

Safe right bundle branch block pattern during permanent right ventricular pacing: a case report

Sağ ventriküle kalıcı kalp pili yerleşimi sırasında güvenli sağ dal blok paterni: Olgu sunumu

Abdelkarim Errahmouni, M.D., Jean Christophe Charniot, M.D.,
Jean Yves Artigou, M.D.

Department of Cardiology, Avicenne Hospital, (Assistance Publique Des Hôpitaux De Paris), Bobigny, France

Summary– We present the case of a 72-year-old male who underwent a permanent transvenous DDD pacemaker implantation for symptomatic complete heart block. The post-operative surface electrocardiogram (ECG) revealed a right bundle branch block (RBBB) pacing pattern with transition in lead V3 and left bundle branch block (LBBB) in D1, suggesting a malpositioned ventricular lead in the left heart. Malposition of a lead was ruled out by chest X-ray and echocardiogram confirming apical right ventricular pacing. After a literature review, a surface ECG maneuver, by placing leads V1 and V2 one intercostal space lower, restored the usual patterns of paced LBBB pattern. We discuss the literature concerning safe-paced RBBB.

Özet– Bu yazıda, semptomlu tam kalp bloku için venöz yolla kalıcı DDD kalp pili takılmış 72 yaşındaki bir erkek olgu sunuldu. İşlem sonrası dönemde yüzey elektrokardiogramı (EKG) V3'de geçişli sağ dal bloku (RBBB) ritim kalıbını, D1'de ise sol kalpte hatalı yerleşimli elektrodu düşündüren sol dal blokunu (LBBB) ortaya çıkardı. Göğüs filmi elektrodun hatalı konumda olmadığını gösterdi, eko-kardiogram sağ ventriküler apeks ritminin varlığını doğruladı. Literatür gözden geçirildikten sonra, yüzey EKG'sinin V1 ve V2 elektrotları bir interkostal mesafe aşağıya yerleştirilerek normal LBBB ritim kalıplarına yeniden kavuşuldu. Bu sunumda, güvenli RBBB uyarımına ilişkin literatür tartışıldı.

Left bundle branch block (LBBB) is the assumed presentation of right ventricular pacing. Paced right bundle branch block (RBBB) raises the suspicion of lead malposition. In a well placed right ventricular lead an atypical conduction pattern must be evoked. It is important to differentiate malposition from well placed ventricular lead because malposition

is associated with embolic complications and may require therapeutic interventions including anticoagulation or radical lead replacement.

Abbreviations:

ECG Electrocardiogram
LBBB Left bundle branch block
RBBB Right bundle branch block
RV Right ventricle

We report a case of a paced RBBB pattern despite a well-placed right ventricular lead, as confirmed by chest X-ray and echocardiography. We discuss the literature concerning safe paced RBBB.

CASE REPORT

A 72-year-old male was admitted to our hospital for new-onset history of syncope. His physical examination was unremarkable except for a slow heart rate (44 beats/min). His initial electrocardiogram (ECG) showed complete heart block with an escape rhythm at the rate of 44 beats/min and QRS complex duration <100 ms (Fig. 1a).

A transvenous dual chamber pacemaker was implanted. The postoperative course was uneventful with normal physical examination, but the initial ECG showed an unusual RBBB pattern with LBBB in lead D1. QRS on the frontal axis was around -70° with exclusive R wave in V1 and V2 leads. Precordial transition occurred by lead V3 (Fig. 1b). Malposition of a ventricular lead was suspected and an echocardiography was

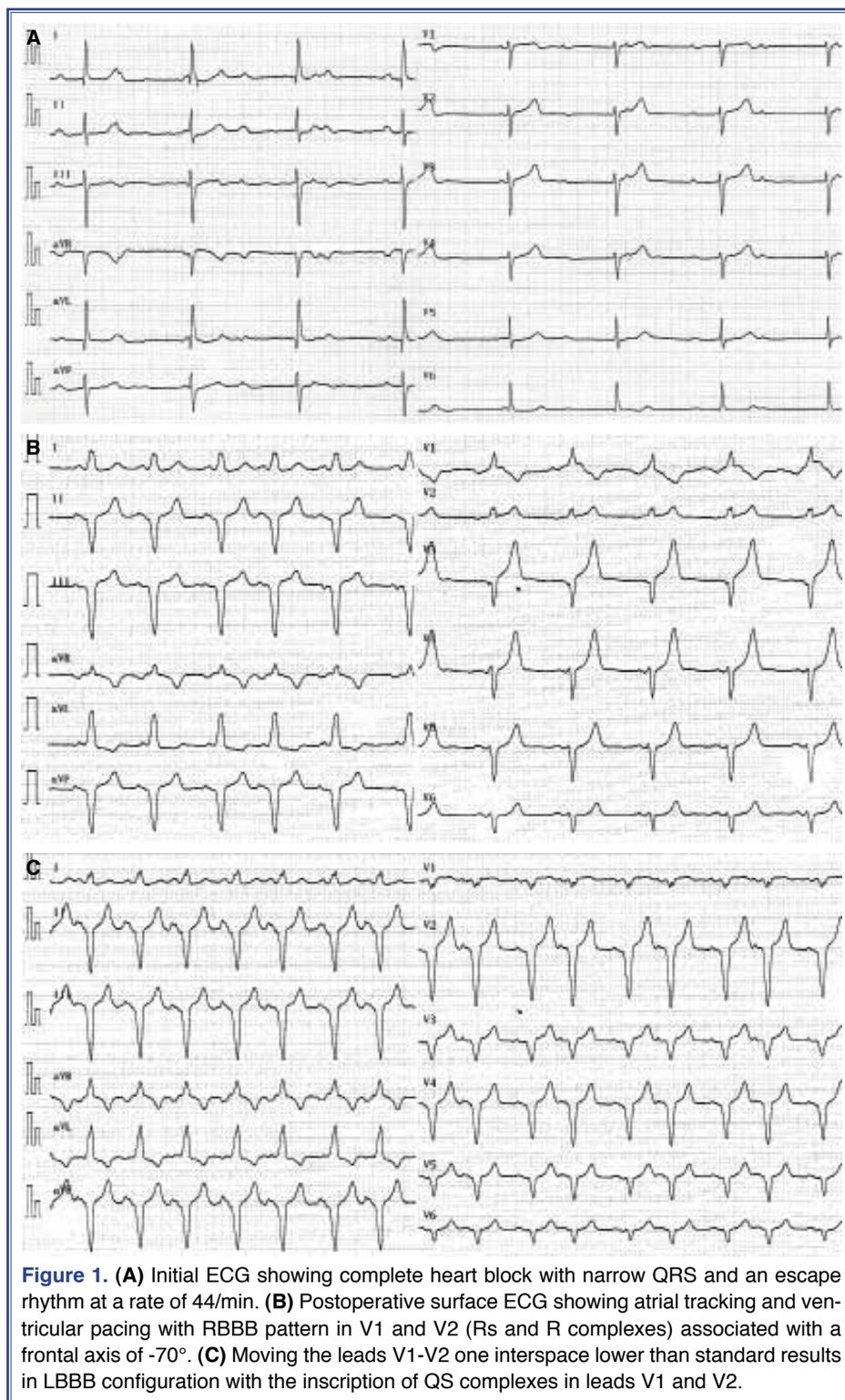
Received: September 21, 2012 Accepted: November 16, 2012

Correspondence: Dr. Abdelkarim Errahmouni. 125 Route De Stalingrad, 93009 Bobigny Cedex, France.

Tel: +33 1 48 95 53 22 e-mail: a.errahmouni@gmail.com

© 2013 Turkish Society of Cardiology





performed, which ruled out this diagnosis by showing a correct position of the ventricular lead traversing the tricuspid valve and lying in the right ventricle (RV) apex without pericardial effusion (Fig. 2). After a literature

review, an ECG maneuver by placing leads V1 and V2 one intercostal space lower than standard eliminated the RBBB pattern (Fig. 1c), and the pacemaker was deemed by the cardiologist to be operating properly.



Figure 2. Echocardiography, subcostal view, showing the correct position of the ventricular lead traversing the tricuspid valve.

DISCUSSION

During ventricular pacing, the configuration of the QRS complex depends upon the site of stimulation. The expected morphology of RV pacing is a LBBB pattern consequent to delayed activation of the left ventricle (LV) or QRS duration <100 ms when the lead is located in the mid-septum.

Paced RBBB can occur in the case of RV free wall perforation, malposition of a lead in the left heart through a septal defect, septal perforation, coronary sinus pacing, or retrograde transarterial pacing.^[1-3] These situations can create serious clinical problems, like a need for immediate surgical revision in the case of free RV wall perforation, lead removal, or need for lifelong anticoagulation.

In some cases, RBBB patterns may occur during RV pacing despite correct placement of the pacing lead.^[4] Therefore, it is important to determine whether a RBBB pattern induced by ventricular pacing is the result of a malpositioned lead or is due to uncomplicated transvenous RV pacing even in asymptomatic patients. Klein et al.^[5] designated this finding as pseudo RBBB pattern after a report of eight patients with RBBB patterns in leads V1 and V2, LBBB patterns in lead I, and pacing leads located in the RV apex. They also recognized that placement of leads V1 and V2 one interspace lower than standard will usually, as their experience has shown, eliminate the RBBB appearance and result in the inscription of deep QS or rS complexes in V1-V2. They also reported that place-

ment of leads V1 and V2 higher than the usual space enhanced the pattern of this finding of pseudo RBBB.

Coman et al.^[6] reported four patients with safe-paced RBBB, and in each of them, the RV lead was located in the mid-septum. RBBB pattern could not be eliminated by movement of leads V1 and V2. Hence, they suggested that this technique reliably distinguished patients with mid-septal leads from those with leads in the distal septum and apex. A similar case with apical RV pacing was reported by Yang et al.^[4]

An algorithm to separate RV and LV pacing morphologies using the frontal axis and precordial transition was developed by Coman et al.^[6] They suggested that after excluding LV pacing from the proximal and mid-septum, a frontal axis of 0° to -90° and precordial transition by V3 separates uncomplicated RV septal or apical pacing from all other forms of LV pacing with 86% sensitivity, 99% specificity, and 95% positive predictive value.

In our case, the frontal plane axis was approximately -70° and precordial transition occurred by V3, which suggested an uncomplicated RV apical pacing according to Coman's algorithm. Further, paced RBBB pattern was eliminated by moving leads V1-V2. This diagnosis was supported by the echocardiography showing the pacing lead lying in the RV apex.

As to the mechanism of the RBBB patterns in cases in which the lead is placed normally, several hypotheses have been proposed. One plausible mechanism proposed by Mower et al.^[7] was that portions of the interventricular septum, which are anatomically RV, may behave functionally and electrically as LV. Barold et al.^[8] suggested that the RBBB pattern could be the result of a combination of RV activation delay due to severe disease of the RV conduction system and early penetration of the electrical impulse into the LV conduction system.

Safe uncomplicated RBBB pattern may be seen with correctly positioned RV leads. At the time of bedside echocardiography, ruling out malposition of a lead can be made rapidly and accurately. However, careful analysis of the surface ECG with an algorithmic approach combining frontal axis, precordial transition and simple diagnostic maneuvers may correctly identify the correct position of a pacing lead.

Conflict-of-interest issues regarding the authorship or article: None declared.

REFERENCES

1. Altun A, Akdemir O, Erdogan O, Aslan O, Ozbay G. Left ventricular pacemaker lead insertion through the foramen ovale—a case report. *Angiology* 2002;53:609-11.
2. Ghani M, Thakur RK, Boughner D, Morillo CA, Yee R, Klein GJ. Malposition of transvenous pacing lead in the left ventricle. *Pacing Clin Electrophysiol* 1993;16:1800-7.
3. Mazzetti H, Dussaut A, Tentori C, Dussaut E, Lazzari JO. Transarterial permanent pacing of the left ventricle. *Pacing Clin Electrophysiol* 1990;13:588-92.
4. Yang YN, Yin WH, Young MS. Safe right bundle branch block pattern during permanent right ventricular pacing. *J Electrocardiol* 2003;36:67-71.
5. Klein HO, Beker B, Sareli P, DiSegni E, Dean H, Kaplinsky E. Unusual QRS morphology associated with transvenous pacemakers. The pseudo RBBB pattern. *Chest* 1985;87:517-21.
6. Coman JA, Trohman RG. Incidence and electrocardiographic localization of safe right bundle branch block configurations during permanent ventricular pacing. *Am J Cardiol* 1995;76:781-4.
7. Mower MM, Aranaga CE, Tabatznik B. Unusual patterns of conduction produced by pacemaker stimuli. *Am Heart J* 1967;74:24-8.
8. Barold SS, Narula OS, Javier RP, Linhart JW, Lister JW, Samet P. Significance of right bundle-branch block patterns during pervenous ventricular pacing. *Br Heart J* 1969;31:285-90.

Key words: Bundle-branch block/etiology; cardiac pacing, artificial; echocardiography; heart block/therapy.

Anahtar sözcükler: Dal bloku/etyoloji; kalp pili, yapay; ekokardiyografi; kalp bloku/tedavi.