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Case Report

Successful radiofrequency catheter ablation in a patient with symptomatic hypertrophic obstructive cardiomyopathy

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Abstract: We report a case of a 29-year-old male presenting with symptomatic hypertrophic obstructive cardiomyopathy (HOCM). The symptoms continued despite optimized medical therapy. After an in-depth discussion with both the patient and the family, we proceeded with radiofrequency catheter ablation (RFCA), which was successful in both reducing his LVOT gradient and his symptoms.

Keywords: Hypertrophic obstructive cardiomyopathy, radiofrequency catheter ablation, left ventricular outflow tract

Introduction

Hypertrophic obstructive cardiomyopathy (HOCM) comprises a group of clinical symptoms involving the left ventricular outflow tract (LVOT) consistent with ventricular septal asymmetric hypertrophy combined with anterior mitral systolic forward motion, which results in the blockage of cardiac ejection. It was first reported by Teare [1] in 1958, and after 1960 it was considered to be a type of primary cardiomyopathy that was also known as idiopathic hypertrophic subaortic stenosis [2]. Approximately 30% of the patients that were diagnosed had a family history. The patients often suffered from various symptoms, such as dizziness, chest tightness, fatigue, angina attacks, syncope, hypertension, arrhythmia sudden death and other diseases. It is a heterogeneous disease resulting from asymmetric hypertrophy of the septum and left ventricular free wall and left ventricular outflow tract obstruction. However, many patients remain asymptomatic throughout life.

The aim of treatment is to improve left ventricular diastolic function, alleviate outflow tract obstruction, relieve symptoms, reduce the sudden death rate and improve the long-term survival rate. At present, the treatment of hypertrophic obstructive cardiomyopathy mainly includes drug therapy, surgical treatment and interventional therapy. At present, chemical ablation is often used to treat hypertrophic obstructive cardiomyopathy, while radiofrequency catheter ablation is rarely used. Lawrenz and Cooper reported that radiofrequency catheter ablation was effective and that the incidence of complications was low. We report the case of a patient who had HOCM treated with radiofrequency ablation of the ventricular septum guided by intracardiac ultrasound.

Case report

A 29-year-old male without diabetes or previous cardiac history was admitted to the cardiac medicine department with chest tightness and shortness of breath after activity for 4 days. An electrocardiogram (ECG) obtained at admission showed sinus rhythm, abnormal Q waves in the inferior wall leads, and tall and symmetrical T waves from leads V1-V5 (**Figure 1**). The echocardiogram showed a ventricular septum with a maximum thickness of 16 mm, a left ventricular outflow tract velocity of 5.67 m/s, a pressure

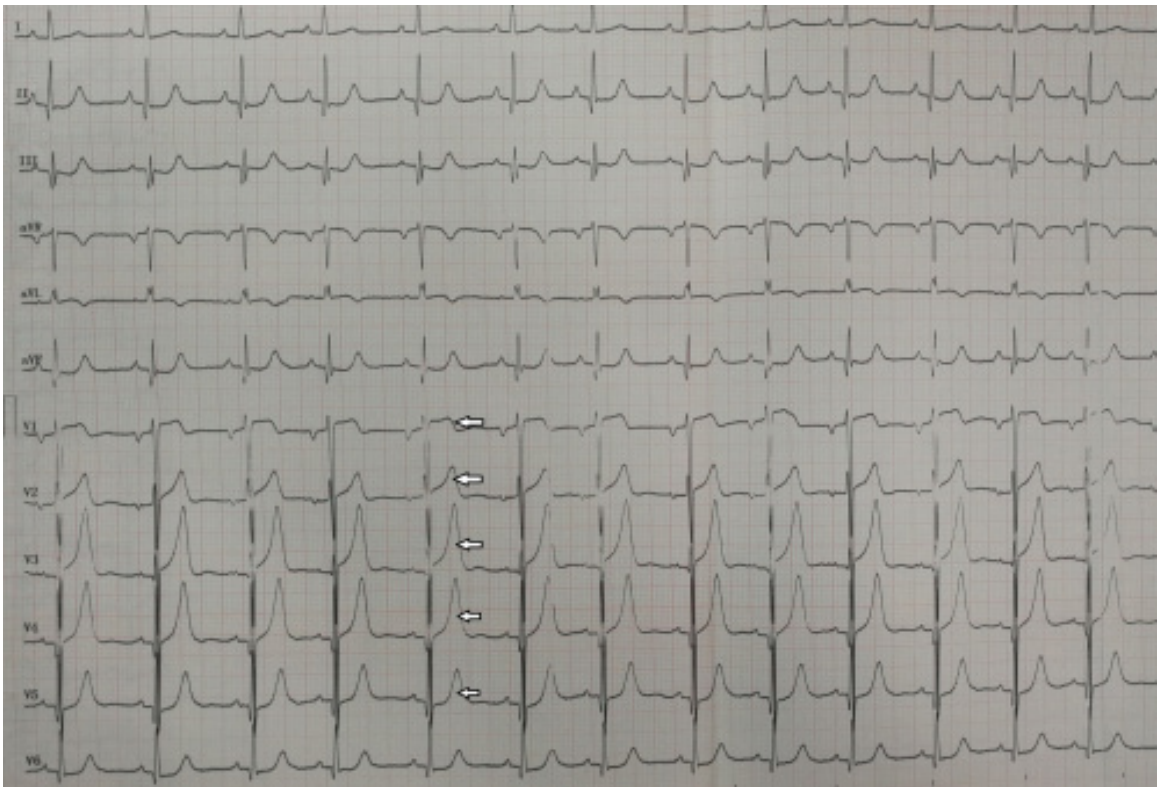

Figure 1. The ECG showed sinus rhythm, abnormal Q waves in the inferior wall leads, and tall and symmetrical T waves from leads V1-V5.

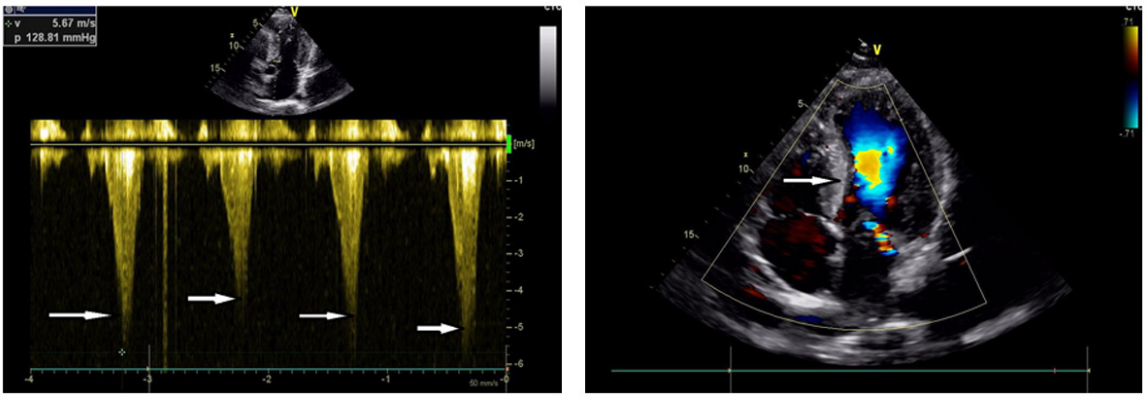

Figure 2. The echocardiography showed a ventricular septum with a maximum thickness of 16 mm, a left ventricular outflow tract velocity of 5.67 m/s, a pressure differential of 128.8 mmHg, and it also showed evidence consistent with SAM (+) in the anterior mitral valve.

differential of 128.8 mmHg, and it also showed evidence consistent with SAM (+) in the anterior mitral valve (**Figure 2**). The laboratory examination results were as follows: myocardial enzymes, routine blood tests, liver function, renal function and brain natriuretic peptide were all within normal ranges; blood potassium (K^+) was 3.93 mmol/L. The blood pressure was 100/60 mmHg, the pulse was 62 beats/min, respiration was 23 breaths/min, and the axillary temperature was 36.3°C. The pulmonary and cardiac examination revealed a clear respiratory sound in the bilateral lungs without rhonchus and moist rales and a systolic 3/6 grade

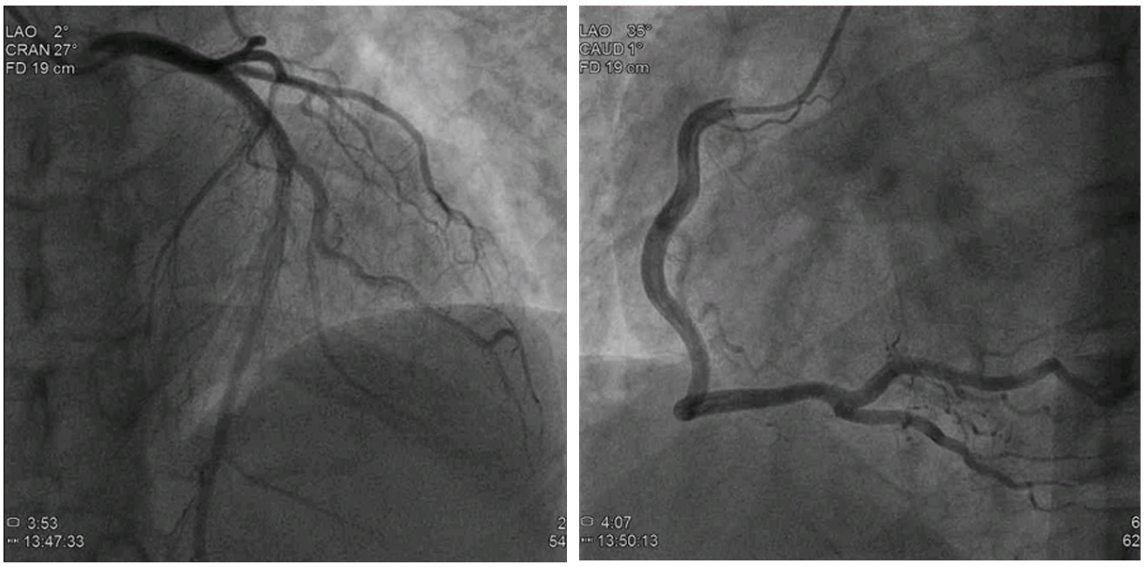

Figure 3. The coronary angiography showed no significant abnormalities in the coronary artery.

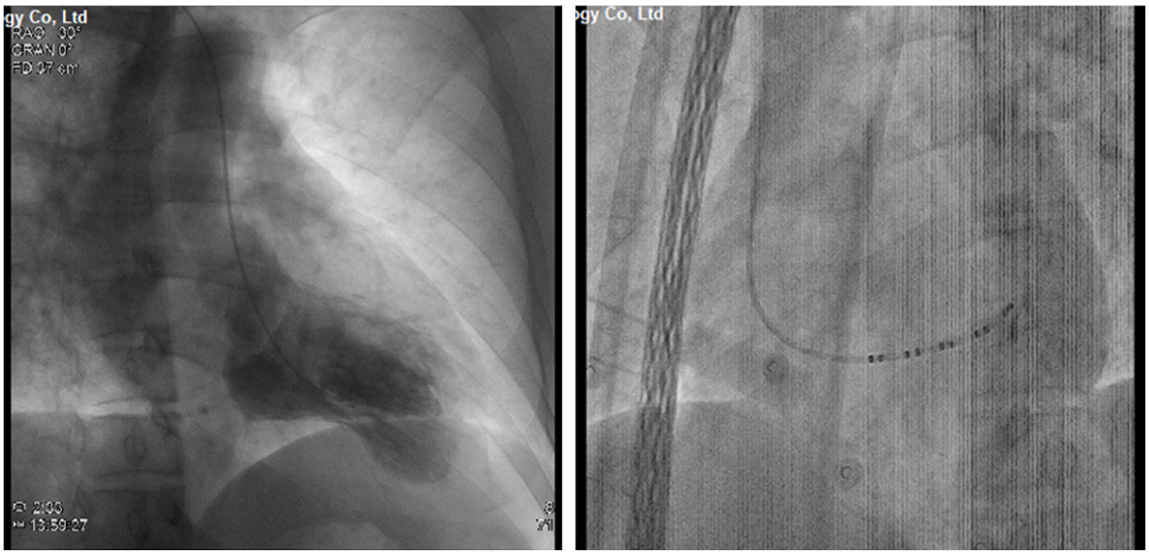

Figure 4. Successful radiofrequency catheter ablation of interventricular. Preoperative (left) and postoperative (right).

murmur in the third intercostals space in the left border of the sternum. Therefore, the diagnosis was hypertrophic obstructive cardiomyopathy. A beta-blocker was administered after admission. On the fourth day after admission, coronary angiography showed no significant abnormalities in the coronary artery (**Figure 3**). The left ventricular manometry result was 130/6 mmHg, and left ventricular outflow tract stenosis was demonstrated by left ventricular angiography with a high pressure syringe. Radiofrequency catheter ablation of the interventricular septum was performed on the 6th day after admission (**Figure 4**). Preoperative catheter manometry showed that the pressure gradient of the left ventricular outflow tract was 84 mmHg and 22 mmHg after the operation. There was no obvious discomfort during the operation, and the symptoms of chest tightness improved significantly after the operation. The left ventricular outflow tract pressure measured by ultrasonography was 28 mmHg, which

was also significantly lower than that observed before the operation.

Discussion

At present, there is no particularly effective treatment for HOCM. Surgical resection of the hypertrophic myocardium, chemical ablation with absolute alcohol and pacemaker implantation still produce many adverse reactions and complications.

In the present case, physical examination showed that the apical pulsation was shifted to the lower left, the voice boundary was enlarged to the left, and middle or late rough air-drying murmurs caused by left ventricular outflow tract (LVOT) obstruction could be heard in the lower part of the left sternum or medial apex, which was accompanied by tremor. Digitalis and valsalva movements could enhance the murmurs [3]. The diagnosis of HOCM was made due to the unexplained left ventricular wall thickness >15 mm, which was found by cardiac magnetic resonance imaging or echocardiography, and there was no left ventricular dilatation. Left ventricular outflow tract obstruction was present (LVOT pressure gradient <30 mmHg indicates obstruction) [4]. The electrocardiogram manifestations are as follows: 1) The most common electrocardiogram abnormality is the ST-T change, which can occur in approximately 92% of patients. Most ST-T changes press horizontally. The T wave of this lead can be upright, inverted or bidirectional, but an inverted and symmetrical T wave is the most common change, accounting for approximately 70% of cases, some of which can show a "coronal T wave" [5]. 2) Approximately 20-50% of patients can have a Q wave, and a Q wave can occur in an I wave. The aVL V4-V6 leads, a few of which can be observed in inferior wall leads including Q-waves, are often not wide and show a time limit of less than 0.04 s; the T-waves of this lead are often upright [6]. 3) ST-segment elevation can occur, and the amplitude of the ST-segment elevation is relatively stable, which is different from the dynamic evolution of the ST-segment observed in acute myocardial infarction [7]. In addition, approximately 20% of patients showed no significant abnormal changes in an ECG.

Radiofrequency catheter ablation (RFCA), widely used in the management of arrhythmias, has previously been used to ablate the hypertrophied septum of HOCM patients. Compared with the surgical resection of the ventricular septum and chemical ablation of the ventricular septum, radiofrequency catheter ablation of the ventricular septum has the advantages of involving a relatively simple operation, a low risk of hypertrophy of the ablation outflow tract, fewer complications and the rapid improvement of symptoms. Lawrenz [8] et al. reported that radiofrequency catheter ablation for hypertrophic obstructive cardiomyopathy is safe and effective and resulted in a significant improvement in exercise capacity and NYHA functional class after 6 months. Previous studies have also found that radiofrequency catheter ablation for left ventricular outflow tract obstructive hypertrophic cardiomyopathy can significantly reduce the LVOT gradient, improve clinical symptoms and improve quality of life [8]. RFCA is a novel technique to treat HOCM that shows significant promise. Nevertheless, a larger prospective multicenter study is needed to establish safety and efficacy.

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Disclosure of conflict of interest

None.

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References

[1] Teare D. Asymmetrical hypertrophy of the heart in young adults. Br Heart J 1958; 20: 1-8.

[2] Brent LB, Aburano A, Fisher DL, Moran TJ, Myers JD and Taylor WJ. Familial muscular subaortic stenosis: an unrecognized form of "idiopathic heart diseases", with clinical and autopsy observations. Circulation 1960; 21: 167-80.

[3] Makavos G, Kairis C, Tselegkidi ME, Karamitsos T, Rigopoulos AG, Noutsias M and Ikonomidis I. Hypertrophic cardiomyopathy: an updated review on diagnosis, prognosis, and treatment. Heart Fail Rev 2019; 24: 439-459.

[4] Paluszkiewicz J, Krasinska B, Milting H, Gummert J and Pyda M. Apical hypertrophic cardiomyopathy: diagnosis, medical and surgical treatment. Kardiochir Torakochirurgia Pol 2018; 15: 246-253.

[5] Eriksson MJ, Sonnenberg B, Woo A, Rakowski P, Parker TG, Wigle ED and Rakowski H. Long-term outcome in patients with apical hypertrophic cardiomyopathy. J Am Coll Cardiol 2002; 39: 638-45.

[6] Elliott PM, Anastasakis A, Borger MA, Borggrefe M, Cecchi F, Charron P, Hagege AA, Lafont A, Limongelli G, Mahrholdt H, McKenna WJ, Mogensen J, Nihoyannopoulos P, Nistri S, Pieper PG, Pieske B, Rapezzi C, Rutten FH, Tillmanns C and Watkins H. 2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy: the Task Force for the diagnosis and management of hypertrophic cardiomyopathy of the European Society of Cardiology (ESC). Eur Heart J 2014; 35: 2733-79.

[7] Rapezzi C, Arbustini E, Caforio AL, Charron P, Gimeno-Blanes J, Heliö T, Linhart A, Mogensen J, Pinto Y, Ristic A, Seggewiss H, Sinagra G, Tavazzi L and Elliott PM. Diagnostic work-up in cardiomyopathies: bridging the gap between clinical phenotypes and final diagnosis. A position statement from the ESC Working Group on myocardial and pericardial diseases. Eur Heart J 2013; 34: 1448-58.

[8] Lawrenz T, Borchert B, Leuner C, Bartelsmeier M, Reinhardt J, Strunk-Mueller C, Meyer Zu Vilsendorf D, Schloesser M, Beer G, Lieder F, Stellbrink C and Kuhn H. Endocardial radiofrequency ablation for hypertrophic obstructive cardiomyopathy: acute results and 6 months' follow-up in 19 patients. J Am Coll Cardiol 2011; 57: 572-6.