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Case Report

Cardio-vocal syndrome as a complication patient with severe mitral regurgitation and moderate aortic regurgitation with pulmonary hypertension

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ABSTRACT

Hoarseness due to paralysis of vocal cord, as in Cardio-vocal syndrome, is caused by mechanical affection of left recurrent laryngeal nerve from enlarged cardiovascular structures. Mitral valve prolapse is rarely found to cause this syndrome. Case report presenting a 47 years old male visited the outpatient department with a clinical history of dyspnea and hoarseness since a year ago. Physical examination revealed late systolic murmur in apex and low-grade diastolic murmur in right second intercostal space. Echocardiography confirmed severe mitral regurgitation due to flail anterior mitral valve leaflet with severe left atrium dilatation (9.0 cm) and moderate aortic regurgitation due to mal-coaptation of aortic valves. Laryngoscopy revealed an immobile left vocal cord. He underwent successful double valve replacement after three months follow up the patient showed improvement of hoarseness. The incidence of Cardio-vocal syndrome in mitral valve disease varies from 0.6% to 5%. In cases diagnosed with thoracic disease, paralysis of the left vocal cord was reported 1.75 times more frequent than the right side. The aim of this case report is we have to aware that Cardio-vocal syndrome is a rare cause of vocal cord paralysis and should be considered as a differential diagnosis of hoarseness, particularly if the patient has a cardiac history. Comprehensive evaluation and prompt treatment may allow reversal of the damage to left recurrent laryngeal nerve. Permanent nerve damage can occur due to late diagnosis.

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INTRODUCTION

Hoarseness is a common symptom found in the Ear, Nose, and Throat outpatient department (OPD) but less common in Cardiology OPD. Vocal cord paralysis, due to left recurrent laryngeal nerve palsy (LRLNP) caused by cardiovascular disease, is called Cardio-vocal syndrome, formerly known as Ortner syndrome (Stocker & Enterline, 1958) (Mulpuru, Vasavada, Punukollu, & Patel, 2008). The etiology of LRLNP were iatrogenic surgical injury (10.4–75%), neoplasms (6.8–42%), infection and metabolic disease (1.5–11%) and idiopathic etiology including cardio-vocal syndrome (2.2–23%) (Tammiraju, Krishna, Prasad, & Babu, 2018).

There is a collective literature study conduct by Yuan in 2014, including a total of 256 patients who had cardiovascular hoarseness between 1980 and 2011, showed that aortic aneurysms overwhelming predilections leading to left vocal cord palsy and hoarseness in 132 patients (51.56%). Moreover, left atrial lesions due to mitral valve disease, presented in 20 patients (7.81%), and congenital heart defects presented in 14 patients (5.47%) (Yuan, 2014). There are several cardio-vocal syndrome cases is reported, Tammiraju *et al* and Ramasamy *et al* reported that hoarseness due to mitral stenosis (Tammiraju et al., 2018) (Ramasamy, Kale, Ramalingam, & Veerappa, 2018), and Chen et al in 2009 reported that hoarseness due to large aortic arch aneurysm (Chen, Lin, & Lu, 2009). There is no study nor literature mention the exact number of the incidence of Cardio-vocal syndrome in Indonesia.

This case is important, because we should remember that hoarseness of voice due to cardiovascular disease, particularly mitral valve prolapse, is rare and should be an important differential diagnosis in patients with a cardiovascular risk factor.

CASE REPORT

A 47 years old male visited the outpatient department with a clinical history of dyspnea and hoarseness since a year ago. The patient's history was active smoker, no history of hypertension, diabetes mellitus, or dyslipidemia. The general status of the patient was good, with the vital sign was stable. Physical examination revealed irregularly irregular heart sound with a late systolic murmur in apex grade V/VI radiating to left axilla and low-grade diastolic murmur in right second intercostal space. No jugular neck vein distention. Electrocardiography (ECG) showed atrial fibrillation rhythm with a moderate ventricular response, right axis deviation, counterclockwise rotation (**Figure 1**). Chest x-ray (CXR) showed cardiomegaly with cardiac thoracic ratio (CTR) 65% with horizontal heart waist, double contoured suggest mitral heart configuration and inverted coma sign suggest pulmonary hypertension (**Figure 2**).

Trans Thoracic Echocardiography (TTE) confirmed the flail of an anterior mitral leaflet (AML) with severe mitral regurgitation (**Figure 3A**), mal-coaptation of the aortic valve with moderate aortic regurgitation, mild tricuspid regurgitation. All heart chambers are dilated with severe left atrium dilatation (LA), with a diameter of LA reaching 9.0 cm (**Figure 3B**). There was moderate pulmonary hypertension (estimated Pulmonary Artery Systolic Pressure/ PASP 62.00 mmHg). Left ventricle (LV) systolic function decreased (EF by Teich 44% and EF by Biplane 46%), normal right ventricle (RV) systolic function with TAPSE 1.9 cm. Hypokinetic global LV segmental analysis. And there was an eccentric Left Ventricle Hypertrophy (LVH). There were no abnormalities in the pericardium (no pericardial effusion was found). We assessed the patient with severe mitral regurgitation and moderate aortic regurgitation with moderate pulmonary hypertension. Then we decided to make a double

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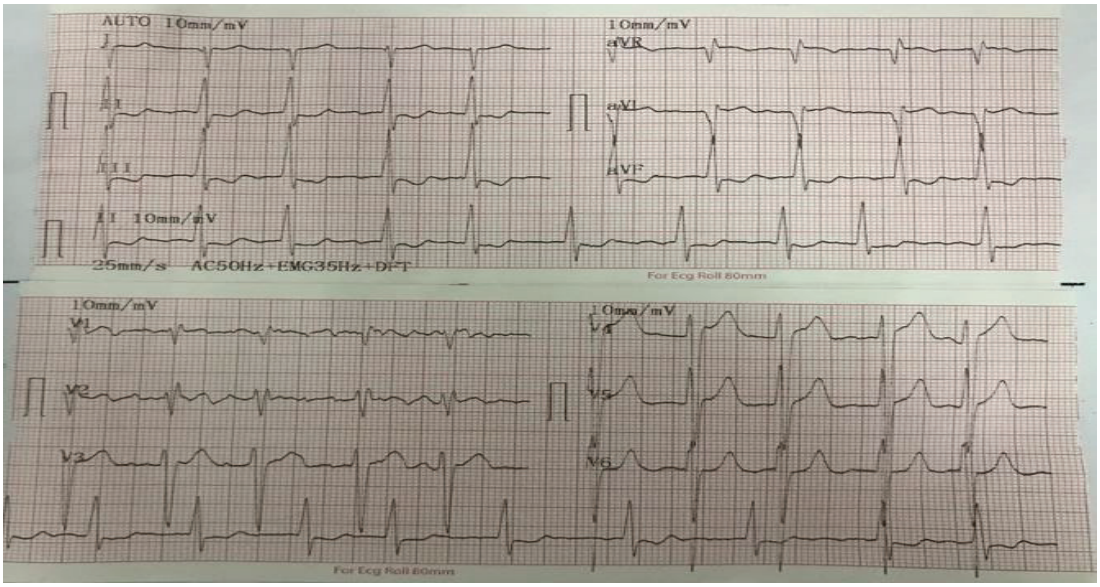

Figure 1. ECG examination showed atrial fibrillation rhythm with moderate ventricular response, right axis deviation, counter clockwise rotation.

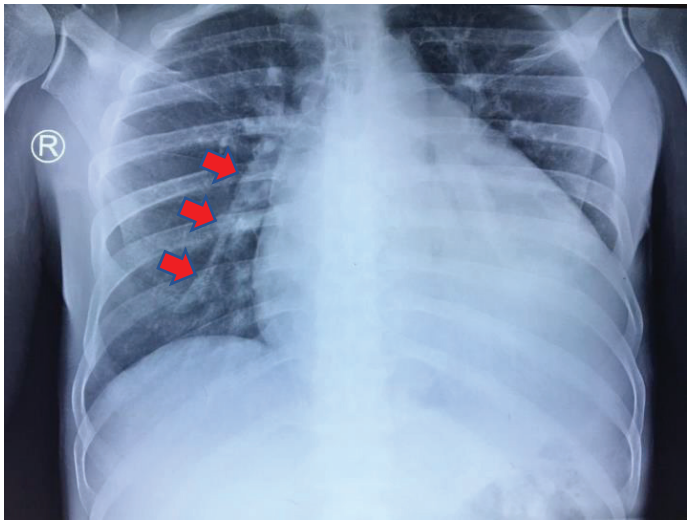

Figure 2. CXR examination showed cardiomegaly with mitral heart configuration and inverted coma sign (red arrow) suggest pulmonary hypertension.

valve replacement surgery for the management of this case. Before the surgery, we made some preparation for the patient. We consulted the patient to Pulmonology department, Dental Medicine department to find and resolve source of infection in their expertise and particularly to Ear, Nose and Throat (ENT) department for management of hoarseness. ENT department's advice was fiber optic laryngoscopy (FOL) examination to find the etiology of hoarseness. FOL examination was done with normal anatomy vocal cord, there were no nodules, tumour, granulation tissue (**Figure 4A**). But there was left vocal cord paralysis (**Figure 4B**), due to left recurrent laryngeal nerve palsy (LRLNP).

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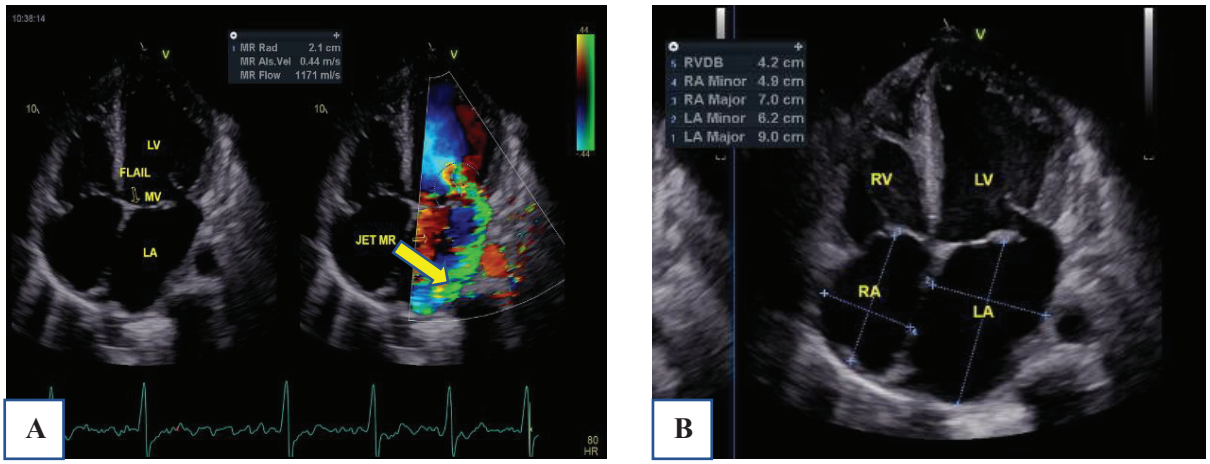

Figure 3. TTE examination (A) showed mitral regurgitant jet (yellow arrow) in color doppler. (B) There was hugely dilated of left atrium (LA)

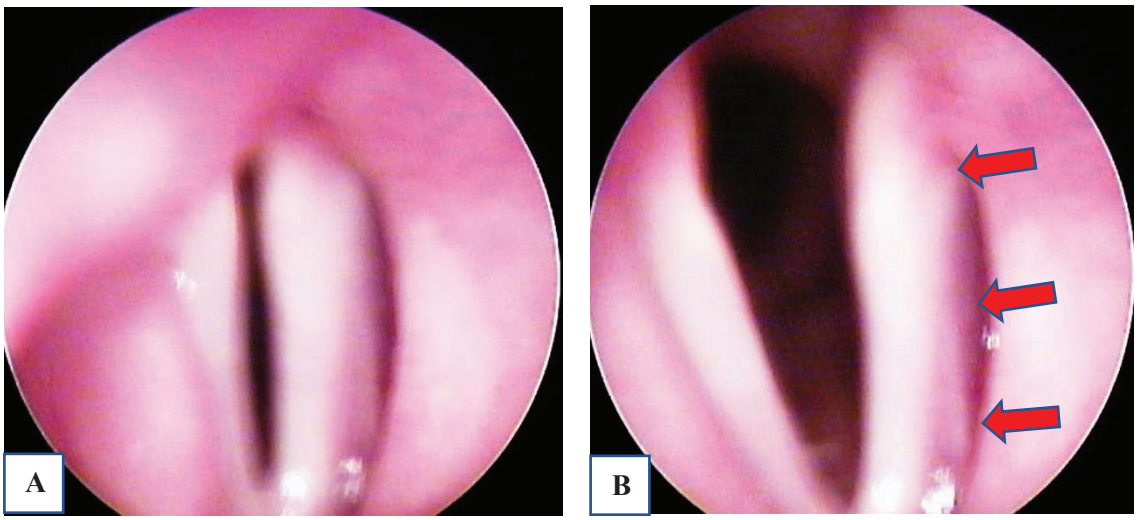

Figure 4. FOL examination (A) normal anatomy of vocal cord during respiration phase. (B) There was inability of left vocal cord to move compared with contralateral (red arrow) during phonation phase.

The final diagnosis of the patient was valvular heart disease due to severe mitral regurgitation and moderate aortic regurgitation with moderate pulmonary hypertension, LRLNP without local etiology of hoarseness, so we can conclude that patient had cardio-vocal syndrome as a complication. Then he underwent successful double valve replacement two weeks later. Three months after double valve replacement, the patient did not have any experience of dyspnea and showed improvement of hoarseness symptoms. Echocardiography evaluation showed the normal function of mechanical heart valve, and there was a decline of pulmonary hypertension severity. Now, the patient is undergoing voice therapy rehabilitation and still under follow up.

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DISCUSSION

The first discovery of hoarseness due to LRLNP was described in three patients with mitral stenosis, and left atrium enlargement was described by Nobert Ortner, an Austrian physician in 1897 (Plastiras, Pamboucas, Zafiriou, Lazaris, & Toumanidis, 2010). He deduced the cause to be the compression of the left recurrent laryngeal nerve by an enlarged left atrium. Hereafter, this condition is called as Ortner syndrome (Kishan, Wongpraparut, Adeleke, Frechie, & Kotler, 2000).

Although it was initially associated with mitral stenosis, this paralysis has also been attributed to other cardiovascular condition, include Patent Ductus Arteriosus (PDA), aortic arch aneurysm, pulmonary artery aneurism, Eisenmenger's syndrome, pulmonary hypertension, pulmonary embolism, VSD, ASD, and mitral valve diseases (Mulpuru et al., 2008). Later in 1958, Stocker and Enterline further identified hoarseness attributable to recurrent laryngeal nerve paralysis caused by cardiovascular disease as Cardio-vocal syndrome (Stocker & Enterline, 1958).

Study epidemiology in Scotland found that LRLNP tends to affect men in any age group, ranges from age 23 to 85 years, with an average occurring at the age of 61 years. The most common causes are bronchogenic carcinoma (43%) and mitral valve disease (0.6–5%) (Loughran, Alves, & MacGregor, 2002) (Tammiraju et al., 2018). As we know that the etiology of hoarseness may vary, and we have to make a differential diagnosis. FOL examination, in this case, is an important tool to evaluate the anatomy and physiology movement of vocal cords, and become a golden standard diagnosis for LRLNP (Anuar, Baki, Sani, & Sabir Husin Athar, 2011).

The initial hypothesis of the occurrence of cardio-vocal syndrome is based on compression of the left recurrent laryngeal nerve by an enlarged left atrium. In a later development, several authors showed that the distance between the aorta and pulmonary artery in the aortic window was 4 mm. They also suggested that nerve compression due to the two structures is the cause of the paralysis (Wu et al., 2013).

Posterior wall enlargement or left atrial roof expansion that compress esophagus, left primary bronchus, left ventricle, middle and inferior lobes of the right lung, and left recurrent laryngeal nerve was responsible for dysphagia, dyspnea, and hoarseness (Seyed Toutounchi, Eydi, Golzari, Ghaffari, & Parvizian, 2014). Since the left recurrent laryngeal nerve is longer than the right nerve, left vocal cord paralysis is more commonly encountered. In unilateral vocal cord palsy due to thoracic diseases, left-sided vocal cord paralysis was 1.75 times more frequent than right-sided paralysis (Tammiraju et al., 2018).

In this case, from anatomically perspective, there was the enlarged structure of the left atrium caused by a severe regurgitant jet of mitral valve, moderate pulmonary hypertension. It implies dilatation of the pulmonary artery, and moderate aortic regurgitation due to mal-coaptation of the aortic valves may also indicate aortic root dilatation which causes compression of the left recurrent laryngeal nerve and cause hoarseness of voice and shortness of breath.

According to the European Society of Cardiology 2017 Guidelines for the management of valvular heart disease, the symptom of shortness of breath in this patient is a Class I indication for surgical intervention (mitral and aortic valve replacement). Hoarseness due to LRLNP in this patient, should be a determinant and considered equivalent to mitral regurgitation symptom for Class I indication for surgery (Baumgartner et al., 2017). Voice therapy rehabilitation should be considered when hoarseness is persisted after we had removed the offending agent that

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Table 1. Sunderland classification of nerve injury

Class I (Neuropraxia)	Slight pressure with no axonal disruption but a conduction block. Excellent recovery after the offending agent is removed
Class II (Axonotmesis)	More severe lesion involving axonal injury. Recovery usually occurs once offending agent is removed but is delayed.
Class III (Neurotmesis)	Class II + endoneurium injury. Aberrant regeneration causes incomplete/partial recovery
Class IV (Neurotmesis)	Class III + perineurium injury. Recovery is difficult to achieved, depends on timing in offending agent is removed.
Class V (Neurotmesis)	Class IV + epineurium injury. There is no hope for recovery

compress laryngeal recurrent nerve (Acharya, Bahrami, Popov, & Bhudia, 2017)(Mulpuru et al., 2008).

The severity of recurrent laryngeal nerve paralysis can be classified according to Sunderland's classification (Sunderland, 1990). There are five classes of severity of nerve damage (**Table 1**). In this case, after three months follow up the patient showed improvement of hoarseness, so it could be classified into class III nerve injury.

Information regarding the reversibility of hoarseness in cardio-vocal syndrome after correction of the underlying cardiovascular disease is limited, 12 of 14 cases resolved within 1 week to 3 years, with a duration of preexisting hoarseness ranging from 1 month to 10 years (Chen et al., 2009). The prognosis of recurrent laryngeal nerve paralysis depends on the degree and duration of nerve compression (Kaipuzha, Pulimootti, Bakshi, & Gopalakrishnan, 2018). The treatment of this syndrome depends on how quickly we manage the underlying causative. Early detection and prompt treatment may allow the reversibility of the nerve damage.

CONCLUSION

It has been reported a patient with Cardio-vocal syndrome as a complication of severe mitral regurgitation, moderate aortic regurgitation, and pulmonary hypertension. Cardio-vocal syndrome should always be listed as the differential diagnosis of patients with cardiovascular disease presenting with hoarseness. Early detection and prompt treatment of the causative Cardio-vocal syndrome may allow the reversibility of the left recurrent laryngeal nerve damage.

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