Young women with sudden tachyarrhythmic event

Mujer joben con súbito evento arritmico

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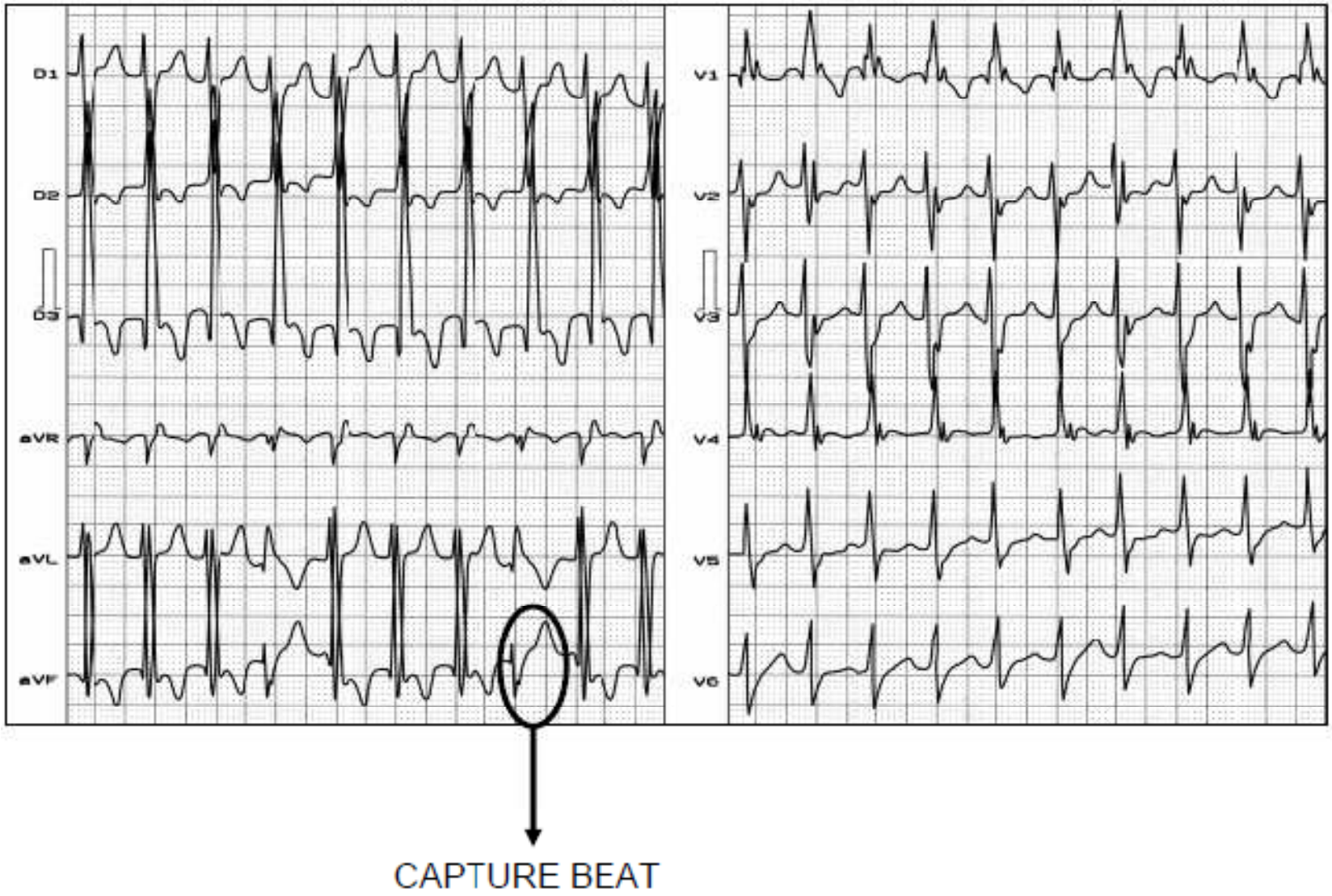
D1
D2
D3
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
CAPTURE BEAT

Colleagues opinions

Left anterior fascicular tachycardia with two capture beats with RBBB

Taquicardia fascicular antero-superior con dos latidos de captura y BRD

Taquicardia fascicular ântero-superior com dois batimentos de captura e BRD

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En el ECG no se observa ritmo sinusal y la FC está cercana a 150 spm; Las ondas T están deformadas, y en algunos latidos picudas, como que allí puede estar una onda P. Hay un Hemibloqueo Posterior asociado a un BCRD y muy probable sobrecarga importante de cámaras derechas, a juzgar por el eje eléctrico en aprox +120°y las pequeña s del BRD qu e recién se manifiestan las S desde v2 a V6;
-Probable Taquic. auricular vs AA 2:1
Clínicamente:
- Probable Hipertensión Pulmonar primaria Vs TEPA.
- Probable cardiopatía congénita con sobrecarga/hipertrofia de cámaras derechas;
Saludos
Carlos a Soria

The rhythm is not in sinus rhythm, Heart Rate near 150bpm. Deformed T waves with several of its showing acute apexes (hidden P waves?). I observe a LPFB associated with Complete RBBB and severe RVH: QRS axis +120º. primary pulmonary hipertension? Acute pulmonary embolism? Probable congenital heart disease with
RVH.
Greeting
Dr Carlos Soria. Argentina.

Andrés Reply/question

Dear colleague I have two questions that I would like that you respond to me:
1) You said that this rhythm is not sinus. So, which is the rhythm?
2) You said that there is a LPFB and that furthermore it has overload of the right chambers. Do you agree that the LPFB diagnosis is only possible in absence of RVH among others things? Rosembaum wrote in his classic book "los hemibloqueos" ("The hemiblocks"): " LPFB diagnosis must be always clinical-electrocardiographic in the absence of aesthetic biotype (vertical heart in drop), RVH, or lateral infarct.
Andrés.

Andrés, impresiona ser una taquicardia ventricular izquierda fascicular que se origina en el fasciculo anterior (imagen de BCRD+AQRS inferior). En el plano frontal hay dos latidos con diferente morfología que se anticipan, pudiendo ser latidos de fusión o latidos de captura. Siempre hay que hacer diagnóstico diferencial con TSV. Es una TV de corazones sanos. Puede desencadenarse por el ejercicio y el stress mental. Debutan con palpitaciones. El síncope o la MSC son raros. Tienen buen pronóstico y se curan con la ablación.
Veremos que traés debajo del poncho. Abrazo.
Oscar Pellizón MD Argentina.

Dear Andrés I think that it is an Idiopathic Left Ventricular Tachycardia (ILVT) originated from left anterior fascicle.
I observe two beat suggestive of fusion or capture beats. This entity has not structural heart disease. The triggers could be exercises and mental stress. Palpitations Is the first complaint. Syncope or SCD are infrequent. This TV has a good prognosis and the choose approach is ablation.
Let's see what do you have under the poncho*.
Dr Oscar Pellizón

'(Clothing & Fashion) a cloak of a kind originally worn in South America, made of a rectangular or circular piece of cloth, esp wool, with a hole in the middle to put the head through (from American Spanish, from Araucanian pantho woollen material).

There is no doubt that this is VT. I do agree with Josep Brugada's diagnosis. This also can be called "Inverse Belhassen VT" !!@@!!! but the name given by Josep is the right one.
Best regards

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No hay dudas esta es una TV, Concuerdo con el diagnóstico de Josep Brugada. Esta también pode ser llamada "TV inversa de Belhanssen" pero el nombre dado por Josep es el correcto.
Saludos BB

Andrés commentaries: Belhassen et al[1] were the first to report on the characteristic termination of this VT with intravenous verapamil, hence accounting for the terms Belhassen VT and verapamil-responsive or sensitive VT to describe the condition.

1. Belhassen B, Rotmensch HH, Laniado S. Response of recurrent sustained ventricular tachycardia to verapamil. *Br Heart J.* 1981;46:679–682.
2. Quimby TW, Clark AA, Fix ML. Idiopathic ventricular tachycardia: belhassen type. West J Emerg Med. 2010 Sep;11:389-390.
3. Weaver L, Curry M, Schakenbach L, Yakobitis K. Belhassen ventricular tachycardia: a case study. Crit Care Nurse. 2010 Oct;30:71-77.

Left anterior fascicular VT with right bundle branch block (RBBB) like-pattern and right-axis deviation (uncommon form)

Others denominations

Idiopathic fascicular ventricular tachycardia, Idiopathic Left Ventricular Tachycardia (ILVT), Ventricular tachycardia with narrow QRS complexes, Ventricular tachycardia with “relatively” narrow QRS complexes, verapamil-responsive or sensitive VT, Belhassen type VT, borderline-broad complex tachycardia.

Characteristics

1. Relatively narrow QRS complex. QRSd = 120ms (between 120 to 140ms)
2. RBBB-like pattern
3. Right axis deviation with LPFB like-pattern (uncommon form) 5% to 10% of cases.
4. Eventual capture and/or fusion beats
5. Observed predominantly in young patients between 15 to 40yo.

ILVT Subtypes1

1) Left posterior fascicular VT with a RBBB) pattern and left axis deviation (common form): 90% to 95% of cases.
2) Left anterior fascicular VT with RBBB pattern and right-axis deviation (uncommon form) or "Inverse Belhassen VT" (for me a new nomenclature, but very appropriate!!!”) 10 to 15% Would indicate anterograde conduction over the left anterior fascicle with retrograde conduction over the left posterior fascicle.
3) Upper septal fascicular VT with a narrow QRS and normal axis (rare form). <1%

1. Nogami A. Idiopathic left ventricular tachycardia: assessment and treatment. *Card Electrophysiol Rev.* 2002;6:448–457.

Others characteristics

1. Relatively narrow QRS.(between 120 to 140ms)
2. Usually seen in individuals without structural heart disease.
3. Masculine predominance: 70% of cases.
4. Age between 15 to 40 years old.
5. Macro-reentrant mechanism: positive entrainment.
6. Responsive to verapamil3 or verapamil-sensitive VT
7. A presystolic or diastolic potential preceding the QRS, from the Purkinje fibers can be recorded during sinus rhythm and VT in many patients.
8. Frequent premature ventricular contractions which progressed to runs of sustained VT4.
9. It can be confused with VT and supraventricular tachycardia5. Incorrect diagnose of supraventricular tachycardia with aberrant conduction are very frequent.
10. Rarely sudden death
11. Negative SAECGs analyzed in the time domain
12. Treatment: patients with syncope, or presyncope, recurrent sustained VT and with intolerance to verapamil are appropriate for ablation. Asymptomatic or with rare palpitations verapamil 160 to 320 mg/day.

1. Cohen HC, Gozo EG, Jr, Pick A. Ventricular tachycardia with narrow QRS complexes (left posterior fascicular tachycardia) *Circulation.* 1972;45:1035–1043.
2. Zipes DP, Foster PR, Troup PJ, et al. Atrial induction of ventricular tachycardia: reentry versus triggered automaticity. *Am J Cardiol.* 1979;44:1–8.
3. Belhassen B, Rotmensch HH, Laniado S. Response of recurrent sustained ventricular tachycardia to verapamil. *Br Heart J.* 1981;46:679–682.
4. Quimby TW, Clark AA, Fix ML. Idiopathic ventricular tachycardia: belhassen type. West J Emerg Med. 2010 Sep;11:389-390.
5. Chew HC, Lim SH. Verapamil for ventricular tachycardia. Am J Emerg Med. 2007 Jun;25:572-575.

IMMEDIATE RESTING ECG

Non-specific transient inferolateral T-wave changes may be present after cessation of event.

The ECG morphology changes after ablation were divided into two categories:

- With new or deepening Q wave in inferior leads and/or disappearance of Q wave in leads I and VL
- Without change.

HISTORICAL BACKGROUND

May 1972: Cohen et al[1]. First description: VT with a relative narrow QRS complexes (≤140ms).

1979: Zipes et al[2] reported three patients with VT characterized by QRS width of 120 to 140 ms, RBB pattern and extreme left-axis deviation. These authors described the characteristic triad:
1) Induction with atrial pacing
2) RBBB pattern with extreme left axis deviation
3) Without structural heart disease

1981: Belhassen et al[3] were the first to report on the characteristic termination of this VT with intravenous verapamil, hence accounting for the terms Belhassen VT and verapamil-responsive VT to describe the condition.

1) Cohen HC, et al.Circulation. 1972; 45:1035-1043.
2) Zipes et al. Am J Cardiol. 1979; 44:1–8.
3) Belhassen B, et al. Br Heart J. 1981;46:679–682.

MVT WITHOUT APPARENT STRUCTURAL HEART DISEASE

CLASSIFICATION

1) MVT sensitive to adenosine by triggered activity.
2) MVT sensitive to verapamil by intrafascicular reentry.
3) MVT sensitive to propranolol and automatic.
4) Undifferentiated MVT.

1) MVT SENSITIVE TO ADENOSINE BY TRIGGERED ACTIVITY

SENSITIVE TO ADENOSINE (TRIGGERED ACTIVITY): MORPHOLOGY:
LBBB with inferior axis, RBBB; inferior axis; RBBB, superior axis.

INDUCTION: programmed stimulation +- catecholamines.

MECHANISM: triggered activity mediated by cyclic adenosine monophosphate (cAMP).

SENSITIVE: adenosine, verapamil and propranolol.

“ENTRAINMENT”: negative.

2) MVT SENSITIVE TO VERAPAMIL BY INTRAFASCICULAR REENTRY

MORPHOLOGY:

Left posterior fascicular VT with a RBBB) pattern and left axis deviation (common form): 90% to 95% of cases.

Left anterior fascicular VT with RBBB pattern and right-axis deviation (uncommon form) or "Inverse Belhassen VT" (for me a new nomenclature, but very appropriate!!!") 10 to 15% Would indicate anterograde conduction over the left anterior fascicle with retorgrade conduction over the left posterior fascicle.

Upper septal fascicular VT with a narrow QRS and normal axis (rare form). <1%

MECHANISM: reentry.

"ENTRAINMENT": positive;

SENSITIVE: verapamil and + - propranolol.

3) MVT SENSITIVE TO PROPRANOLOL AND AUTOMATIC

INDUCTION: catecholamines. Induced by incessant exercise.

MORPHOLOGY: RBBB or LBBB or left ventricle or polymorphic.

MECHANISM: increased automaticity.

“ENTRAINMENT”: negative.

SENSITIVE: transient/permanent suppression with propranolol. Transient suppression with adenosine or with no effect.

4) UNDIFFERENTIATED MVT

INDUCTION: by exercise.

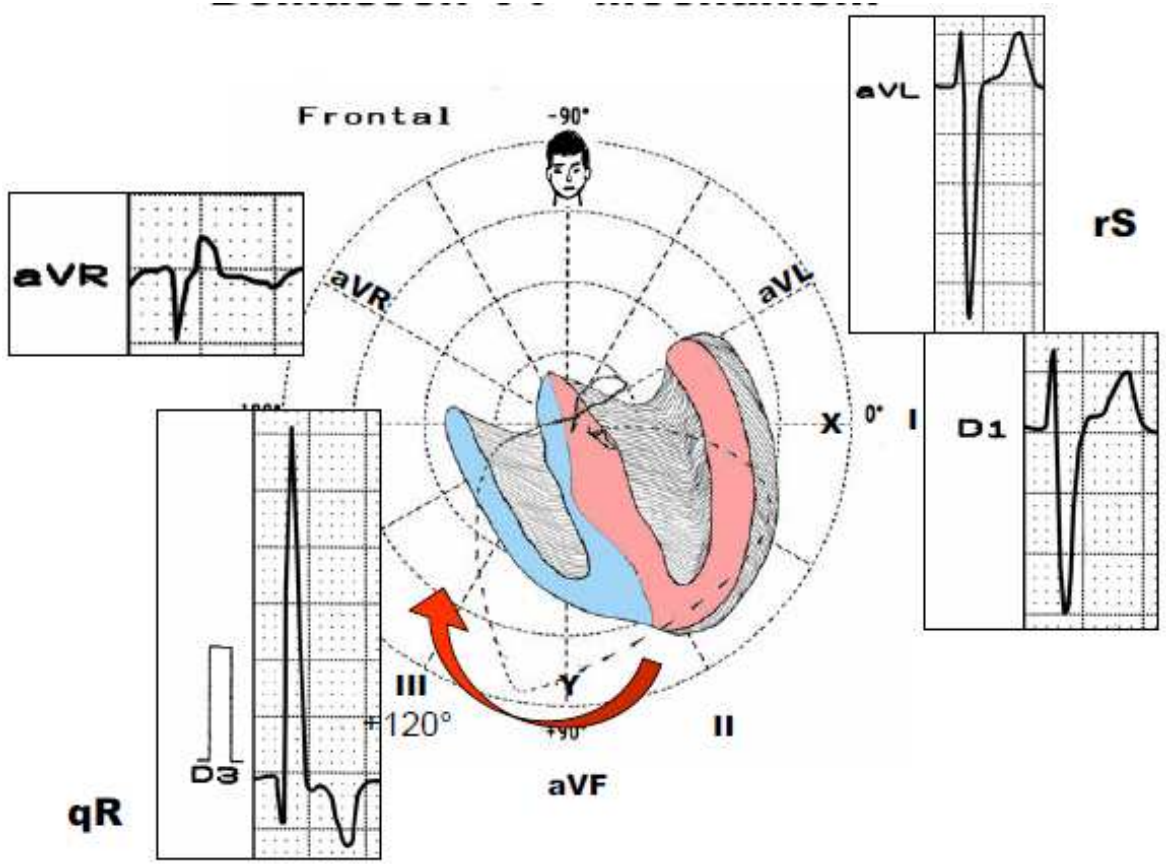
MORPHOLOGY: LBBB with left axis. VT of RV outflow tract.

MECHANISM: reentry.

“ENTRAINMENT”: positive.

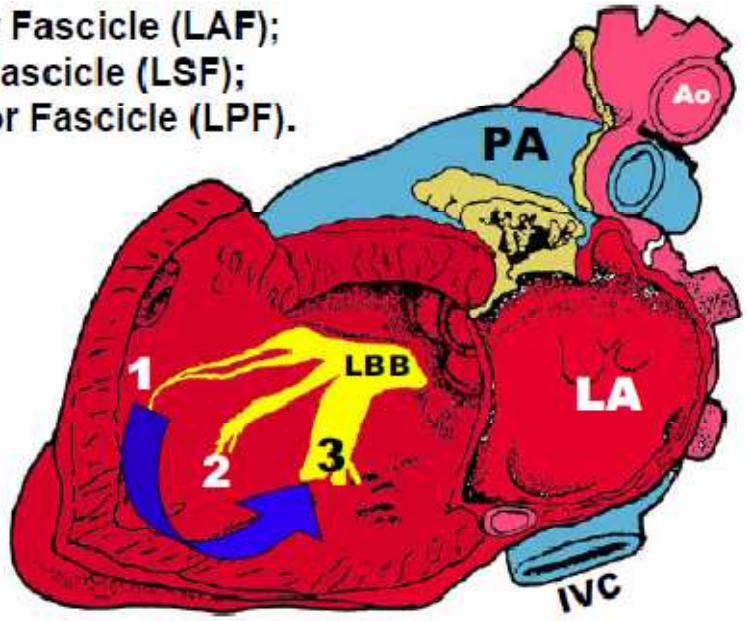
SENSITIVE: adenosine, propranolol or verapamil: negative.

Left anterior fascicular VT with RBBB pattern and right-axis deviation (uncommon form) or "Inverse Belhassen VT" Mechanism



"Inverse Belhassen VT" Mechanism

1) Left Anterior Fascicle (LAF);
2) Left Septal Fascicle (LSF);
3) Left Posterior Fascicle (LPF).



Anterograde conduction over the left anterior fascicle (LAF) with retrograde conduction over the left posterior fascicle (LPF).

Criteria required to diagnose left interfascicular tachycardia[1]

1) RBBB morphology during the event which is similar to that recorded in sinus rhythm

2) Reversal in activation sequence of the His and left bundle potentials during the event.

3) An H-V interval shorter during the event than sinus rhythm

4) Spontaneous oscillations of tachycardia cycle length due to changes in the left bundle – left bundle interval that precede and drive the ventricular cycle length

5) Termination of tachycardia with ventricular extrastimuli or radiofrequency ablation that produces block in either of the two fascicles.

1. Lerman BB. Ventricular Tachycardia in Patients with Structurally Normal Hearts. In CARDIAC ELECTORPHYSIOLOGY From Cell to Bedside Fifth Edition Zipes PD & Jalife J. Saunders Elservier. 2009; Chapter 61, pp: 657-668.

Idiopathic VT is a generic term that refers to VTs that occur in patients without structural heart disease. They can arise from a variety of specific areas within both ventricles and in the supravalvular regions of the great arteries. Five groups need to be differentiated: two main and two miscellanies:

1. From the Right Ventricular Outflow Tract (RVOT): VT/premature ventricular complexes (PVCs) particularly in the sinuses of Valsalva or the anterior epicardium or the great cardiac vein. 80% of cases.
2. From the LVOT(20%) the superior basal region of the left interventricular septum, the aortomitral continuity, aortic coronary cusps, and epicardial sites in the region of the great cardiac and anterior interventricular veins.
3. Fascicular, tachycardias (ILVTs). Idiopathic fascicular ventricular tachycardia, Idiopathic Left Ventricular Tachycardia (ILVT), Ventricular tachycardia with narrow QRS complexes, Ventricular tachycardia with “relatively” narrow QRS complexes, verapamil-responsive VT, Verapamil-sensitive VT, Belhassen type VT.
4. Originating in the left ventricular (LV) papillary muscles (PAMs)1.
    - From the posterior papillary muscle (PPM)
    - From the anterior papillary muscle (APM)
5. Originating in the atrioventricular annular regions (MAVT/PVC).
    - From the anterolateral portion of the mitral annulus (AL-MAVT/PVC)
    - From the posterior portion (Pos-MAVT/PVC)
    - From the posteroseptal origin (PS-MAVT/PVC).

1. Good E, Desjardins B, Jongnarangsin K, Oral H, Chugh A, Ebinger M, et al. Ventricular arrhythmias originating from a papillary muscle in patients without prior infarction: a comparison with fascicular arrhythmias. Heart Rhythm.2008 Nov;5:1530-1537.

2. Yamada T, Doppalapudi H, McElderry HT, Okada T, Murakami Y, Inden Y. et al. Idiopathic ventricular arrhythmias originating from the papillary muscles in the left ventricle: prevalence, electrocardiographic and electrophysiological characteristics, and results of the radiofrequency catheter ablation. J Cardiovasc Electrophysiol. 2010 Jan;21:62-69.

ECG differential diagnosis

In other context could be a SVT with intraventricular aberrancy, with high rate of ventricular response (average HR 150bpm)

Right QRS axis deviation: near + 120º

QRS duration (QRSd) = 120ms

Complete Right Bundle Branch Block (CRBBB) like-pattern

SI-QIII-TIII: Mc Ginn-White Pattern. Scott propose that this pattern could be a Left Posterior Fascicular Block.

rS pattern in lead I. There is an inverse correlation between the right ventricular systolic pressure and the R/S ratio in lead I1.

QRS complex with tetraphasic pattern qRsr´and rsr´s´ indicative of intraventricular right intra-ventricular morphology.(RV dilatation)

RS pattern in left precordial leads(V5-V6) indicative of RVH

1. Ryu HM, Lee JH, Kwon YS, Lee SH, Bae MH, Lee JH, et al. Electrocardiography patterns and the role of the electrocardiography score for risk stratification in acute pulmonary embolism. Korean Circ J. 2010 Oct;40: 499-506.