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CASE REPORT

Is subcutaneous fat tissue embolization effective and safe as a septal reduction technique in a patient with hypertrophic obstructive cardiomyopathy?

Subkutanöz yağ dokusu embolizasyonu hipertrofik obstrüktif kardiyomiyopatili bir hastada septal redüksiyon tekniği olarak etkili ve güvenilir mi?

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Summary– Hypertrophic obstructive cardiomyopathy is an inheritable cardiac disease that typically manifests with an increased left ventricular outflow tract gradient. In most cases, basal septal hypertrophy and systolic anterior motion of the anterior mitral valve leaflet are the key components of the left ventricular outflow tract obstruction. The goal of septal reduction therapy, a widely accepted treatment modality, is to remove this obstruction. Although myectomy is a well-established and effective surgical technique for septal reduction therapy, transcoronary alcohol septal ablation is an alternative therapy for patients who decline to have surgery or who are not suited to a surgical intervention. A new septal reduction method has also been described in the literature. This case report describes the successful treatment of hypertrophic obstructive cardiomyopathy in a 57-year-old female using the new septal reduction technique.

Özet– Hipertrofik obstrüktif kardiyomiyopati, kalıtsal bir kalp hastalığıdır ve artmış sol ventrikül çıkış yolu gradiyenti ile kendini gösterir. Çoğu olguda, bazal septal hipertrofi ve anteriyor mitral yaprakçığın sistolik anteriyor hareketi, sol ventrikül çıkış yolu tıkanıklığının anahtar bileşenleridir. Sıklıkla kabul gören bir tedavi modeli olan septal redüksiyon terapisinin amacı, bu tıkanıklığı gidermektir. Miyektomi septal redüksiyon tedavisi için iyi bilinen ve etkili bir cerrahi teknik olmasına rağmen, transkoroner alkol septal ablasyon ameliyatı reddeden veya cerrahi girişim için uygun olmayan hastalarda alternatif bir tedavi yöntemidir. Daha önce literatürde yeni bir septal redüksiyon yöntemi tanımlanmıştır. Bu olgu sunumunda, yeni septal redüksiyon tekniği ile hipertrofik obstrüktif kardiyomiyopatili 57 yaşındaki bir kadının başarılı bir şekilde tedavi edildiğini bildiriyoruz.

Hypertrophic obstructive cardiomyopathy (HOCM) is an inheritable cardiac disease and usually manifests with an increased left ventricular outflow tract (LVOT) gradient. In most cases, basal septal hypertrophy and systolic anterior motion (SAM) of the anterior mitral valve leaflet are the key components of LVOT obstruction. The goal of septal reduction therapy, which is a widely accepted treatment modality, is to remove this obstruction. Although myectomy is a well-established and effective surgical technique for septal reduction therapy, transcoronary alcohol septal ablation (ASA) is an alternative for patients who refuse surgery or who are not suited to surgical intervention. A new septal reduction method has been described in the literature.

In this case report, the successful treatment of HOCM in a 57-year-old female using the new septal reduction technique is described.

CASE REPORT

A 57-year-old female patient presented at the cardiology clinic with exertional dyspnea that had progressed over the previous 2 months. The patient's medical history revealed coronary artery disease, diabetes mellitus, and hypertrophic obstructive cardiomyopathy.

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Abbreviations:

ASA	*Alcohol septal ablation*
HOCM	*Hypertrophic obstructive cardiomyopathy*
IVS	*Interventricular septum*
LVOT	*Left ventricular outflow tract*
SAM	*Systolic anterior motion*
TTE	*Transthoracic echocardiography*
SAM	*Systolic anterior motion*

Her blood pressure was 140/75 mm Hg and her pulse was measured at 95 beats/minute during the physical examination. Cardiac auscultation revealed a 4/6 systolic murmur over the apex and along the left parasternal line. An electrocardiogram showed a normal sinus rhythm and left ventricular hypertrophy. Bedside transthoracic echocardiography (TTE) demonstrated an interventricular septum (IVS) thickness of 19 mm, systolic anterior motion (SAM) of the anterior mitral valve leaflet, mild mitral regurgitation, and a resting left ventricular outflow tract (LVOT) gradient of 100 mm Hg (Fig. 1a-c). After medical treatment (low-dose intravenous furosemide added to metoprolol 200 mg/day), the patient was transferred to the coronary care unit. The dyspnea improved the next day. Transcoronary alcohol septal ablation (ASA) is an alternative for patients who refuse surgery or who are not suited to surgical intervention.[1] This patient was scheduled for ASA after she declined to have surgery. However, because we did not have the sufficient catheterization support required for the ASA procedure, it was cancelled. The patient agreed to subcutaneous fat tissue embolization, which is a new septal reduction method recently described in the literature.[2] Coronary angiography was performed through the right femoral artery, which indicated atherosclerotic coronary artery disease without significant stenosis. The dominant septal artery was determined using the right anterior oblique cranial

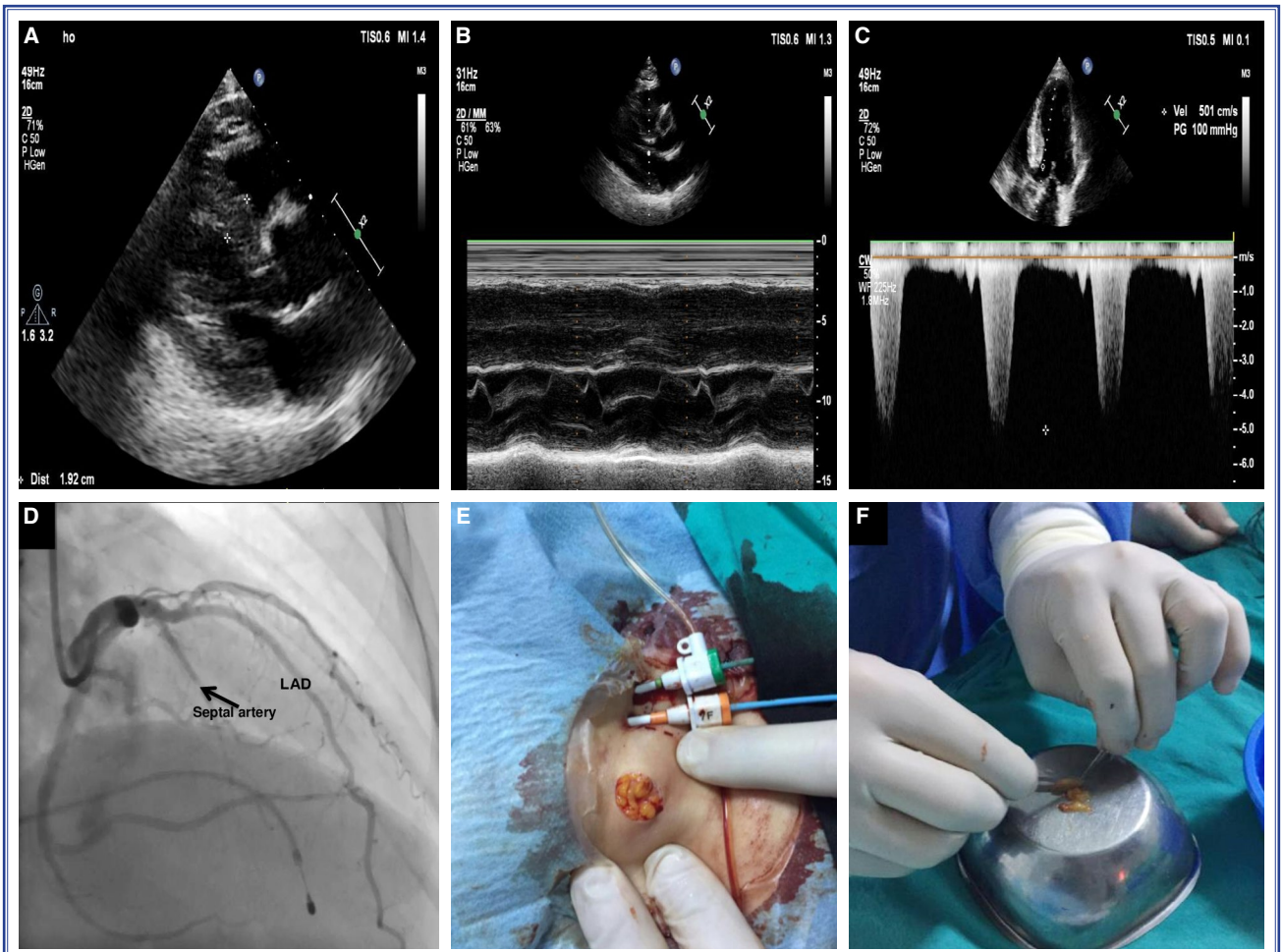

Figure 1. **(A)** Pre-procedural parasternal long-axis transthoracic echocardiography view shows that the interventricular septum is 19.2 mm in size; **(B)** M-mode view of systolic anterior motion of the anterior mitral leaflet; **(C)** Pre-procedural resting left ventricular outflow gradient; **(D)** Right anterior oblique cranial angle view of the dominant septal artery on a coronary angiography; **(E, F)** Images illustrating the removal of subcutaneous fat tissue from the inguinal area and being divided into 1-1 -mm thick sections.

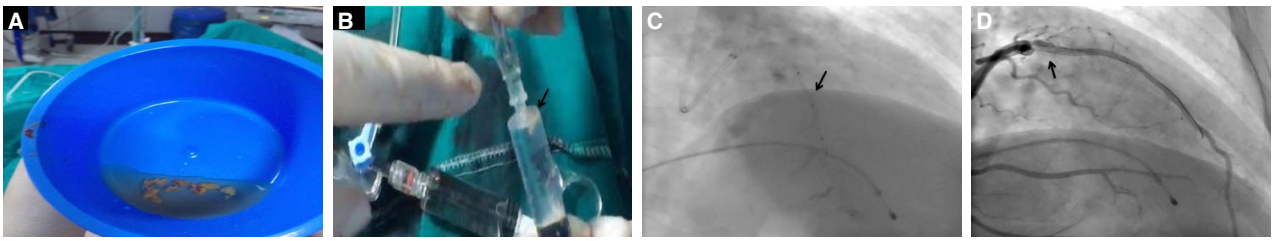

Figure 2. **(A-C)** The images show that subcutaneous fat tissue divided into 1-1 -mm thick sections and separately injected into the septal artery; **(D)** A coronary angiography image demonstrates that the septal artery was completely occluded.

angle view (Fig. 1d, Video 1*). After passing a 0.014-inch guidewire through the septal artery, it was then used to insert a microcatheter into the proximal part of the septal artery. Selective angiography of the septal artery displayed no collateral artery originating from the septal artery to the distal right coronary artery or to the left system. Subcutaneous fat tissue was removed from the inguinal area and divided into 1-1 -mm thick sections (Fig. 1e, f and Fig. 2a). A total of 5 cuts of subcutaneous fat tissue were separately injected into the septal artery through the microcatheter (Fig. 2b, c, Video 2*). Following the removal of the microcatheter, coronary angiography was repeated and it was determined that the septal artery was completely occluded (Fig. 2d). Immediately after the procedure, TTE showed decreasing SAM and a resting LVOT gradient of 16 mm Hg (Fig. 3a, Video 3*). After a 5-day follow-up, the patient was discharged with a gradient of 14 mm Hg. At the end of the third month, the LVOT gradient was 12 mm Hg, the SAM had disappeared completely on M-mode echocardiography, (Fig. 3b, c) and her New York Heart Association functional class had improved from III to I.

DISCUSSION

The treatment options for the symptoms caused by LVOT obstruction in patients with hypertrophic cardiomyopathy include negative inotropic drugs and

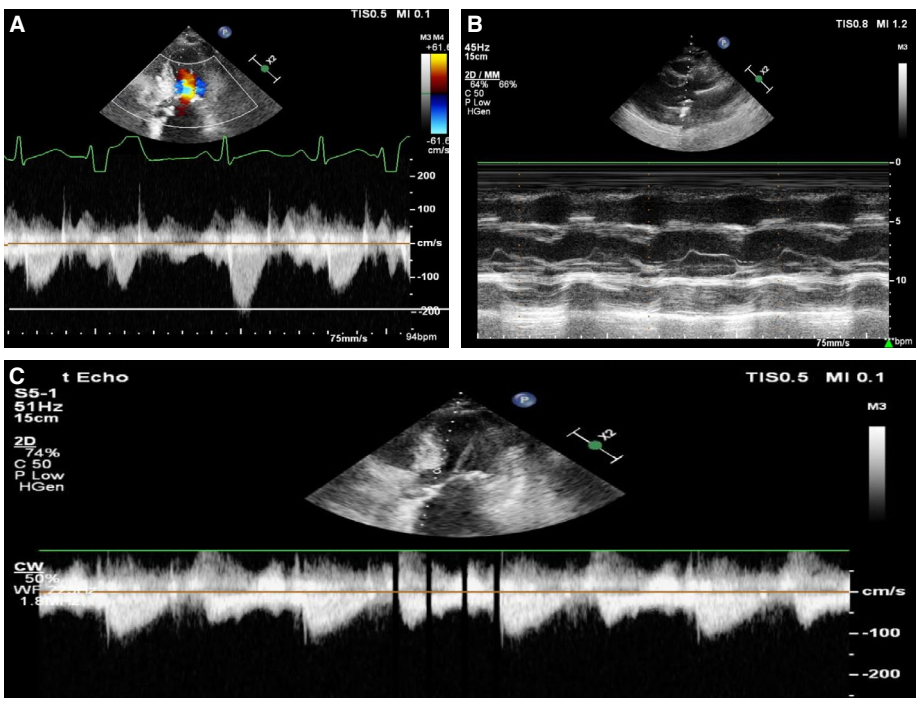

Figure 3. Echocardiography images: **(A)** A sudden decrease in the left ventricular outflow gradient after the septal artery embolization; **(B, C)** After 3 months, parasternal, long-axis, M-mode view shows no systolic anterior motion and a left ventricular outflow tract gradient of 12 mm Hg after the Valsalva maneuver.

AV sequential pacing with or without an implantable cardioverter defibrillator[3] and septal reduction therapies (such as surgical myectomy, endocardial septal ablation, and ASA).[4] Septal reduction therapies are effective treatments for patients with drug-refractory symptomatic HOCM.[5] A discussion on the comparative advantages of these strategies is still ongoing.[6–8] It is sometimes difficult to choose the most suitable treatment strategy, and we believe that the preoperative evaluation is critical.

Surgical myectomy is the safest septal reduction therapy and represents the gold standard. It is preferred for the majority of patients with severe symptoms of HOCM refractory to optimal medical management. Over the last two decades, the improvement in surgical techniques designed to decrease perioperative mortality as well as methods to provide myocardial protection have reduced the mortality of hospitalized patients with isolated septal myectomy to less than 1% according to the hypertrophic cardiomyopathy Centers of Excellence.[9]

ASA is a widely available, percutaneous, catheter-based technique that can be performed in virtually any laboratory and avoids most of the inconvenience related to surgery. In particular, alcohol ablation requires a shorter hospitalization and recovery time compared with surgery, and causes less postoperative disability. In the last decade, ASA took precedence over surgery in the treatment of HOCM worldwide (particularly in Europe), which can be demonstrated in the number of procedures per year. It is important to emphasize that ASA was adopted though the early outcomes were inferior to septal myectomy in the hands of an equally experienced practitioner. ASA decreases the LVOT gradient through different mechanisms. Alcohol may cause myocardial ischemia and myocardiolysis (i.e., direct toxic damage). In addition, it damages the coronary endothelium and causes capillary obliteration, which prevents retrograde filling and myocardial recovery, and thus provides a more durable decrease in the LVOT gradient. These effects of alcohol may cause certain complications, depending on the experience of the practitioner. The most common complication following ASA is a complete heart block, which may require permanent pacing. Patients with a pre-existing left bundle branch block have a higher risk of developing complete heart block, as nearly one-half of patients develop complete right bundle branch block during the procedure.[10] Other complications include coronary artery dissection, coronary spasm, ventricular fibrillation, cardiac tamponade, pulmonary embolism, cardiogenic shock, stroke, and problems with the puncture site.[11]

A new septal reduction technique reported by Çağdaş et al.[2] demonstrated that septal ablation carried out with fat tissue instead of alcohol is safer and more cost-effective. However, as described above, fat tissue embolization does not decrease the LVOT gradient through the same mechanisms. Subcutaneous fat embolization does not cause myocardial damage, depending on the mechanism, except perhaps septal artery occlusion, which may be considered a disadvantage in comparison with ASA. This may also not provide a sufficient decline in the LVOT gradient over the long term. Due to the lack of information about similar cases in the literature,[2] the efficacy and safety of this technique remain unclear. Nevertheless, the easy accessibility (fat tissue is obtained from the patient), low cost, and lack of toxic effects, unlike with alcohol usage, may make this technique superior to ASA. Although there is sufficient information about the long-term efficacy and complications of ASA, it is noteworthy that ASA is thought to have been responsible for early (AV block) and late (ventricular arrhythmia) complications, including the development of large non-homogeneous scarring. It is thought that less scarring will result from fat tissue embolization and that it will be more homogeneous, as well as having a lower risk of early-late complications. There is also less reduction in the LVOT gradient. For these reasons, fat tissue embolization in patients with less than 20 mm IVS thickness could be a good alternative to ASA. We conclude that subcutaneous fat embolization could be a practical and low-cost alternative to other septal occlusion techniques. But the efficacy and safety of such a method should be confirmed in comparison to ASA with large series.

Supplementary video file associated with this article can be found in the online version of the journal.

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Anahtar sözcükler: Alkol septal ablasyon; hipertrofik kardiyomiyopati; miyektomi.