Intraoperative Detection of Rate Dependent Left Bundle Branch Block

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Rate dependent left bundle branch block (RDLBBB) is an uncommon case. RDLBBB is defined as an intraventricular conduction defect that may return, if only temporarily, to sinus rhythm at lower heart rates. It appears when the heart rate exceeds a certain critical value. Although RDLBBB is usually benign, its diagnosis and treatment have clinical importance for association of RDLBBB and myocardial ischemia and infarction. Therefore, in the case of detection of intraoperative RDLBBB, a clear differentiation should be done as soon as possible. Also it is important to start appropriate treatment and to do clinical follow-up examination. We report a case of intraoperative RDLBBB during general anesthesia for laparoscopic cholecystectomy in 82 years old female patient who has a history of hypertension.

Keywords: Bundle-branch block; Myocardial ischemia; Electrocardiography; General anesthesia

INTRODUCTION

Left bundle branch block (LBBB) is a common electrocardiographic abnormal finding in hypertensive patients. In a healthy young patient, LBBB may be benign. But in hypertensive or older patients, it may be related to cardiovascular disease [1,2].

Rate dependent left bundle branch block (RDLBBB) is a rare arrhythmia during general anesthesia. RDLBBB is a transient bundle branch block that occurs when heart rate exceeds a certain critical value. Although RDLBBB is usually benign, its diagnosis and treatment have clinical importance for association of RDLBBB and myocardial ischemia and infarction [3]. Therefore, it is necessary to do careful observation and clear differentiation. We report a case of intraoperative RDLBBB during general anesthesia for laparoscopic cholecystectomy in 82 years old female patient who has a history of hypertension.

CASE REPORT

An 82 years old female patient was scheduled for elective laparoscopic cholecystectomy due to gallbladder stones. She had histories of cerebral infarction, Alzheimer’s disease, and hypertension. She was being medicated with calcium channel blocker and beta blocker for the treatment of hypertension for 10 years. Preoperative laboratory values were within normal limits. Preoperative electrocardiogram (ECG) was normal sinus rhythm with heart rates at 60 beats per minute (bpm). Cardiac echocardiography revealed mild diastolic dysfunction with normal ventricular systolic function and normal chamber sizes.

Glycopyrrolate 0.2 mg was given intramuscularly 30 minutes before arriving at operation theatre. On arrival in the operating theatre, the patient was monitored using a three-lead ECG, pulse oximetry, non-invasive arterial pressure measurement (Solar 8000; GE, Milwaukee, WI, USA), and a bispectral index monitor (BIS, BIS XP; Aspect Medical Systems, Newton, MA, USA). General anesthesia was induced using infusion pump (Fresenius Kabi, Italy) with propofol (Marsh mode) and remifentanil (Minto mode) at target effect site concentrations of 3.0 μg/mL and 3.0 ng/mL, respectively. Trachea was intubated uneventfully after 2 minutes of bolus rocuronium bromide 0.6 mg/kg. After tracheal intu-
bation, the heart rate increased to 80 bpm and a wide QRS complex with ST depression appeared at lead II on ECG. Blood pressure was within normal limits at this moment. Heart rate gradually decreased to 60 bpm after increasing plasma concentration of remifentanil and propofol to 3.5 ng/mL and 3.5 μg/mL. Then ECG was returned to normal sinus rhythm. As ECG abnormalities was recovered suddenly without accompanying gradual changes in QRS width or ST segment, authors presumed that the ECG finding of this patient is relevant to that of RDLBBB.

During the operation, conversion between RDLBBB and NSR was occurred 5 to 6 times as heart rate changes between early 60 bpm and over 70 bpm. Overall, the ECG finding was NSR when heart rates were within 60 bpm. Operation finished uneventfully. RDLBBB reappeared at emergence phase and continued until the patient stayed at post-anesthesia care unit. Postoperative creatine kinase-MB, troponin-T values were within normal limits. On postoperative day 6, she was discharged from the hospital without any episodes.

**DISCUSSION**

Recently, ECG is one of the most common diagnostic tools in routine clinical setting because of its wide diffusion, undemanding feasibility, and low cost. As a result of its broad use, the finding of LBBB in the absence of well-defined clinical setting has become relatively frequent and raises questions and often concerns [4].

LBBB is a frequent electrocardiographic abnormality in hypertensive patients. Also it may imply associated coronary artery disease, aortic valve disease or cardiomyopathies [5]. In a healthy young adult, isolated LBBB may be benign. But in hypertensive or older patients, it may signify a progressive degenerating myocardium involving cardiac conduction system [1,2]. Incidence of LBBB increases with age [5]. During last 30 years, the prevalence of LBBB in the general population has been reported to vary considerably according to population size, sampling criteria, ranging 0.16% to 0.82% [4]. The prognosis of LBBB has varied widely, mainly as a result of the different population from which the cases were selected, presence or absence of heart disease, and the type and severity of heart disease [6]. Therefore, physicians should be aware of the role of LBBB and investigate the risk of cardiovascular events [4]. Corrado et al. [7] reported that patients who positive findings at basic clinical evaluation, as in the case of LBBB, should be referred for additional testing, initially noninvasive such as echocardiography, 24-hour ambulatory Holter monitoring, and exercise testing. In the selected case, invasive tests such as coronary angiography and electrophysiologic study may be necessary to confirm or rule out the suspicion of the heart disease [7].

Rate dependent bundle branch block is defined as an intraventricular conduction defect that may return, if only temporarily, to sinus rhythm at lower heart rates [8]. The exact mechanism of such a block remains obscure but may result from anatomic and pathologic interruptions in cardiac conducting bundle either due to ventricular enlargement or strain from neurogenic or functional depression with or without underlying pathological lesions of the conducting tissue [9]. RDLBBB occurs when the heart rate exceeds a certain critical value [3]. The onset of RDLBBB is sudden in most patients and once initiated, it persists until the heart rate is slower than that which triggered it [3]. Bauer [9] reported that the transition from normal to abnormal intraventricular conduction may be related alterations of the rate by only 1 or 2 beats/min. This critical heart rate is dependent on change in heart rate. With rapid decrease in heart rate, sinus rhythm may appear at higher rates and with rapid acceleration in heart rate, it may appear at lower heart rates [8]. RDLBBB is usually found in patients with hypertension or coronary artery disease, although up to ten percent may have no evidence of organic heart disease [3,9]. In this case, the patient also had a history of hypertension. And her preoperative ECG finding was normal sinus rhythm with heart rates at 60 bpm. Although RDLBBB is usually benign, its diagnosis and treatment have clinical importance for several reasons. First, it may mask the electrocardiographic manifestations of other less benign disturbances, such as myocardial ischemia and infarction. Second, the ST-T wave changes associated with LBBB may be mistaken for ST-T changes due to ischemia. RDLBBB may also be mistaken for slow ventricular tachycardia and may be inappropriately treated [3]. A clear differentiation of LBBB into a benign RDLBBB, and LBBB associated with myocardial ischemia or infarction, may avoid the unnecessary postponement of a case because of high cardiac risk [8].

Diagnostic methods should first be attempted by observation of changes in conduction with spontaneously occurring changes in heart rate. If the diagnosis is not obvious and the bundle branch block persists, then judiciously changing the heart rate may prove helpful [3]. Pharmacologic and physiologic manipulations which alter heart rate can be used to change conduction in patients with
RDLBBB. Normal conduction is changed to LBBB in these patients by increasing heart rate with exercise, valsalva, arterial cuff release, amyl nitrate, or atropine [3]. Manipulations which slow heart rate such as carotid massage, deep inspiration, and pharmacological agents like neostigmine, edrophonium or propranolol, change the aberrant conduction back to normal with the slowing of heart rate [10,11]. Manipulations which increase heart rate to induce a LBBB should be attempted with extreme caution by careful titration of atropine only after myocardial ischemia has been ruled out. Drug doses should be appropriately chosen to avoid inducing tachycardia and precipitating myocardial ischemia [3]. These provocative maneuvers should be used with caution in patients with hypertension, angina, cerebrovascular or atrioventricular node disease. Prevention of tachycardia and in some cases deliberately slowing the heart rate, can be of diagnostic and therapeutic value [3].

In conclusion, rate dependent LBBB is an uncommon entity. During anesthesia, RDLBBB may be related to hypertension or tachycardia. And its appearance makes the diagnosis of acute myocardial ischemia or infarction difficult. Therefore, in co-morbid patients with LBBB, it is always better to do further cardiac evaluations in order to rule out an associated coronary artery disease. In the case of detection of intraoperative RDLBBB, a clear differentiation should be done as soon as possible. Also it is important to start appropriate treatment and to do clinical follow-up examination.

REFERENCES