

## Right Atrial Diverticulum in an Adult Woman with Left Bundle Branch Block

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### رتج الأذنين الأيمن في امرأة بالغة مع إحصار الحزمة اليسرى

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**ABSTRACT:** Right atrial diverticulum is a very rare anomaly. It is an outpouching arising from the right atrial free wall. Clinical presentations vary widely but some cases are associated with supraventricular tachycardia and atrial flutter/fibrillation. The incidence/prevalence of this anomaly is not available because only a few cases have been reported. We report a 38-year-old female patient who presented to the Heart Clinic, Tehran, Iran in 2019 with a history of dyspnea and chest pain. Electrocardiography revealed left bundle branch block. Following a magnetic resonance imaging study, the patient was diagnosed with a right atrial diverticulum. She underwent surgical resection of the diverticulum. The post-operative course was uneventful and no recurrence of the arrhythmia was detected during the six months of follow-up. To the best of the authors' knowledge, this combination has not been described in the literature.

**Keywords:** Right Atrium; Diverticulum; Left Bundle Branch Block; Case Report; Iran.

**المخلص:** رتج الأذنين الأيمن هو شذوذ نادر جداً. هو تجيب خارجي ينشأ من الجدار الحر للأذنين الأيمن. تتفاوت الأعراض السريرية متفاوتة كبرى ولكن ترتبط بعض الحالات بتسارع القلب فوق البطيني والرفرفة الأذينية/الرجفان الأذيني. معدل حدوث/انتشار هذا الشذوذ غير معروف لأنه لا يتم الإبلاغ إلا عن حالات قليلة فقط. نعرض هنا حالة مريضة تبلغ من العمر 38 عاماً قدمت إلى عيادة القلب، طهران، إيران في عام 2019 ولديها تاريخ من ضيق التنفس وألم في الصدر. كشف تخطيط كهربية القلب عن إحصار الحزمة اليسرى. تم تشخيص المريضة برتج أذيني أيمن بعد دراسة التصوير بالرنين المغناطيسي. خضعت لعملية استئصال جراحي للرتج وكانت مرحلة ما بعد الجراحة خالية من المضاعفات ولم يتم الكشف عن أي تكرار لاضطراب ضربات القلب خلال الأشهر الستة من المتابعة. على حد علم المؤلفين لم يتم وصف هذه التوليفة في الأدبيات.

**الكلمات المفتاحية:** أذنين أيمن؛ رتج؛ إحصار الحزمة اليسرى؛ تقرير حالة؛ إيران.

**S**INGLE RIGHT ATRIAL (RA) DIVERTICULUM, A rare congenital anomaly, is a saccular structure that protrudes from an otherwise normal RA.<sup>1</sup> Most of the diverticula originate from the atrial free wall. The aetiology of this anomaly is not yet clearly understood. The size of the diverticulum is variable. This case report describes a patient with a rare atrial diverticulum and left bundle branch block (LBBB) who underwent surgery successfully. The presence of (LBBB) has not been reported in the English literature to date.

### Case Report

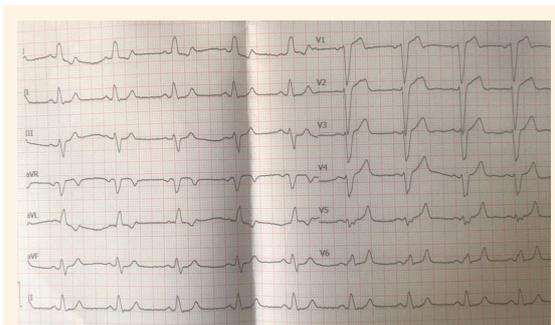
A 38-year-old female patient presented to the Heart Clinic, Tehran, Iran in 2019 with a history of palpitation, dyspnoea on exertion and recurrent chest pain accompanied by three episodes of syncope that occurred two years prior to presentation. She received imipramine for depression but the symptoms did not improve. Therefore, she discontinued it six

months before presenting to the hospital. She had no significant history or family history. Cardiovascular system examination did not reveal any murmurs.

Electrocardiography (ECG) showed sinus rhythm with LBBB [Figure 1]. All laboratory tests were within normal limits. Transthoracic echocardiography showed an echolucent space around the RA approximately 2 × 3 cm in size that was connected to the RA [Figure 2]. Contrast echocardiography was suggestive of an RA diverticulum. The tricuspid valve was normal without significant annular dilation. No stenosis or abnormal displacement of the tricuspid valve leaflets was detected and no significant regurgitation of the tricuspid valve was found. No other cardiac anomalies were found. The left ventricle ejection fraction was 55%. Cardiac magnetic resonance imaging (MRI) showed a 25.2 × 16.5 × 35 mm pouch in the inferior wall of the RA [Figure 3]. The pericardium was visualised without any abnormality. The diverticulum caused no haemodynamic effects. The patient was evaluated by a cardiac team and

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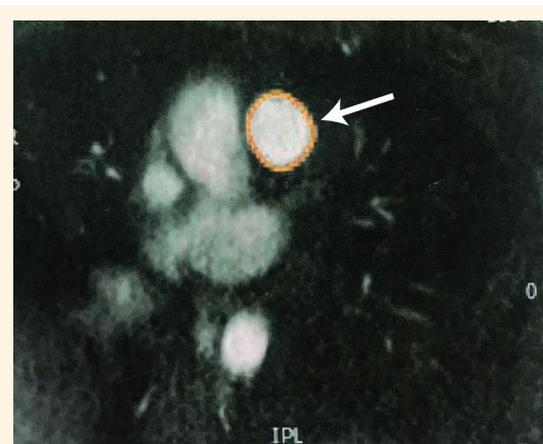


**Figure 1:** Electrocardiogram of a 38-year-old female patient showing left bundle branch block.

due to arrhythmias (LBBB), high risk of thrombus formation and the risk of progression, the patient was scheduled for surgery. Through a median sternotomy, cardiopulmonary bypass was established with aortic and bicaval cannulation. The diverticulum was visible, arising from the free wall of the RA, discrete from the caval veins, coronary sinus and tricuspid valve. Intraoperative findings were consistent with the features of a diverticulum [Figures 4A & B]. There was no thrombus in the diverticulum. Resection of the diverticulum was done and cryoablation of the diverticulum neck was performed successfully. The RA was reconstructed by direct sutures. Histologic examination revealed a thin wall with areas of fibrosis covered by cuboidal cells without muscular tissue suggestive of an atrial diverticulum [Figure 4C]. The postoperative course was uneventful and sinus rhythm was maintained. She was discharged on the sixth postoperative day. After discharge, she remained asymptomatic with no arrhythmias. The patient was still asymptomatic six months after the operation.



**Figure 2:** Echocardiography of a 38-year-old female patient showing a right atrial diverticulum.



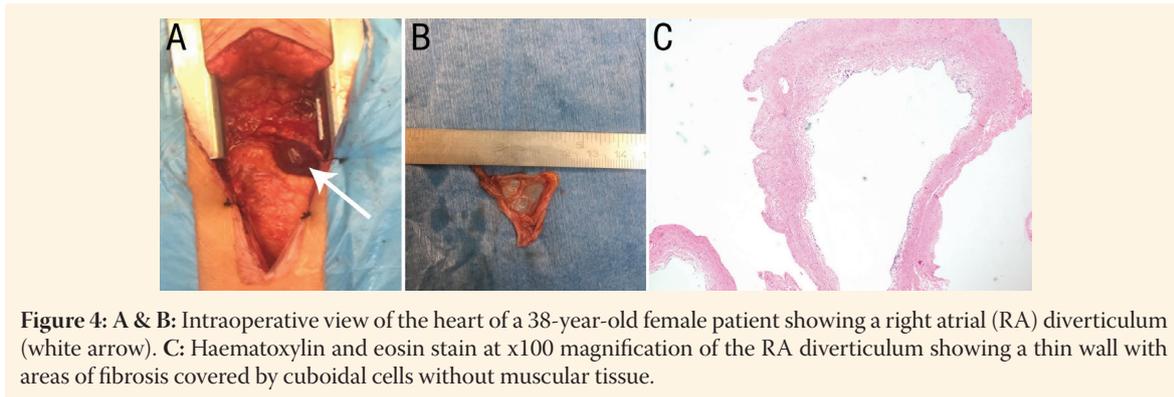
**Figure 3:** Cardiac magnetic resonance image of a 38-year-old female patient showing the finding of a right atrial diverticulum (white arrow).

## Discussion

RA diverticulum is a very rare congenital anomaly with an unclear aetiology. Bailey described the excision of a right atrial diverticulum for the first time in 1953.<sup>2</sup> RA diverticulum is a structure that protrudes from the RA free wall but does not include all layers of the atrial wall.<sup>3</sup> A diverticulum can be detected at any time between fetal and adult life and the size varies with the largest being reported at 13 × 8.9 × 13.8 cm.<sup>4</sup>

This anomaly is usually asymptomatic, but it can be associated with atrial arrhythmia, chest pain, peripheral oedema, shortness of breath, fatigue and jugular engorgement. The incidence of arrhythmia and the clinical outcome of the patients have not been reported to date. Arrhythmia may be caused by abnormal impulses generated within the diverticular wall. Supraventricular arrhythmia has been reported in patients, which is associated with a high risk of morbidity and mortality due to cardiac dysfunction and increased risk of stroke and heart failure.<sup>5,6</sup> The current patient did not have any supraventricular arrhythmias but she did have LBBB on ECG.

While antidepressant agents can cause cardiac arrhythmias, this was not considered for the current patient as she had stopped taking imipramine six months before presenting to the hospital. LBBB is usually associated with coronary artery disease, hypertension and cardiomyopathy. LBBB is usually pathological and is rare in young individuals.<sup>7</sup> In case of cardiac arrhythmia, structural anomalies of the atrium should be suspected. LBBB can progress to complete heart block. The reason for arrhythmia was not clear in the patient but the authors believe that it was caused by structural disorientation of the conduction system, which may allow ample electrical communication



**Figure 4:** A & B: Intraoperative view of the heart of a 38-year-old female patient showing a right atrial (RA) diverticulum (white arrow). C: Haematoxylin and eosin stain at x100 magnification of the RA diverticulum showing a thin wall with areas of fibrosis covered by cuboidal cells without muscular tissue.

between the atrium and ventricle without a well-defined accessory pathway. This is supported by the fact that a normal sinus rhythm resumed when the diverticulum was removed.

The slow flow in the diverticulum is likely to predispose a patient to clot formation and pulmonary embolisation. The incidence of sudden death is approximately 6%.<sup>8</sup> A right atrial diverticulum is usually diagnosed by echocardiography but computed tomography and MRI imaging are also used. Differential diagnosis includes Ebstein's anomaly, aneurysms, pericardial cysts and mediastinal tumours. Although the optimal treatment of this rare anomaly is not clear, surgical excision is the therapy of choice and indicated in arrhythmia, thromboembolism, progressive RA dilatation and compressive symptoms; therapeutic outcomes are good. Other options include resection of the diverticulum with an endoscopic linear cutter through a limited right thoracotomy, but this device is not available in the authors' centre. Transcatheter ablation through the whole diverticulum is crucial for the successful treatment of arrhythmia. Due to a wide connection between the RA diverticulum and right ventricle, transcatheter ablation may not be complete, which may result in recurrence.

## Conclusion

A combination of RA diverticulum and LBBB has not been reported in the literature to date as was presented in the current case. Surgical excision of the diverticulum removes the substrate and cures

the conduction abnormality. Patients do not usually experience the recurrence of conduction abnormality after excision of the diverticulum.

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