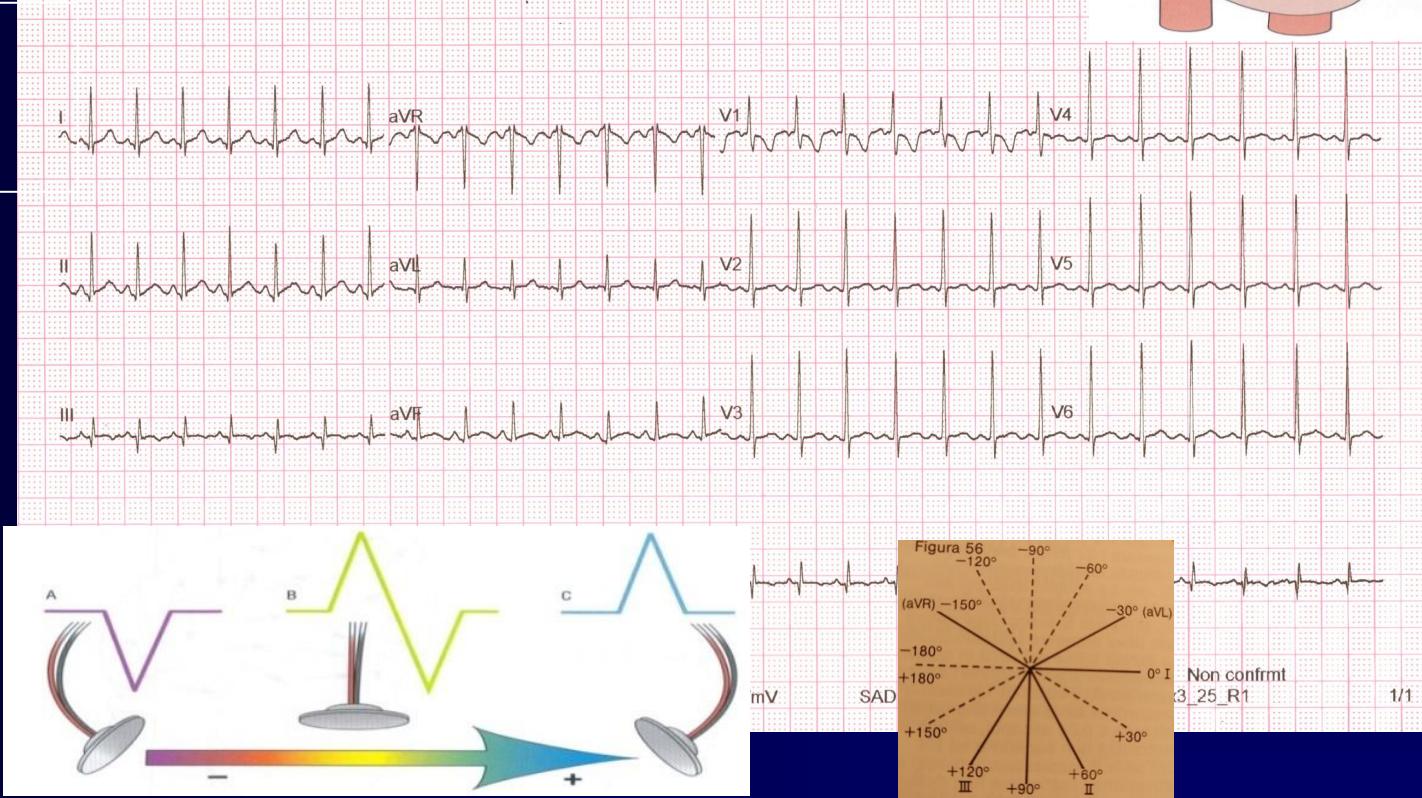
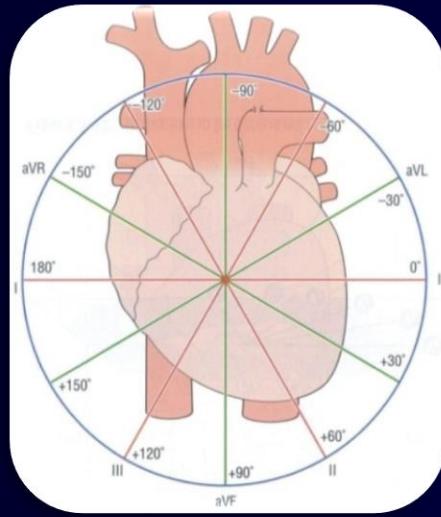


Asse elettrico cardiaco



L'asse elettrico o del QRS è la sommatoria risultante di tutti i vettori istantanei generati durante la depolarizzazione

Sei derivazioni periferiche



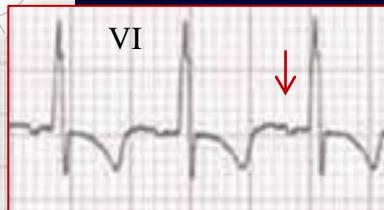
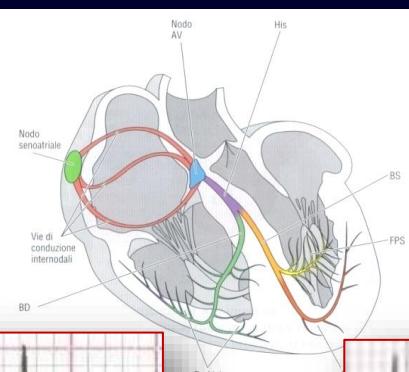
L'asse del QRS Esprime:

- Posizione del cuore
- Cavità prevalente

Si calcola anche:

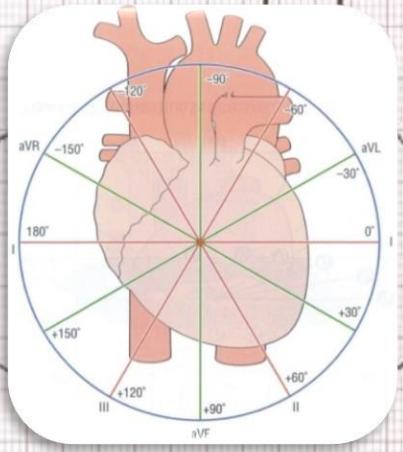
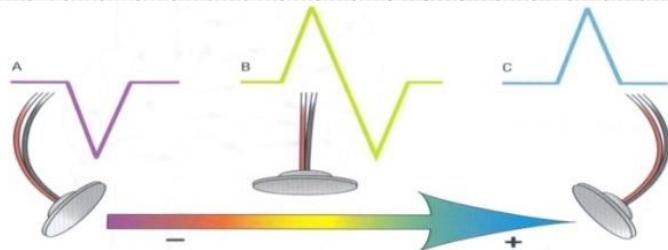
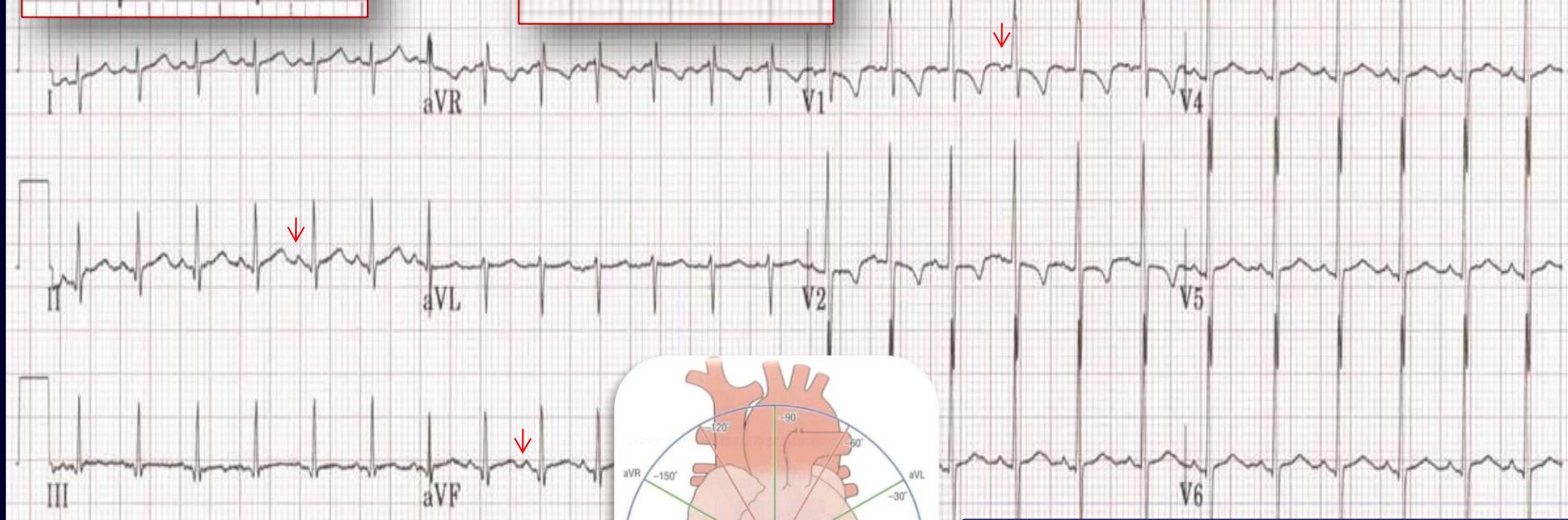
asse elettrico onda P definisce origine del ritmo
asse onda T concordanza con QRS

Ritmo Sinusale!



Studio Onda P : Quando Ritmo Sinusale?

I,II,III, aVL,aVF,V2-V6 positiva
 aVR negativa
 V1 isodifasica
 Asse elettrico onda P 0-90°

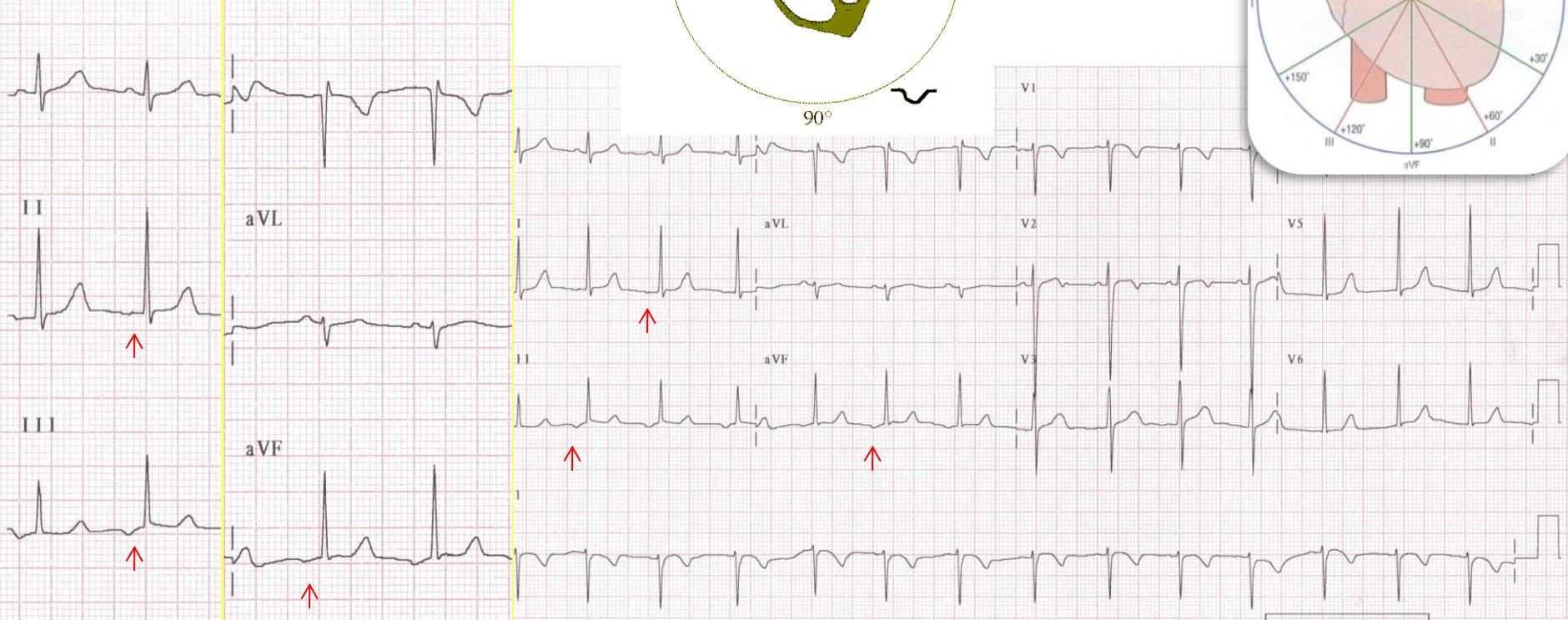
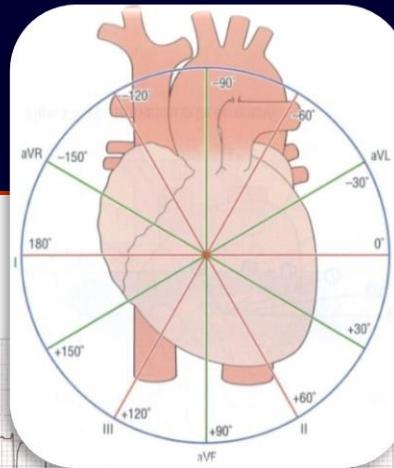
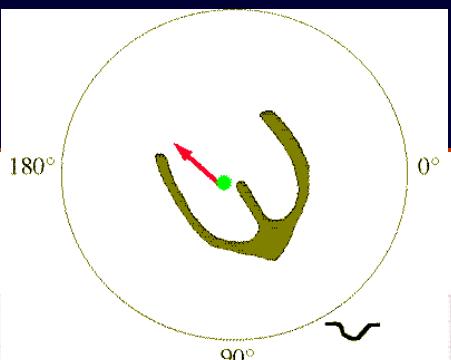


Onda P: depolarizzazione bi-atriale

Aampiezza	$\geq 1.5 \leq 2.5$ mm
Durata	0.06 ± 0.02 sec
Durata max	0.08 sec < 12 mesi 0.10 sec > 12 mesi

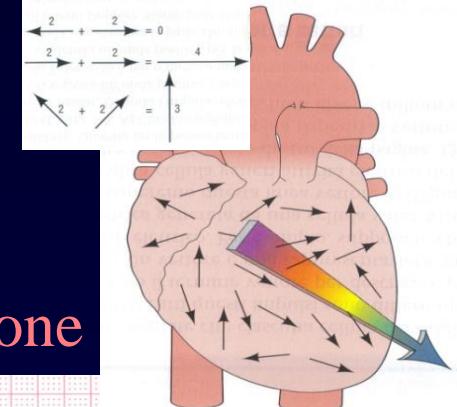
Variante Normale Ritmo del Seno Coronarico

Asse dell'onda P – 30°



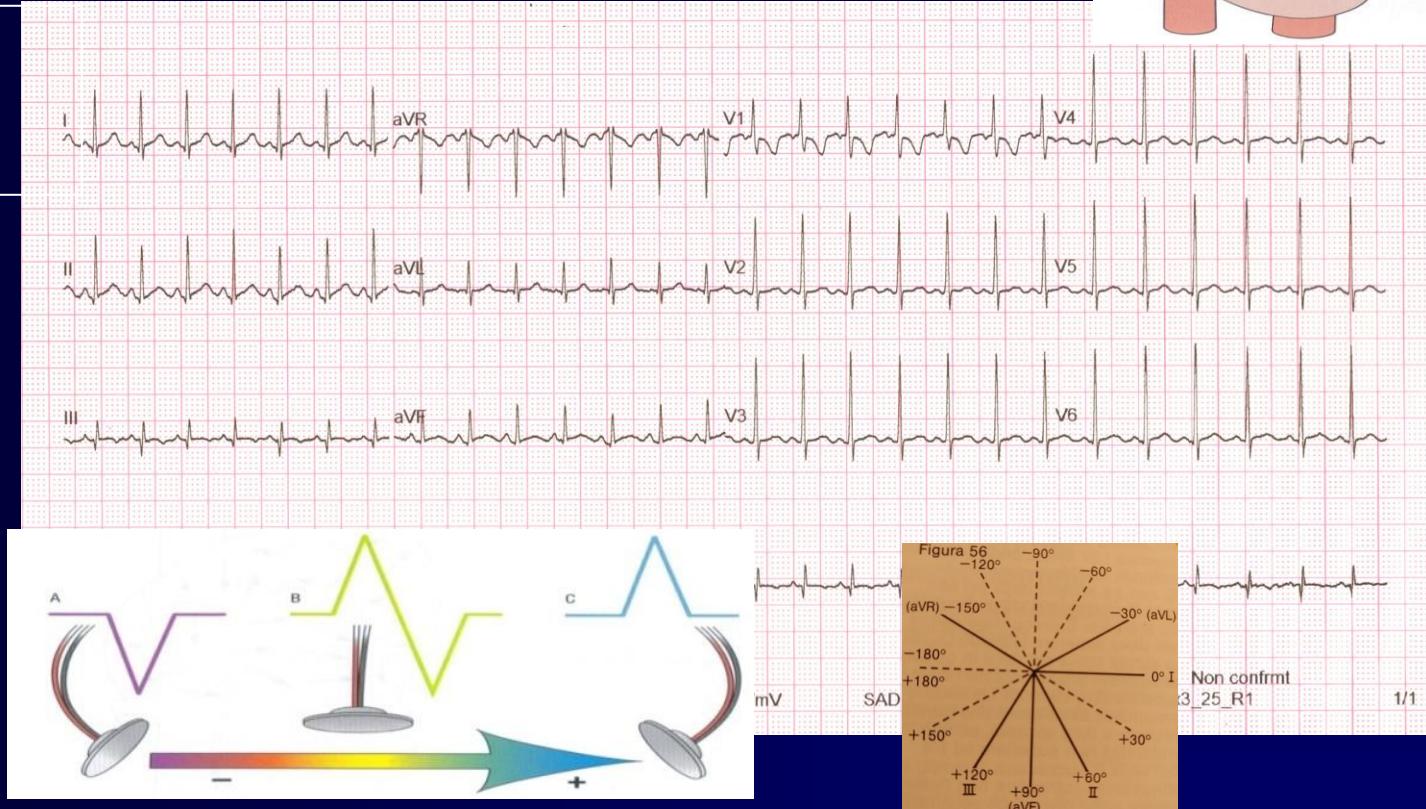
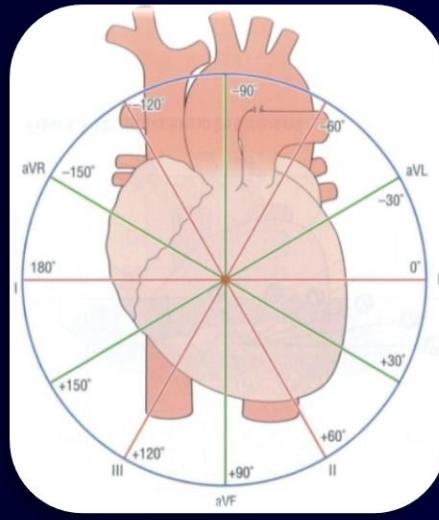
Una attivazione atriale che origina in modo anomalo – atrio destro basso- darà onde P negative in II, aVF, III

Asse elettrico cardiaco



L'asse elettrico o del QRS è la sommatoria risultante di tutti i vettori istantanei generati durante la depolarizzazione

Sei derivazioni periferiche



L'asse del QRS Esprime:

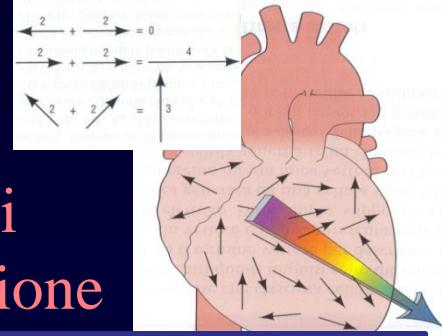
- Posizione del cuore
- Cavità prevalente

Si calcola anche:

asse elettrico onda P definisce origine del ritmo
asse onda T concordanza con QRS

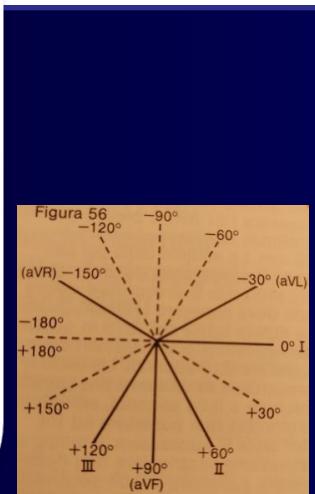
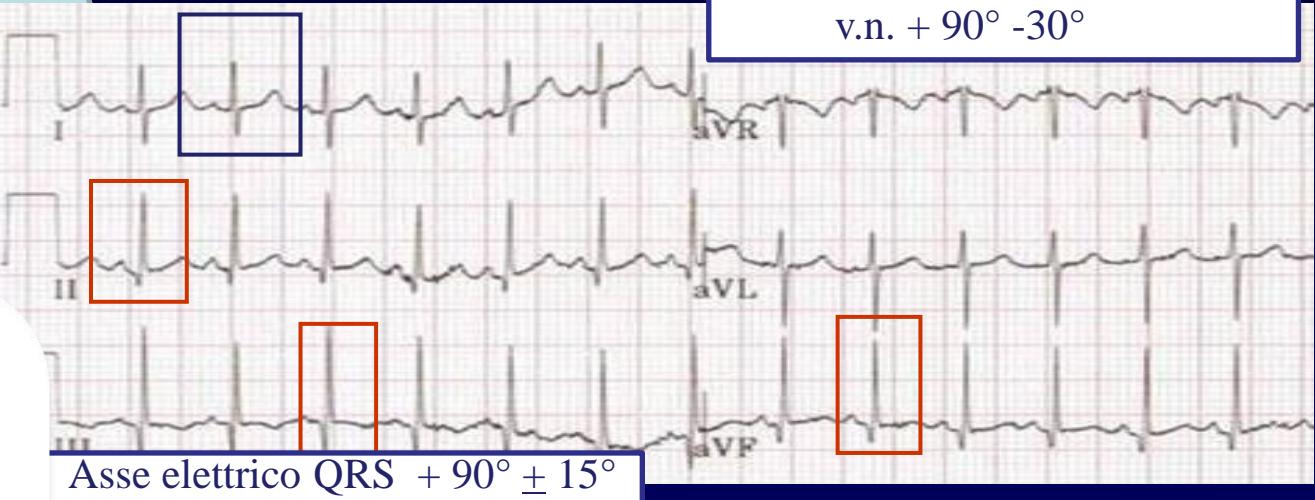
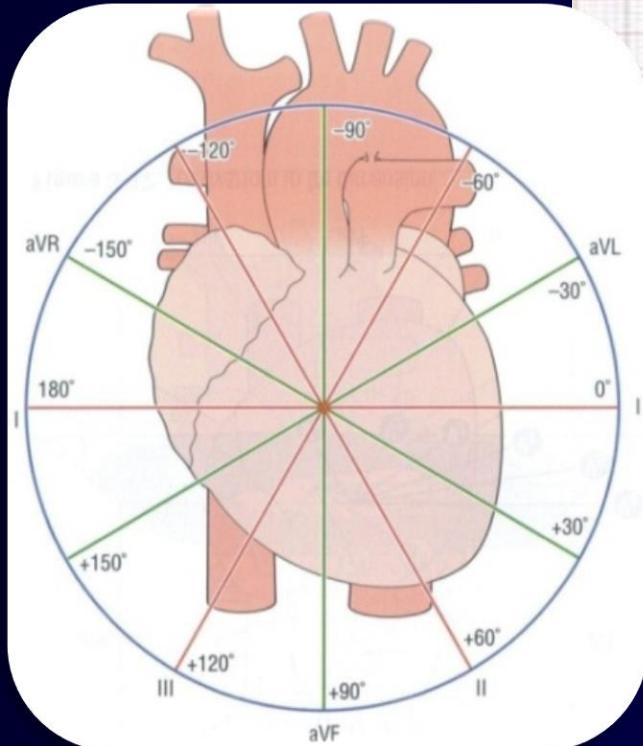
Asse elettrico cardiaco

L'asse elettrico è la sommatoria risultante di tutti i vettori istantanei generati durante la depolarizzazione

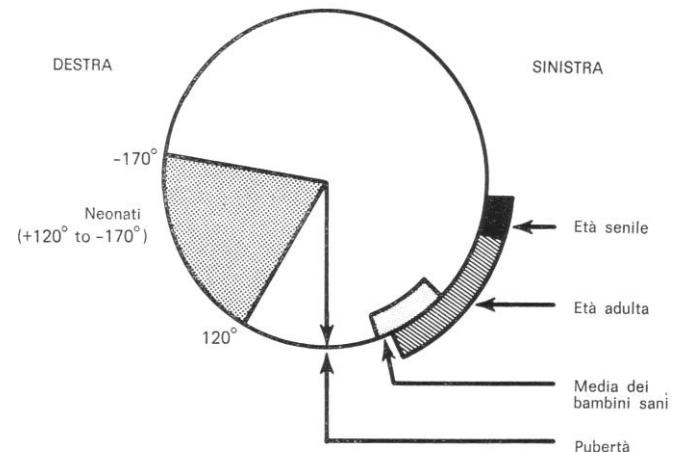


L'asse del QRS Esprime:

- Posizione del cuore
- Cavità prevalente



Normale evoluzione dell'asse del QRS dalla nascita all'età senile

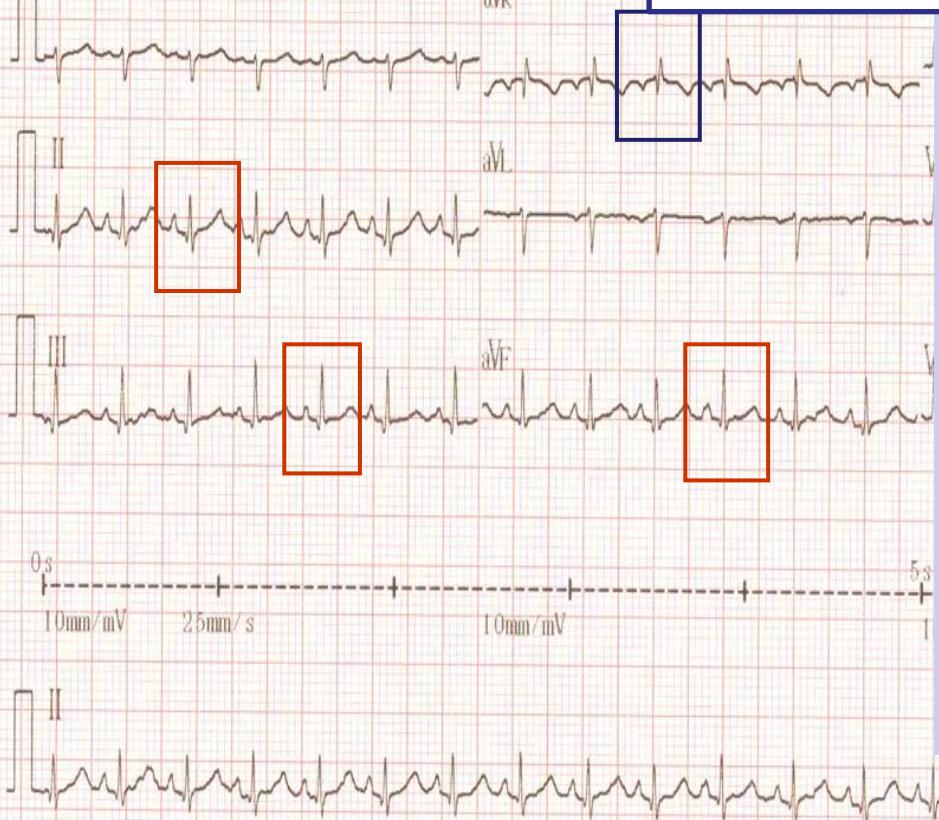


“Modello Neonatale”

Asse elettrico normale
 $\geq 120^\circ$ (III positiva)

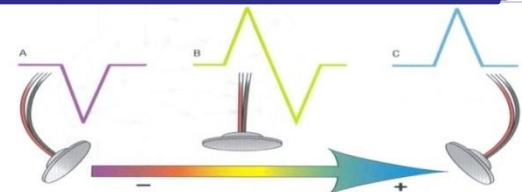
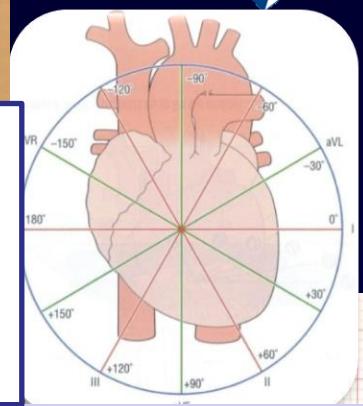
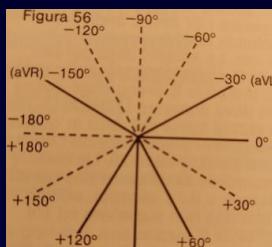
20 giorni

Asse $+120^\circ \pm 15$

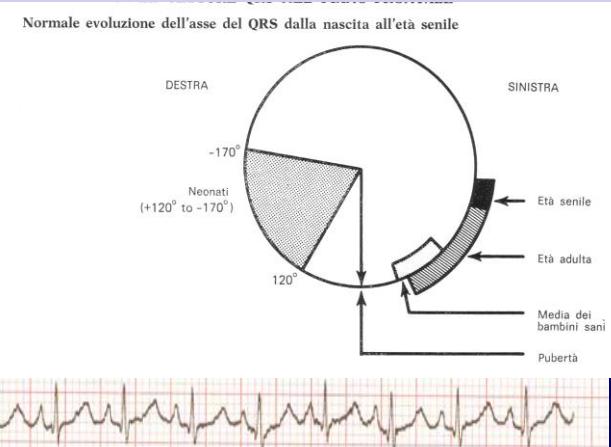


Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anno + 060 (+10 a +100)



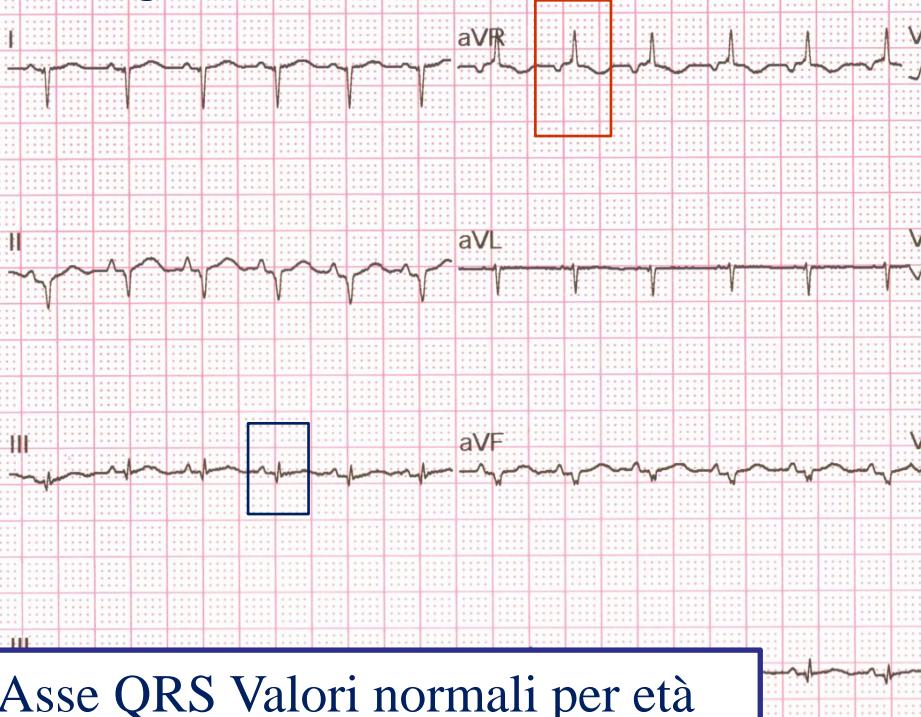
aVR isodifasica, derivazione perpendicolare III



“Modello Neonatale”

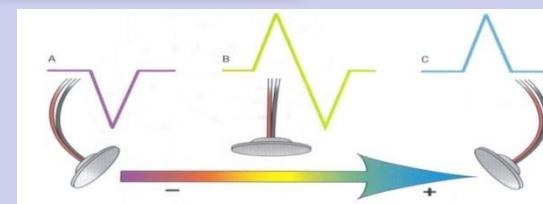
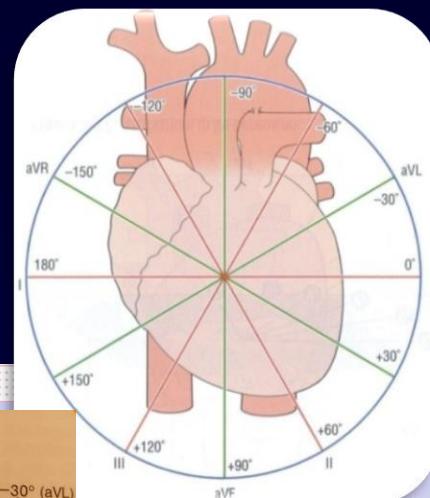
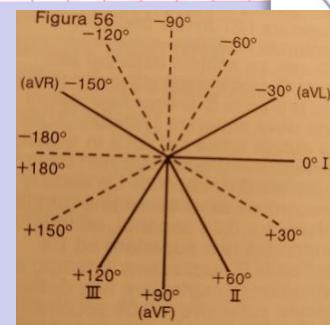
I[^] settimana

6 giorni



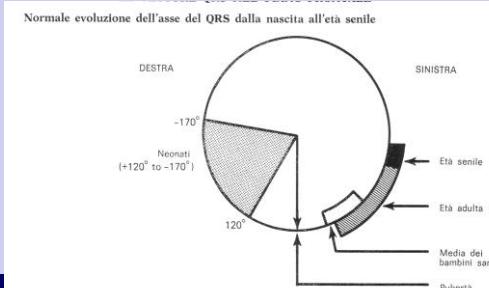
Asse QRS Valori normali per età

- I[^] sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)



III isodifasica, derivazioni perpendicolari aVR

Asse elettrico:
estrema
prevalezza
destra + 210°



“Modello Lattante”

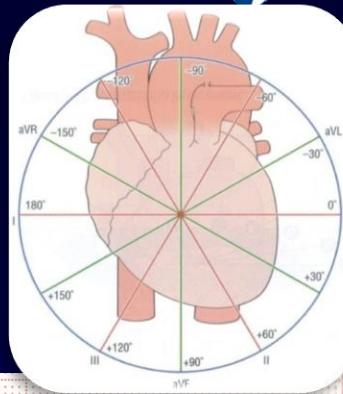
Asse elettrico
inferiore a 120° (III positiva)

Asse + 60° ±15, Asse +90° ±15

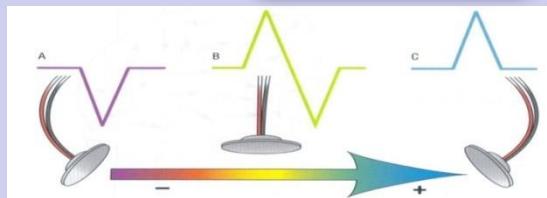
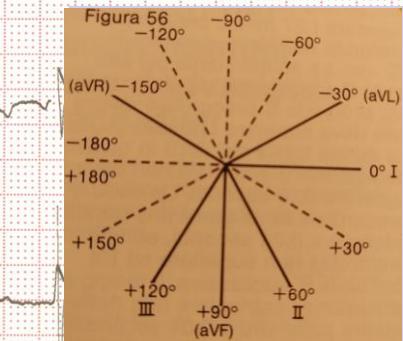
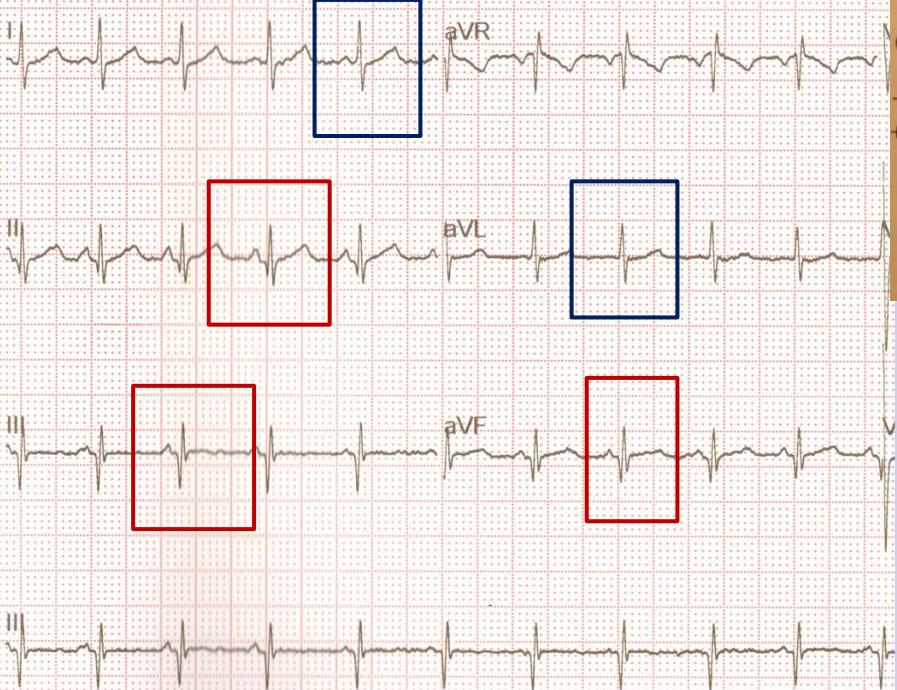
Asse +75°

Asse QRS Valori normali per età

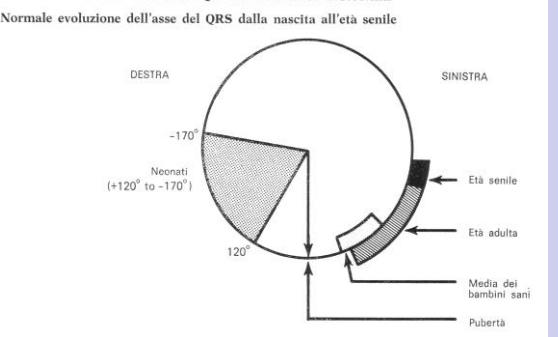
- I^ sett. + 110 (+30 a +180/210)
- Neonato + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)



6 mesi



aVL quasi isodifasica,
derivazioni
perpendicolare II

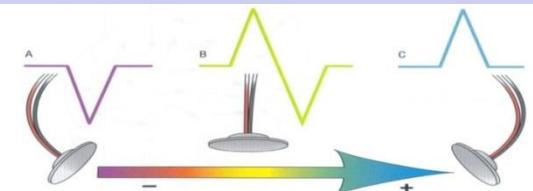
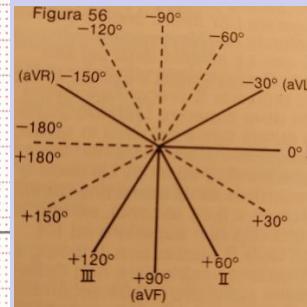
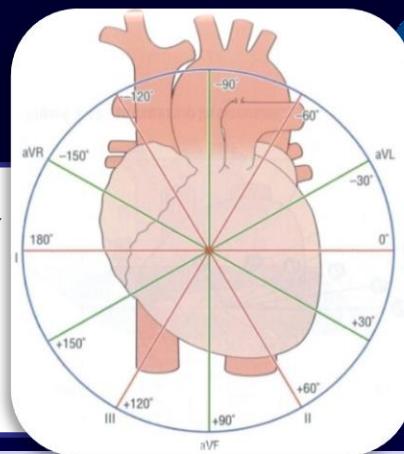


“Modello Adulto”

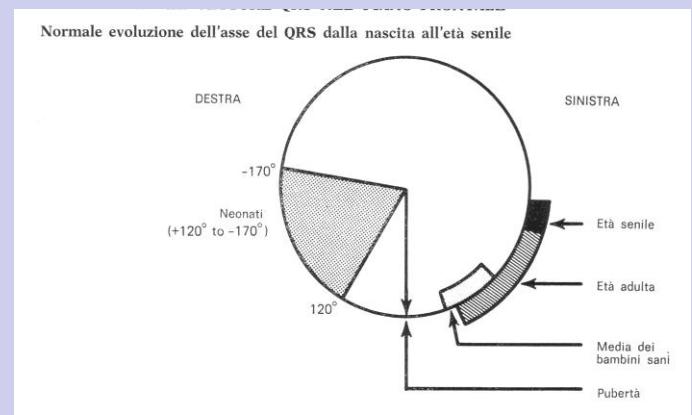
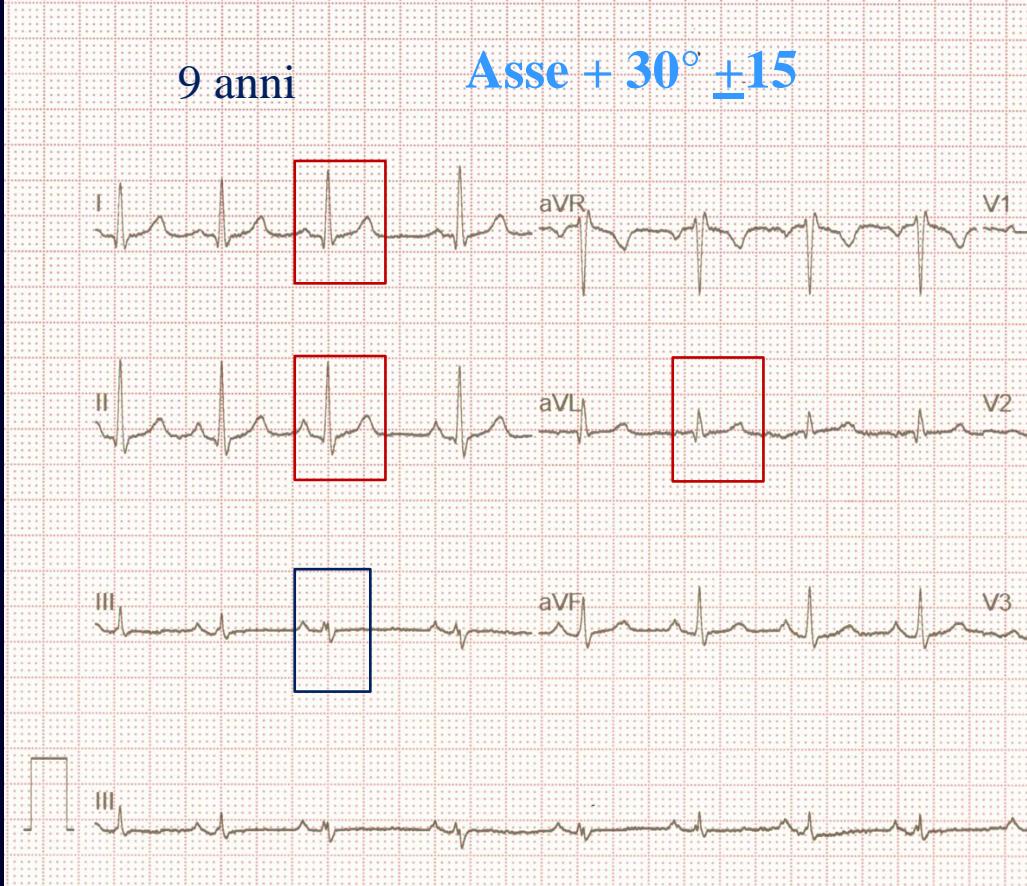
Asse elettrico dopo il I anno Normale inferiore a 100°

Asse QRS Valori normali per età

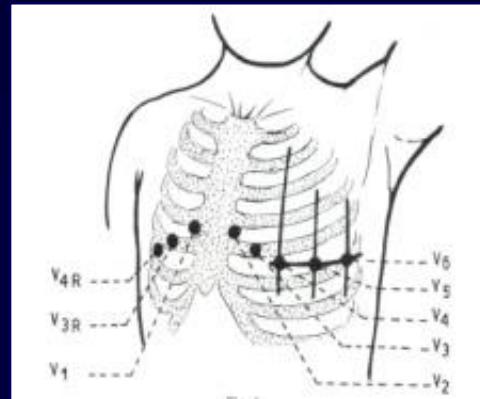
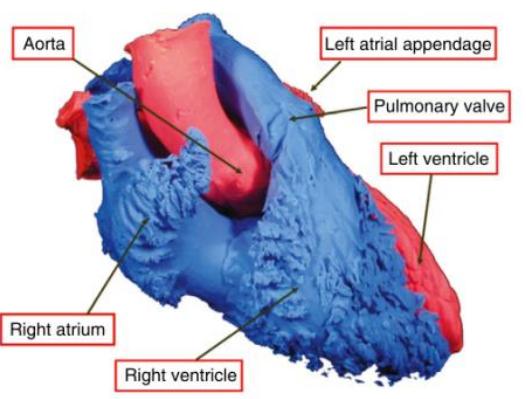
- I⁺ sett. +110 (+30 a +180/210)
 - 7-30 gg + 120 (+30 a +190)
 - 1-12 mesi + 070 (+10 a +120)
 - > 1 anni + 060 (+10 a +100)



III isodifasica derivazione perpendicolare aVR



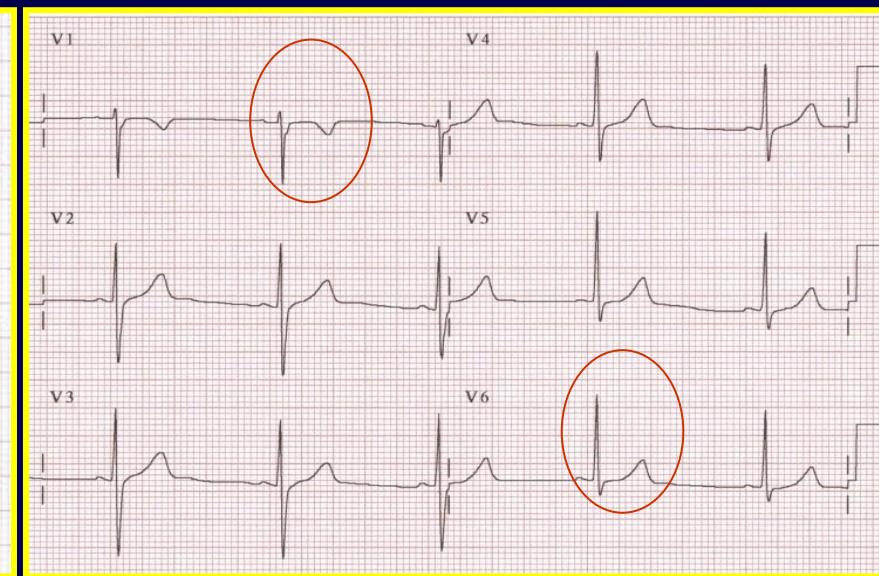
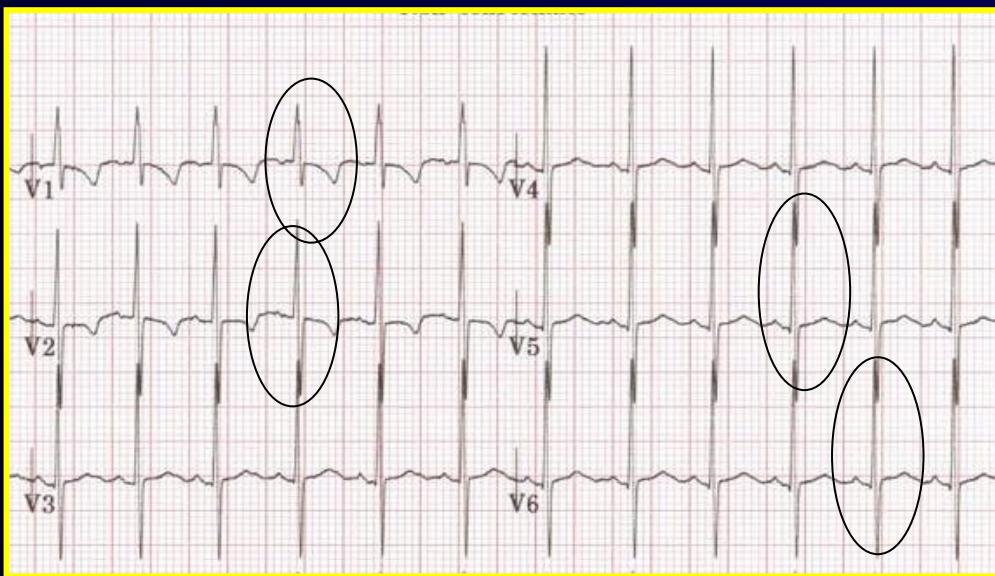
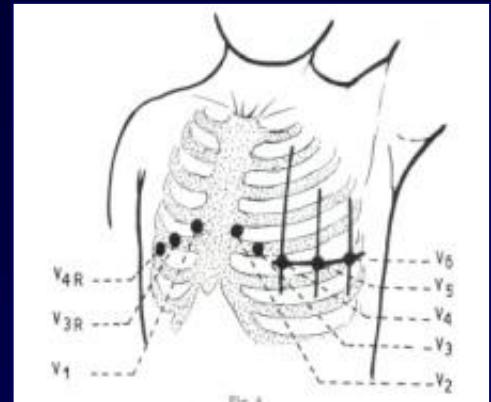
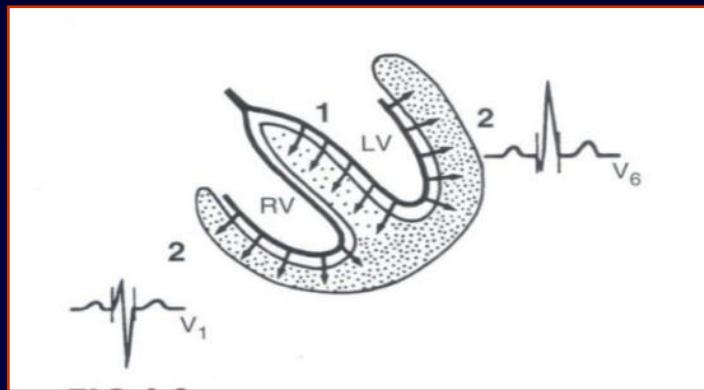
Elettrocardiogramma a 12 derivazioni



- V1 4 spazio intercostale margine sternale dx
- V2 4 spazio intercostale margine sternale sn
- V3 tra V2 e V4
- V4 5 spazio intercostale linea emoclaveare
- V5 5 spazio intercostale linea ascellare anteriore
- V6 5 spazio intercostale ascellare media



Ecg: complesso QRS

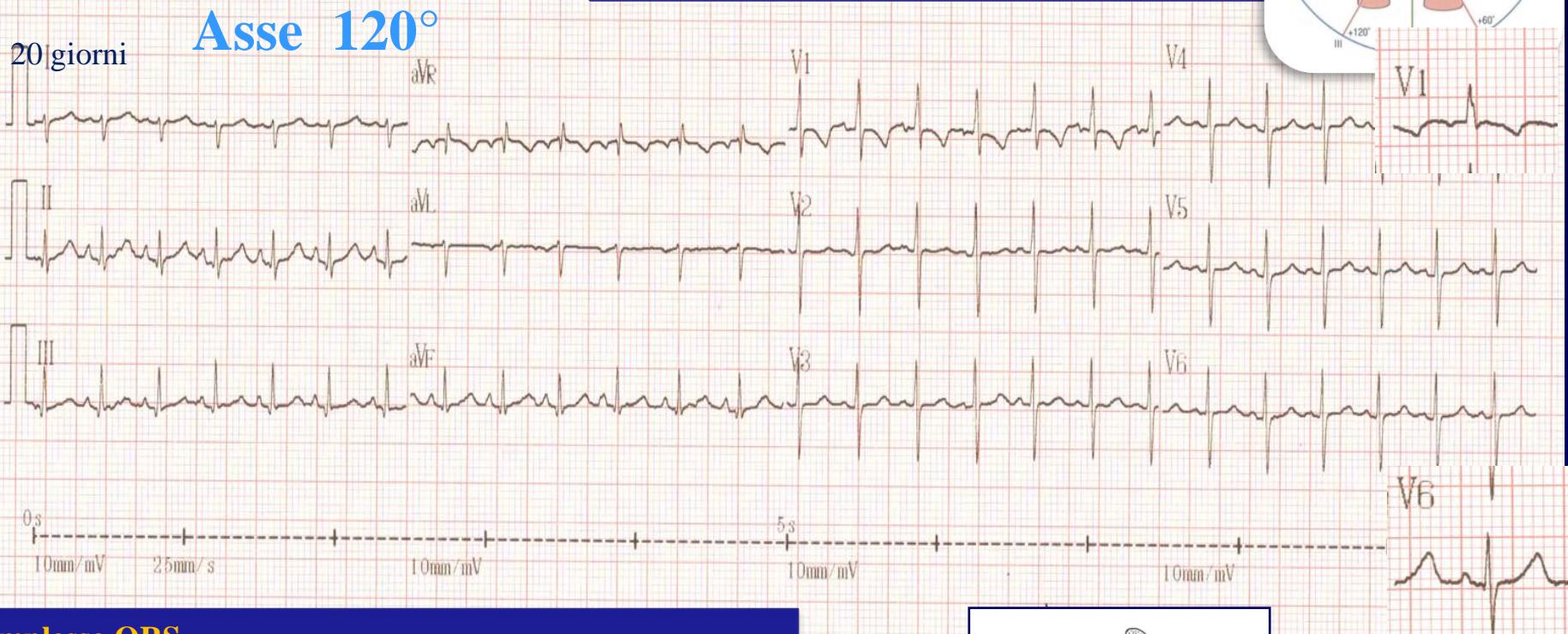


Modello pediatrico

Modello adulto

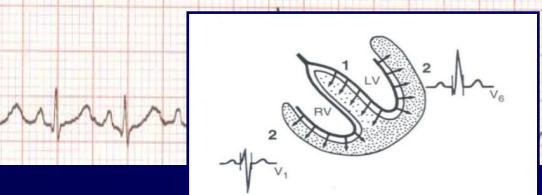
“Modello Neonatale”

Asse elettrico normale
 $\geq 120^\circ$ (III positiva)



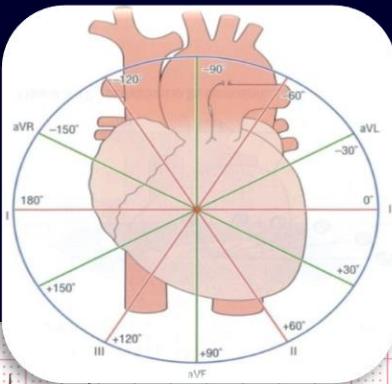
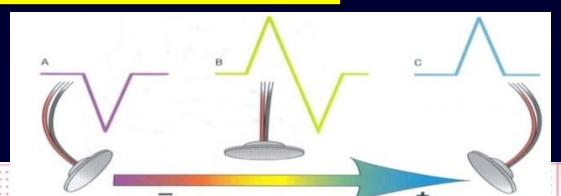
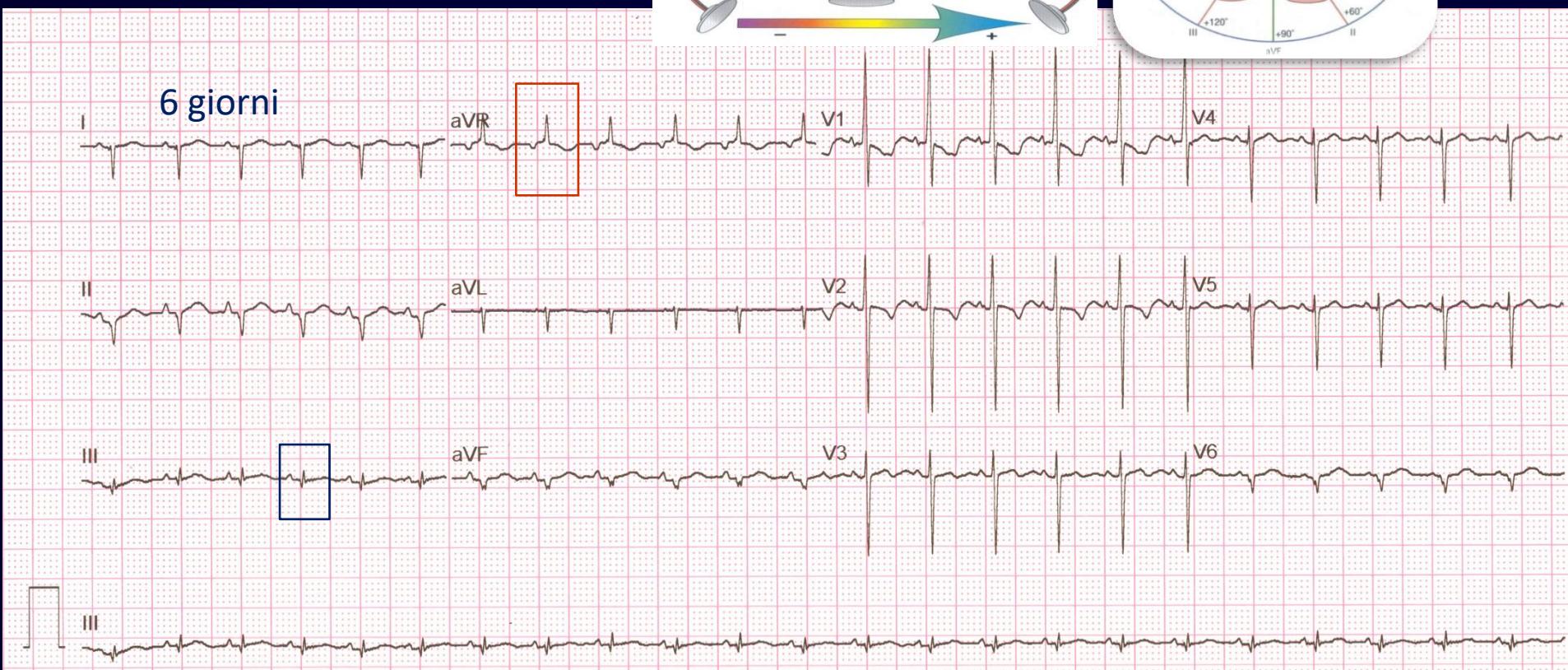
Complesso QRS

- | | | |
|-----|--------------|------------------------------|
| V1 | R/S>1, | R<25 mm S<20 mm |
| | R | R<13/10mm (I settimana/dopo) |
| V6: | R/S \leq 1 | o R/S> 1 S < 10mm; |



“Modello Neonatale”

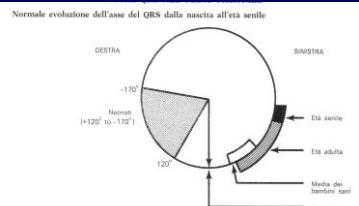
I[^] settimana



Asse QRS Valori normali per età

- I[^] sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Asse elettrico: estrema prevalenza destra 220°





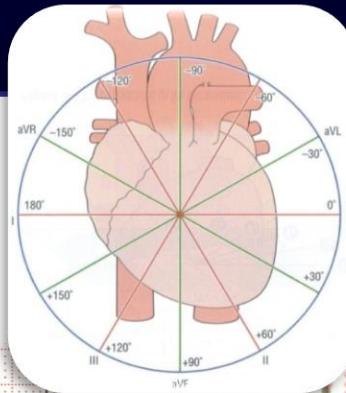
“Modello Lattante”



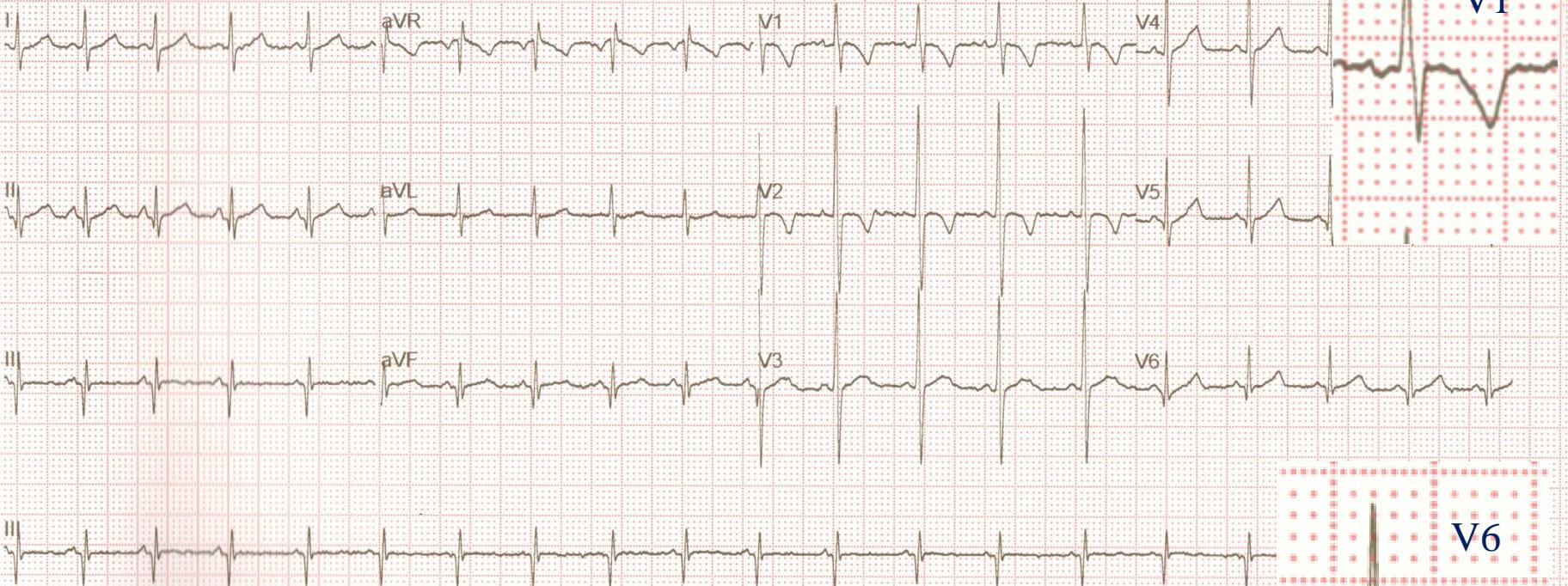
Asse elettrico inferiore a 120°
(III positiva) sino al 1 anno

Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

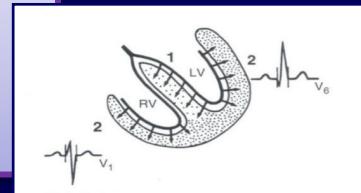


6 mesi Asse $60^\circ \pm 15$



Complesso QRS

V1:	$R/S \geq 1$	$R < 20 \text{ mm}$
	R	$R < 10 \text{ mm}$ (mai dopo il 1 anno)
V6:	$R/S > 1$	$R < 25 \text{ mm}$ $S < 10 \text{ mm}$
II-III-aVF-V6		$q \text{ max } 10 \text{ mm}$



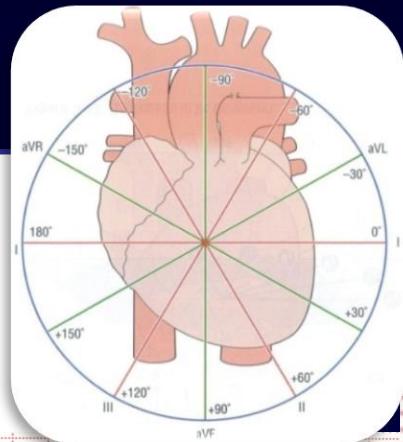
"Modello Adulito"

**Asse elettrico
dopo il I anno
inferiore a 100°**

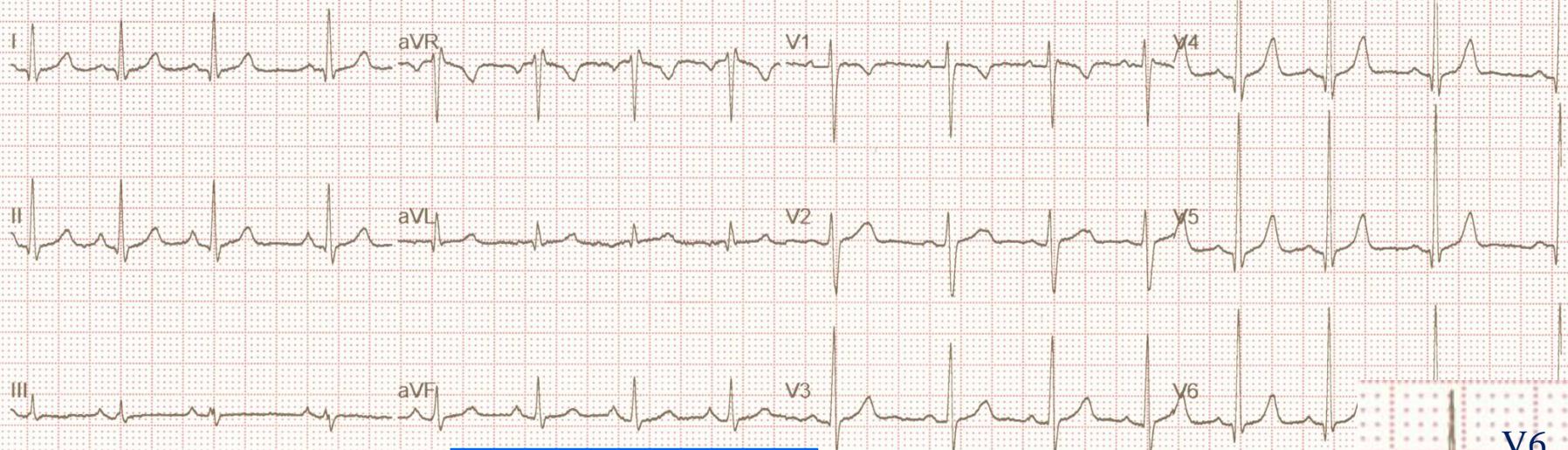
9 anni

Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)



Asse 30° ±15

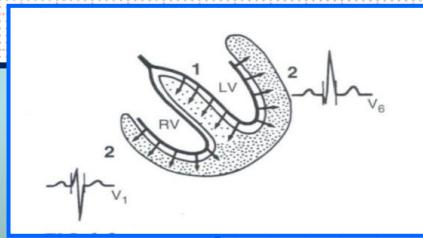


Complesso QRS

V1: R/S <1 S <25 mm

R mai

V6: R/S >1 R <25 mm S <5mm



Complesso QRS Precordiali

$QRS \geq 0.05 < 0.07$ sec

$R < 10$ mm in V1 onda q < 5 mm in V6

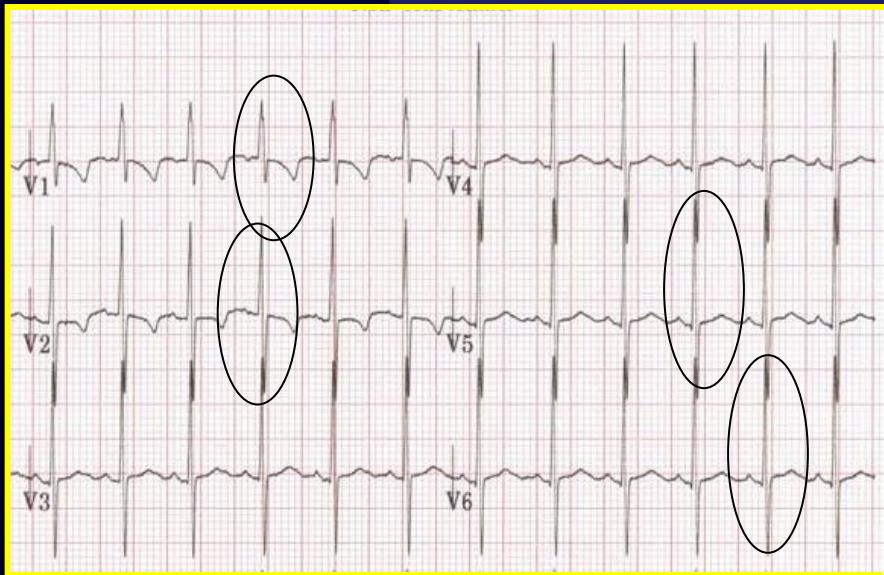
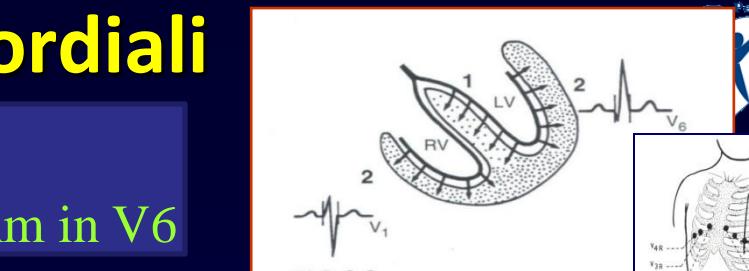


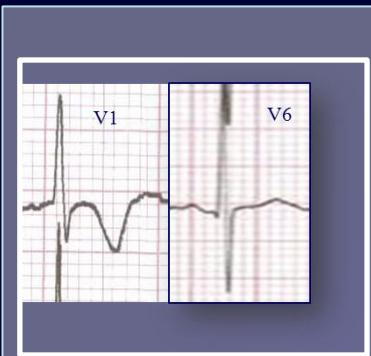
Tabella 6. - AMPIEZZA DELLE PRINCIPALI COMPONENTI DEL COMPLESSO QRS NELLE DERIVAZIONI PRECORDIALI DESTRE.

Age	Aampiezze in V1 (mm)					Aampiezze in V5 (mm)					Onda R					Onda S				
	Min.	5 %	Media	95 %	Max.	S.D.		Min.	5 %	Media	95 %	Max.	S.D.		Min.	5 %	Media	95 %	Max.	S.D.
0-24 ore	5,5	7,0	14,8	20,0	20,5	3,72		0,0	2,5	9,3	27,0	28,5	7,99		0,0	0,0	11,9	24,0	31,5	6,87
1-7 giorni	5,5	9,0	18,2	27,4	29,5	5,44		1,5	4,6	10,4	18,8	25,5	4,70		0,0	3,6	6,8	16,2	19,5	4,73
8-30 giorni	2,5	4,2	11,4	19,8	26,5	4,97		0,0	2,5	5,0	12,8	18,5	3,73		0,0	2,7	4,8	12,3	13,5	3,50
1-3 mesi	0,0	3,6	9,4	17,9	20,5	5,12		0,0	2,0	5,7	17,4	19,5	5,52		4,0	7,3	13,6	20,7	24,0	4,14
3-6 mesi	5,5	6,1	10,8	16,7	17,5	3,14		1,5	2,1	6,8	11,8	13,5	2,80		8,0	9,3	17,8	25,5	28,0	5,08
6-12 mesi	0,0	4,0	7,3	16,0	17,5	3,84		1,5	1,9	6,2	14,4	16,5	3,73		8,0	9,7	17,1	24,7	28,0	4,03
1-3 anni	2,5	3,6	8,8	15,0	17,5	3,23		0,0	2,2	10,7	20,5	28,5	5,90		8,0	9,1	17,8	27,7	40,0	6,69
3-5 anni	0,0	2,6	6,9	15,6	17,5	3,84		4,5	5,0	11,8	24,8	34,5	6,00		8,0	9,4	18,5	30,0	36,0	6,59
5-8 anni	0,0	2,6	6,7	13,5	20,5	3,84		1,5	5,3	12,7	21,0	25,5	5,21		8,0	10,0	20,2	31,2	40,0	6,15
8-12 anni	0,0	3,6	5,7	11,3	17,5	3,10		1,5	4,8	14,0	22,3	25,5	5,74		8,0	10,9	21,9	30,0	36,0	6,23
12-16 anni	0,0	2,1	4,8	11,1	17,5	3,19		1,5	5,5	13,4	22,3	25,5	5,32		4,0	8,4	17,2	26,7	36,0	5,42



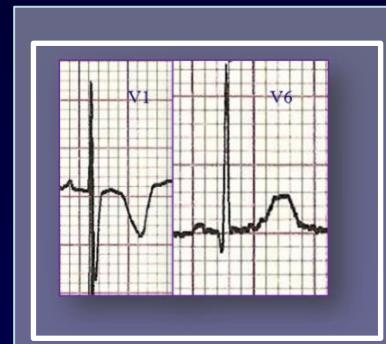
Asse Elettrico e morfologia complesso QRS nelle derivazioni precordiali

Tre Modelli ECG



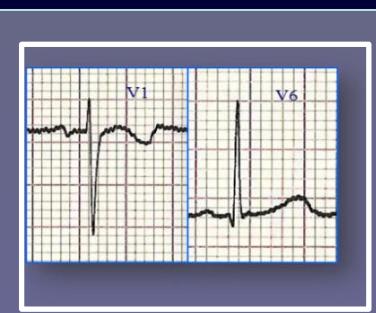
“Modello Neonatale”

1-30 giorni:
prevalenza delle forze
elettriche del
ventricolo destro



“Modello Lattante”

1 mese 3 anni: forze
elettriche ventricolo
sn/dx bilanciate



“Modello Adulto”

2- 3 anni: prevalenza
delle forze elettriche
del ventricolo Sn

“Modello Neonatale”: risente dall’emodinamica fetale, tipica dalla 31° settimana in poi

- piccolo circolo contro alte resistenze polmonari,
- grande circolo contro basse resistenze placentarie

“Modello Lattante”: risente dall’emodinamica postnatale “ prima fase di equilibrio di forze”

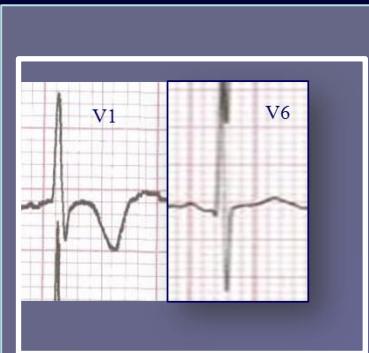
- Inizia il processo di caduta delle resistenze polmonari
- Il ventricolo sinistro pompa contro alte resistenze periferiche

“Modello Adulto”: ultima evoluzione morfologica in età pediatrica

- completamento dell’emodinamica già descritta nel “modello lattante”

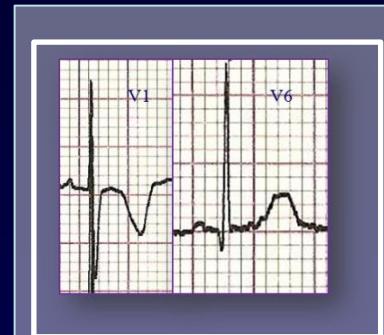
Asse Elettrico e QRS nelle derivazioni precordiali Punti chiave

Tre Modelli ECG



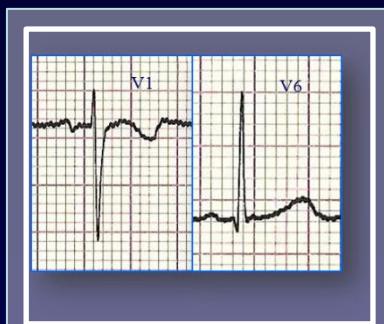
“Modello Neonatale”

1-30 giorni:
prevalenza delle forze elettriche del ventricolo destro



“Modello Lattante”

1 mese - 3 anni: forze elettriche ventricolo sn/dx bilanciate



“Modello Adulto”

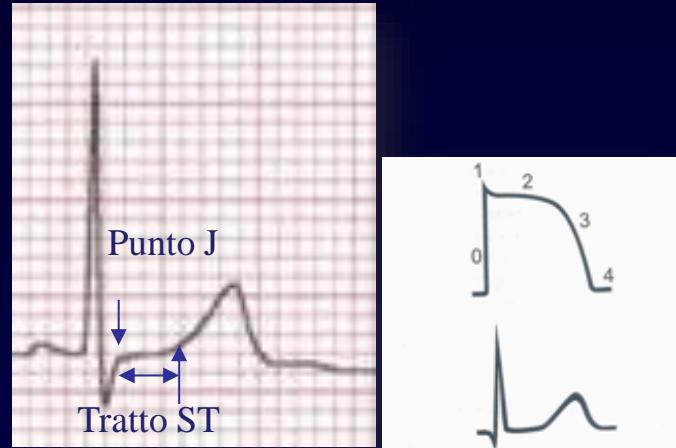
2-3 anni:
prevalenza delle forze elettriche del ventricolo sinistro

- Il “modello neonatale” è caratteristico solo del I mese di vita
- Il “modello lattante” può essere già presente nel primo mese di vita
- Il “modello adulto” talvolta, può anche caratterizzare l’ECG nel I mese di vita
 - criteri utili di normalità voltaggio onda S in V1 e dell’onda R da V4-V6, ancora morfologia onda T e asse QRS

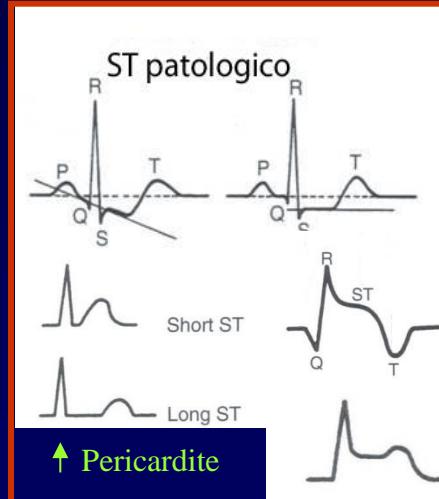
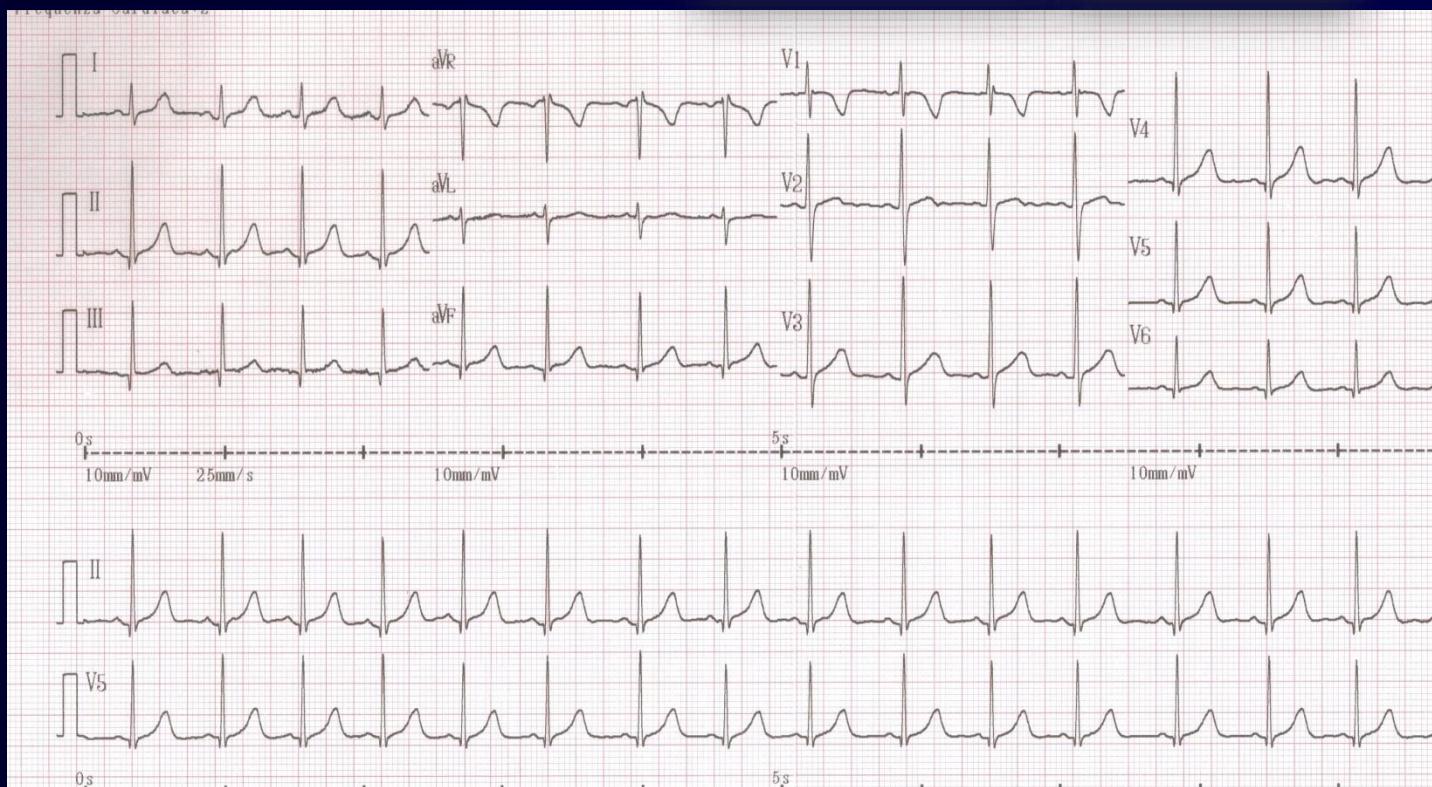
Ripolarizzazione Ventricolare tratto ST-T

Tratto ST

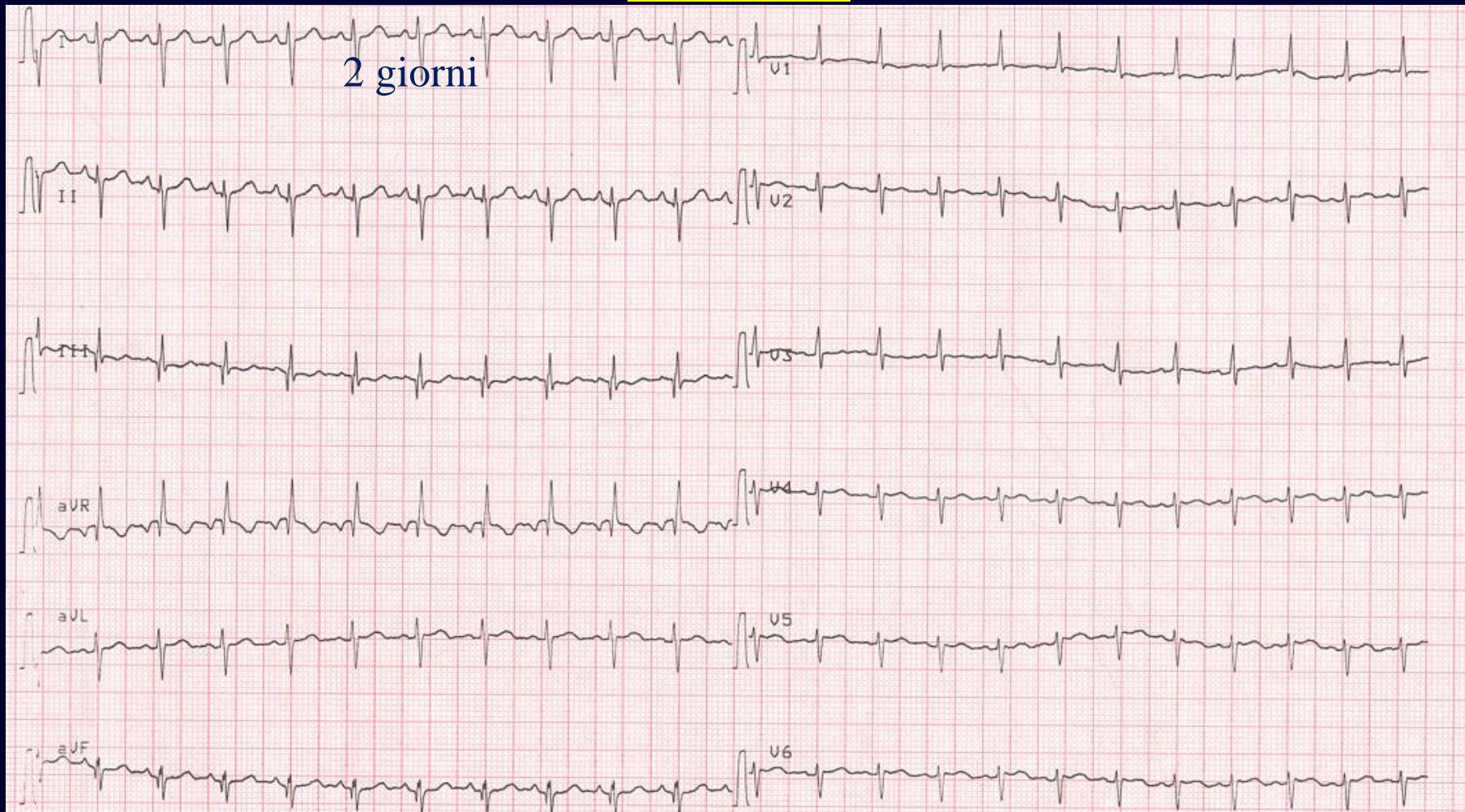
rappresentato da un segmento orizzontale “isoelettrico” stessa linea del tratto PR e TP



- Sono anormali:
- Sopralivellamenti
 - Sottolivellamenti



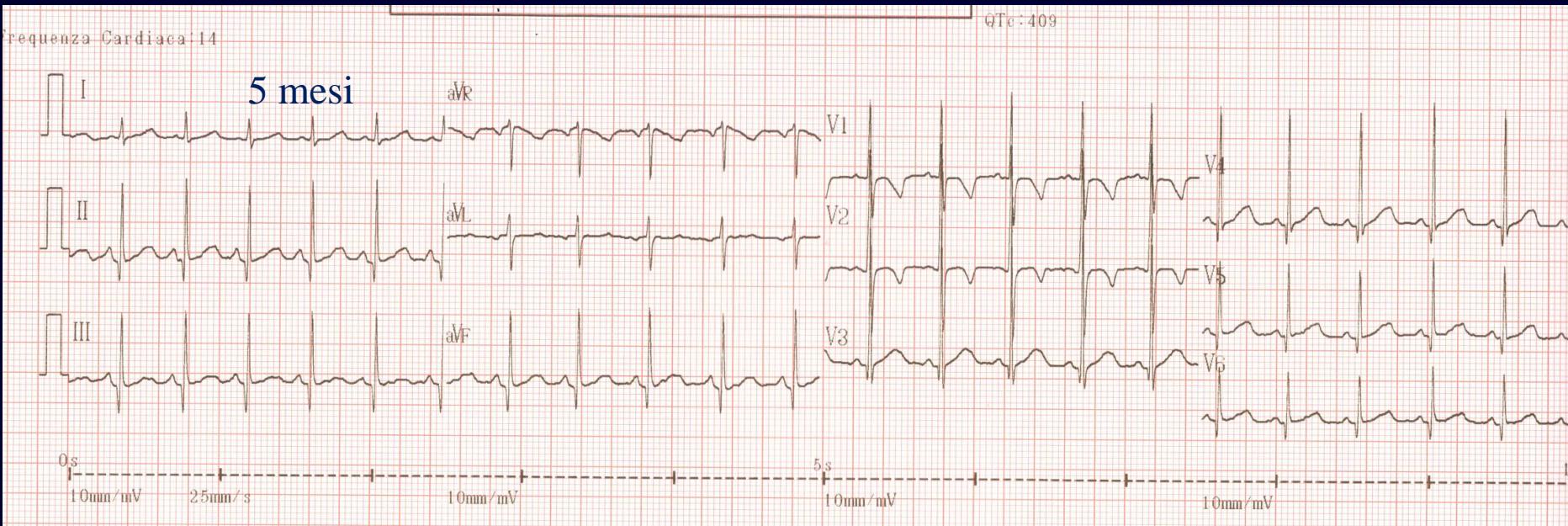
Ripolarizzazione Ventricolare Tratto ST-T ONDA T



Morfologia onda T I^ settimana di vita

- V1 positiva/negativa
- V6 positiva/piatta/negativa

Ripolarizzazione Ventricolare tratto ST-T ONDA T

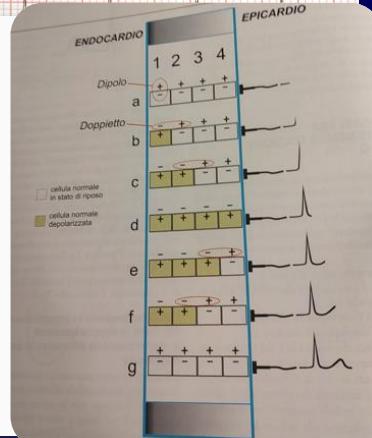
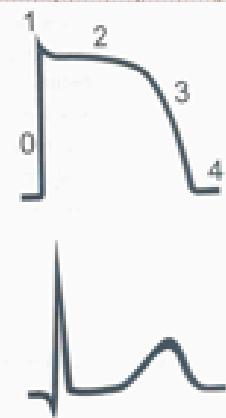


Morfologia

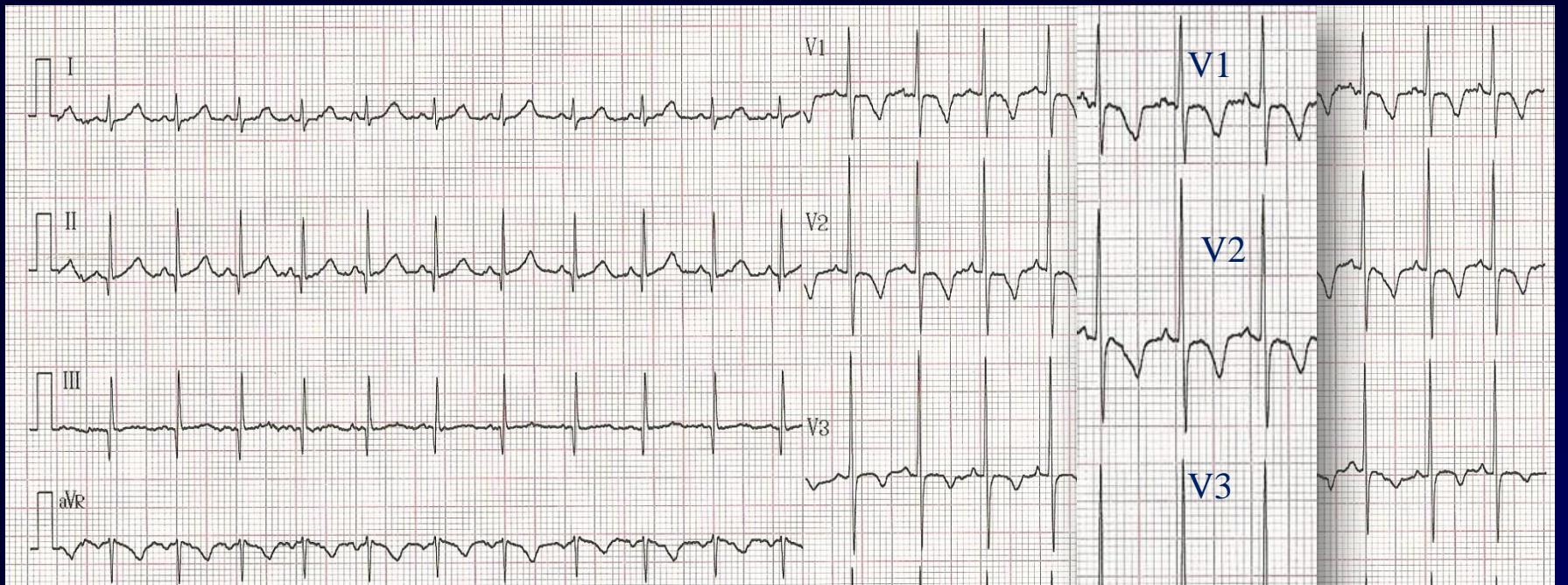
Dopo I^ settimana

- V5-V6
- V1, 3R, V4R
- V1-V2 (50%)
- V1, V2, V3 (5-10%)
- V1 negativa/positiva
- V2 piatta/positiva

positiva
negativa
negativa (fino a 5aa)
negativa sino 8-10
anni o adolescenza
adulto



Ripolarizzazione Ventricolare Tratto ST-T ONDA T

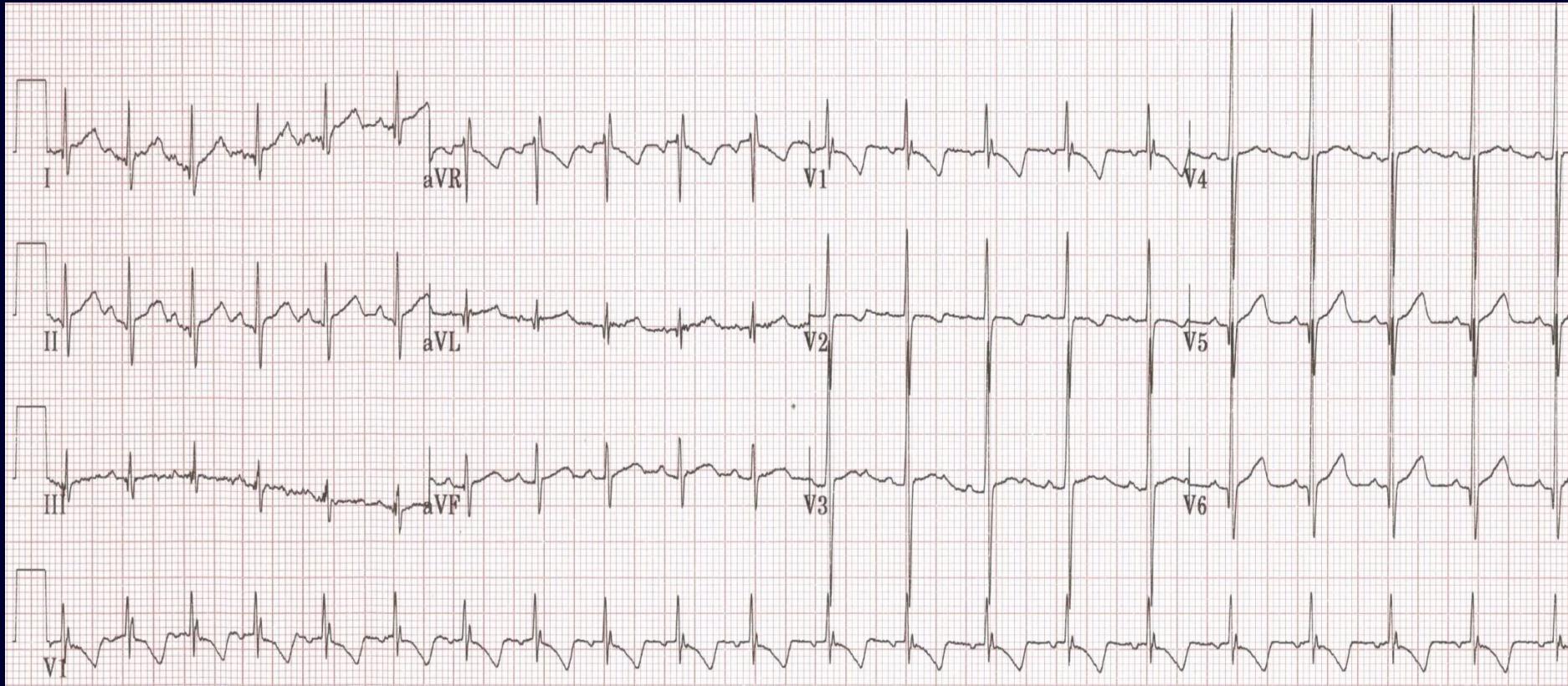


Morfologia

Dopo I^a settimana

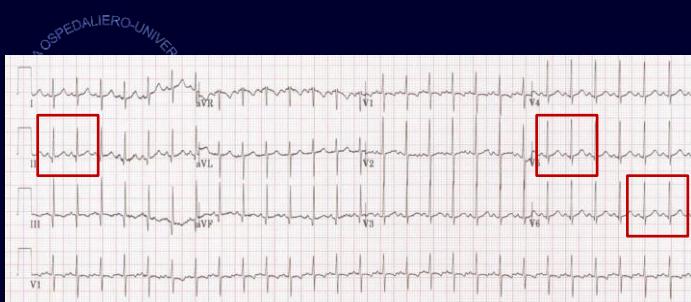
- V5-V6 positiva
- V1, 3R, V4R negativa
- V1-V2 (50%) negativa (fino a 5aa)
- V1, V2,V3 (5-10%) negativa sino 8-10 anni o adolescenza
- V1negativa/positiva adulto
- V2 piatta/positiva

Ripolarizzazione Ventricolare ONDA U

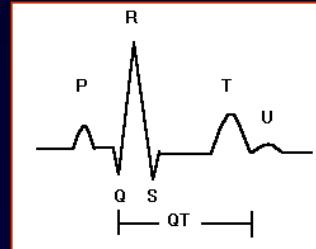


Rappresenta (opinioni controverse):

- Postpotenziali del muscolo ventricolare
- **Ripolarizzazione delle fibre del Purkinje**
- Presenti nelle derivazioni precordiali V2-V5



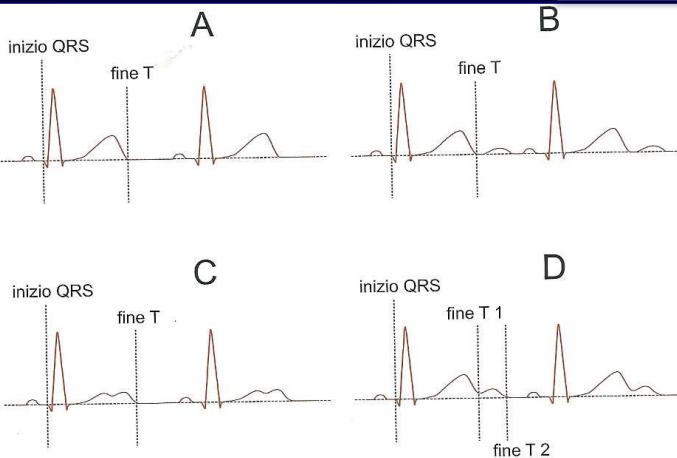
Intervallo QTc < 440, > 320 msec



È misurato dall'inizio del QRS al termine della T, onda U esclusa

II-V5-V6 sono le derivazione che meglio si prestano alla misurazione

La durata è in funzione della frequenza, pertanto, deve essere corretto per la frequenza cardiaca con la formula di Bazett

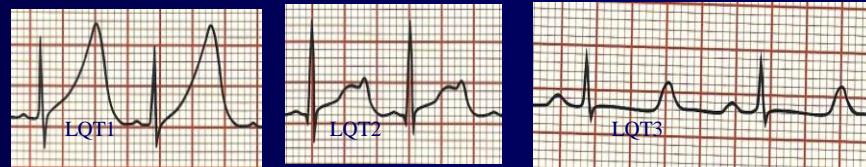


	Formula di Bazett $QTc = QT/\sqrt{RR}$ (in sec)	Misura QT
A	onda T unica	Termine della T
B	onda T seguita da onda U separata	Termine della T senza onda U
C	T bifida con cuspidi simili	Termine dell'onda bifida
D	Onda T e U fuse, il passaggio non raggiunge l'isoelettrica	QT1 fine I° onda QT2 (QTU) fine II° onda



Note

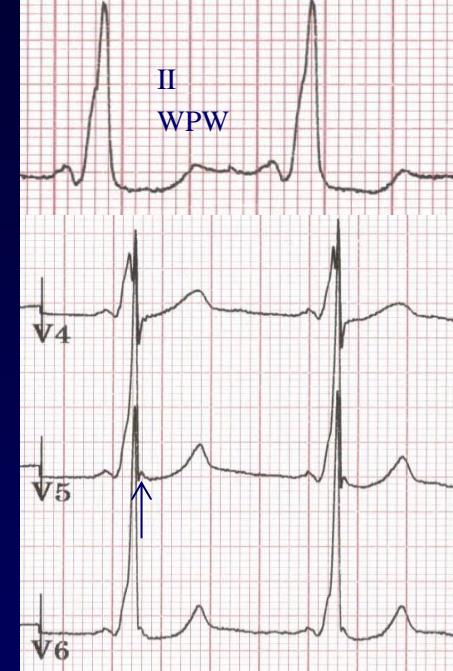
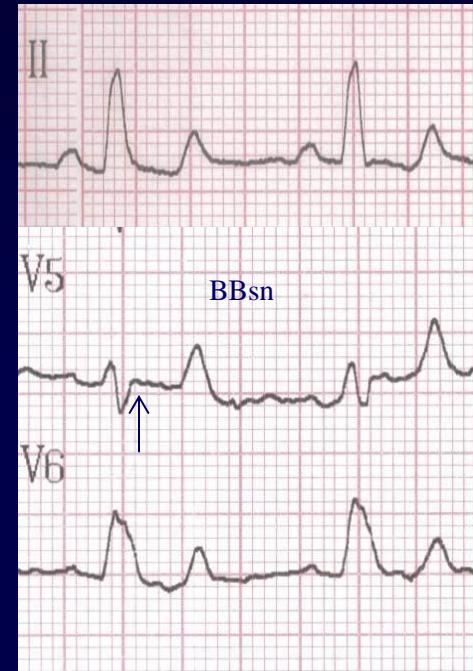
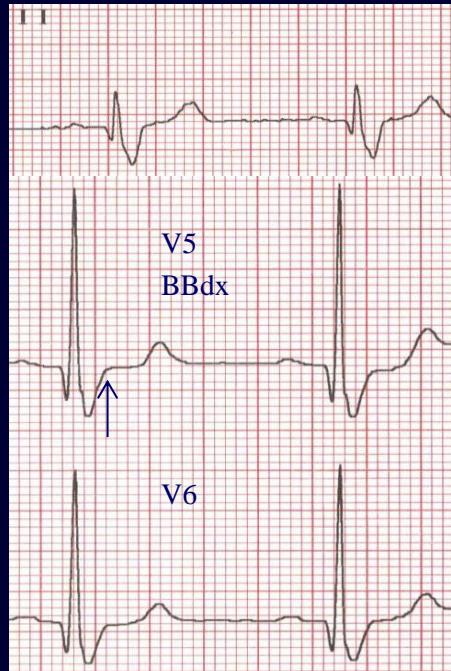
- Misurare il QT senza onda U
- differenziare onda U da onda T bifida
 - Onda U solo precordiali V2-V5
 - Onda T bifida in più derivazioni comprese periferiche



→ considerare QT1
→ considerare QT2

Corretta Misurazione Intervallo QT

in presenza: blocchi di branca e preeccitacone ventricolare



- In presenza di turbe della conduzione il QTc può risultare prolungato conseguente a una maggiore durata del complesso QRS
- Più sensibile, in questo caso, misurare l'intervallo JT
 - Punto J giunzione onda S e segmento ST (vedi )
- Applicando la formula di Bazett
 - valore normale **JTc** = 340 msec bambini e adolescenti

Am J Cardiol 1994;74: 1254-1257

Valori normali: onda P, durata PR, QRS, onda T, QTc

Onda P: depolarizzazione bi-atriale

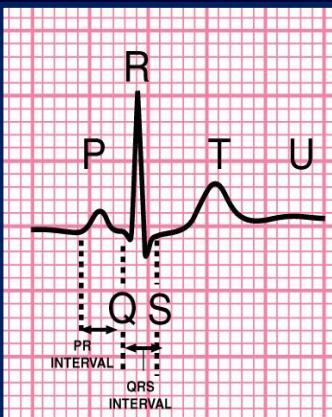
Aampiezza	$\geq 1.5 \leq 2.5$ mm
Durata	0.06 ± 0.02 sec
Durata max	0.08 sec < 12 mesi 0.10 sec > 12 mesi

Il valore del PR correla con l'età e non con la Frequenza Cardiaca
Valore adulto dopo i 12 anni

Età	PR msec
1-30 giorni	80-120
1mese-1 anno	80-140
1-5 anni	100-160
6-12 anni	110-180
> 12 anni	120-220

Età	QRS durata
1-30 giorni	0.05- < 0.065 sec
1 mese – 8/10 anni	0.055- < 0.075 sec
adulti	0.08 - < 0.10 sec

Età	Onda T V5	Onda TV6
< 1 anno	7 mm	5 mm
1-16 anni	11 mm	7 mm

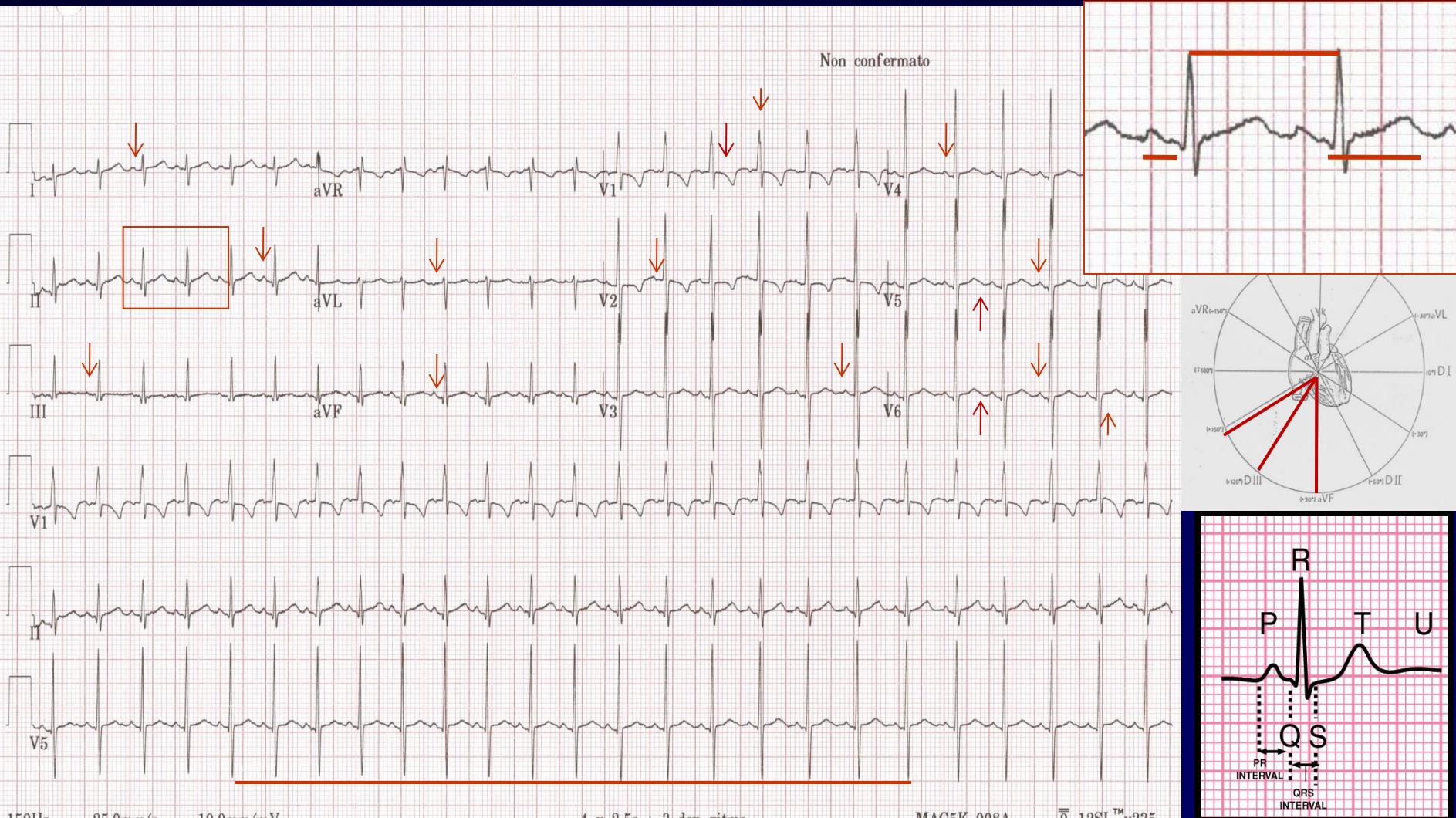


Formula di Bazett $QTc = QT/\sqrt{RR}$ (in sec)

QTc	1-16 anni	> 16 maschio	> 16 femmina
normale	< 440 msec	< 440 msec	< 450 msec
bordeline	440-460	430-450	450-470
lungo	> 460	> 450	> 470
corto ST manca	300-320		

Quindi per un corretto approccio all'elettrocardiogramma bisogna...

Calcolare il QT corretto > 320 msec < 440 msec

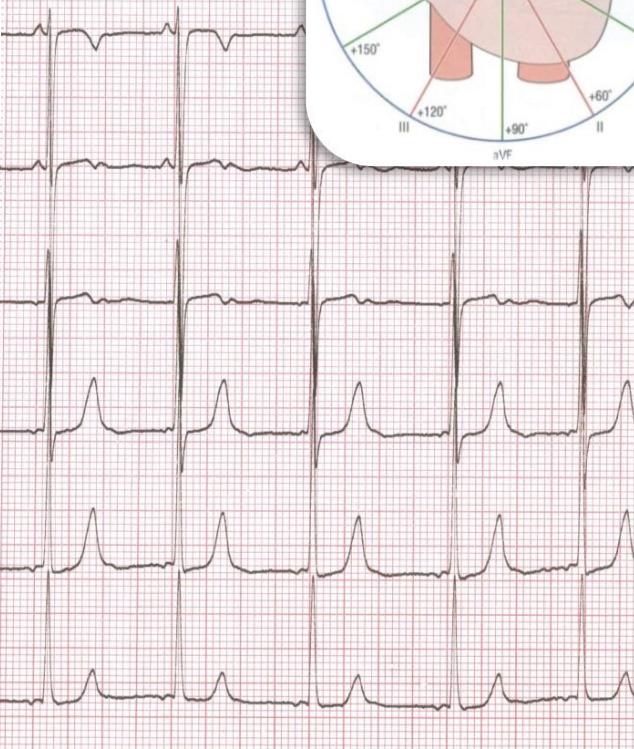
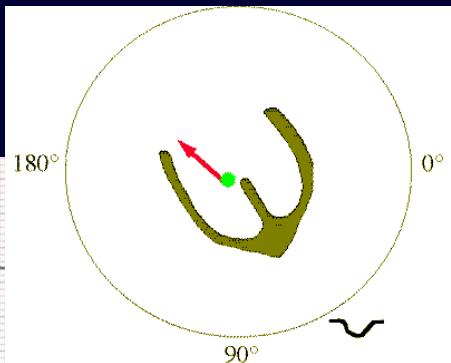
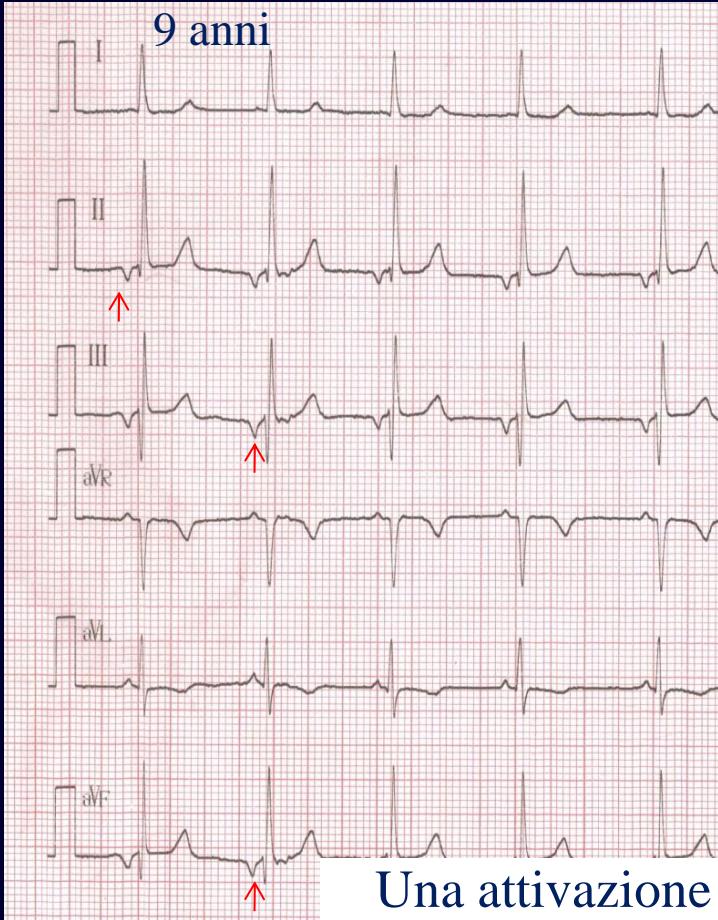




Varianti Normali

Variante Normale Ritmo del Seno Coronarico

Asse dell'onda P – 30°

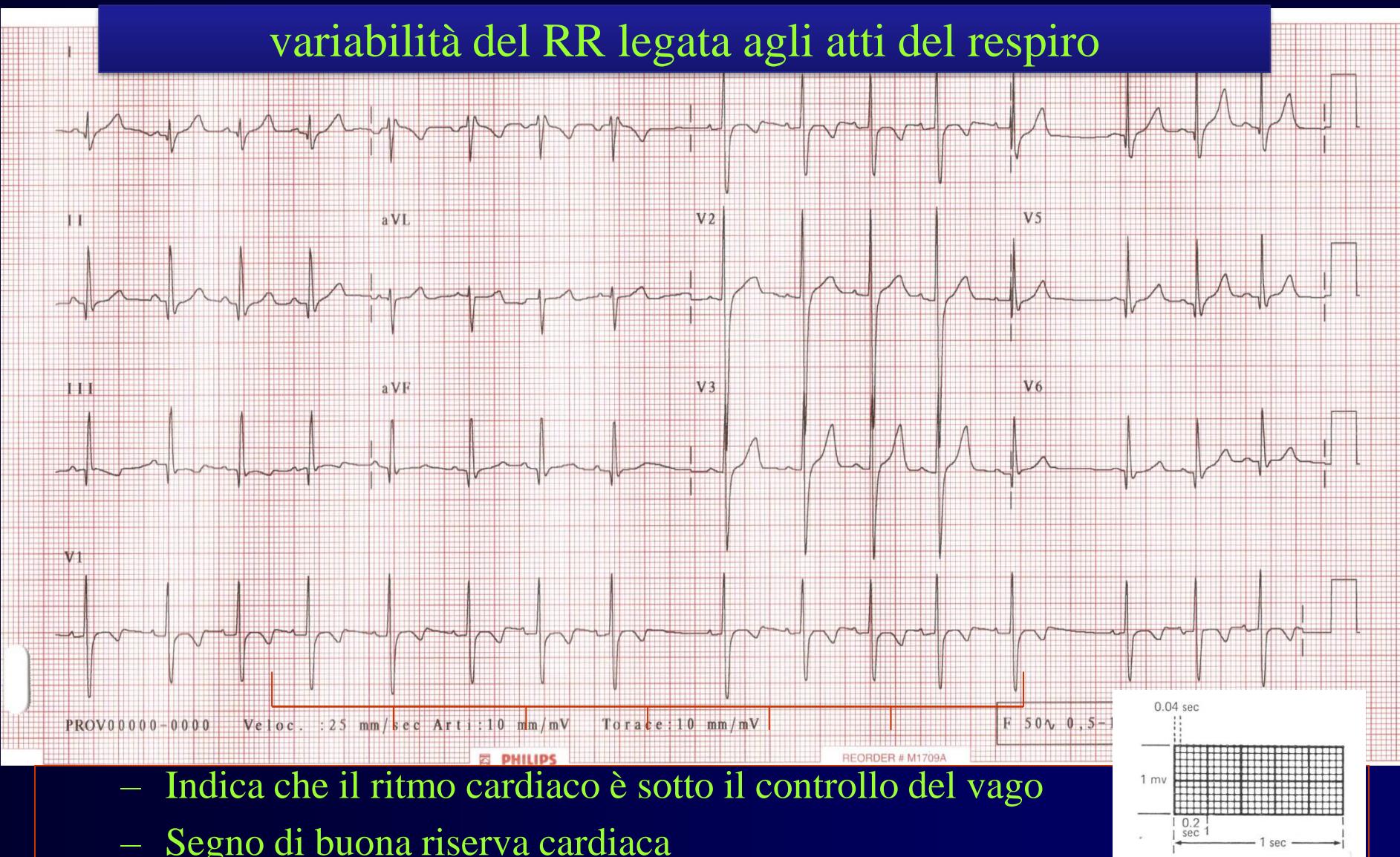


Una attivazione atriale che origina in modo anomalo – atrio destro basso- darà onde P negative in II, aVF, III

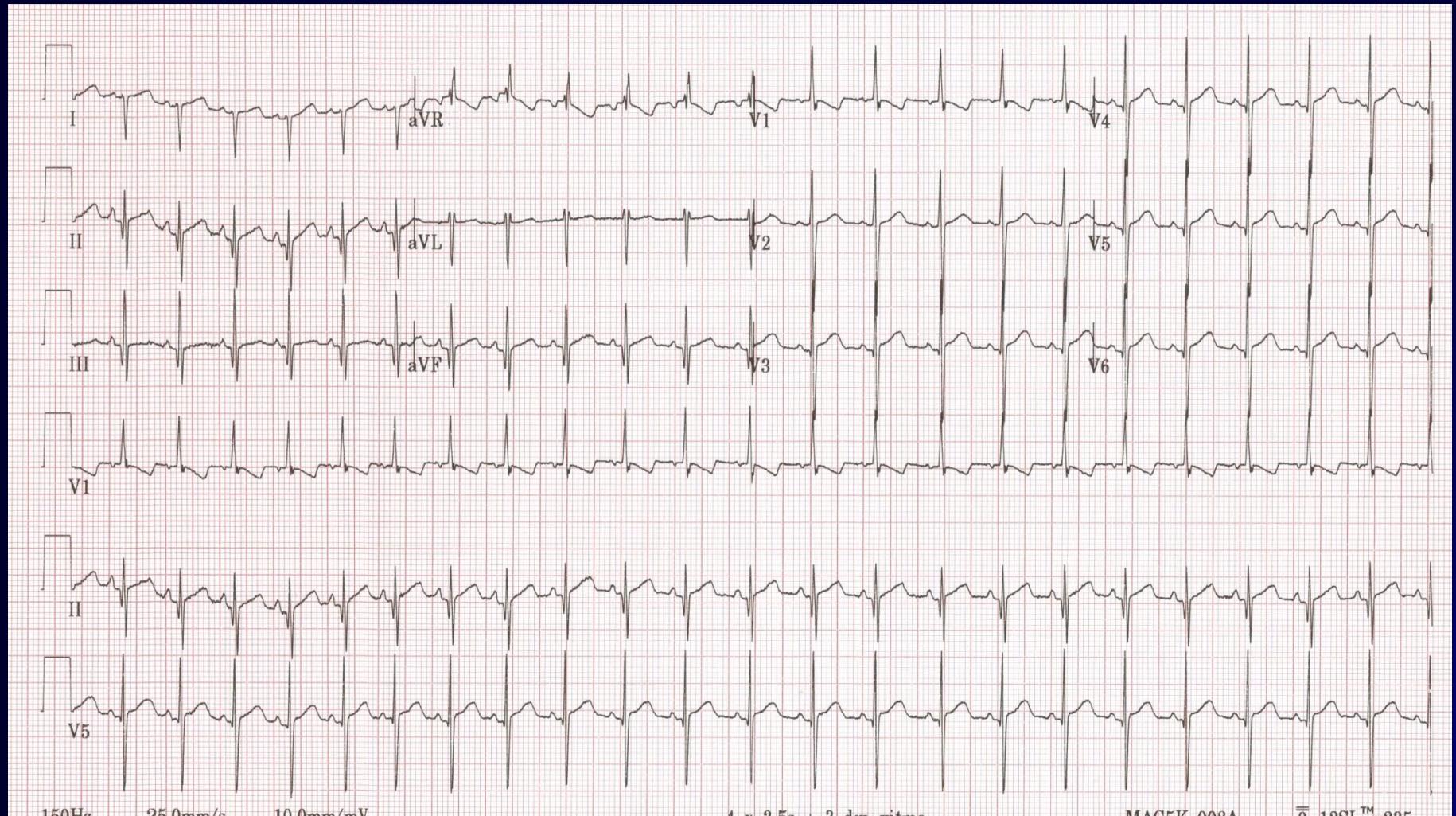
Variante Normale Ritmo

Aritmia sinusale fasica respiratoria

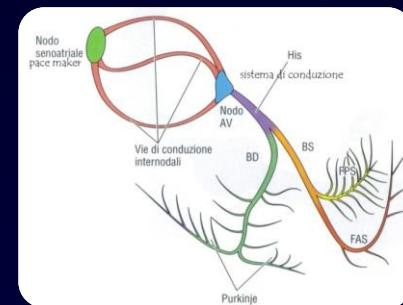
variabilità del RR legata agli atti del respiro



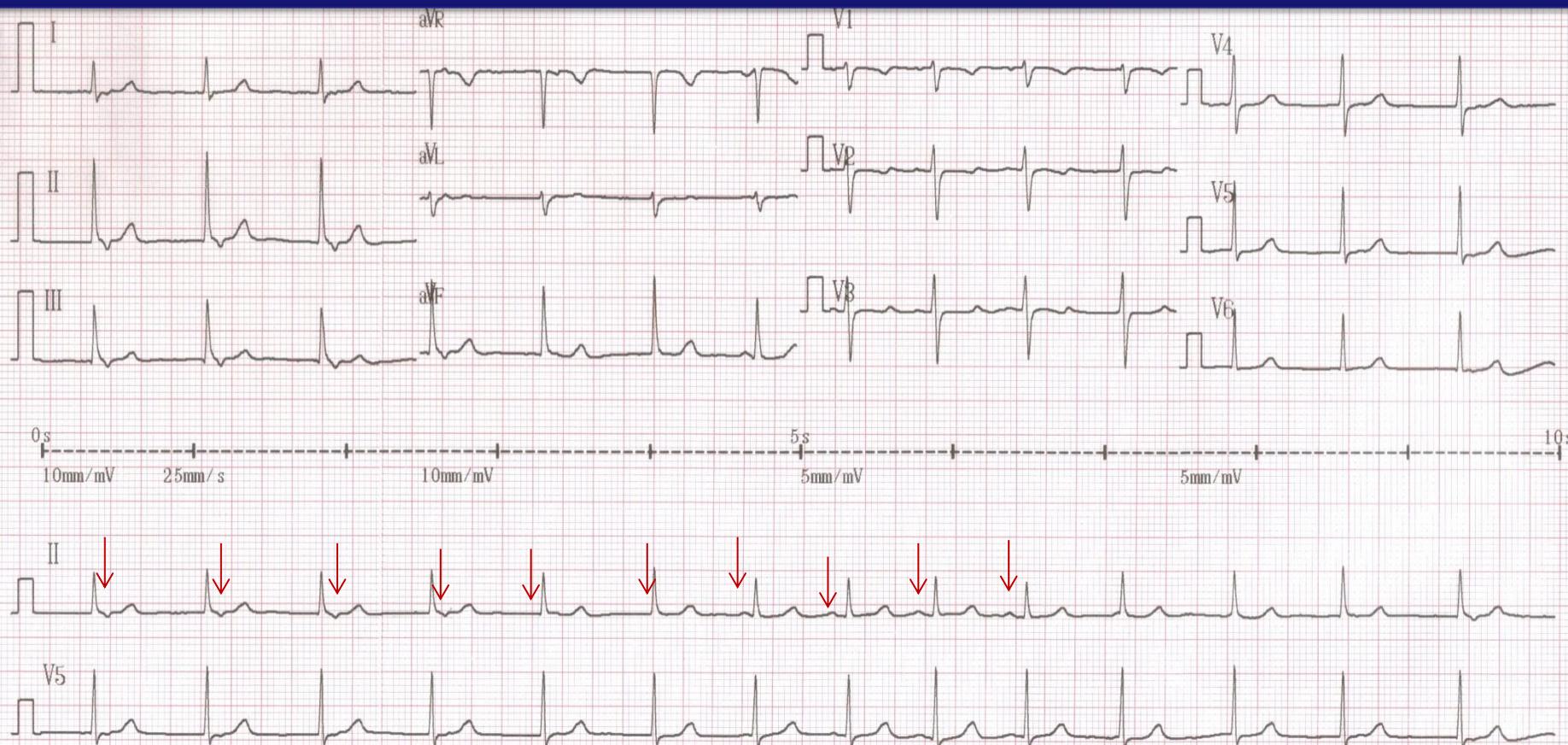
ECG neonatale Ritmo manca la variabilità della FC con gli atti del respiro



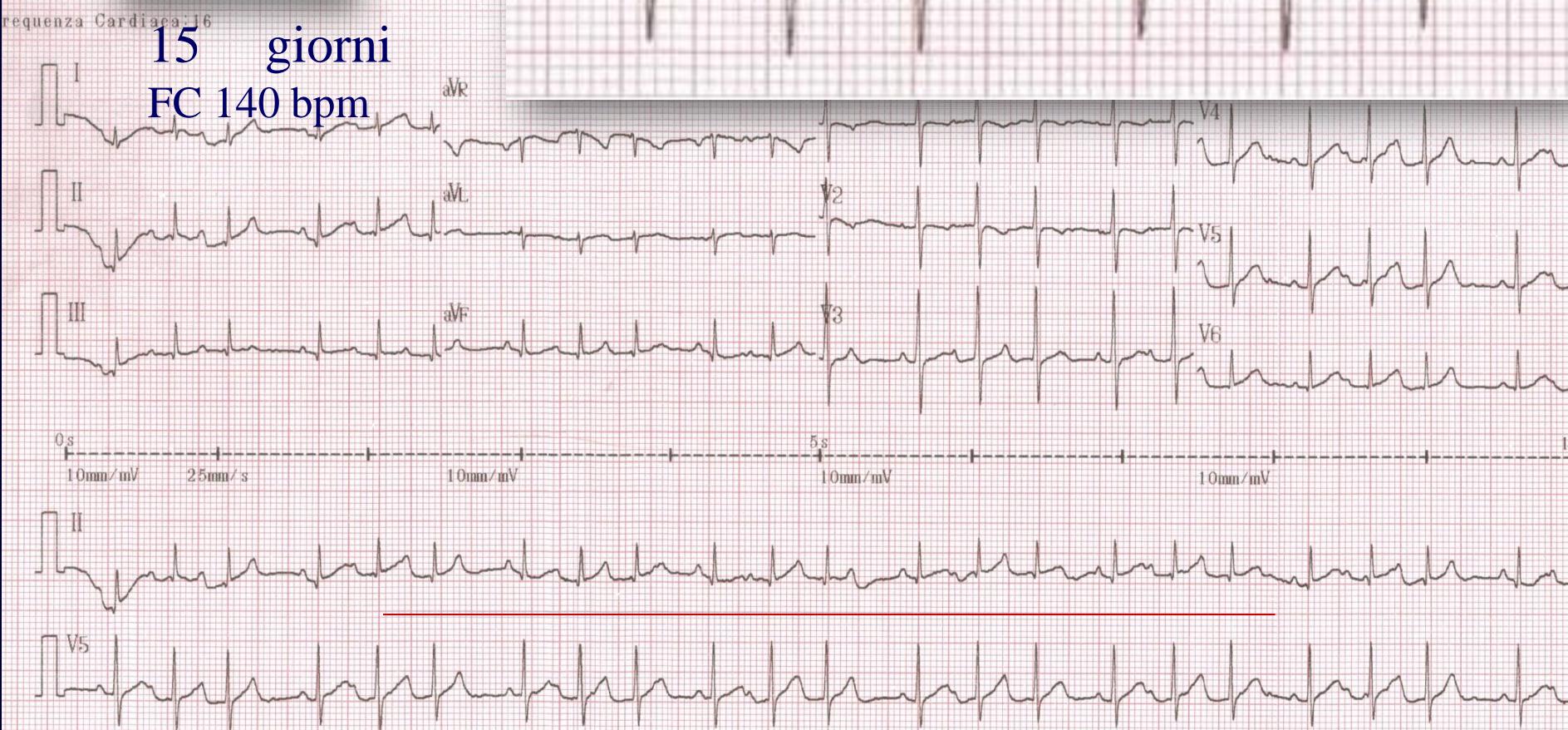
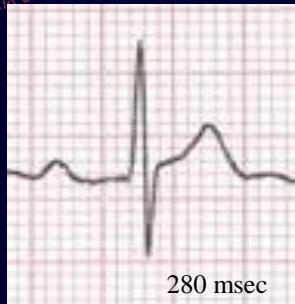
Variante Normale Ritmo Migrazione del Segnapassi o “Wandering Pacemaker”



Il ritmo passa progressivamente dal nodo seno atriale ad atriale basso a giunzionale



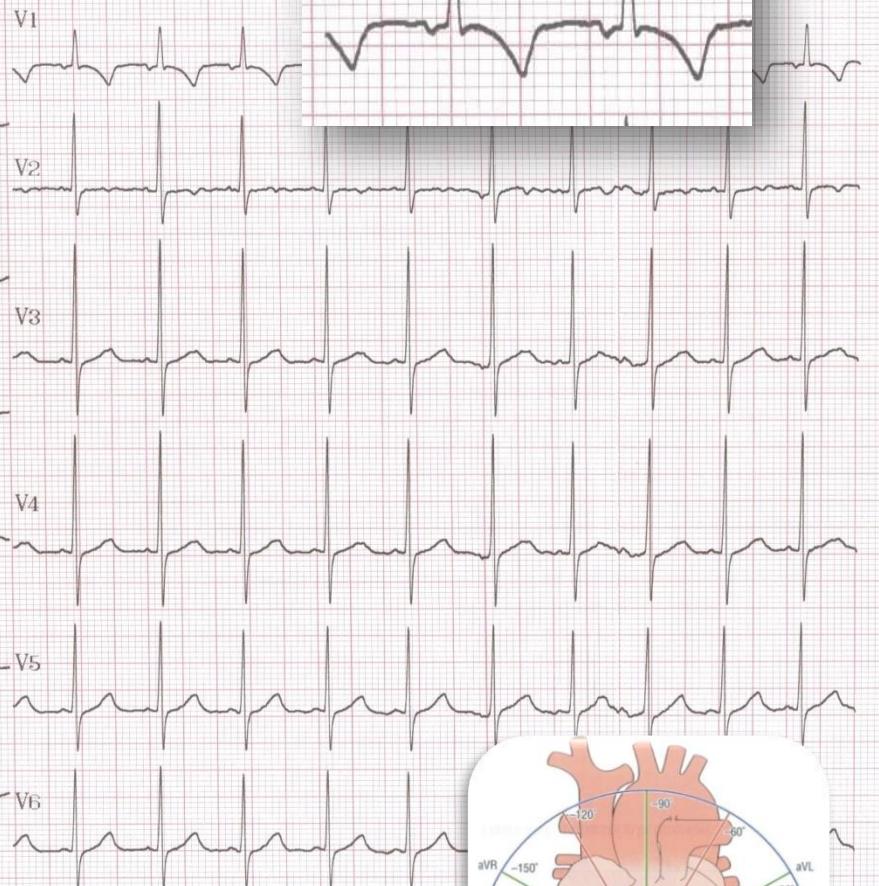
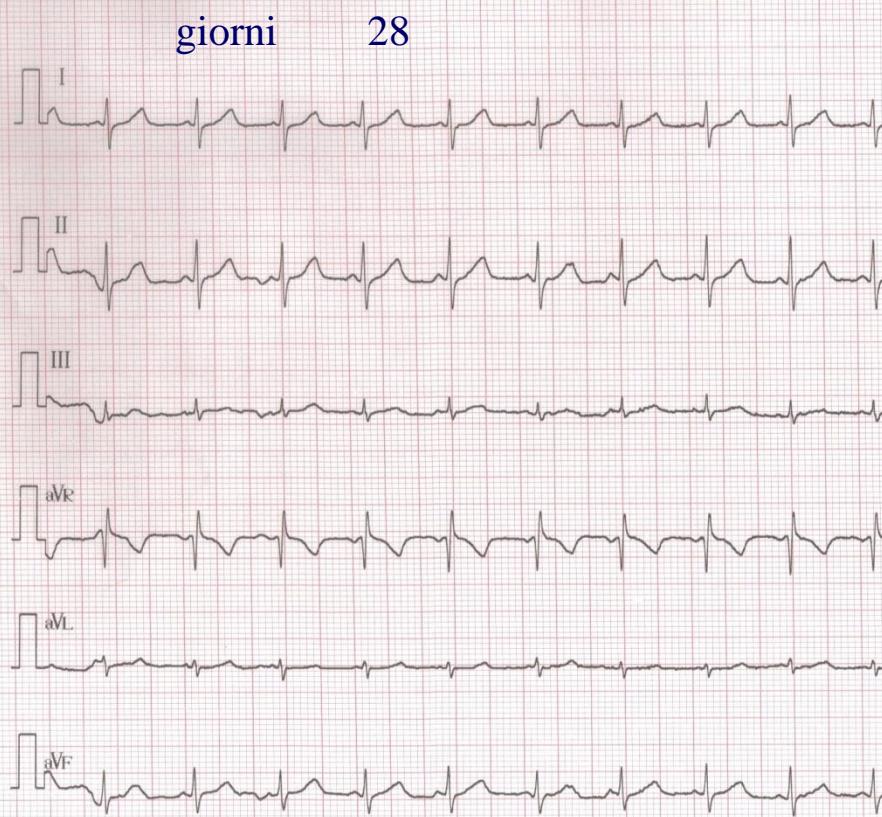
Variante Ritmo nei giovani atleti si può trovare un Blocco atrioventricolare di II grado tipo I Mobitz con periodismi di Luciani Wencheback



"Modello Neonatale" 1-30 giorni

Complesso QRS

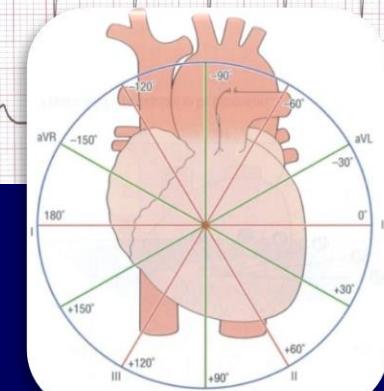
giorni 28



Complesso QRS

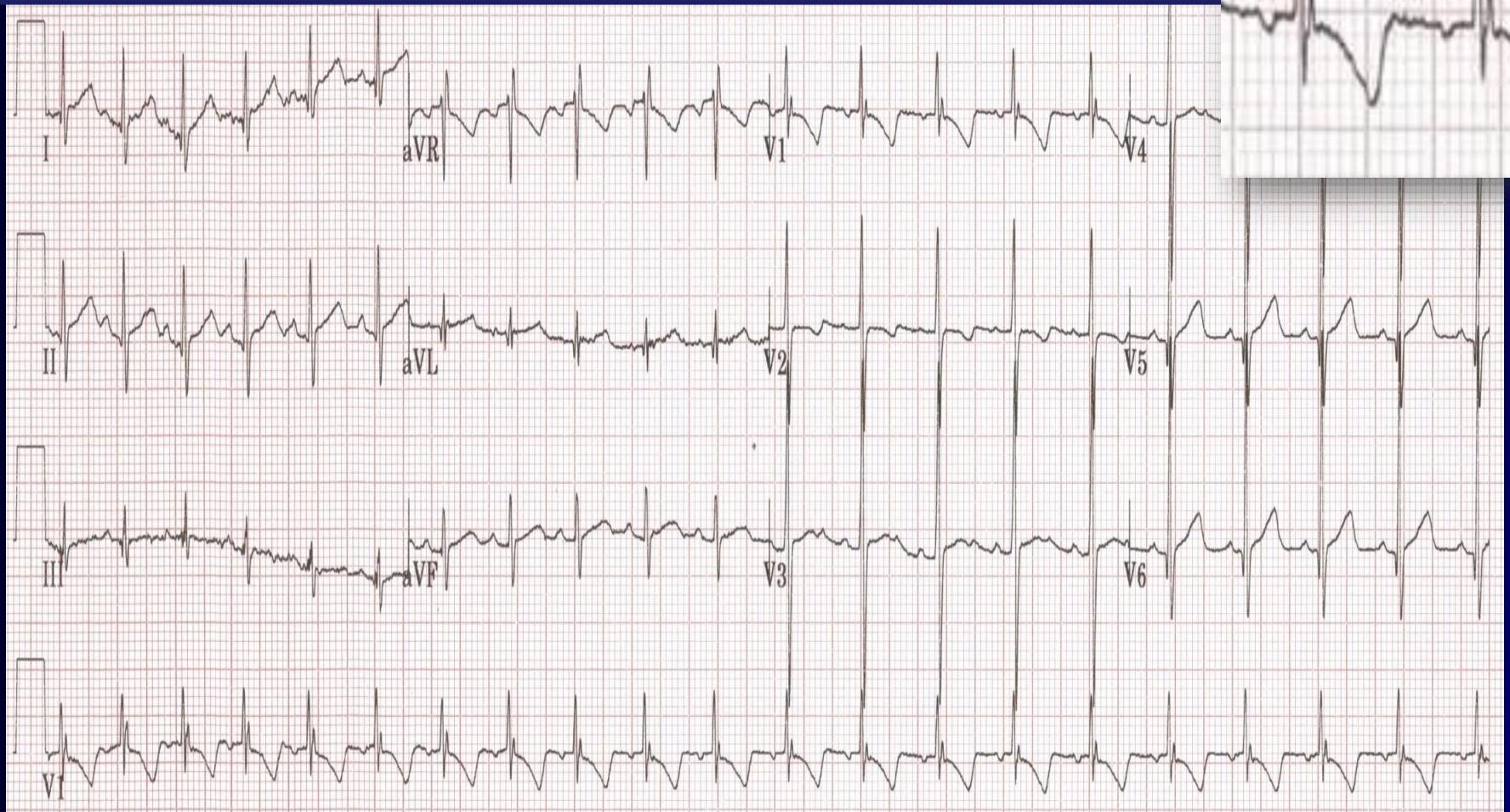
V1 **R/S>1,** R<25 mm S<20 mm
R R<13/10mm (I settimana/dopo)

V6: **R/S≤1** o R/S> 1 S < 10mm;

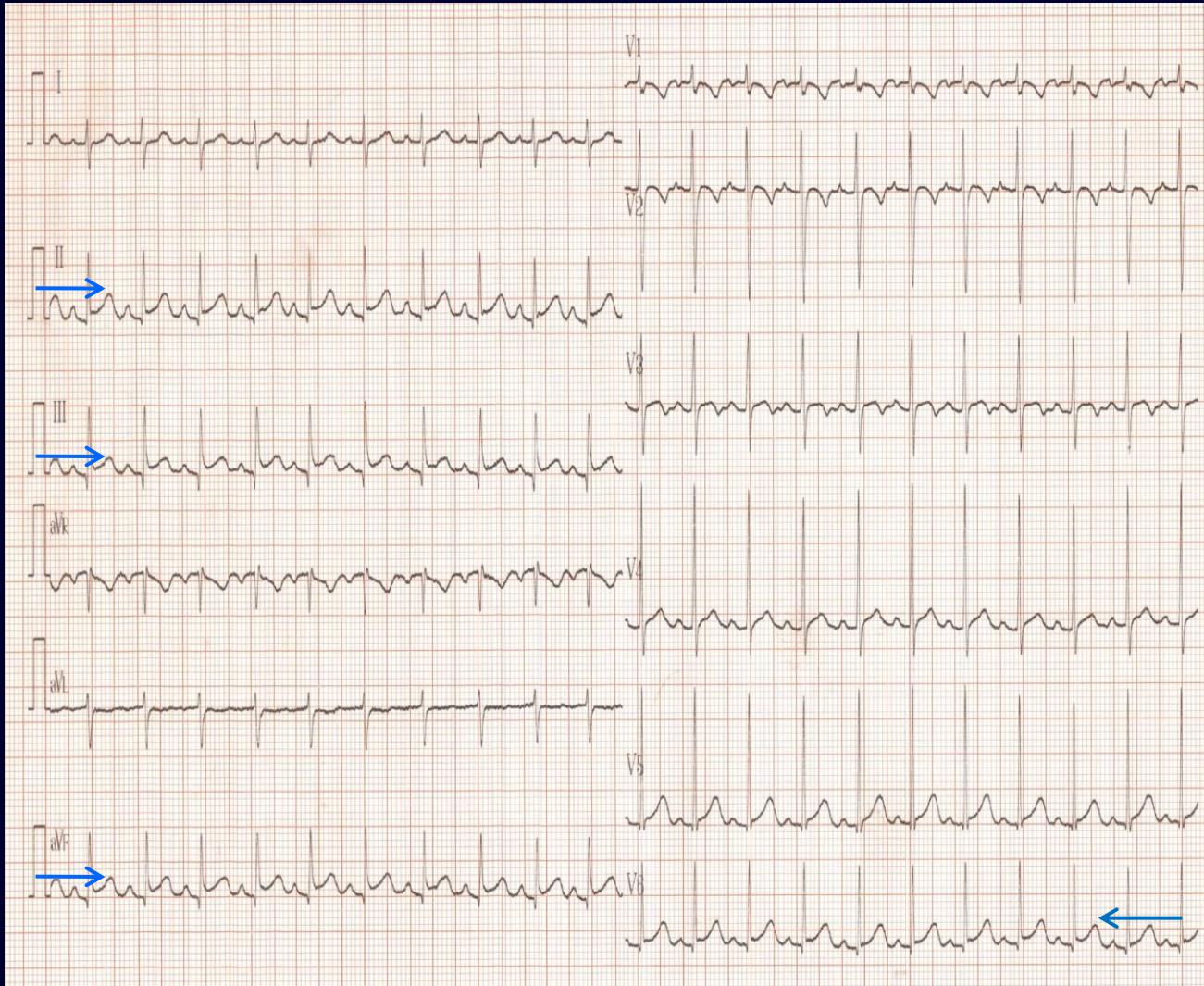


Variante Normale complesso QRS in V1 Rr'

V1 complesso RR' con $R > r'$ durata QRS normale



Tratto ST- T Variante normale Ripolarizzazione ventricolare precoce

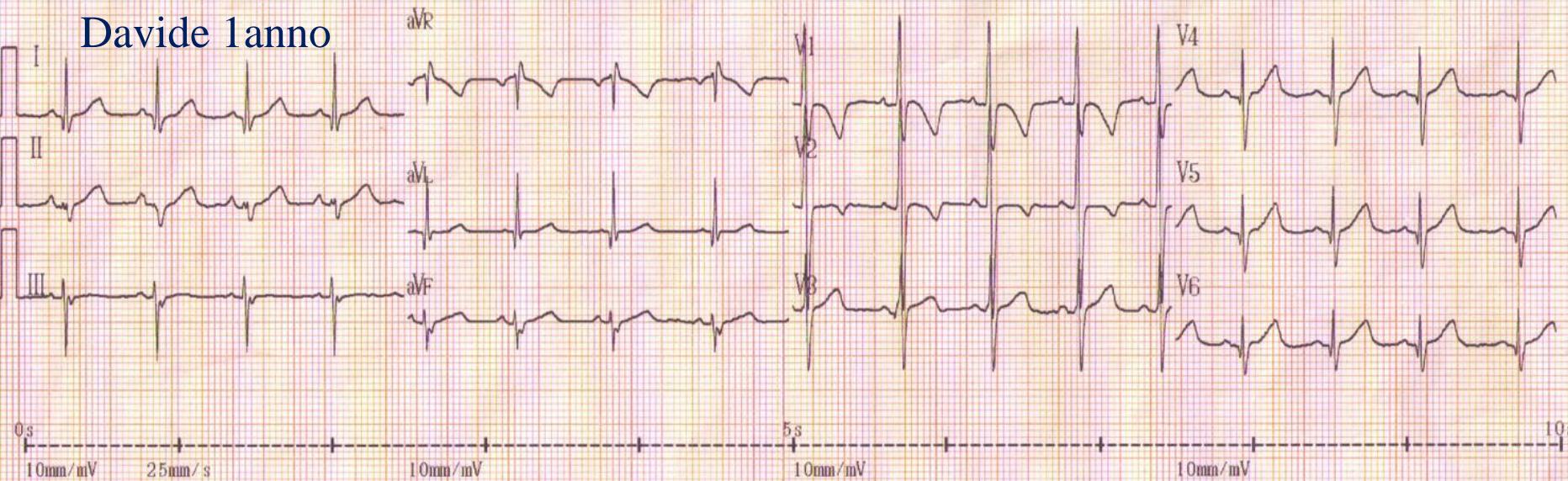


Nelle derivazioni periferiche e sinistre sopra/sottolivellamento dell'ST \leq 1mm può essere normale

Un sottolivellamento rapidamente ascendente che rientra a 0.08 sec dal punto J è normale

Asse elettrico deviato a sinistra, cuore normale

Davide 1 anno



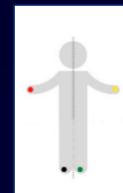
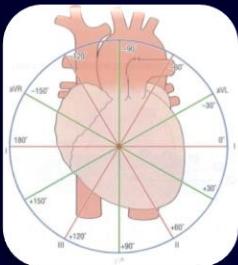
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

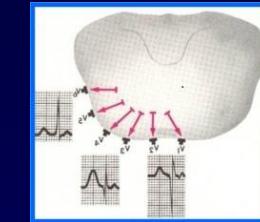
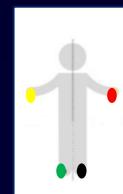
Asse del QRS

Deviazione assiale sinistra possiamo riscontrarla anche in soggetti con cuore normale.

Espressione di semplice ritardo della conduzione intraventricolare (emiblocco anteriore sinistro), deve essere sempre accertata: esame fisico, ecocardiogramma

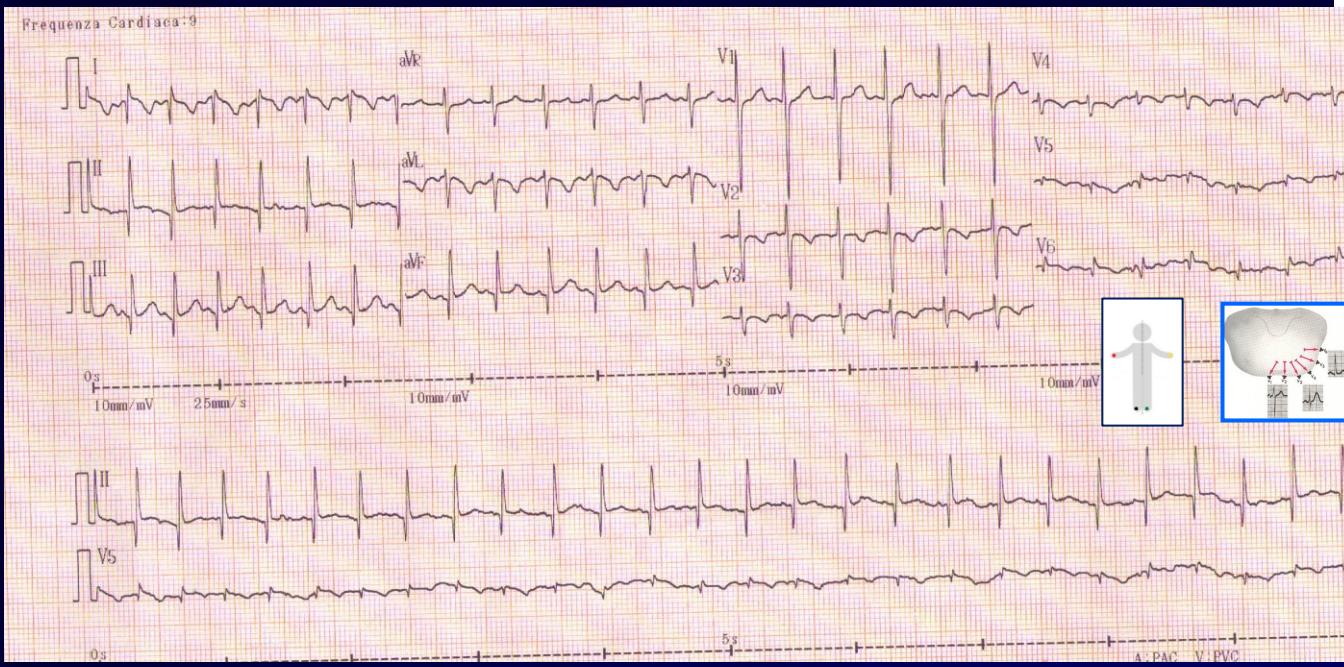
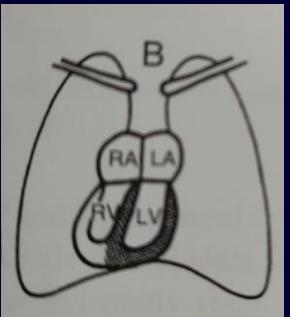


Asse elettrico posizione cuore Situs Inversus in destrocardia

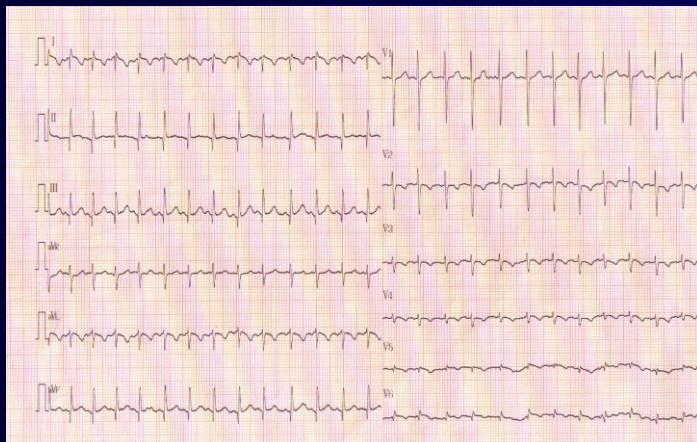
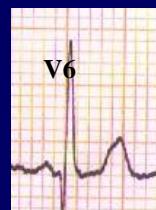


Complessi

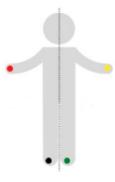
rSr' in I e V6



Elettrodi
invertiti

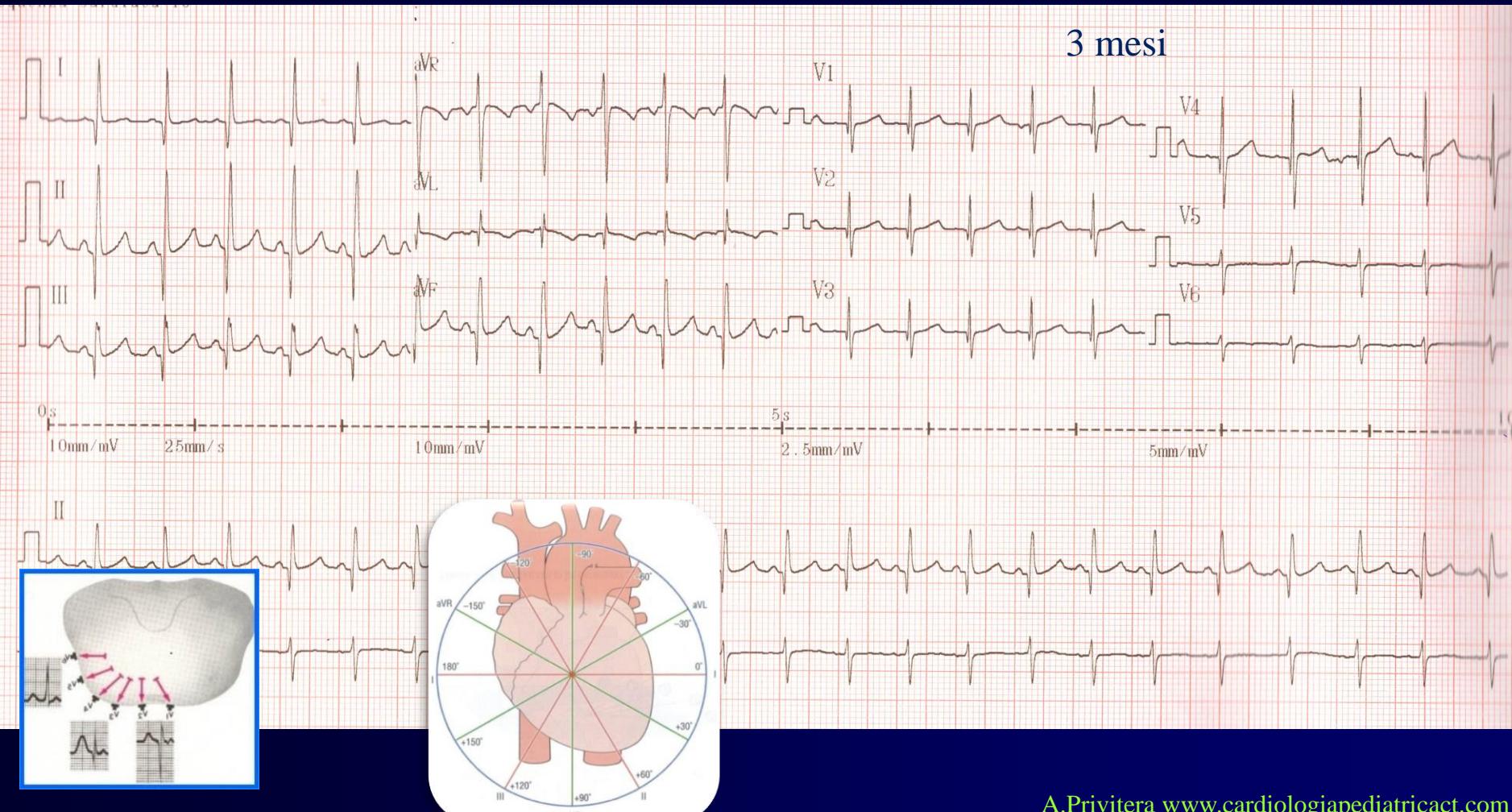


Situs Solitus cuore in destrocardia

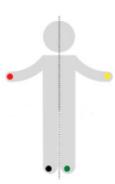


- Elettrodi periferiche normali
- Elettrodi precordiali emitorace destro

- V1-V2 legge il ventricolo sinistro
- V5-V6 legge il ventricolo destro



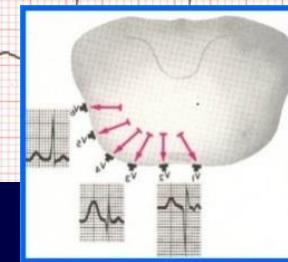
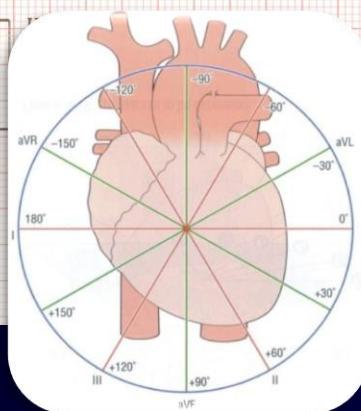
Situs Solitus cuore in destrocardia



- Elettrodi periferiche normali
- Elettrodi precordiali emitorace destro

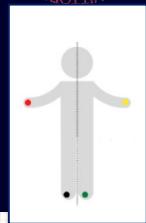
- V1-V2 legge il ventricolo sinistro
- V5-V6 legge il ventricolo destro

Frequenza Cardiaca: 7



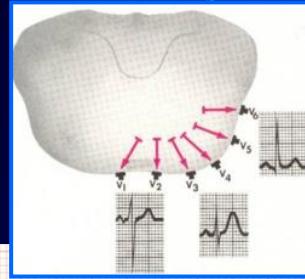


Situs Solitus cuore in destrocardia



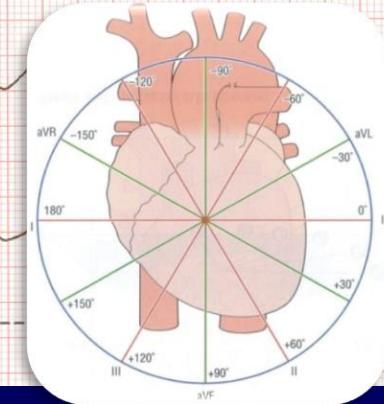
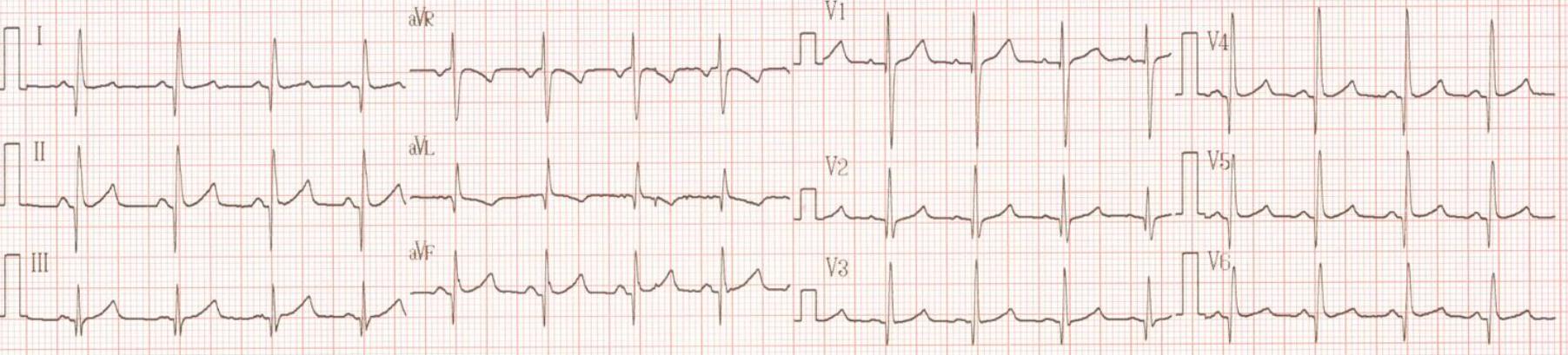
–Elettrodi periferiche e precordiali normali

V1-V6 legge il ventricolo sinistro



Frequenza Cardiaca: 111

2 anni



CARDIOLOGIA PEDIATRICA

Conclusioni

- La normalità è ritrovare un modello ECG adeguato all'età del paziente a cui è stato registrato
- Il riscontro di un modello ECG non congruo con l'età del paziente deve far considerare quell'ECG come patologico
 - per esempio un modello neonatale che persiste oltre il primo mese di vita
- Utile eseguire l'ECG tra la terza e quarta settimana di vita, in neonati considerati a rischio:
 - se presenti apnea, bradicardie, storia familiare di morte improvvisa o SIDS o familiarità per sindromi del QT lungo
- In caso di sospetto di aritmia o di cardiopatia

Elettrocardiogramma in età pediatrica



Agata Privitera

AOU Policlinico Catania

Cardiologia Pediatrica

Presidio San Marco

www.cardiologiapediatricact.com

Padova 30/01/2026



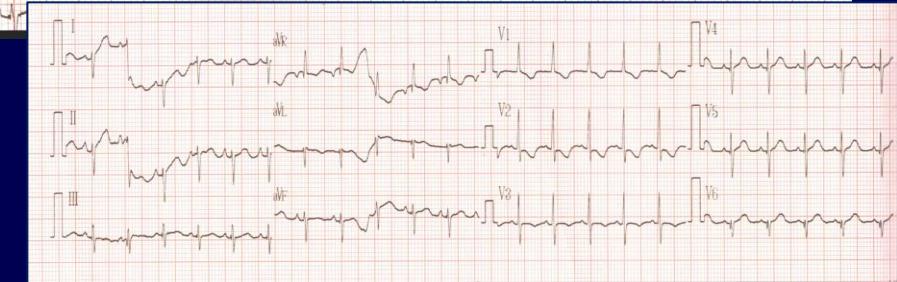
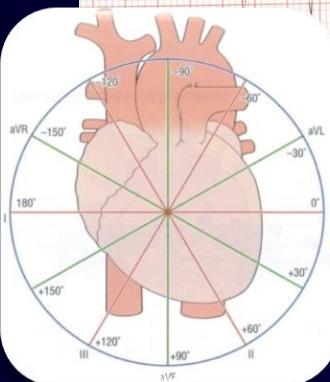
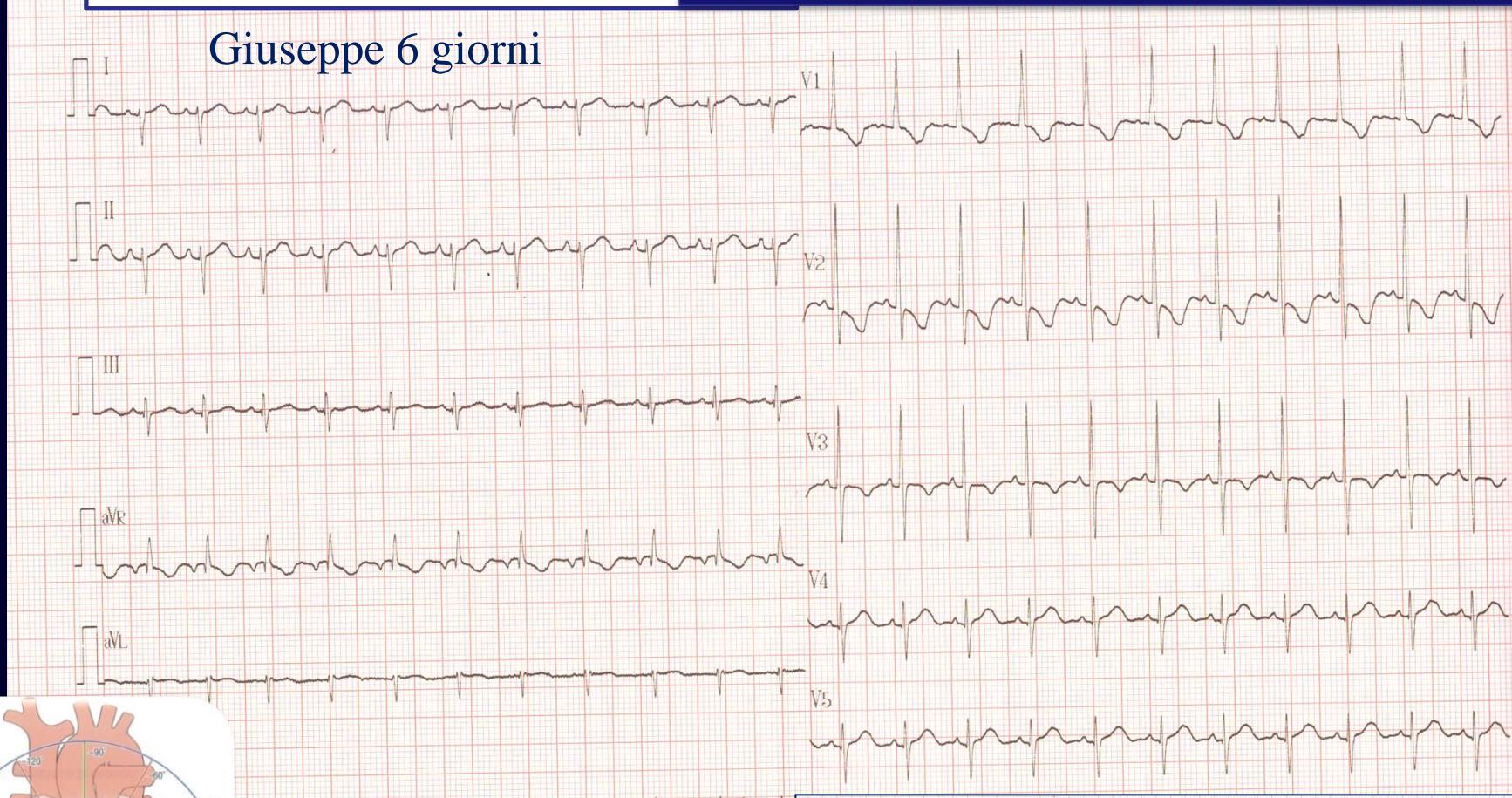
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

- V1 **R/S>1,** R<25 mm S<20 mm
V6: **R** R<13/10mm (I sett./dopo)
 R/S≤1 o R/S> 1 S profonda < 10 mm;

Giuseppe 6 giorni



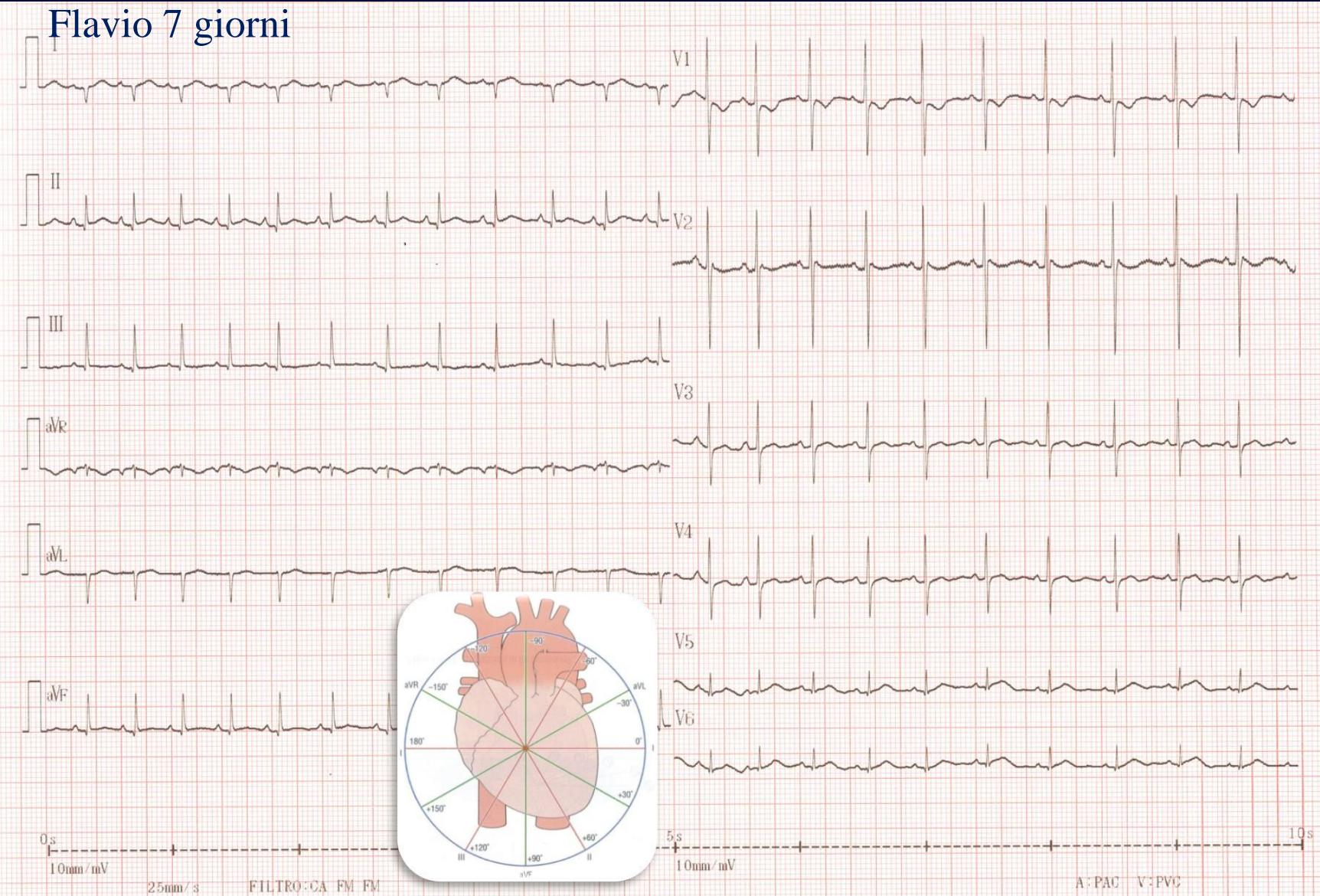
Asse QRS Valori normali per età

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- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

- | | | |
|-----|--------|------------------------------|
| V1 | R/S>1, | R<25 mm S<20 mm |
| | R | R<13/10mm (I sett./dopo) |
| V6: | R/S≤1 | o R/S> 1 S profonda < 10 mm; |

Flavio 7 giorni



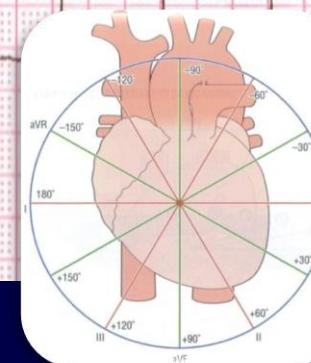
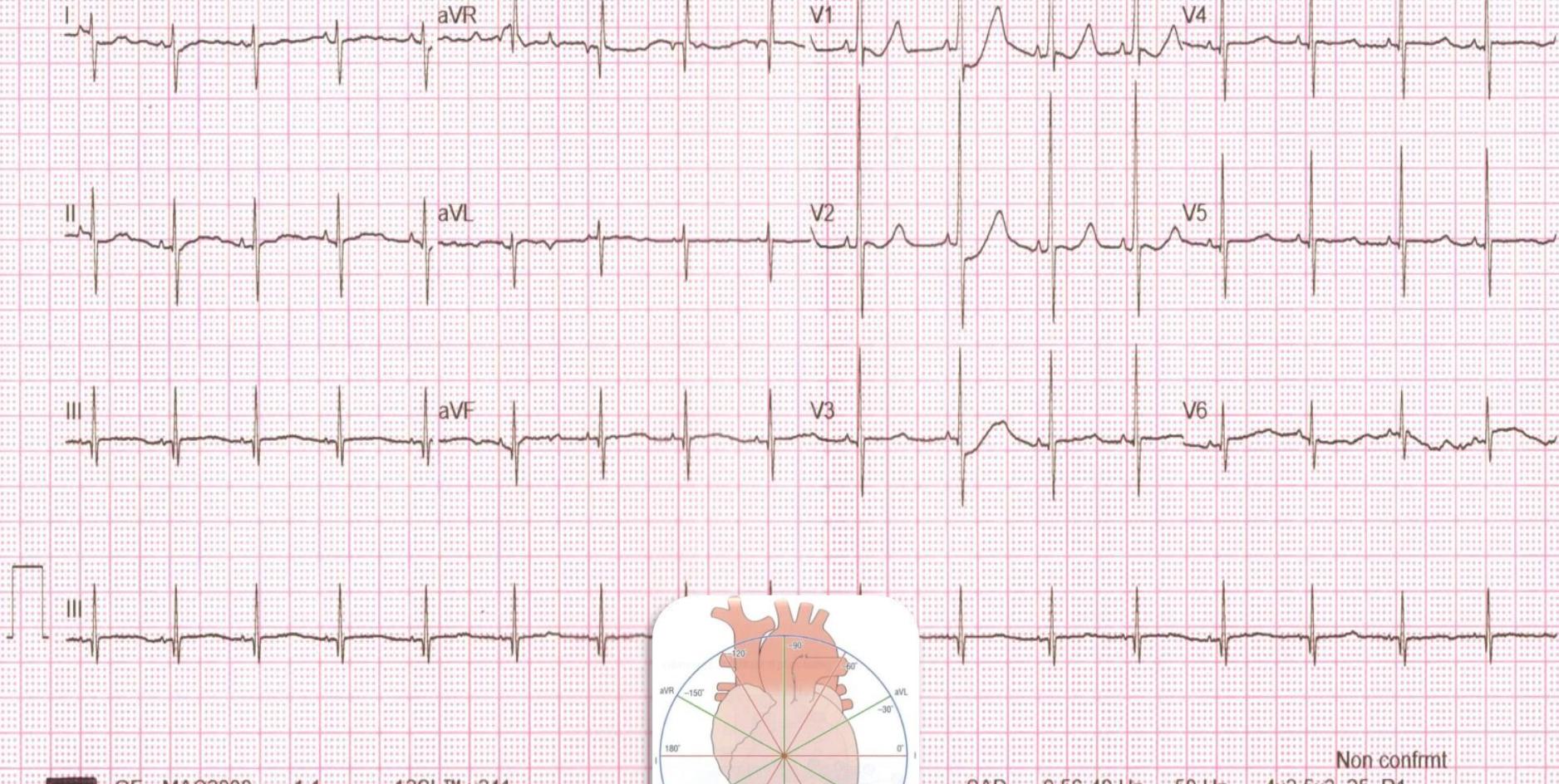
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1	R/S>1,	R<25 mm S<20 mm
	R	R<13/10mm (I sett./dopo)
V6:	R/S≤1	o R/S> 1 S profonda < 10 mm;

Diego 1 giorno



Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1

R/S>1,

R<25 mm S<20 mm

R

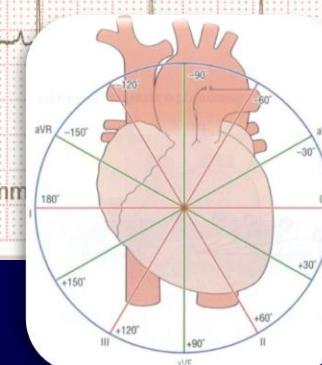
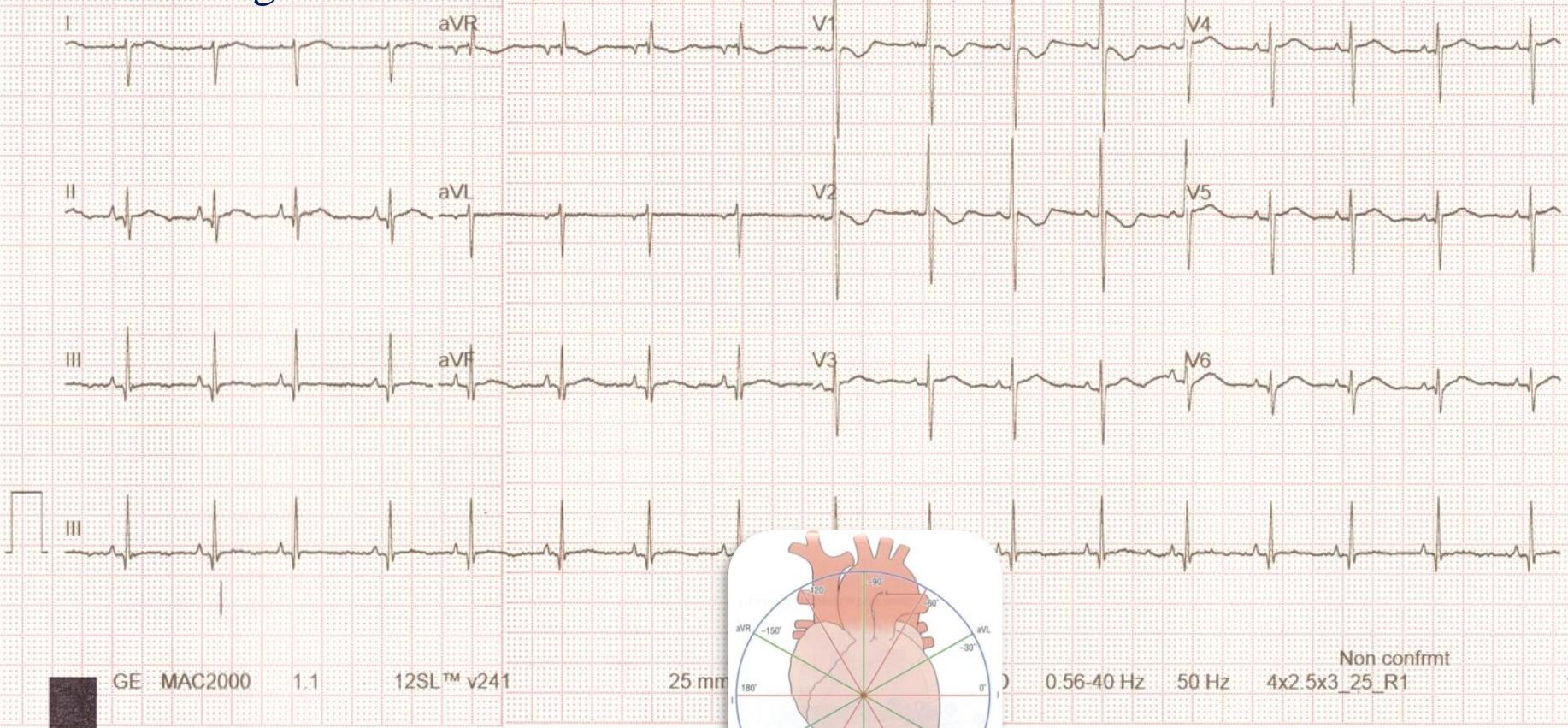
R<13/10mm (I sett./dopo)

V6:

R/S≤1

o R/S > 1 S profonda < 10 mm;

Pietro 4 giorni



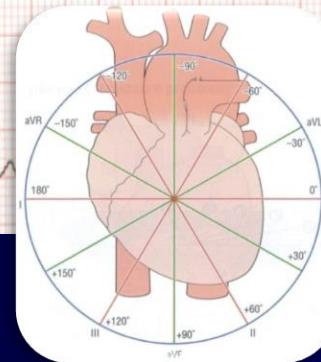
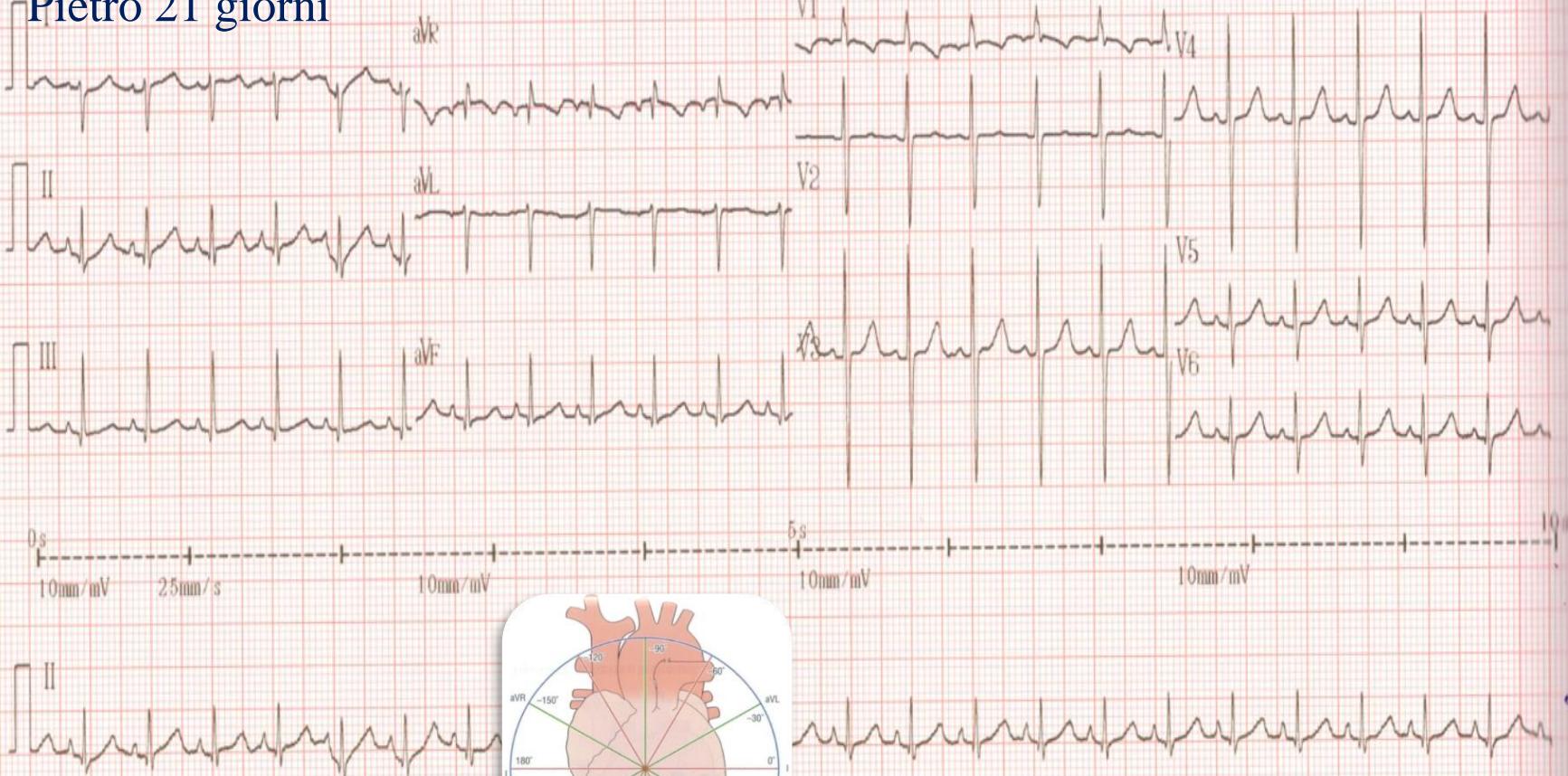
Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1 **R/S>1,** R<25 mm S<20 mm
 R R<13/10mm (I sett./dopo)
 V6: **R/S≤1** o R/S> 1 S profonda < 10 mm;

Pietro 21 giorni



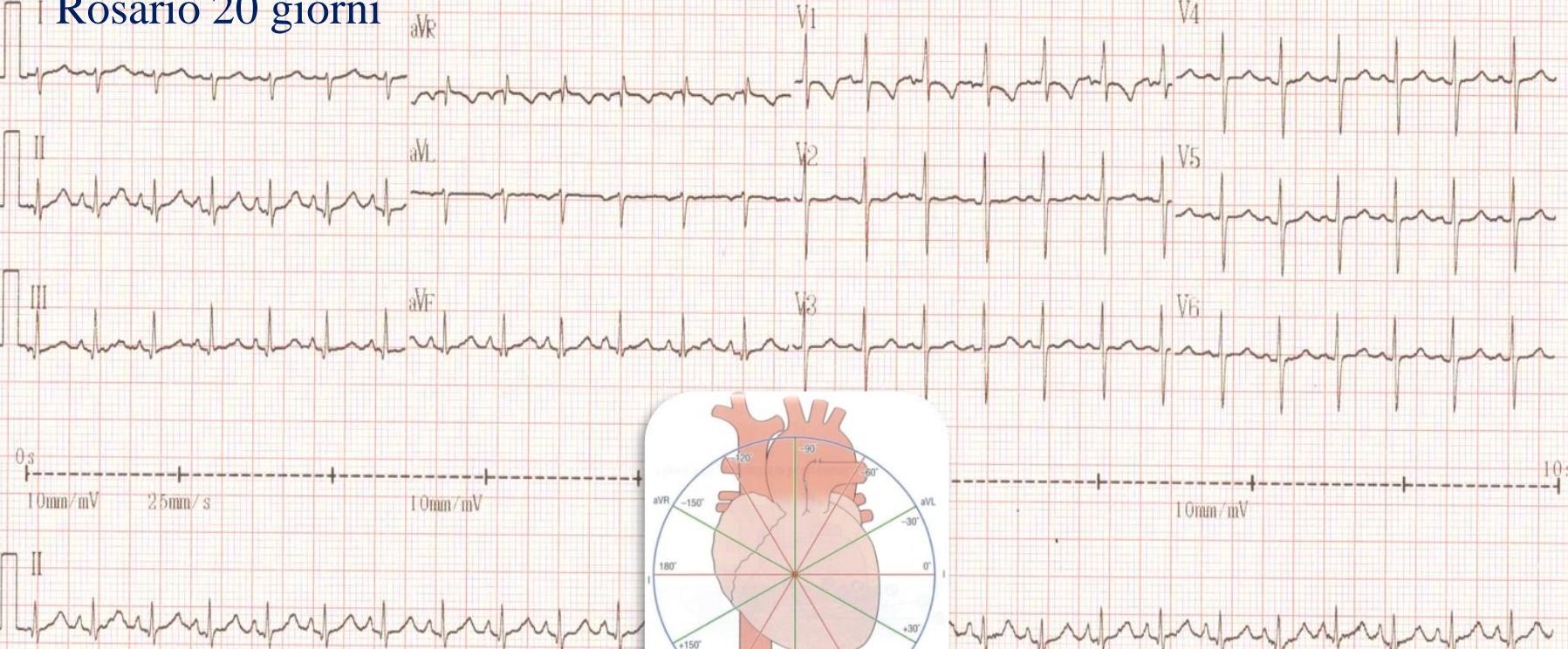
Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1	R/S>1,	R<25 mm S<20 mm
	R	R<13/10mm (I sett./dopo)
V6:	R/S≤1	o R/S> 1 S profonda < 10 mm;

Rosario 20 giorni



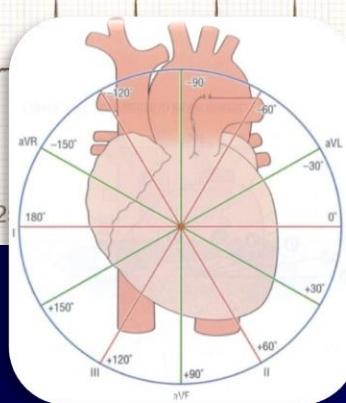
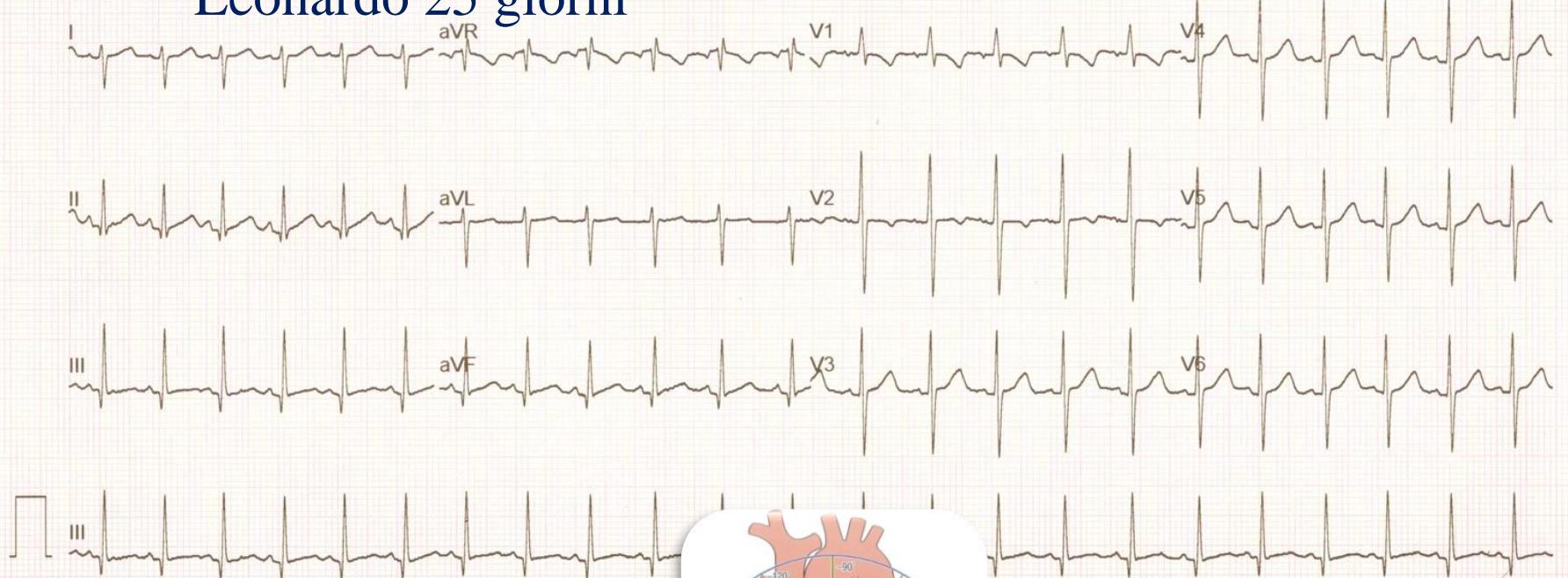
Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

- | | | |
|-----|------------------|------------------------------|
| V1 | R/S>1, | R<25 mm S<20 mm |
| | R | R<13/10mm (I sett./dopo) |
| V6: | R/S≤1 | o R/S> 1 S profonda < 10 mm; |

Leonardo 25 giorni



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Non confirmt
4x2.5x3_25_R1

1/1

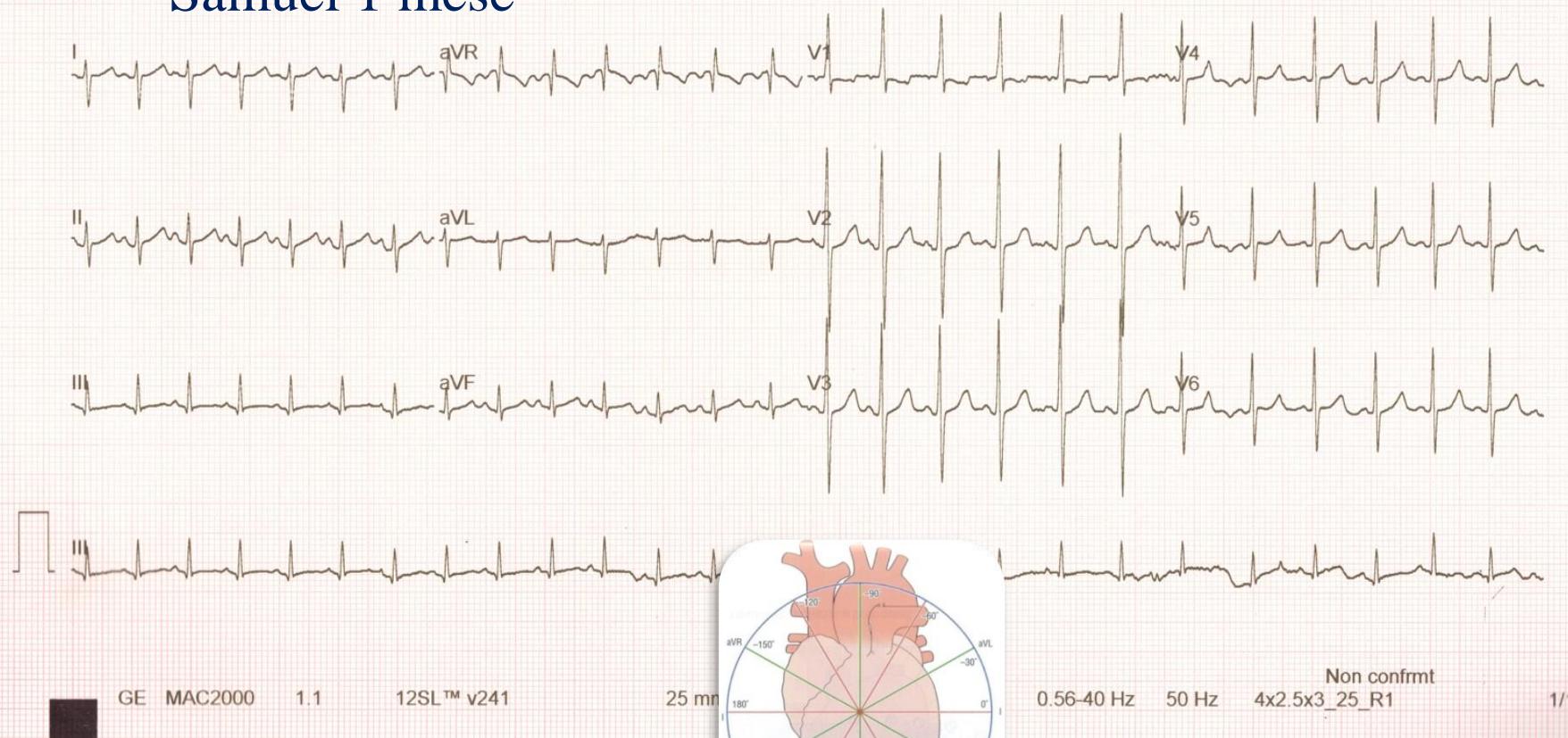
Asse QRS Valori normali per età

- I[^] sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

- | | | |
|-----|------------------|------------------------------|
| V1 | R/S>1, | R<25 mm S<20 mm |
| | R | R<13/10mm (I sett./dopo) |
| V6: | R/S≤1 | o R/S> 1 S profonda < 10 mm; |

Samuel 1 mese



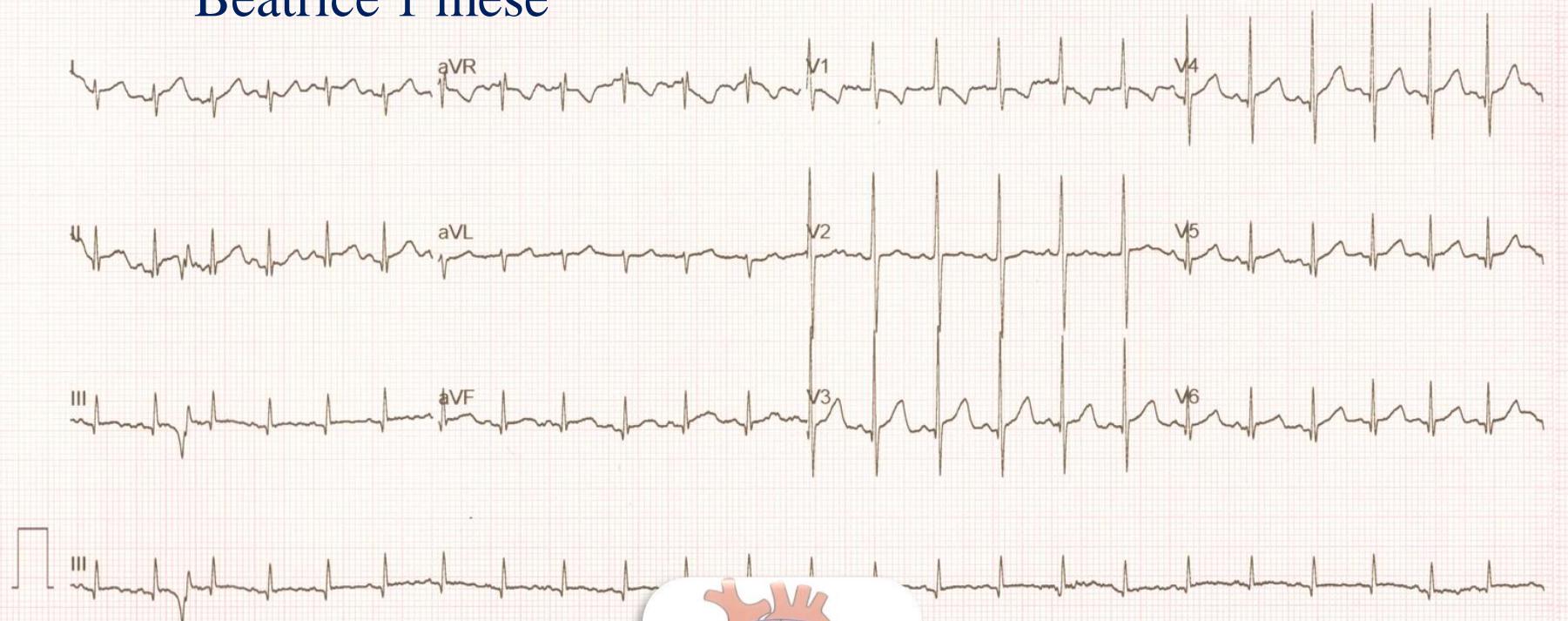
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

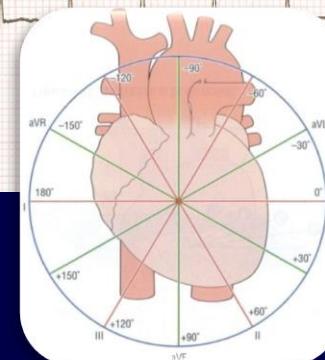
Complesso QRS

V1	R/S>1,	R<25 mm S<20 mm
	R	R<13/10mm (I sett./dopo)
V6:	R/S≤1	o R/S> 1 S profonda < 10 mm;

Beatrice 1 mese



GE MAC2000 1.1 12SL™ v241



SAD 0.56-40 Hz 50 Hz 4x2.5x3_25_R1 Non conformit 1/1

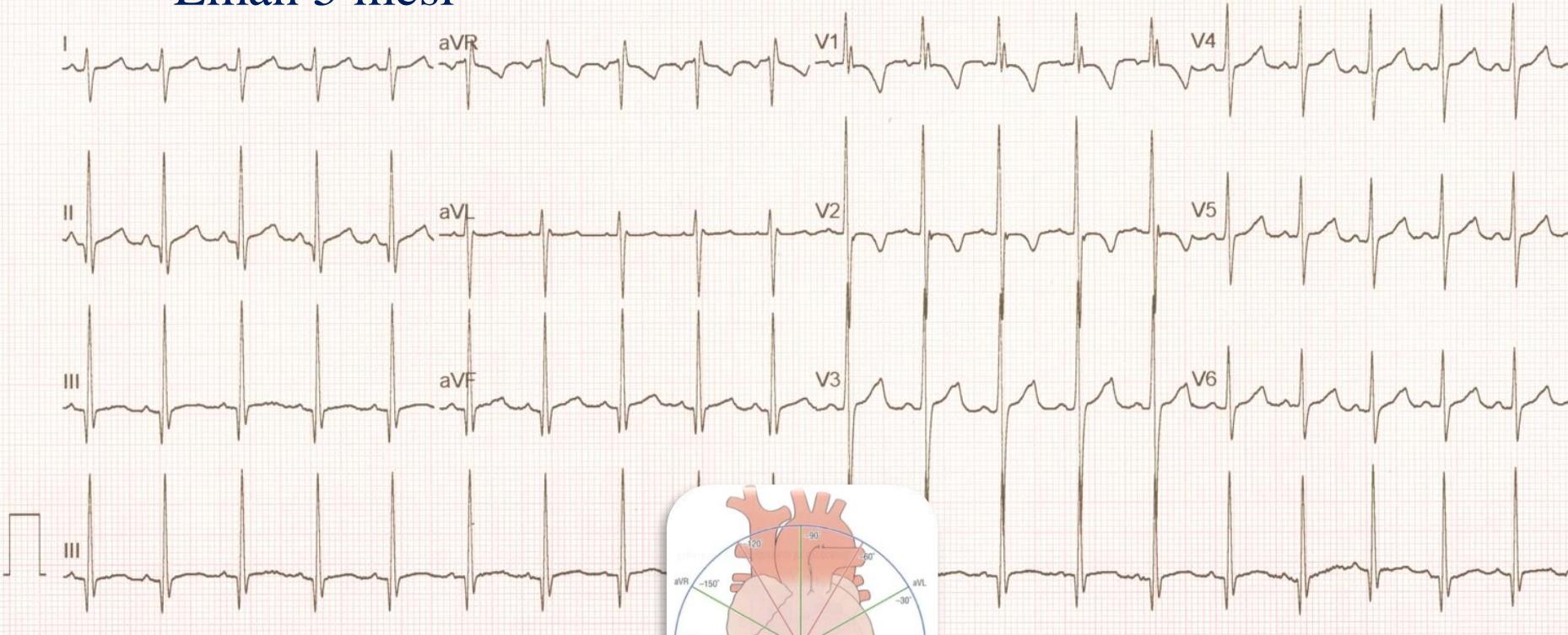
Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1:	R/S\geq1	R<20 mm
	R	R<10 mm (mai dopo il 1 anno)
V6:	R/S>1	R<25 mm S<10 mm
II-III-aVF-V6		q max 10 mm

Eman 5 mesi



GE MAC2000 1.1 12SL™ v241

SAD 0.56-40 Hz 50 Hz 4x2.5x3_25_R1 Non conform

Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

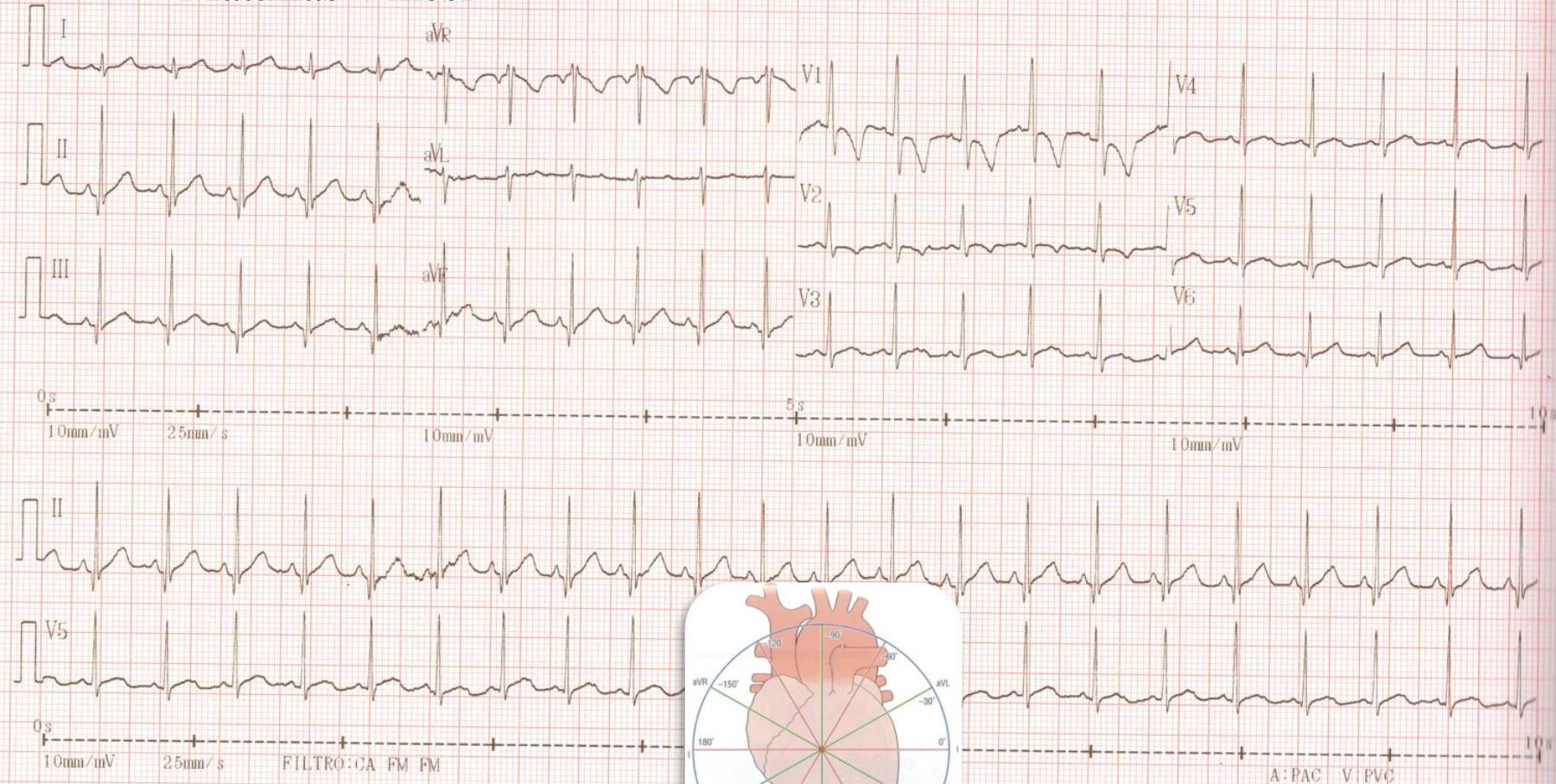
Complesso QRS

- | | | |
|----------------------|-----------------|--|
| V1: | R/S≥1 | R<20 mm |
| | R | R<10 mm (mai dopo il 1 anno) |
| V6: | R/S>1 | R<25 mm S<10 mm |
| II-III-aVF-V6 | | q max 10 mm |

Frequenza Cardiaca: ?

QTc: 407

Matthias 4 mesi



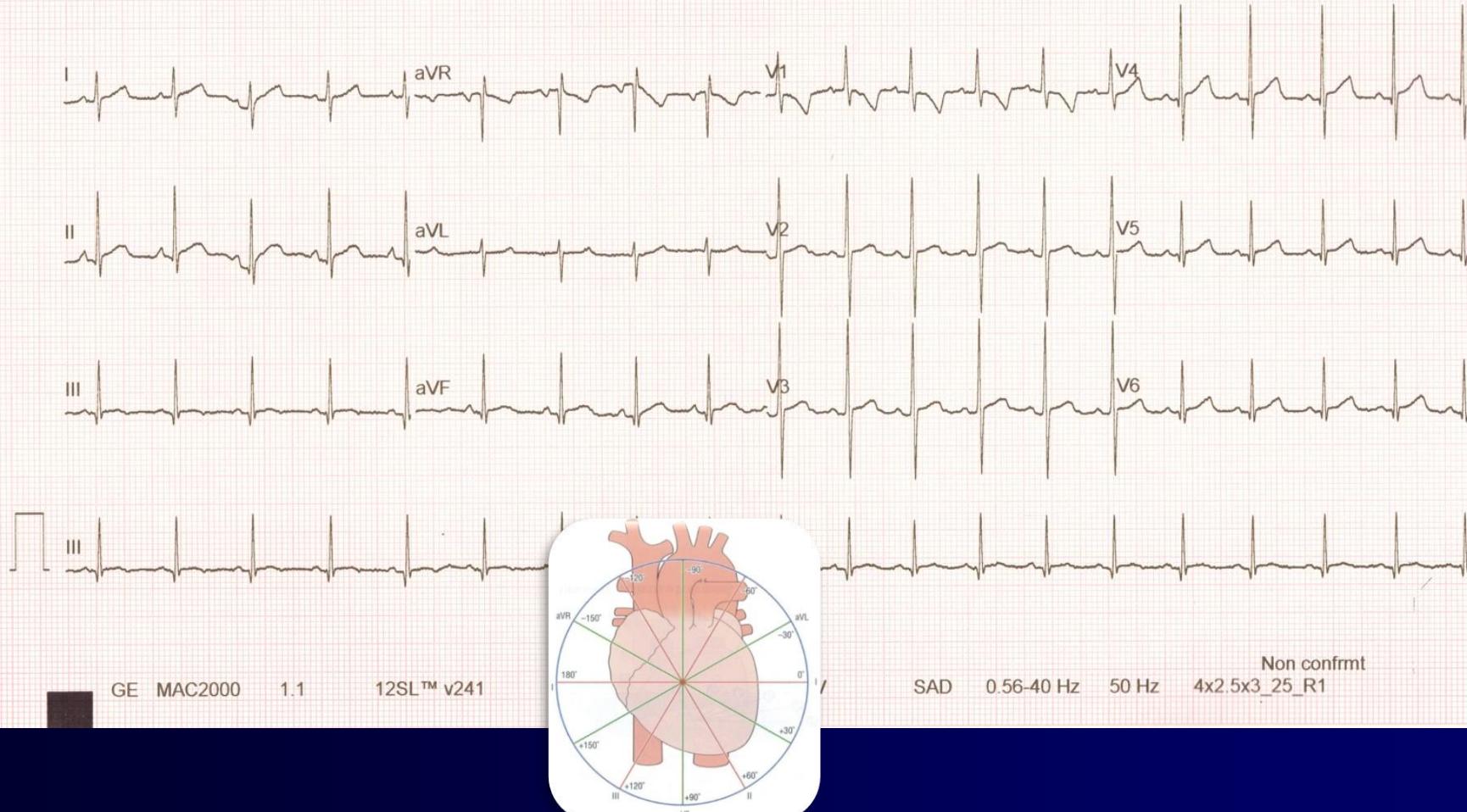
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- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1:	R/S\geq1	R<20 mm
	R	R<10 mm (mai dopo il 1 anno)
V6:	R/S>1	R<25 mm S<10 mm
II-III-aVF-V6		q max 10 mm

Clara 5 mesi



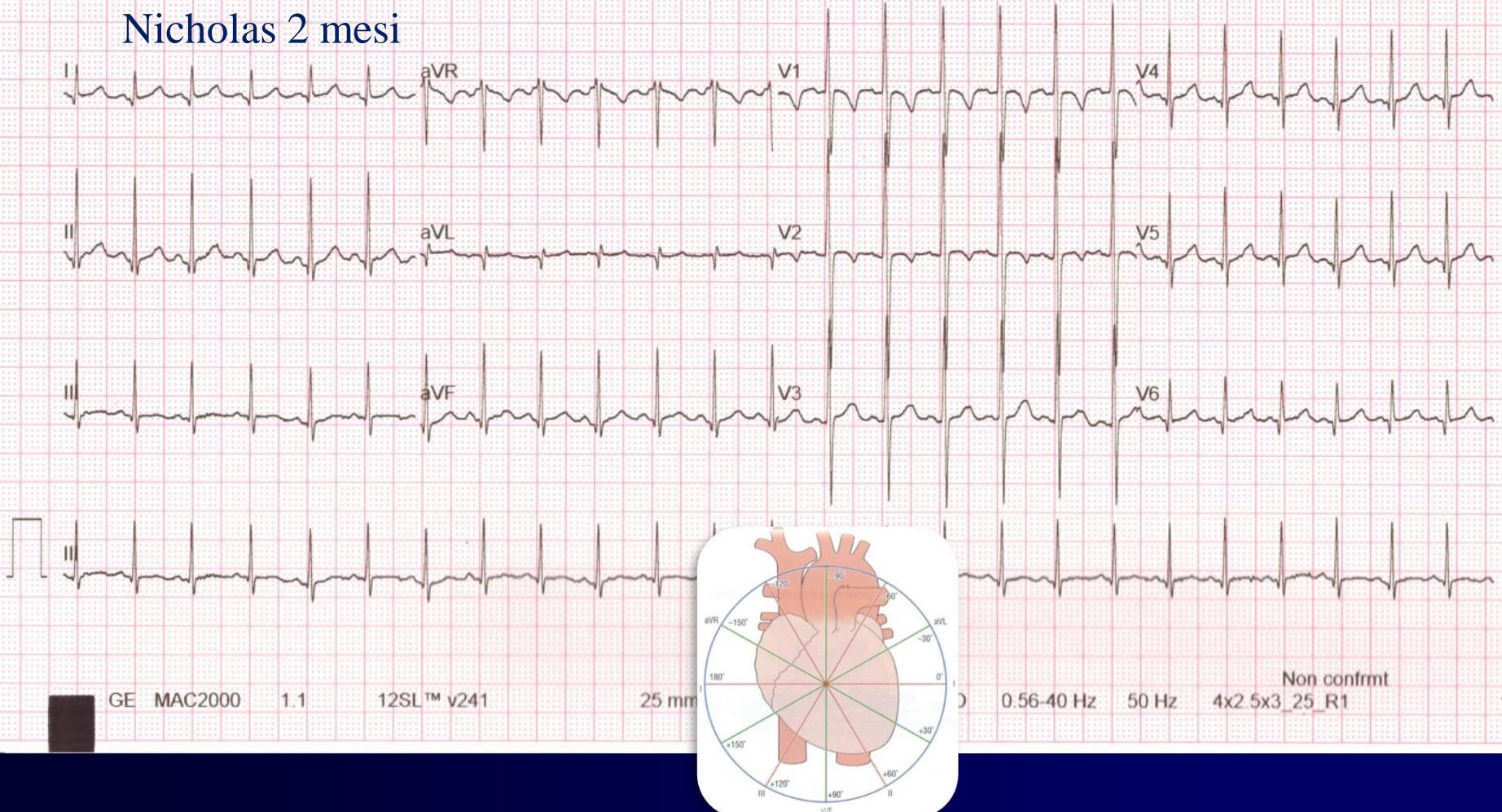
Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

V1:	R/S\geq1	R<20 mm
	R	R<10 mm (mai dopo il 1 anno)
V6:	R/S>1	R<25 mm S<10 mm
II-III-aVF-V6		q max 10 mm

Nicholas 2 mesi



Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

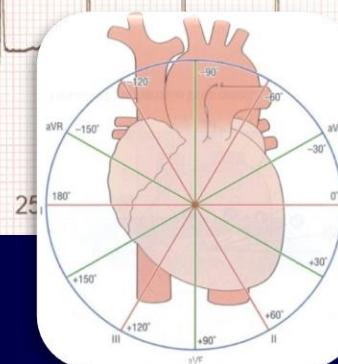
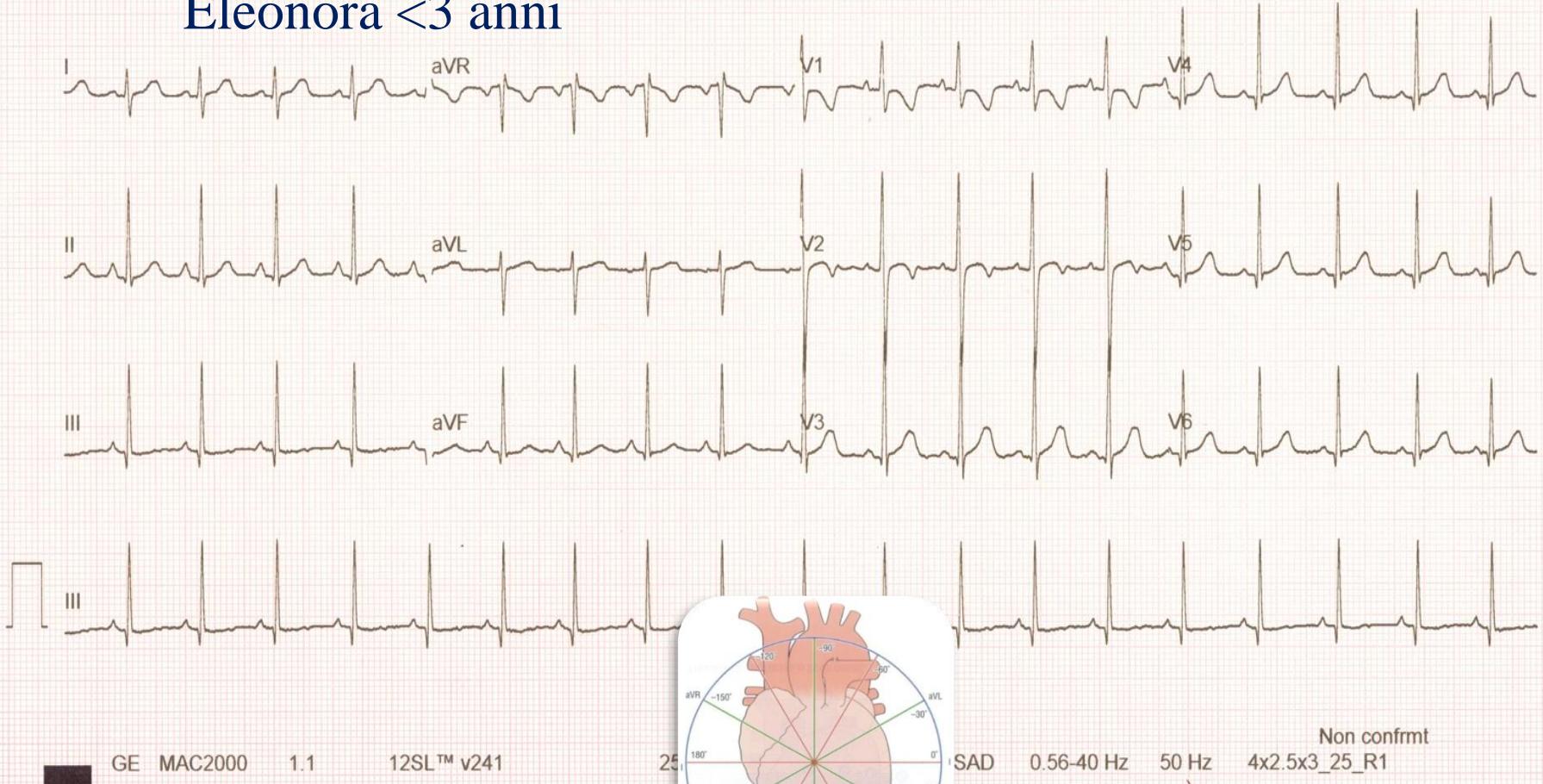
Complesso QRS

V1: R/S <1 S <25 mm

R mai

V6: R/S >1 R <25 mm S <5mm

Eleonora <3 anni





Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

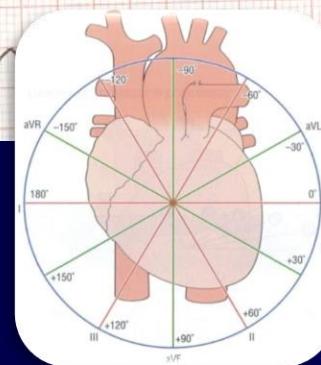
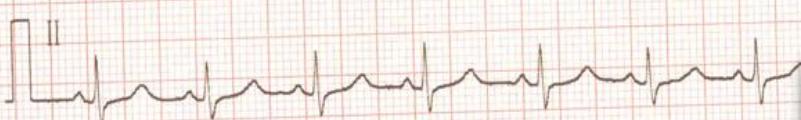
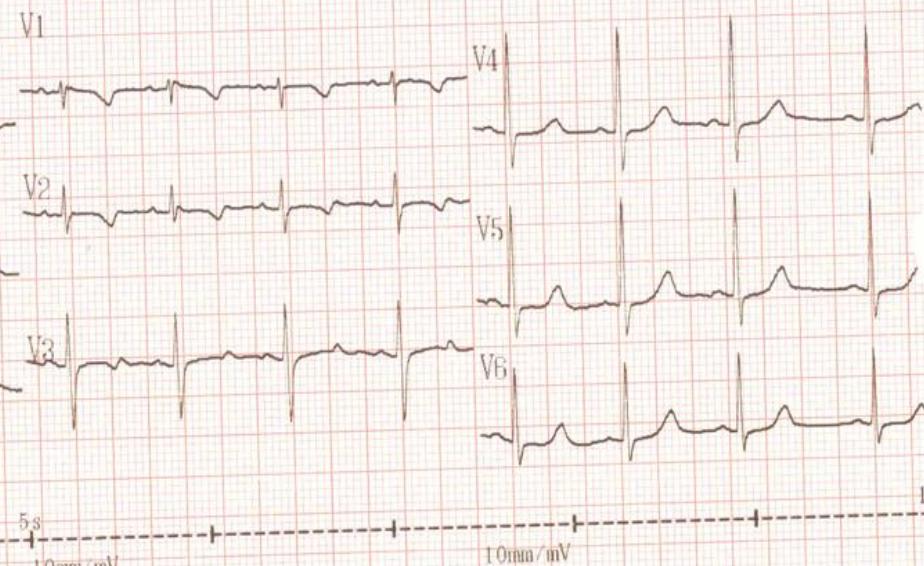
V1: R/S <1 S <25 mm

R mai

V6: R/S >1 R <25 mm S <5mm

Frequenza Cardiaca: 111

Tommaso 3 anni



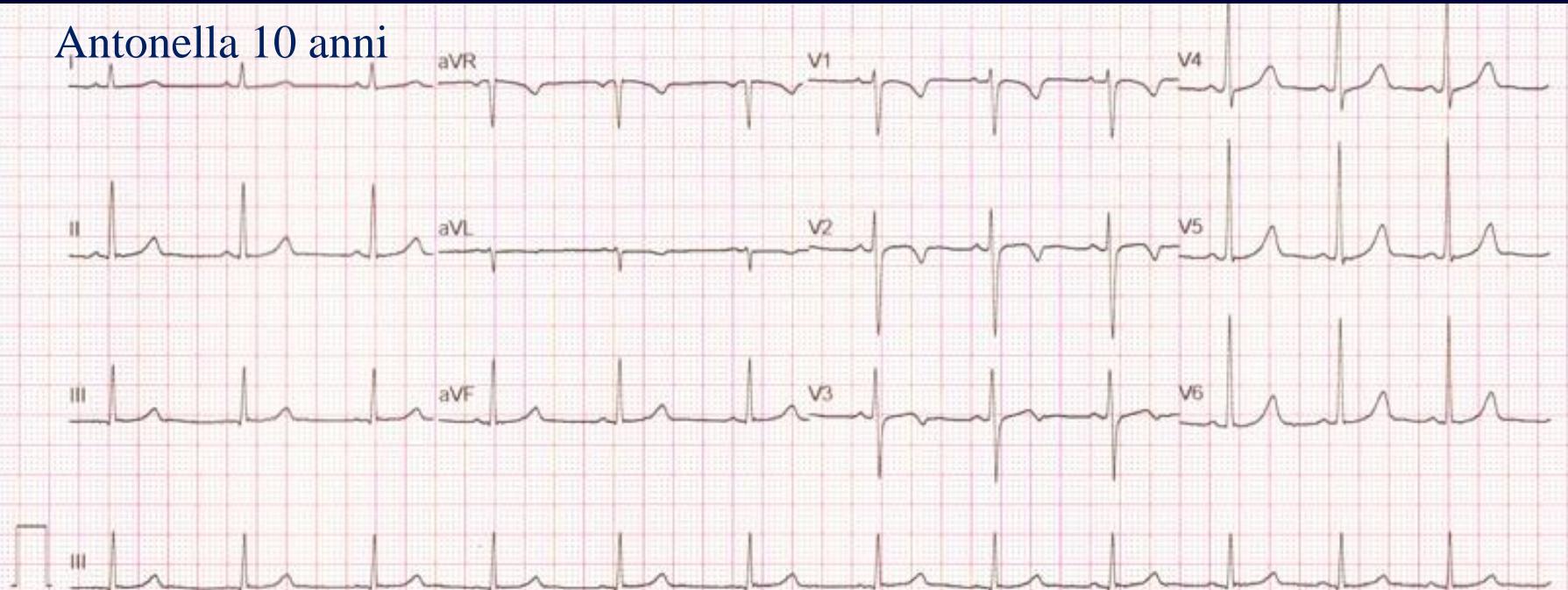
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

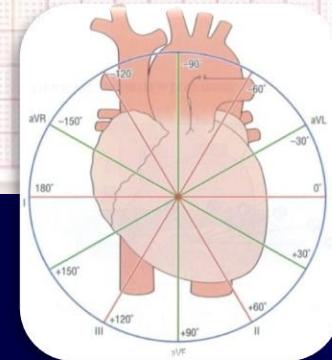
Complesso QRS

- | | | |
|------------|------------------|------------------------------|
| V1: | R/S <1 | S <25 mm |
| | R mai | |
| V6: | R/S >1 | R <25 mm S <5mm |

Antonella 10 anni



GE MAC2000 1.1 12SL™ v241



Non conformi
SAD 0.56-40 Hz 50 Hz 4x2.5x3_25_R1 1/1

Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

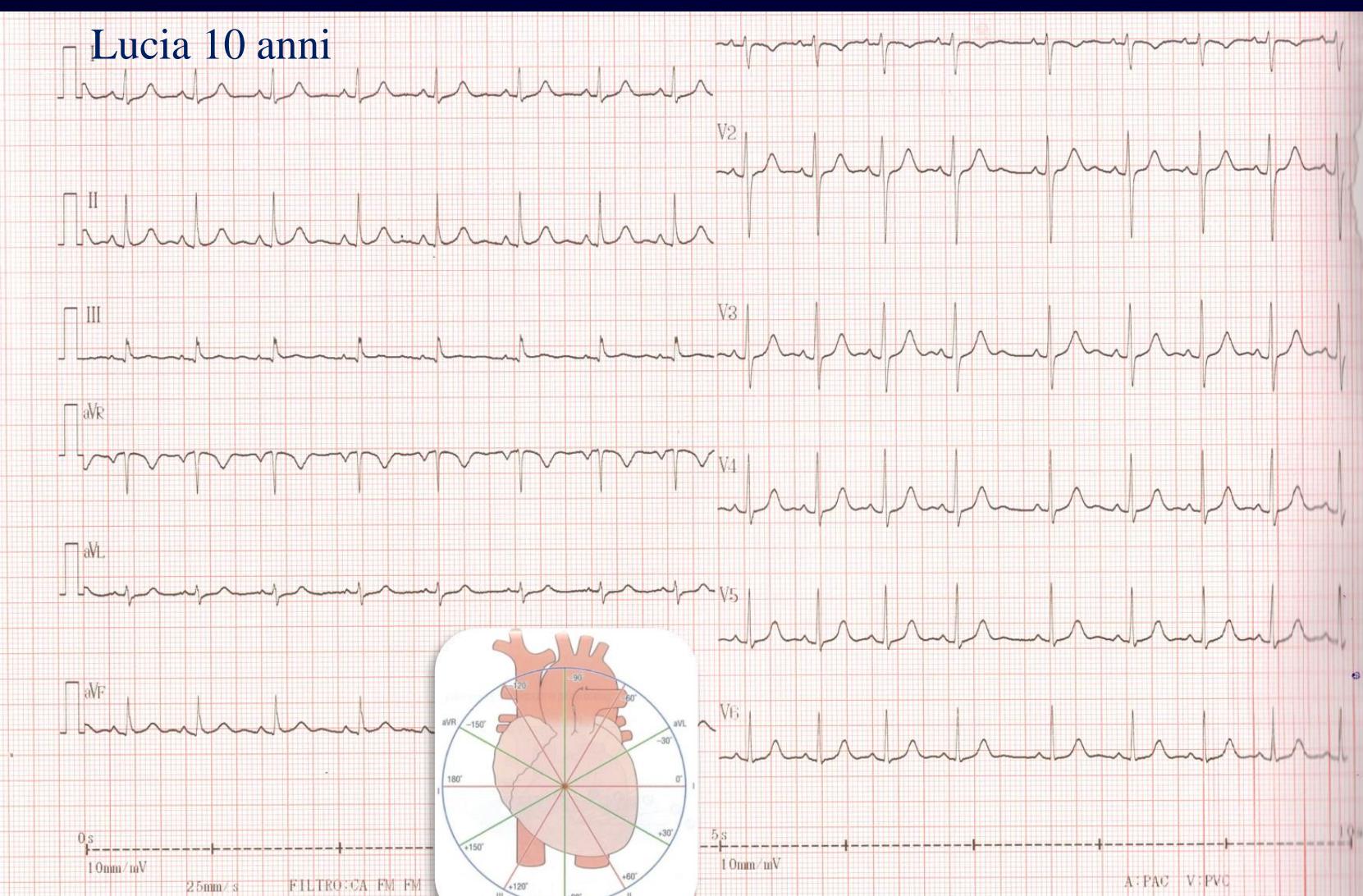
V1: R/S <1 S<25 mm

R mai

V6: R/S>1 R<25 mm S<5mm



Lucia 10 anni



Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

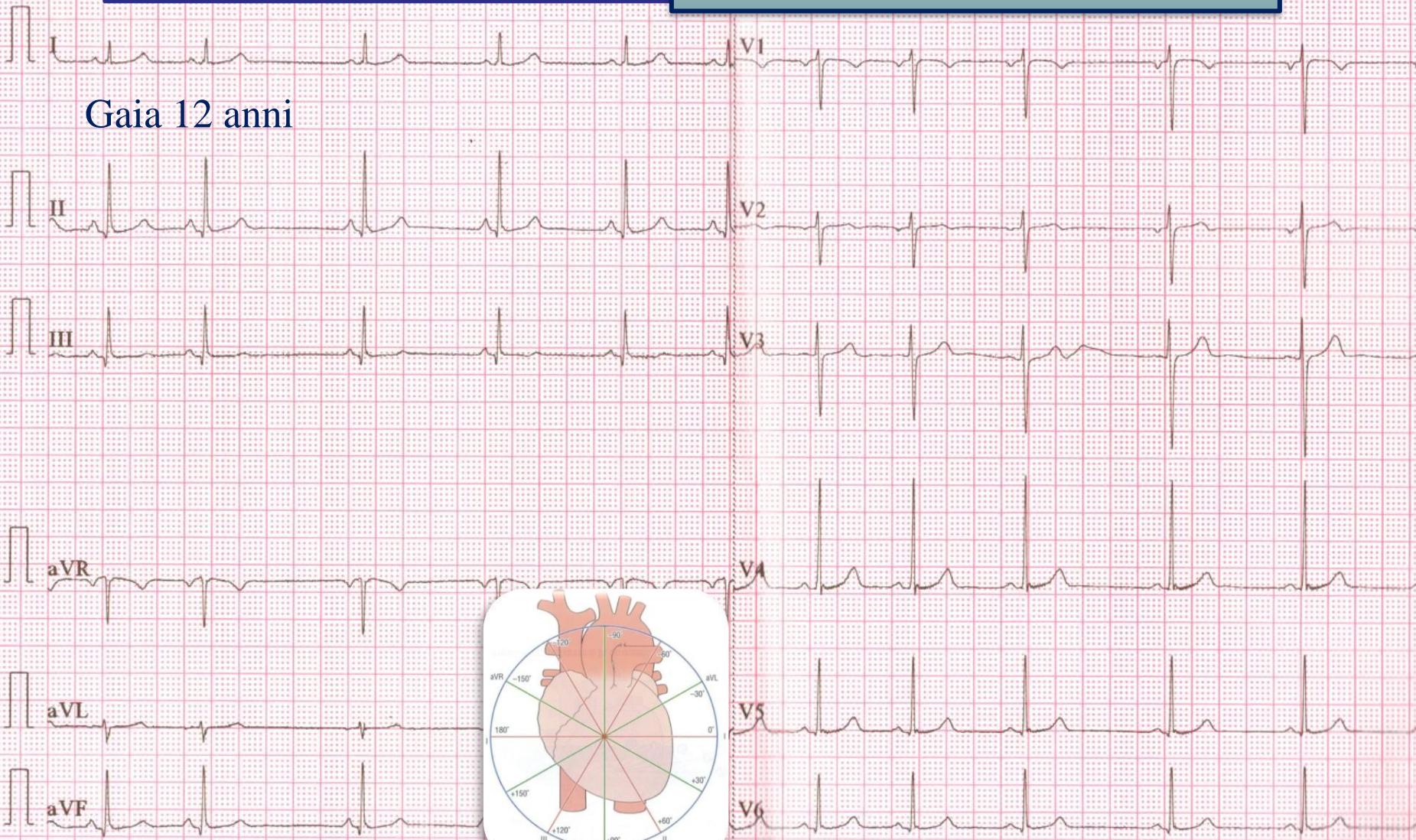
Complesso QRS

V1: R/S <1 S<25 mm

R mai

V6: R/S>1 R<25 mm S<5mm

Gaia 12 anni



0.67~100Hz AC50 25mm/s 10mm/mV 2by5.0s SE-1200Express V2.22 Glasgow V28.6.7 U.O.C. di Pediatria

Asse QRS Valori normali per età

- I^o sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

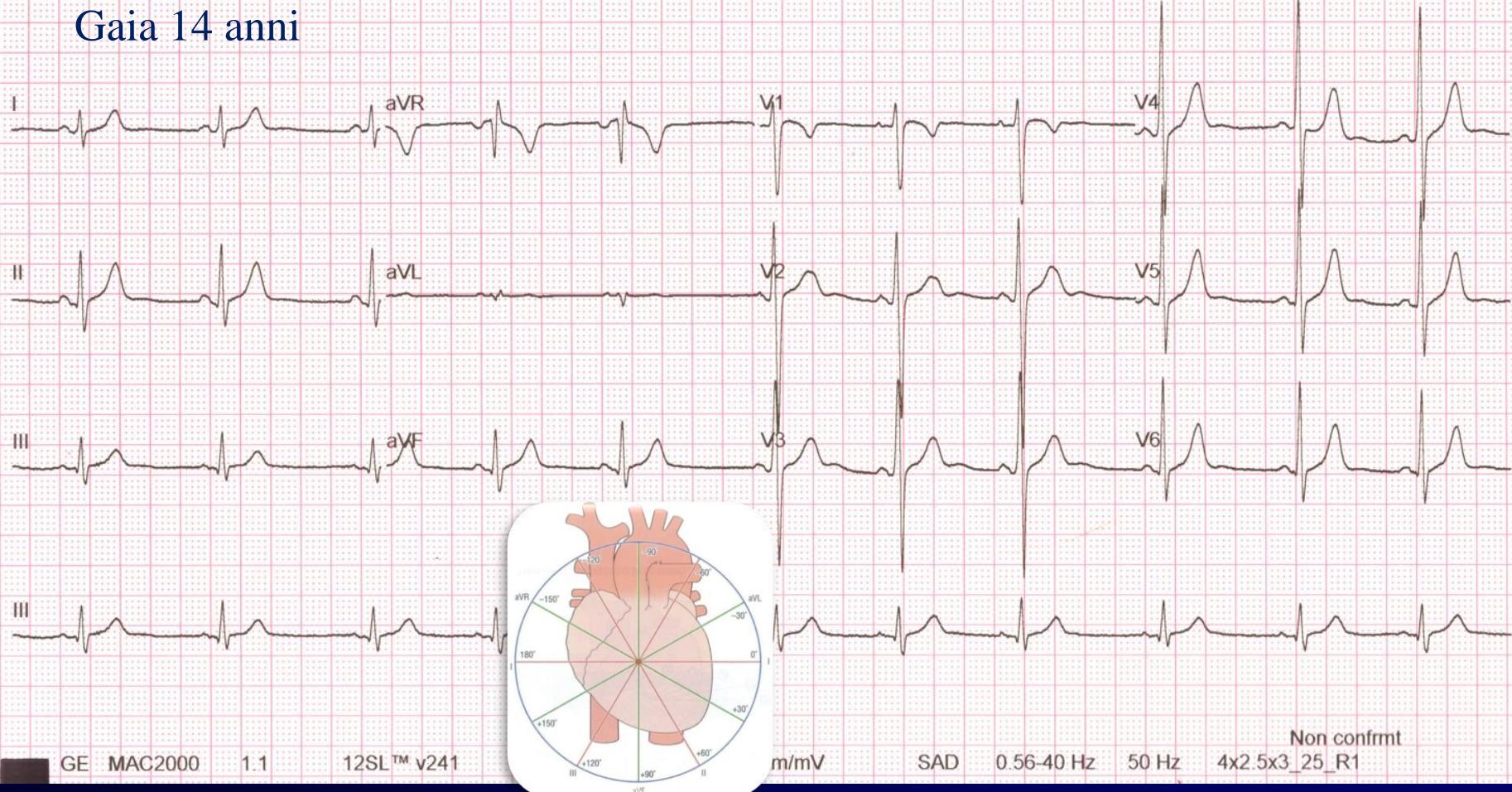
Complesso QRS

V1: R/S <1 S <25 mm

R mai

V6: R/S >1 R <25 mm S <5mm

Gaia 14 anni



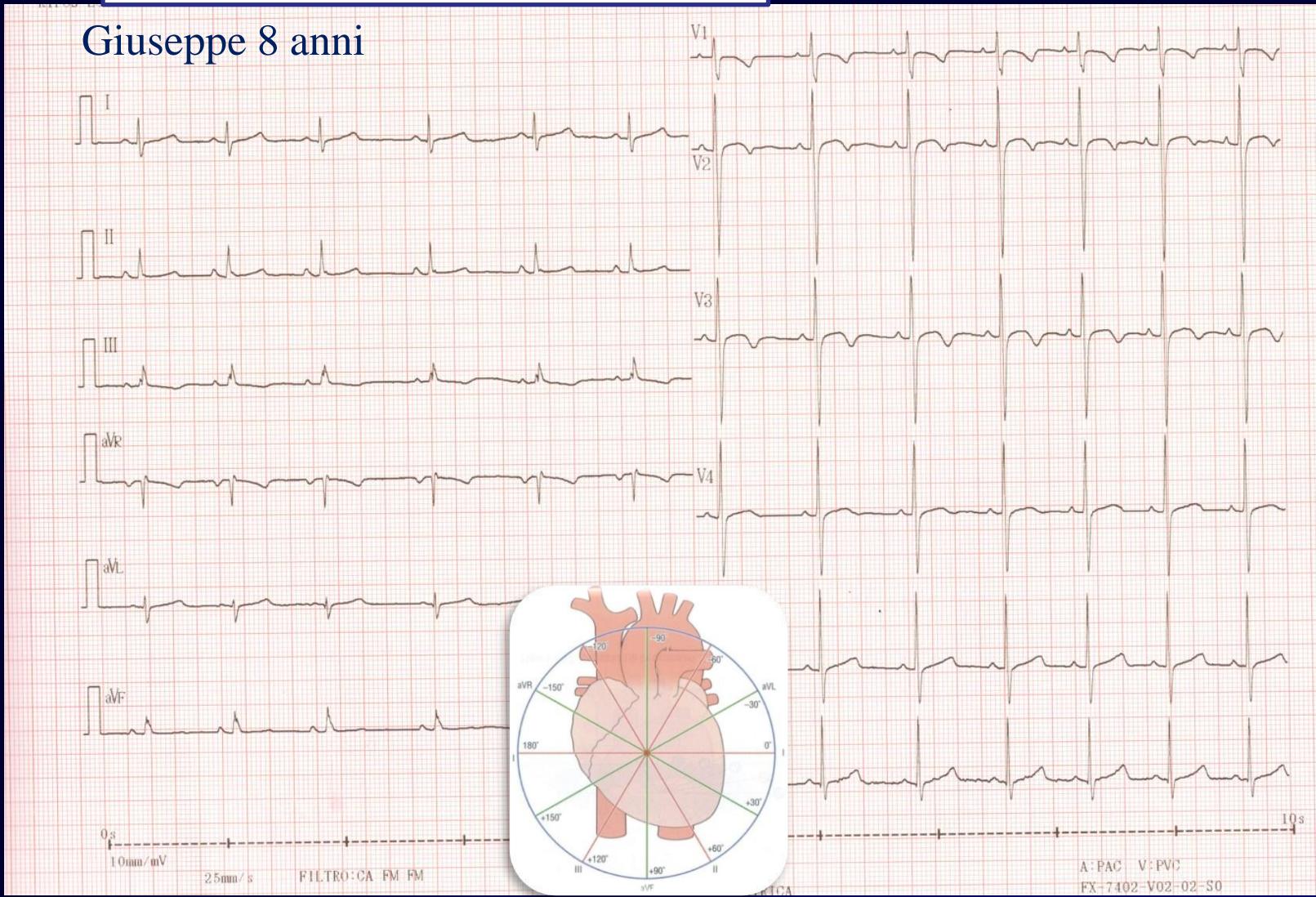
Asse QRS Valori normali per età

- I^a sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

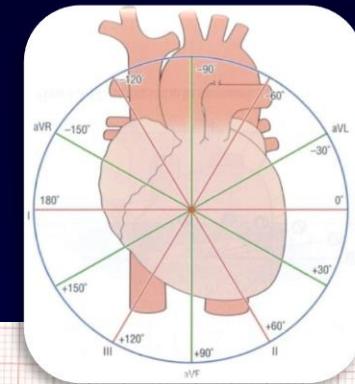
Complesso QRS

- | | | |
|-----|--------|-----------------|
| V1: | R/S <1 | S <25 mm |
| | R mai | |
| V6: | R/S >1 | R <25 mm S <5mm |

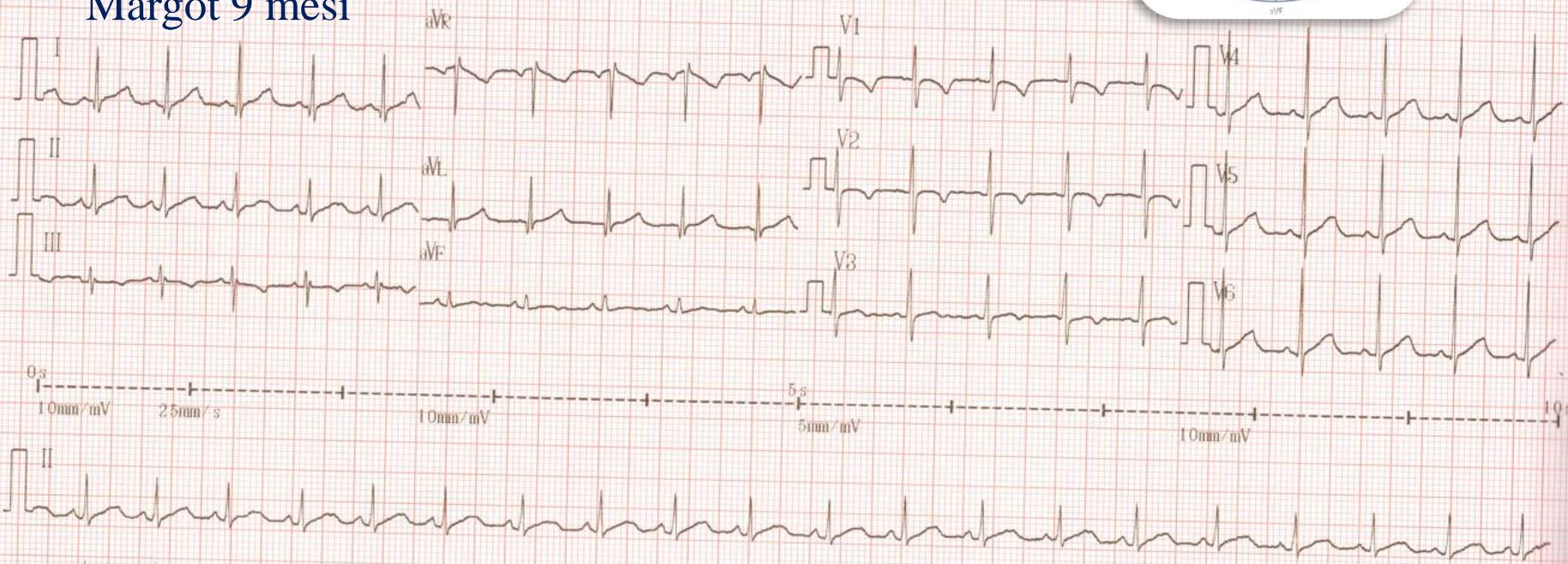
Giuseppe 8 anni



Asse a 30 gradi



Margot 9 mesi



Complesso QRS

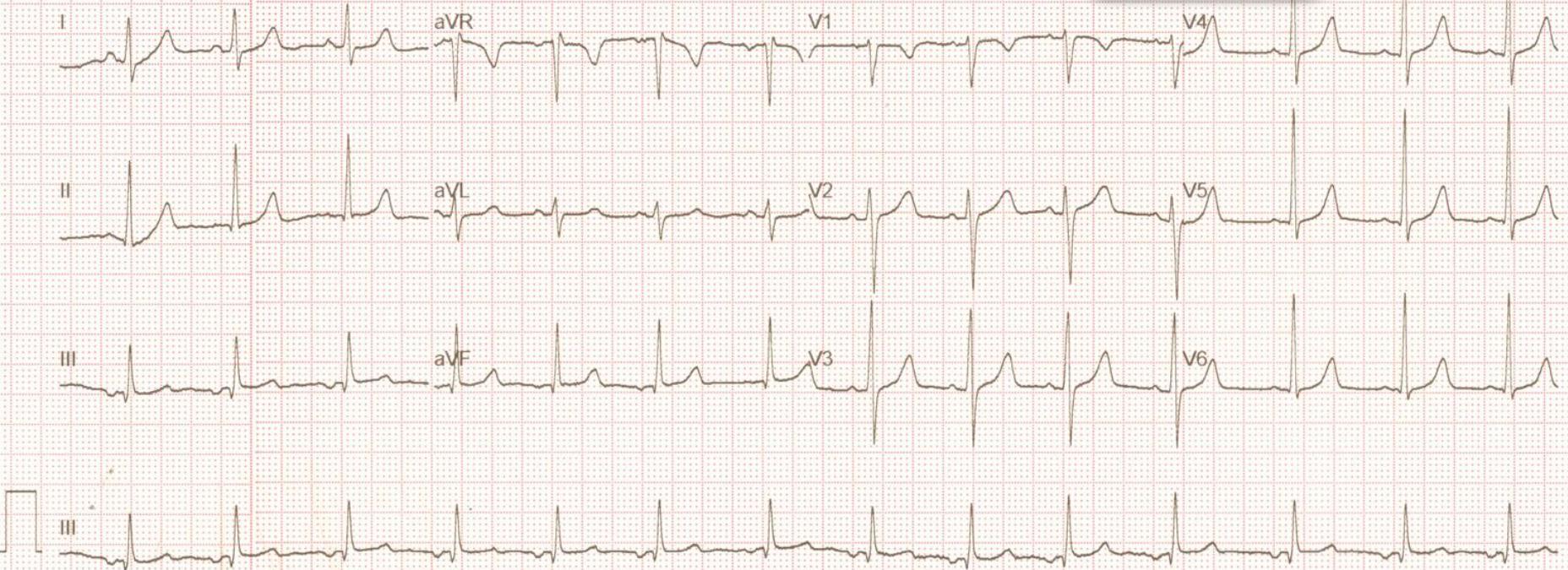
V1:	R/S\geq1	R<20 mm
	R	R<10 mm (mai dopo il 1 anno)
V6:	R/S>1	R<25 mm S<10 mm
II-III-aVF-V6		q max 10 mm

Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Ritmo seno coronarico

Benedetta 9 anni



Asse QRS Valori normali per età

- I^ sett. +110 (+30 a +180/210)
- 7-30 gg + 120 (+30 a +190)
- 1-12 mesi + 070 (+10 a +120)
- > 1 anni + 060 (+10 a +100)

Complesso QRS

- | | | |
|-----|--------------|-------------------|
| V1: | R/S < 1 | S < 25 mm |
| | R mai | |
| V6: | R/S > 1 | R < 25 mm S < 5mm |

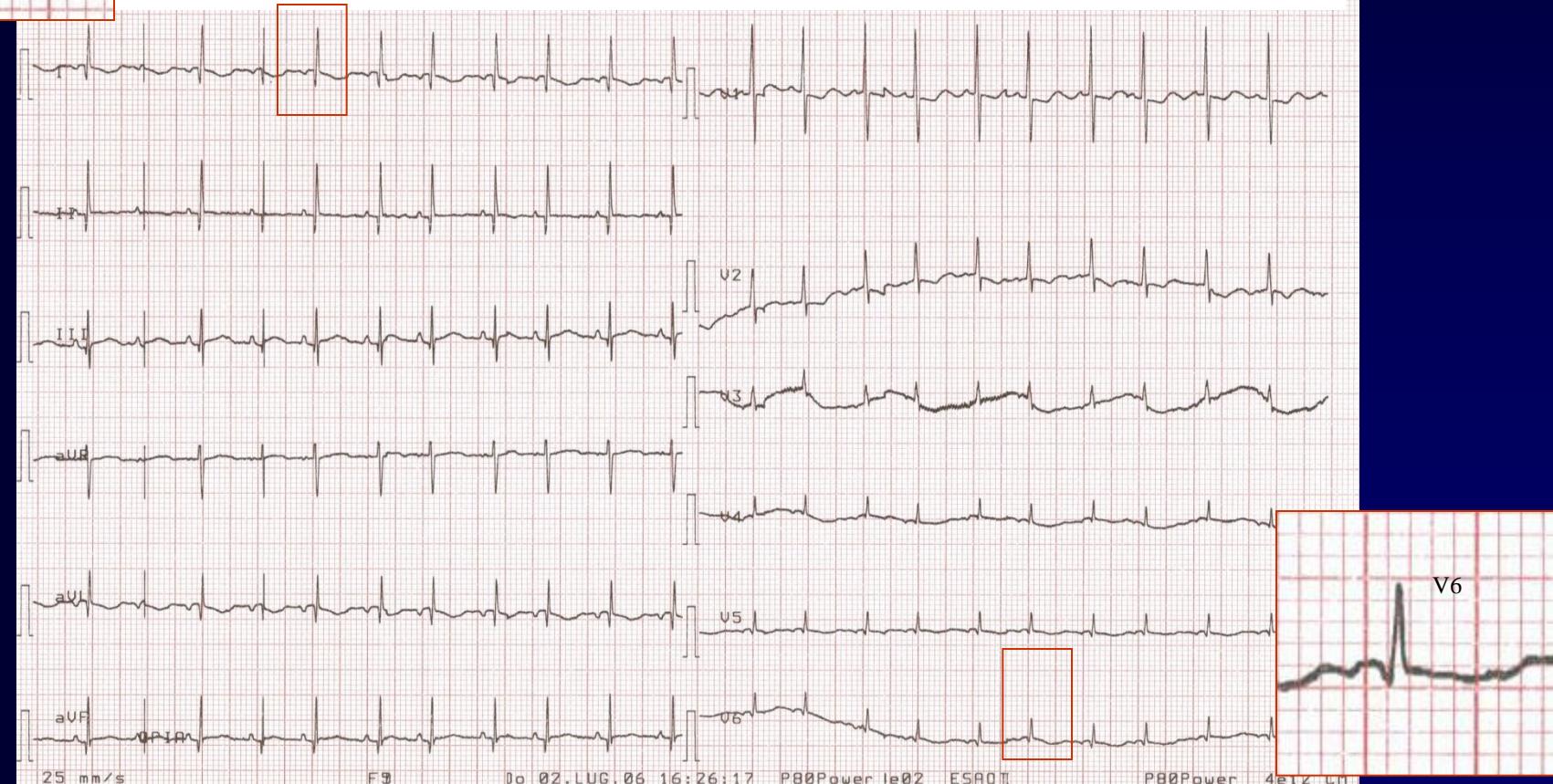
Neonato di 2 giorni

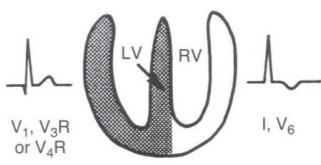
Onda P negativa in I e aVL, V3, V4, V5, V6

Complessi rR^I in I ,aVL V6, mancata progressione della R nelle precordiali

Di cosa si Tratta?

Situs inversus in destrocardia



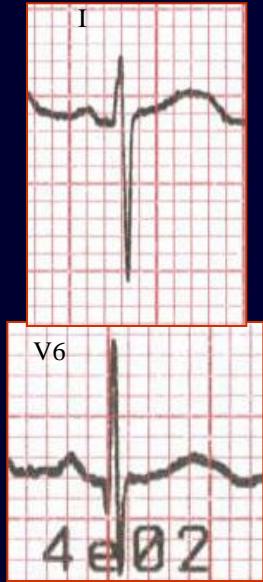


Stesso bambino con elettrodi invertiti

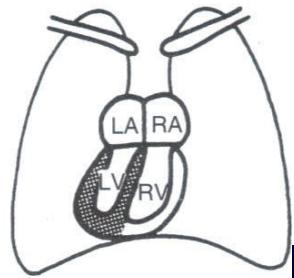
Situs inversus in destrocardia neonato 2g

Onde P positive in tutte le derivazioni

Complesso rS in I, aVL; normale progressione della R nelle precordiali



Complessi
QRS in V6



Elettrocardiogramma in età pediatrica



GRAZIE!

Agata Privitera
AOU Policlinico Catania
Cardiologia Pediatrica
Presidio San Marco

www.cardiologiapediatricact.com

Padova 30/01/2026