Arritmias Perinatales

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Generalidades

- Hasta el 2 al 3 % de los embarazos cursan con arritmias fetales

- Los lactantes menores de 1 año pueden presentar arritmias desde un 0.75% al 14%

Fetal Neonatal Supraventricular Tachyarrhythmias, J. Pike and A. Greene; Neoreviews 2012 ; 13; e605 .
Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

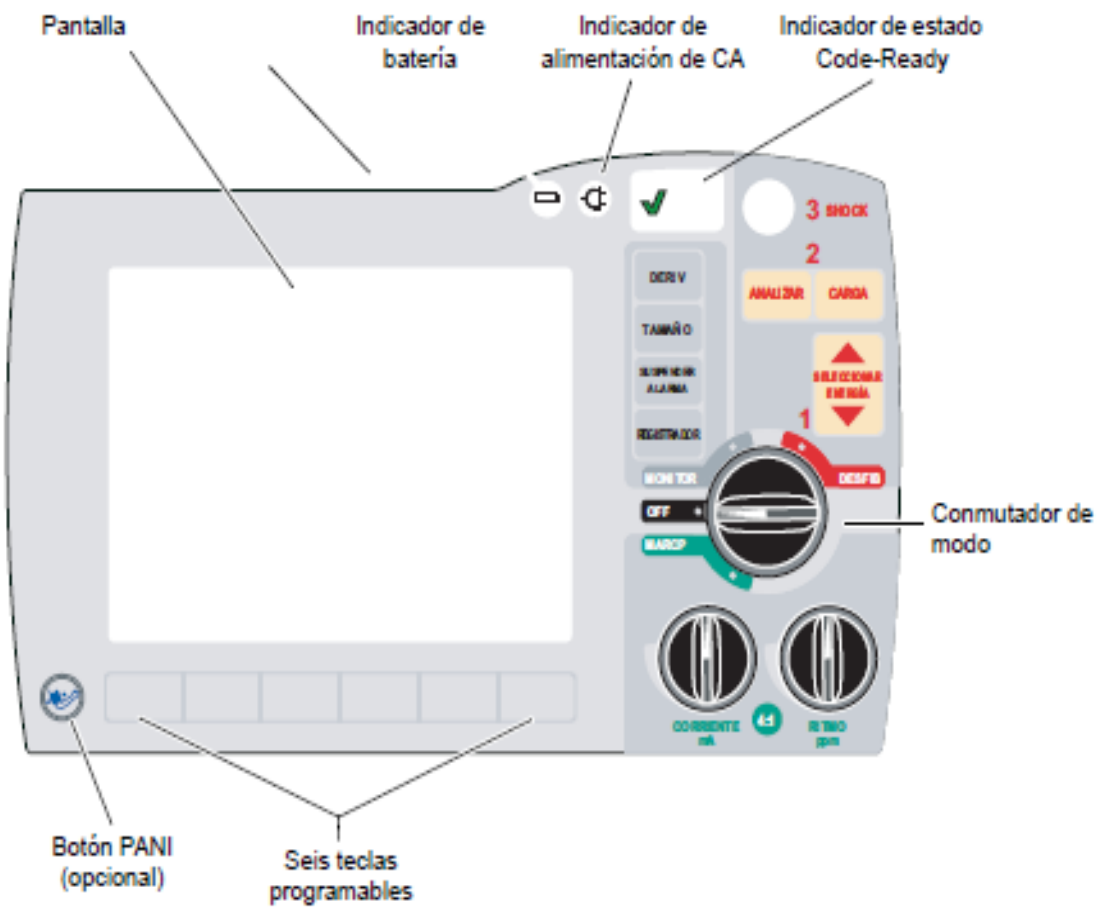
Desarrollo del Sistema de Conducción

- El primer latido se produce a las 3 semanas de gestación
- A las 7 semanas se establece la sincronía de la contracción auricular y ventricular con una FC de aprox. 110 lpm. y a la semana 9-10 alcanza una frecuencia de 170 lpm.
- Entre las semanas 20 - 40 los rangos son entre 110 y 180 lpm.

Heart rate and essential parameters: normal values by age

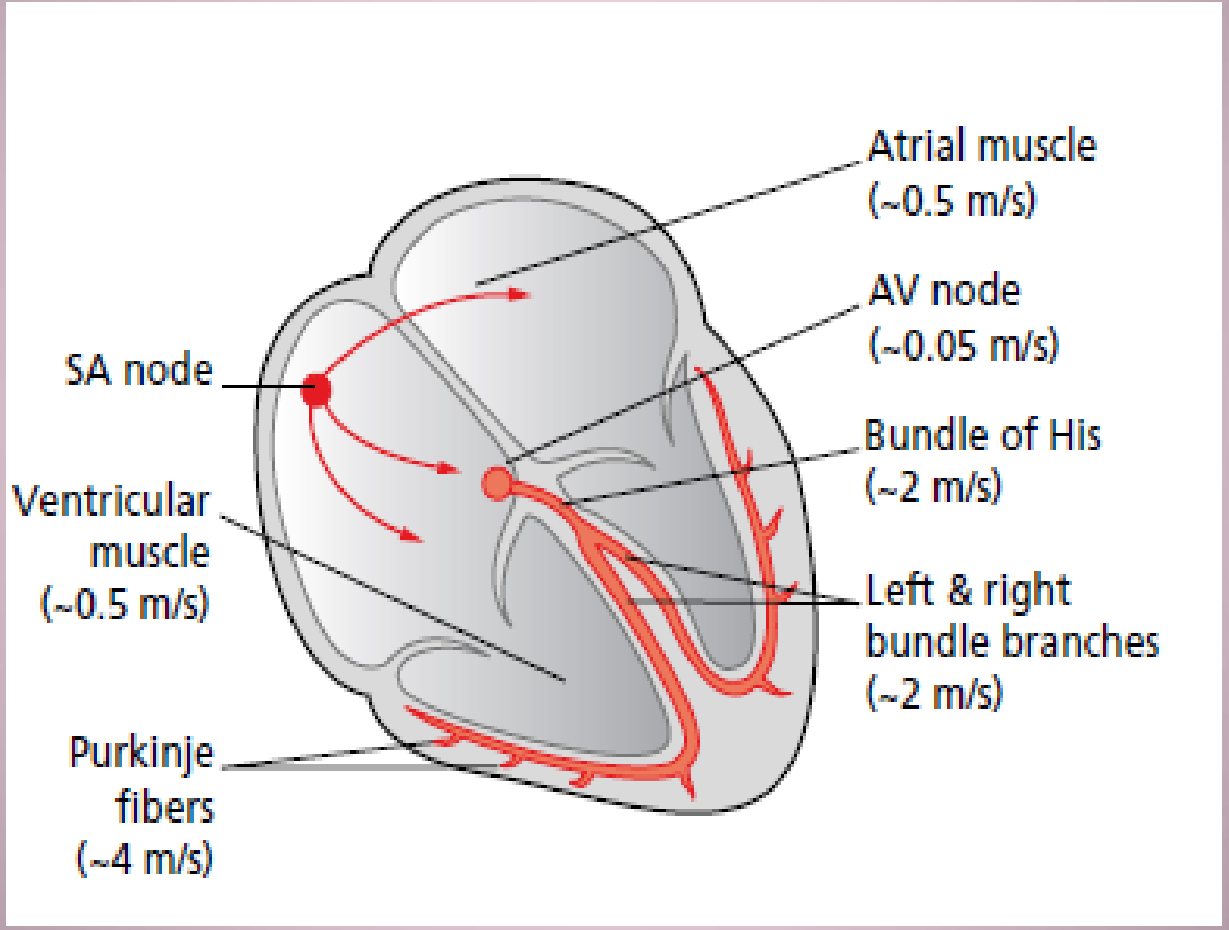
Age group	Heart rate[a] (bpm)	Frontal plane QRS axis[a] (degrees)
Less than 1 day	93–154 (123)	+59 to +192 (135)
1–2 days	91–159 (123)	+64 to +197 (134)
3–7 days	90–166 (129)	+77 to +187 (132)
1–4 weeks	107–182 (149)	+65 to +160 (110)
1–3 months	121–179 (150)	+31 to +114 (75)
3–6 months	106–186 (141)	+1 to +104 (60)
6–12 months	109–169 (134)	+1 to +99 (56)

Desfibrilador Zoll



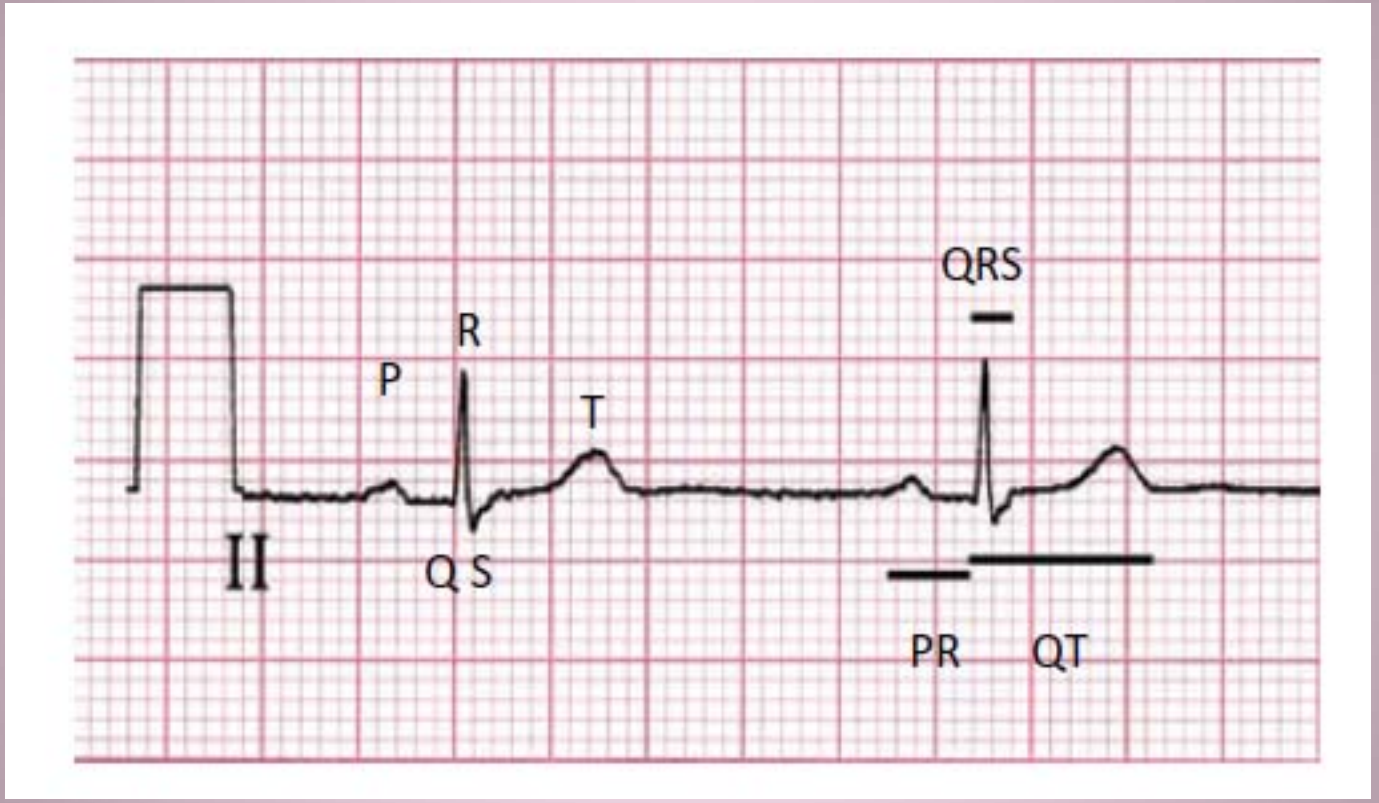
Panel frontal de la unidad R Series

Estructura eléctrica normal del corazón



Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

Electrocardiograma normal



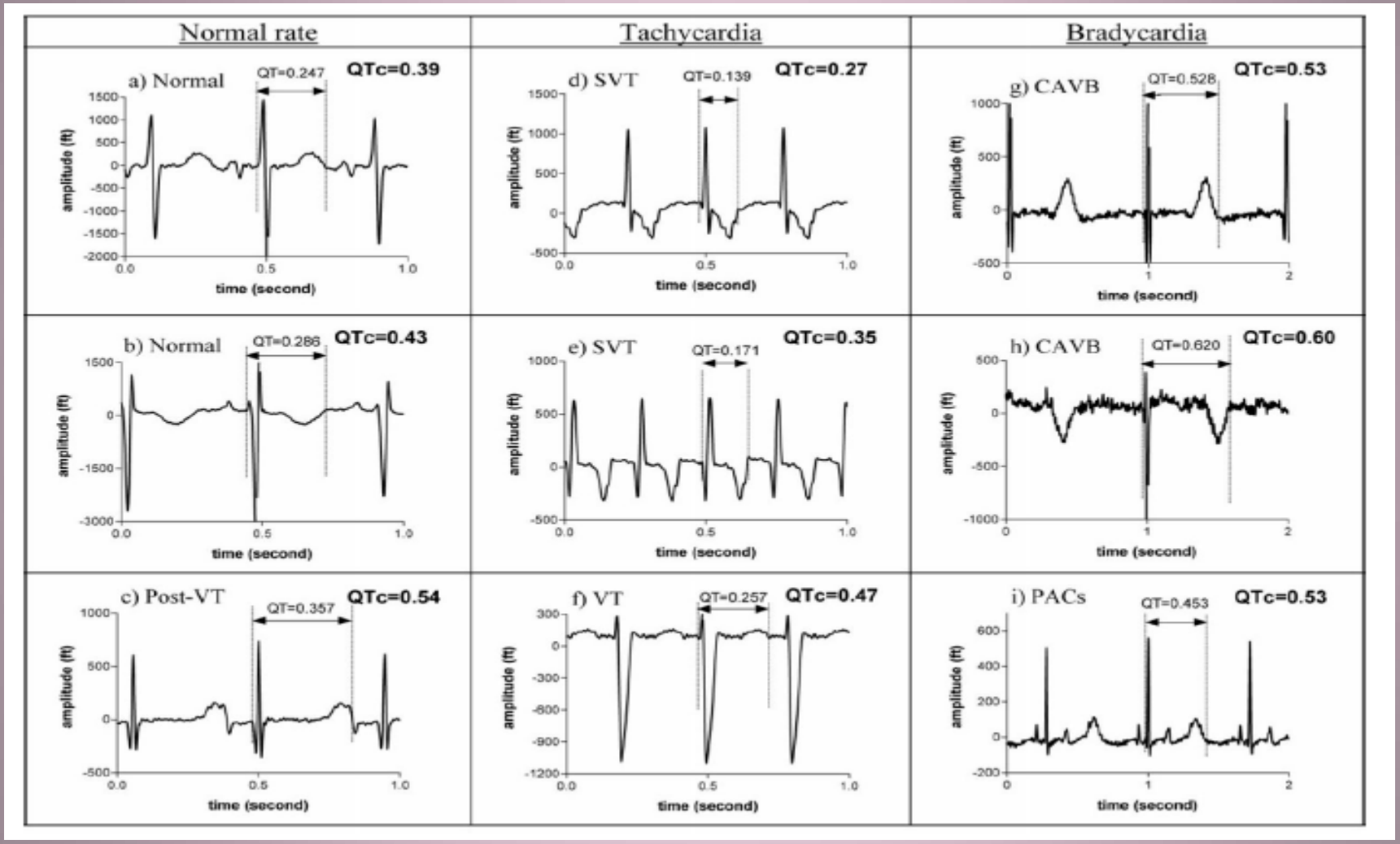
Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

Análisis del ritmo

- Magnetocardiografía
- Ultrasonido evaluando la relación entre la contracción auricular y ventricular
- Electrocardiograma

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Conducción fetal cardíaca por magnetocardiografía



Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman..

Ultrasonido

Eur J Pediatr (2014) 173:983–996

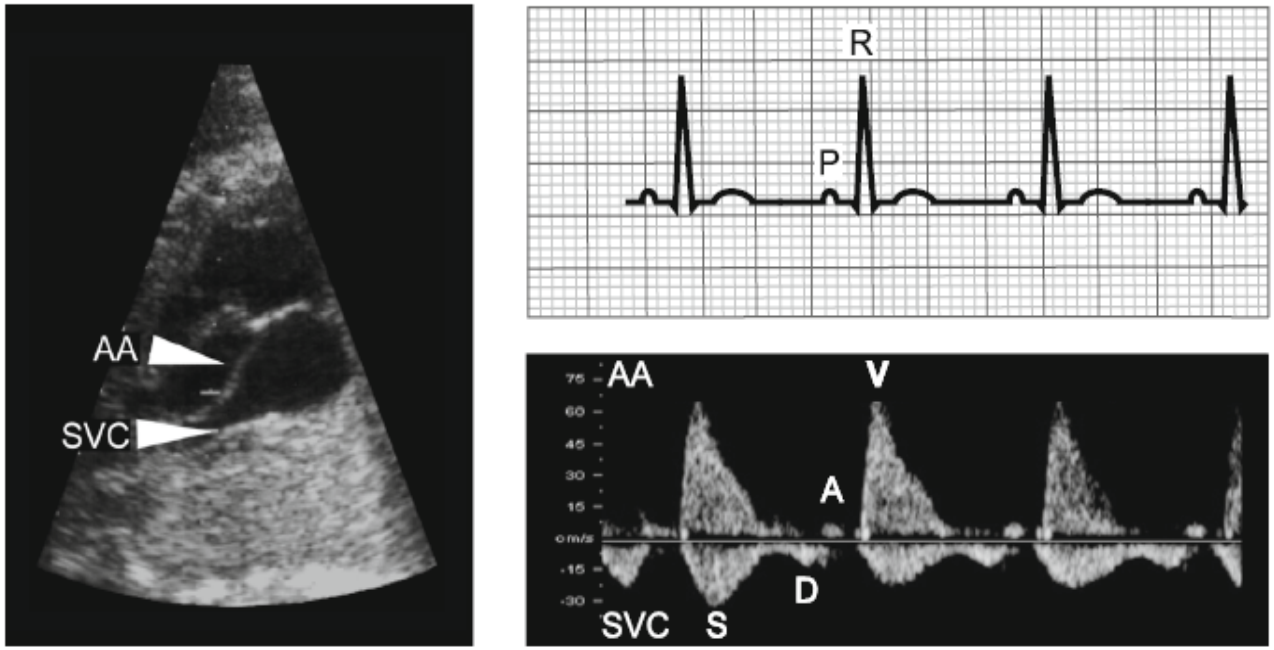
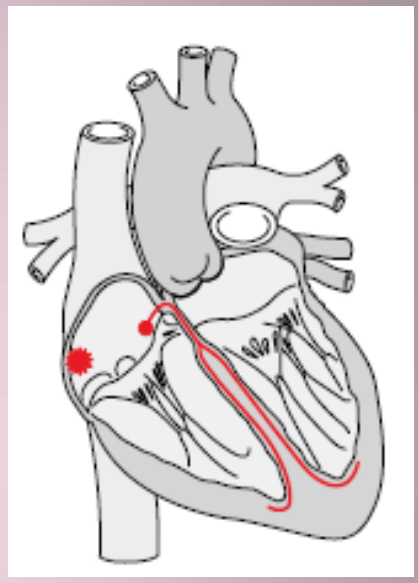


Fig. 1 *Left*, Two-dimensional ultrasound image showing the anatomical proximity of the SVC and the AA. The sample gate can easily be placed so as to record both proximal parts of SVC and AA. *Right*, Fetal virtual ECG (*upper panel*) and SVC/AA Doppler recording (*lower panel*, Doppler tracing turned upside down in order to illustrate analogies with the ECG tracing) in normal sinus rhythm. Ventricular ejection (V) in the AA appears above baseline. Venous flow is typical with systolic (S) and diastolic (E) waves below baseline and the retrograde flow wave (A) due to the atrial contraction above. *A* late diastolic wave due to atrial contraction, *AA* ascending aorta, *AV* atrioventricular interval, *D* early diastolic wave, *ECG* electrocardiogram, *P* P wave, *R* R wave, *S* systolic wave, *SVC* superior vena cava, *V* ventricular ejection

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Arritmias Irregulares-Latidos Prematuros

- LATIDO PREMATURO AURICULAR



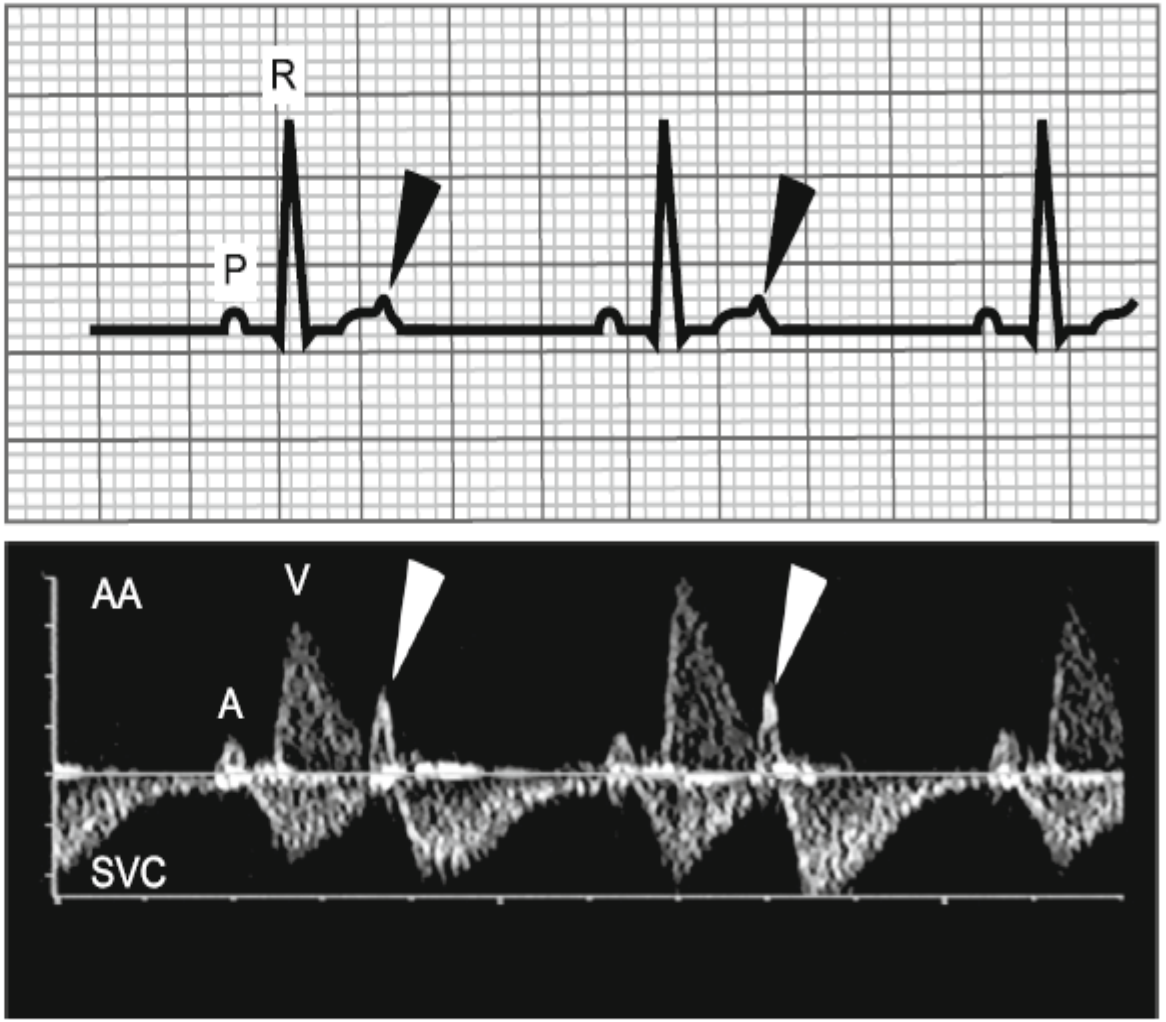
-Corresponde cerca del 90%

-Antes del nacimiento se resuelven el 95%

-En niños enfermos puede desencadenarse por:
hiper o hipokalemia ,CVC, hipercalcemias, hipoglicemias, hipoxia, antiarritmicos, DVA

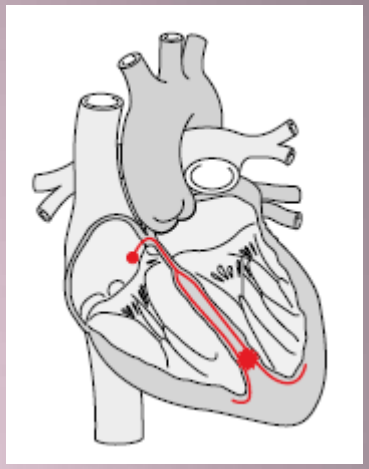
Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996. Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

Upper panel, ECG showing one nonconducted premature atrial beat (*black arrowheads*) occurring during T wave after every conducted atrial beat called bigeminy. This results in a ventricular bradycardia with a ventricular rate of 70 bpm. *Lower panel*, SVC/AA Doppler recording showing the same phenomenon than on the *upper panel* with an APB (*white arrowheads*) occurring at the end of the ventricular contraction which did not result in a ventricular contraction. *A* atrial contraction, *AA* ascending aorta, *P* P wave, *R* R wave, *SVC* superior vena cava, *V* ventricular contraction



Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Arritmias Irregulares-Latidos Prematuros



- LATIDOS PREMATUROS VENTRICULARES

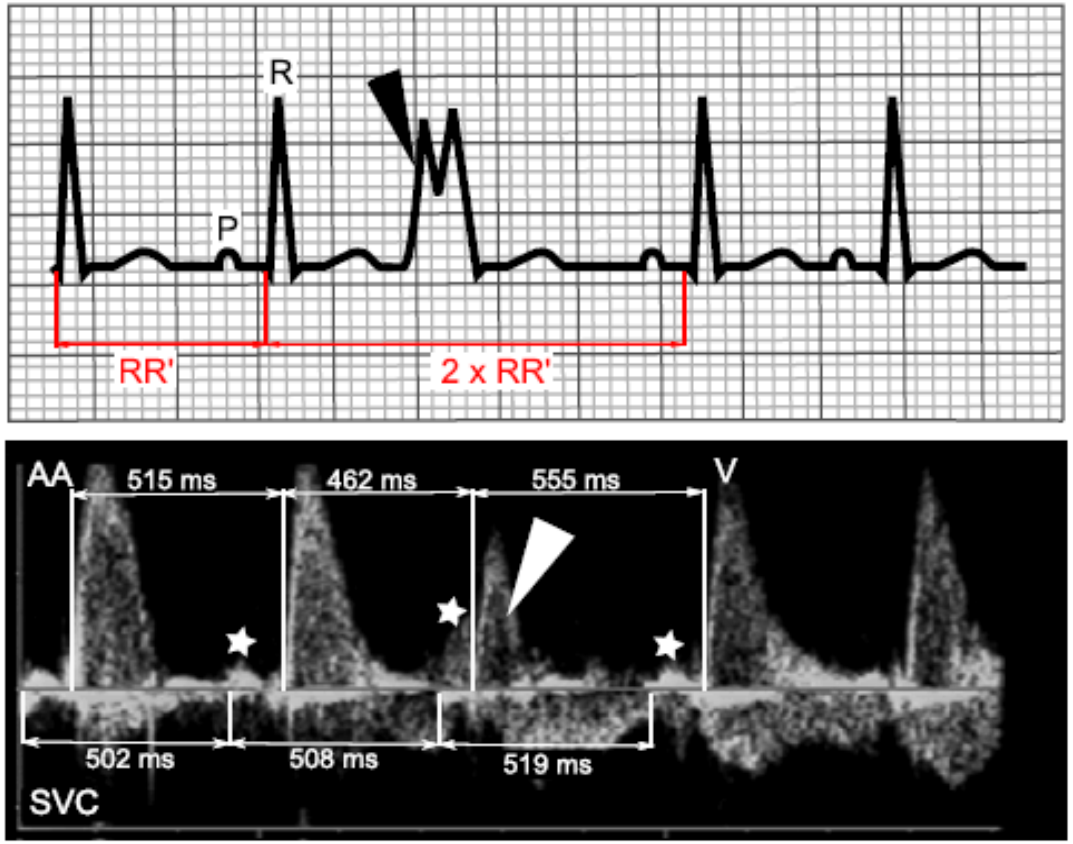
-Corresponden a menos del 2 % en los fetos

-Más frecuente las primeras 24 horas de vida(18%)

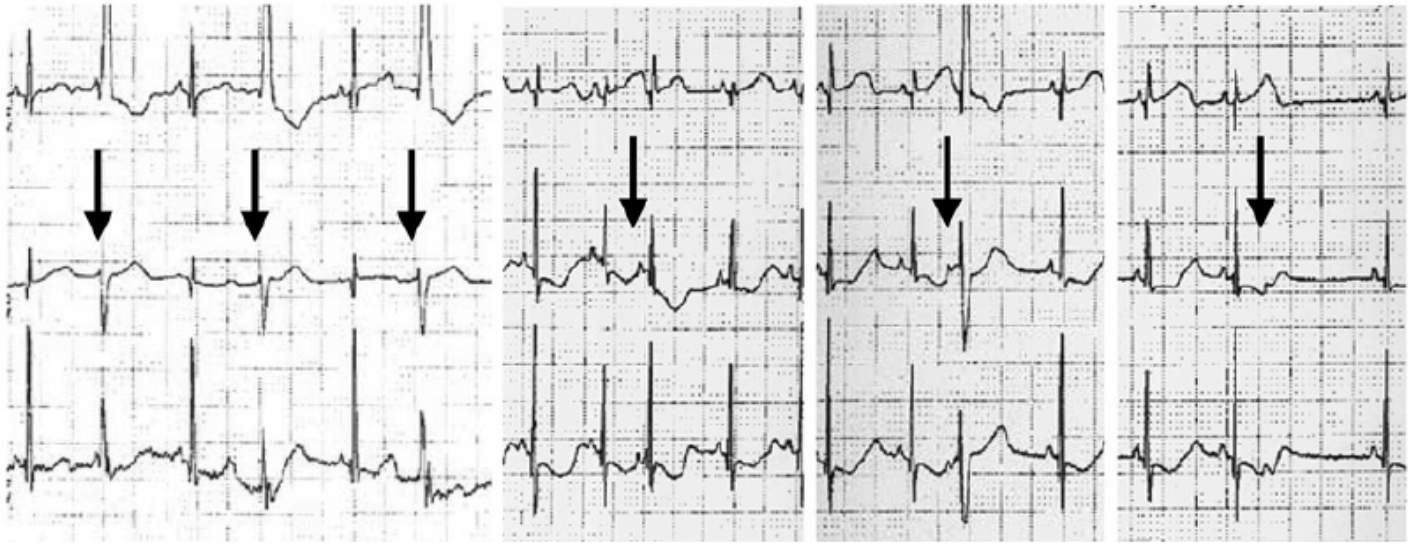
-Puede asociarse a malformaciones cardíacas, cardiomiopatías, tumores

- LATIDOS PREMATUROS DE LA UNIÓN

. Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.. Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.



Upper panel, surface ECG: VPB is diagnosed when a wide premature QRS complex (*black arrowhead*) is observed on surface ECG. Since in rare instances a wide QRS could result from an APB, another feature of VPB is that the interval between the preceding and the following sinus beat is equal to twice the time between two regular sinus beats. This phenomenon called "full compensatory pause" is due, in contrast to APB, to the absence of resetting of the sinus node in VPB. *Lower panel*, SVC/AA Doppler recording: prenatally, since ECG is not obtainable, this phenomenon is essential to the diagnosis. RR′ interval before the VPB (*white arrowhead*) is 515 ms. The interval from the preceding and the following regular ventricular beat equals 1,017 ms, approximately twice the RR′ interval (=1,030 ms). Another feature is the identification of regular atrial contractions (*white stars*), independent of the premature ventricular contraction. *AA* ascending aorta, *P* P wave, *R* R wave, *SVC* superior vena cava, *V* ventricular contraction



Ectopy. The left panel shows a three-lead rhythm strip of PVCs marked by arrows. Note that no early P wave precedes these beats. The three subsequent panels show PACs conducted with a normal-appearing QRS and an aberrant QRS and not conducted through the AV node (*arrows*) (note the P waves).

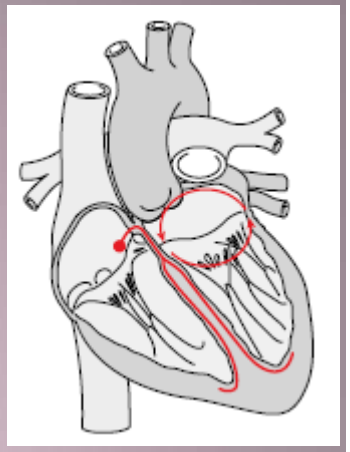
Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007.

TAQUICARDIAS

- En el feto 70% son paroxísticas por mecanismos de reentrada
- 24 % taquicardias auriculares primarias
- 6% taquicardias sinusales
- En la infancia de las taquicardias no sinusales un 80% son por mecanismos de reentrada, 15 % auriculares primarias

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014.

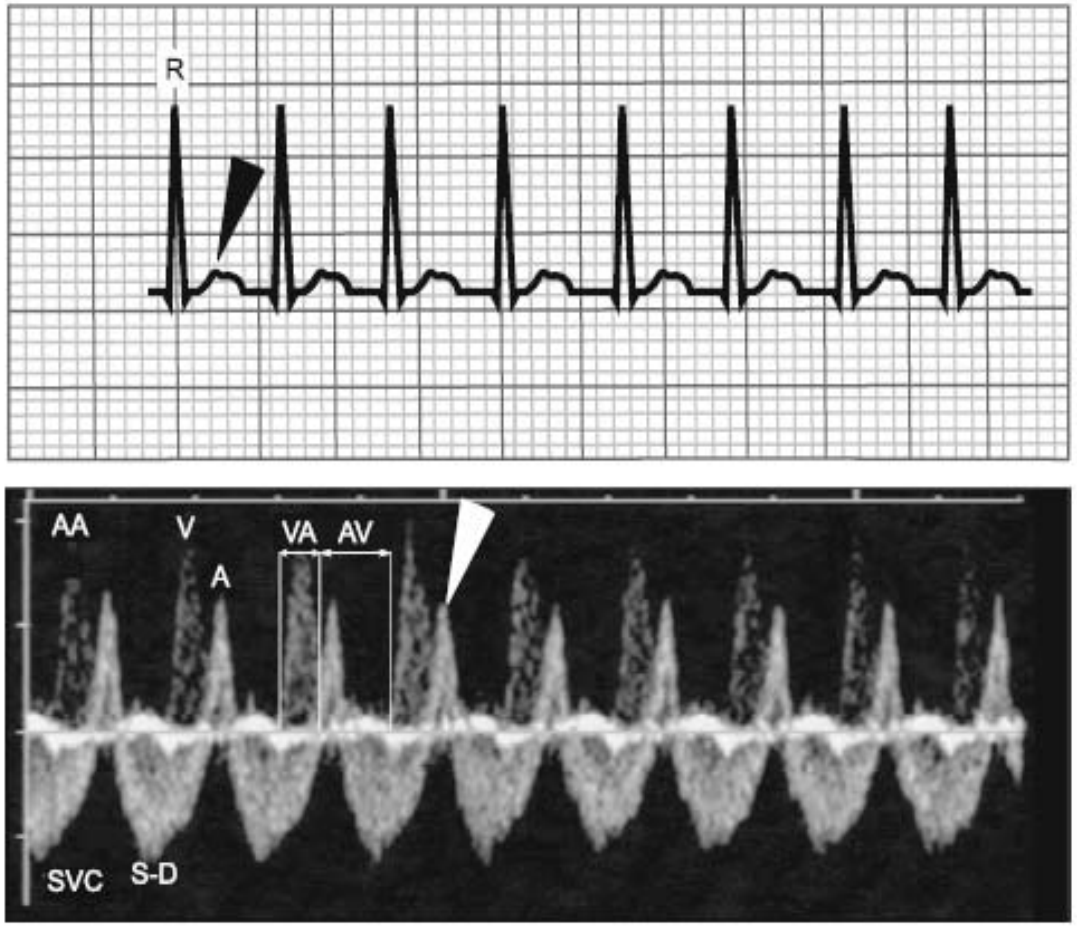
Taquicardia Supraventricular (TSV)



- 1 de cada 3700 embarazos
- 5 a 10 % de las arritmias fetales pero más del 50% de las clínicamente significativas
- En el periodo postnatal ocurre entre 1 /250-1000 niños
- Factores desencadenantes:

cardiopatía congénita, hipertiroidismo, consumo materno de cafeína alcohol o nicotina

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996..



Typical SVT with a short VA interval. On the surface ECG (*upper panel*), a narrow QRS tachycardia is observed. If we look carefully at the T wave, a little deflation (*black arrowhead*) can be observed sometimes corresponding to the retrograde depolarization of the atria. Prenatally (*lower panel*), a tachycardia is also noted on the Doppler recording based on the ventricular rate, but the atrial contractions are very clearly identifiable following shortly every ventricular depolarization. This phenomenon called canon A wave is due to the occurrence of the atrial contraction before the opening of the tricuspid valve (the ventricle is still contracting and ejecting blood). The VA interval is much smaller than the AV interval, 83 and 171 ms, respectively, for a heart rate of 240 bpm. *A* late diastolic wave due to atrial contraction, *AA* ascending aorta, *AV* atrioventricular interval, *D* early diastolic wave, *R* R wave, *S* systolic wave, *SVC* superior vena cava, *V* ventricular ejection, *VA* ventriculoatrial interval

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Miyelaz; Eur J. Pediatr 2014

Manejo TSV

- ***Prenatal***:digoxina-sotalol y flecainide,propafeniona, amiodarona
- ***Postnatal***:
- ***Estable***: medidas vagales mientras se prepara adenosina 0.1 mg /kg(máximo 6) que se podría incrementar hasta 0.3 (máximo 12)

- ***Inestable***: cardioversión eléctrica sincronizada 0.5 a 1 J/Kg

- *Mantención por 6-12 meses*:
  digoxina, propanolol, sotalol, flecainide, propafenona, amiodarona

- Ablación por radiofrecuencia:muerte súbita abortada,síncopes,disfunción ventricular, refractariedad a múltiples drogas, ram severos

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Pediatric Tachycardia
With a Pulse and Poor Perfusion

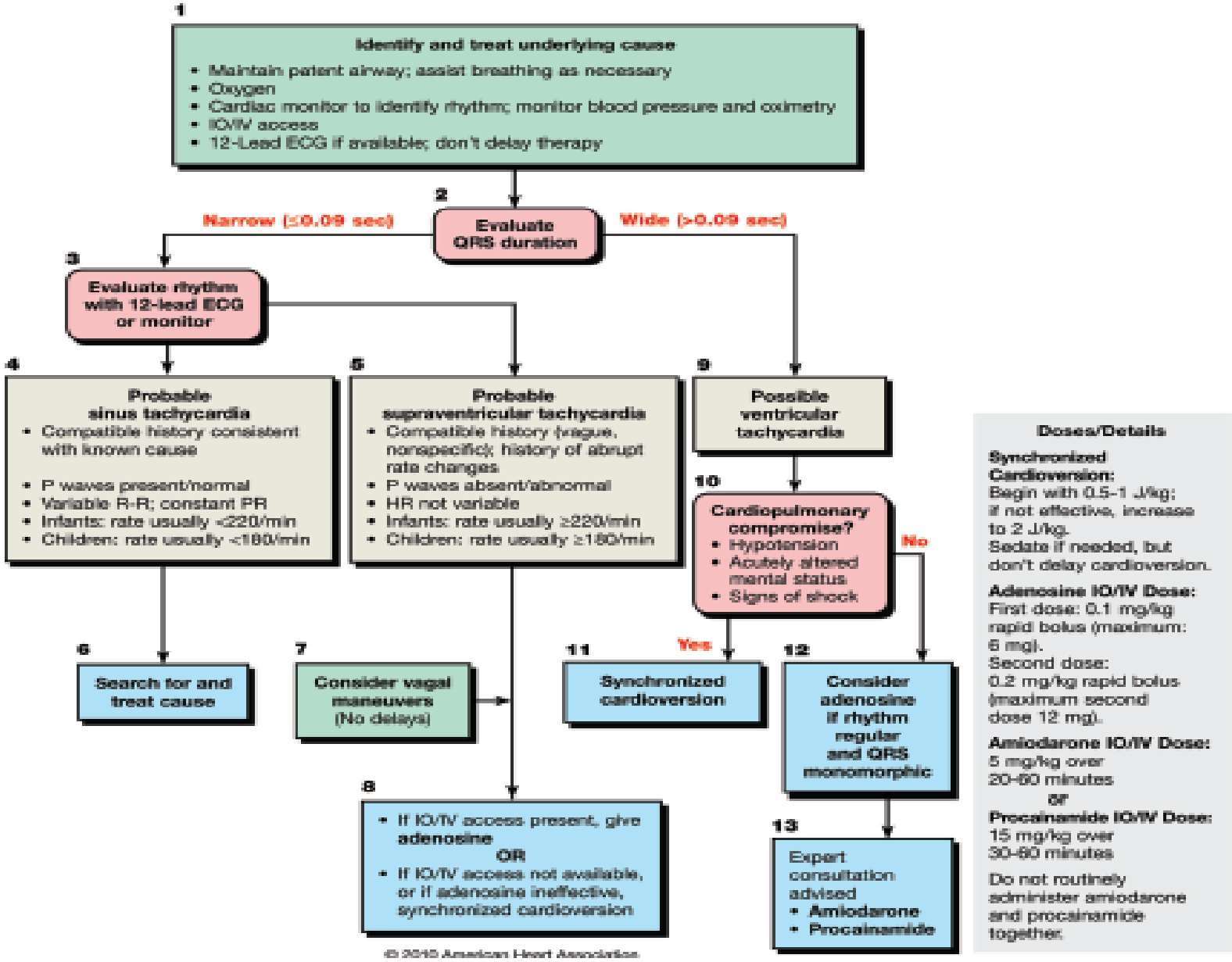
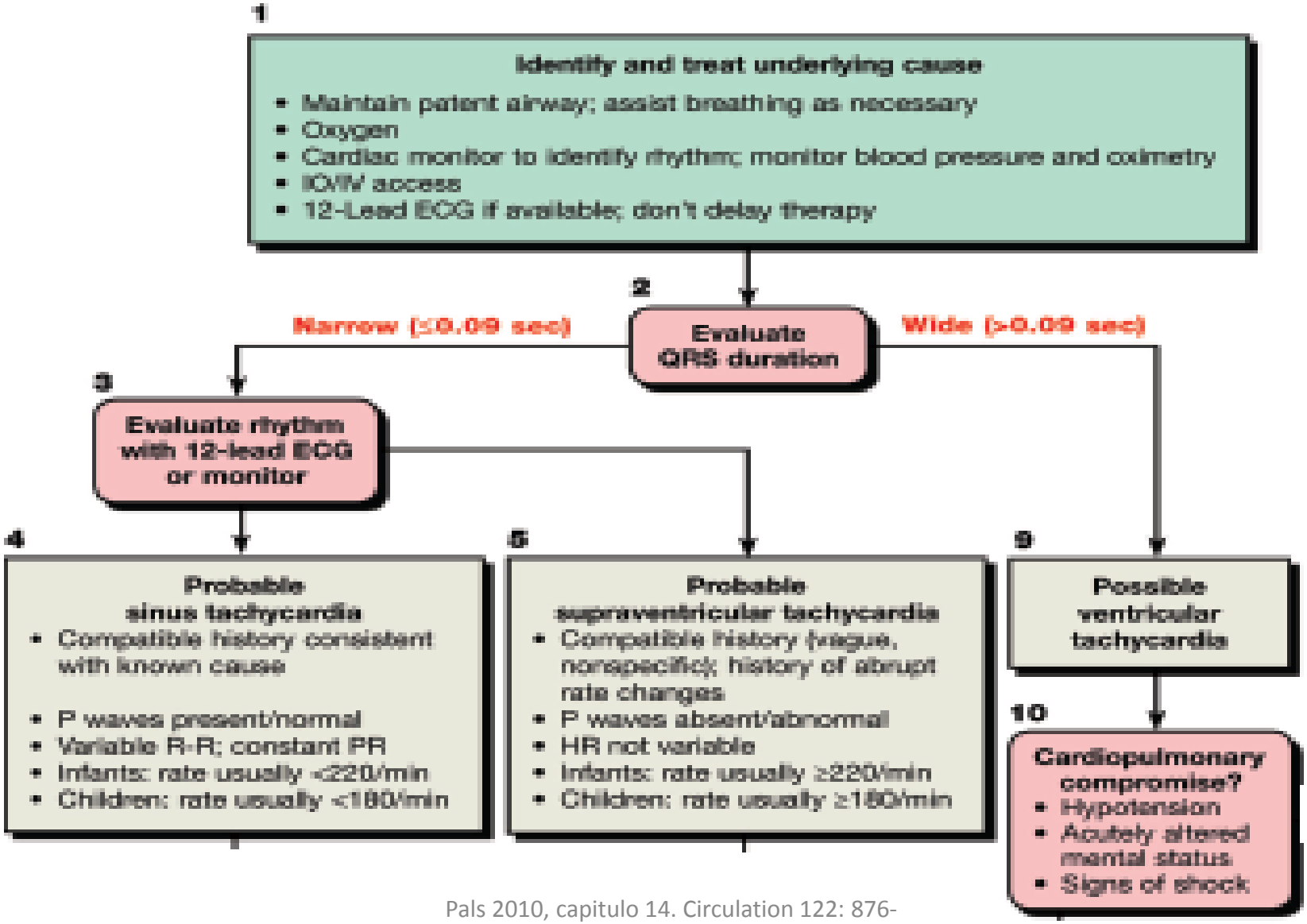


Figure 3. PALS Tachycardia Algorithm.

Pediatric Tachycardia
With a Pulse and Poor Perfusion



Pals 2010, capitulo 14. Circulation 122: 876-908.

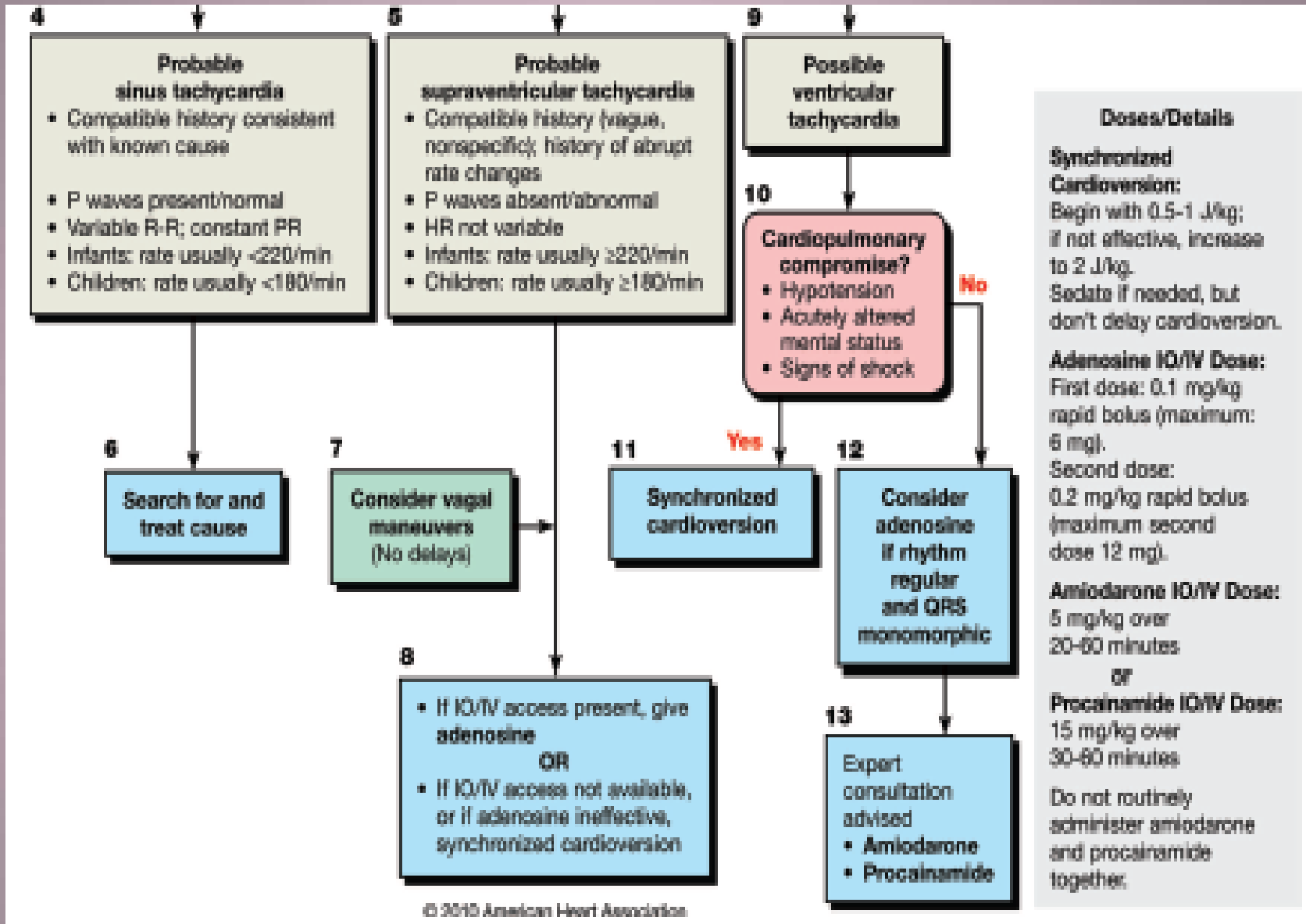
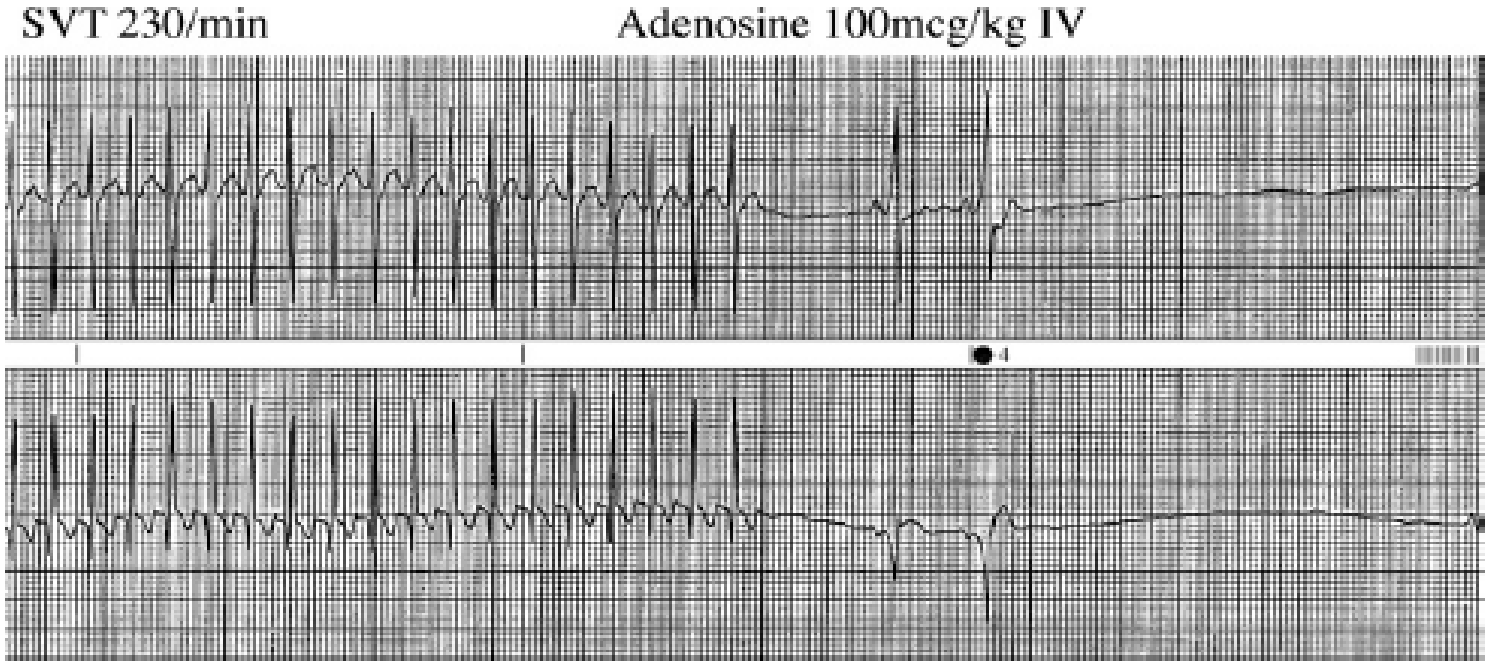


Figure 3. PALS Tachycardia Algorithm.

Pals 2010. Capitulo 14. Circulation 122:876-908.



SVT termination. SVT is present initially. After administration of adenosine 100 µg/kg by rapid intravenous administration, the SVT terminates and there is a sinus pause caused by the vagal effects of the drug. The terminations always should be recorded, because sometimes the presence of Wolff-Parkinson-White pre-excitation is only seen transiently. Note here the short PR interval and delta wave on the two beats after termination.

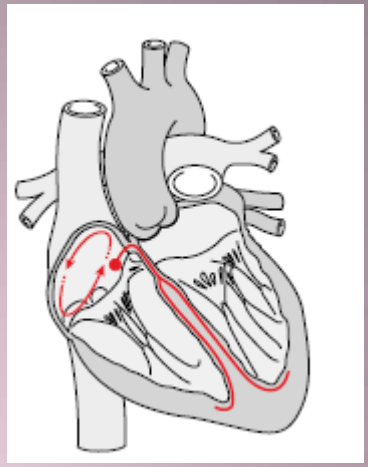
Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007

Consecuencias

- Recurrencia raras para los casos neonatales
- Inversamente relacionado a la edad del diagnóstico
- 17 % de mortalidad en fetos hidrópicos
- 10-20% de secuelas neurológicas

. Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Flutter Auricular



- ***Prenatal***: Conversión es efectiva con sotalol
- ***Postnatal*** : Cardioversión sincronizada es la primera opción

. Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996. Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

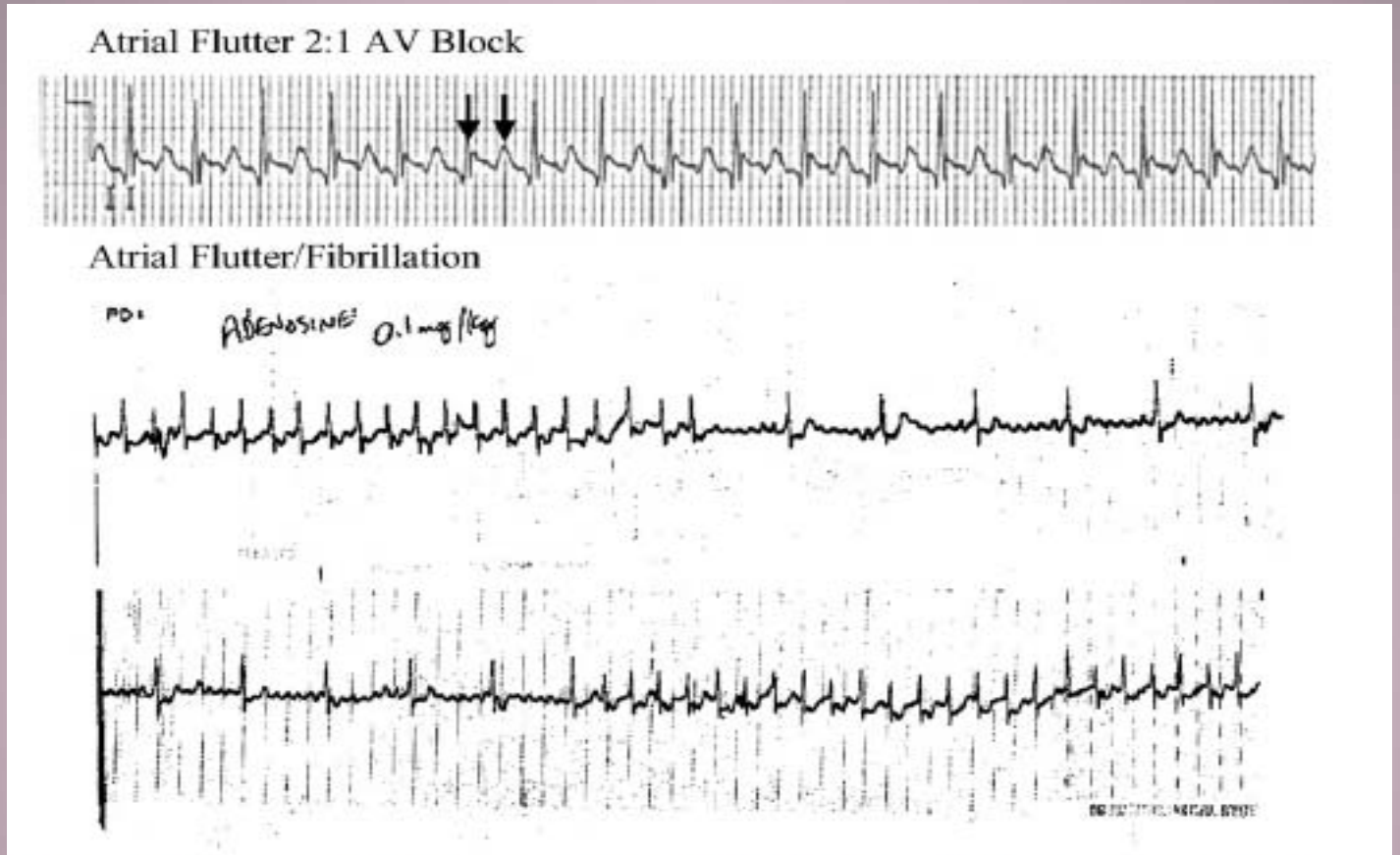
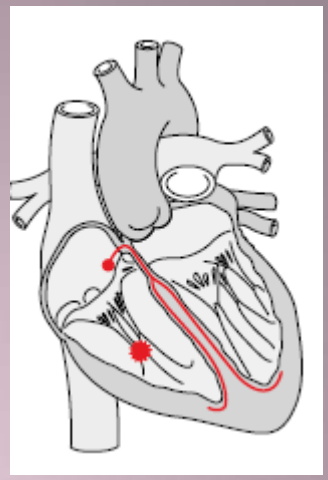


Fig. 8. Atrial flutter. The top tracing shows atrial flutter with 2:1 block. The atrial rate is 460 beats/min, and the ventricular rate is 230 beats/min. Flutter waves are marked with arrows. The QRS almost obscures the P wave. In a different patient in the lower two tracings, the administration of adenosine 100 μg/kg allows easy recognition of the rapid atrial flutter/fibrillation in this infant but does not terminate the tachycardia. Before adenosine, this rhythm could be mistaken for SVT. For this reason, during infusion of adenosine, continuous "real-time" paper recordings of the rhythm should be obtained.

Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007, 627-652.

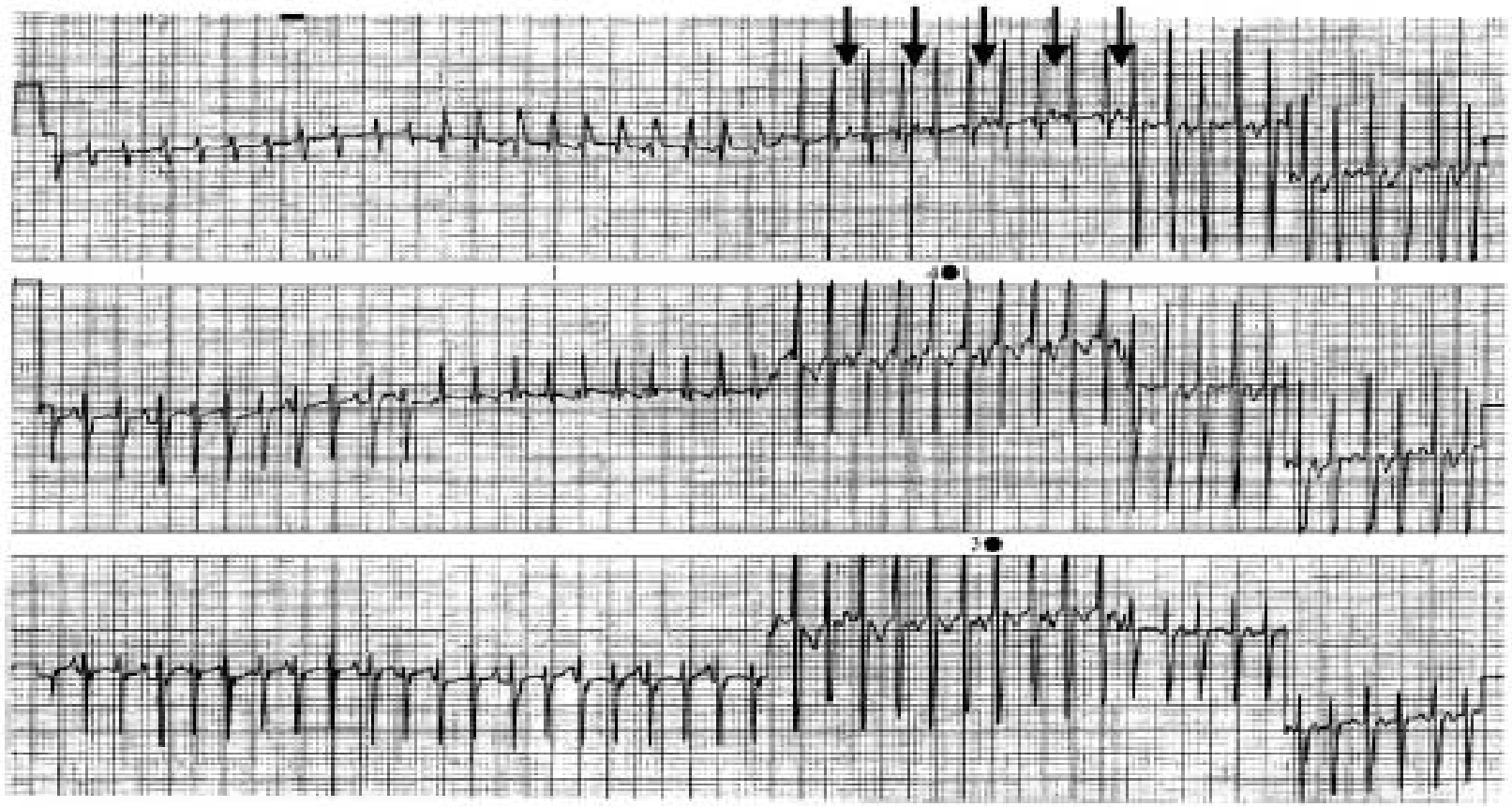
Taquicardia ventricular



- Menos de 1% de las taquiarritmias en fetos y lactantes (0,3 episodios por 100.00 lactantes)

- En la mitad de los casos relacionado con cardiomiopatía hipertrófica, QT prolongado, displasia ventricular derecha, cardiopatías congénitas

. Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.
Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library



Ventricular tachycardia. In the infant, ventricular tachycardia can be mistaken for supraventricular tachycardia, because the QRS is often only slightly wider than normal. The normal QRS duration in an infant is less than 0.08 seconds. Note in lead V1 that there is AV dissociation during tachycardia (*arrows* depict the P waves). This infant had an LV tumor.

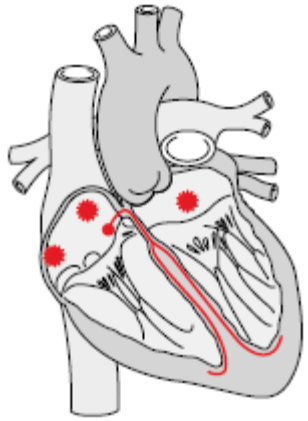
Fetal. Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007, 627-652.

Manejo Taquicardia ventricular

- ***Prenatal***: betabloqeadores, flecainide, sotalol, lidocaína
- ***Postnatal***: cardioversión eléctrica sincronizada 0.5 a 1 j/kg
- Si esta estable se puede administrar lidocaína o amiodarona endovenosa
- **PRONÓSTICO** : en caso de patología cardiaca un 36 % de mortalidad, buen pronòstico en individuos sanos

FetPerinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Taquicardia auricular multifocal



- En lactantes menores de 1 año y desaparece alrededor de los 3 años
- 3 o más ondas P ectópicas con 3 o más diferentes ciclos P-P ectópicos con PR variable y onda P bloqueadas
- Asociado a defectos auriculares septales
- Puede ser necesaria la ablación quirúrgica

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996. Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

Fig. 12. Chaotic (multifocal) atrial tachycardia. Note the changing patterns of atrial rhythm on the two-lead rhythm strips. Chaotic atrial tachycardia often varies in rate and rhythm, with some periods resembling atrial flutter and other periods resembling complex atrial ectopy. Some sinus rhythm also can be noted (*top tracing, right side*).

Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007, 627-652.

Ritmo ventricular acelerado

- Forma de taquicardia ventricular que puede producirse en recién nacidos sanos y es más benigna
- El ritmo es normal con frecuencia cercana a la sinusal normal
- Desaparece antes de los 2 a 3 meses de edad

BRADICARDIA

- Menos del 5% de arritmias en fetos y lactantes
- Más frecuente bradicardia sinusal
- Bradicardia no sinusal se relaciona con disfunción del nodo sinusal que puede ser idiopática o secundario a cardiopatía congénita
- El pronóstico depende de la causa subyacente

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996.

Eur J Pediatr (2014) 173:983–996

Causes of sinus bradycardia in fetuses or infants

- Primary sinus node dysfunction
  - Certain myopathies and inflammatory diseases
  - Following cardiac surgery
  - Heterotaxy syndrome associated with absent SA node (left isomerism)
- Autonomic mediated
  - Hypervagotonia
  - Pallid breathholding spells
  - Long QT syndrome
- Medication (antiarrhythmics)
- Situational
  - Vasovagal syncope
  - Carotid sinus pressure
  - Eye surgery
- Central nervous system
  - Tumors
  - Increased intracranial pressure
  - Meningitis
- Metabolic
  - Hypoxia
  - Hypothermia
  - Hypothyroidism
  - Acidosis
- Sepsis

Alteraciones de conducción auriculoventricular

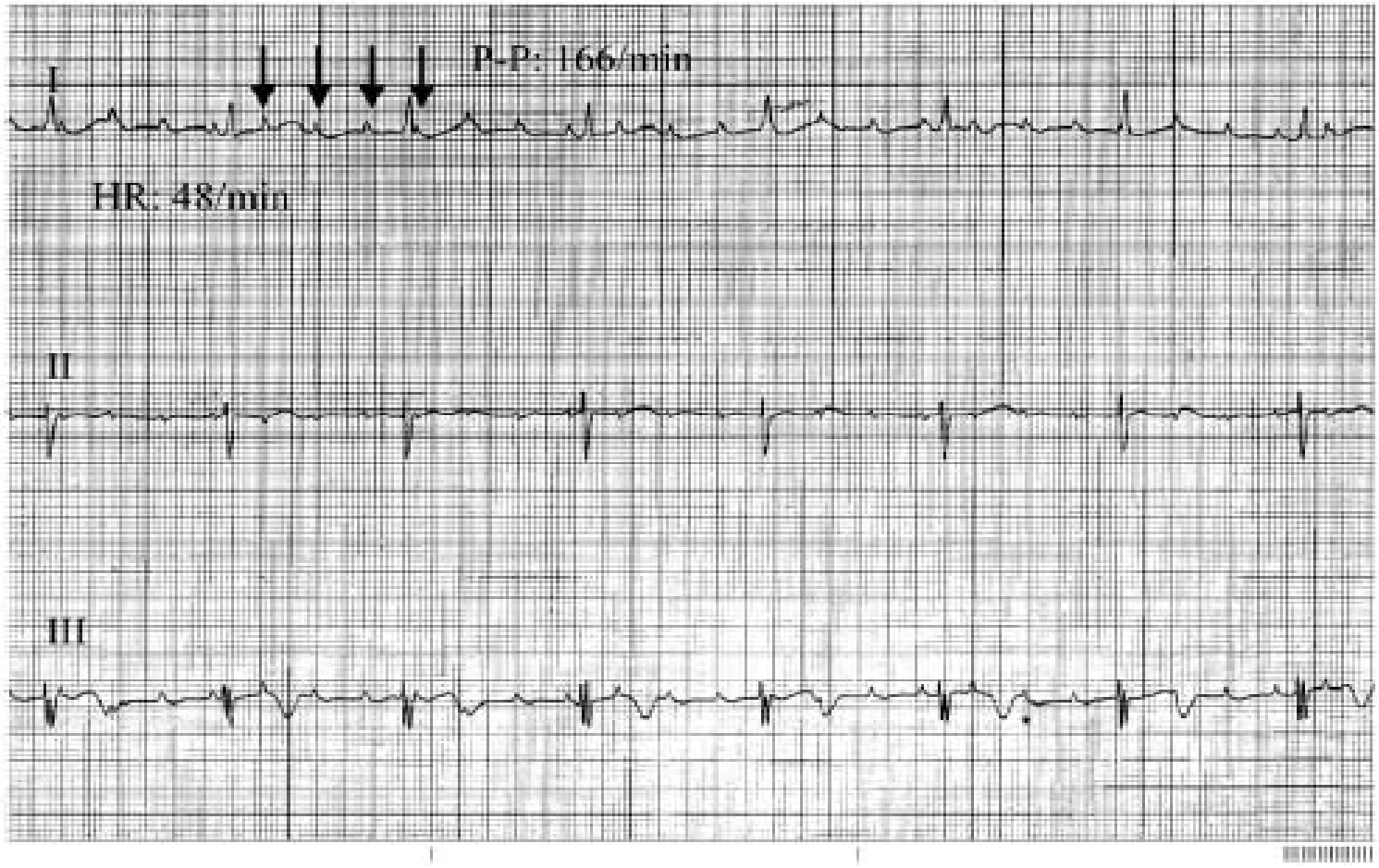
- **BLOQUEO AURICULAR COMPLETO**

-Relacionado con isomerismo izquierdo, defectos del septo auriculoventricular, transposicion de grandes vasos, autoanticuerpos maternos, luego de cirugías cardíacas

-Falla cardíaca e hidrops se produce del 9 al 27%

- ***MANEJO***: Corticoides prenatales,salbutamol transplacentario
  Isoprotenerol, atropina,adrenalina
  Marcapasos

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996. Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman...



Third-degree AVB. Twelve-lead ECG showing third-degree CAVB. The atrial rate is 166 beats/min, whereas the ventricular rate is only 48 beats/min. Note the AV dissociation with P waves (*arrows*) marching through the onset of the QRS. Also note that the QT is prolonged.

PRONÓSTICO

- 20 al 40 % de sobrevida en los pacientes con cardiopatía congénita(resto 80-90%)
- Cardiomiopatía dilatada se observa en aproximadamente en el 25% de los sobrevivientes

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Bloqueo AV de segundo grado

- ***MOBITZ I***

-Es una condicion fisiológica

-Puede evoluciona a tercer grado

- ***MOBITZ II***

-Frecuentemente relacionado con autoanticuerpos maternos o lesiones traumáticas

-Marcapaso cuando luego de una cirugía se produce un bloqueo avanzado

Fetal Neonatal Supraventricular Tachyarrhythmias, J. Pike and A. Greene; Neoreviews 2012 ; 13; e605 . Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014, 173:983-996. Perinatal Arrhythmias: Diagnosis and Management; J. F. Strasburger, B. Cheulkar, H. J. Wichman.. Clinics in Perinatology; 34 , 2007, 627-652. Concise Guide to Pediatric Arrhythmias, Ch. Wren; Wiley Online library 9781119979487.

Bloqueo de primer grado

- PR normal es menos de 160 ms el primer día de vida y disminuye hasta 130 ms a los 3 meses de edad

- Principalmente condición benigna(sueño profundo) pero también puede relacionarse con cardiopatías congénitas, antiarrítmicos, hipotiroidismo,miocarditis,trauma quirúrgico.

Perinatal Arrhythmias, N. Sekarski, J. Meijboom, S. Di Bernardo, T. Boulos, Y. Mivelaz; Eur J. Pediatr 2014.

GRACIAS