ALCOHOL ABLATION OF THE HEART – CASE REPORT

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INTRODUCTION

Alcohol septal ablation (ASA) is a minimally invasive, non-surgical treatment for hypertrophic cardiomyopathy. This condition causes the heart tissue to thicken, restricting blood flow. Reduced blood flow causes symptoms such as shortness of breath and fatigue. Alcohol septal ablation restores normal blood flow by damaging and shrinking the thickened tissue. The procedure does not damage normal tissue. Providers perform this procedure on people who have HCM and, despite medication, have symptoms of shortness of breath and/or fatigue with exertion.[1]

Alcohol ablation has been successfully used in the ablation of ventricular tachycardia, ventricular fibrillation, and atrial fibrillation.[2]

MATERIAL AND METHODS

The procedure is performed under the control of the Toshiba Infinix discoscope, in the coronary angiography program. Diascopy parameters are 86 kVp, 800 mA, fluoroscopy: 5 fr/sec, radiography 10 fr/sec, pulse width of 12 bit, matrix size 1024x1024. The procedure was performed in the RAO 30° CRANIAL 30° projection, and with a magnification of 20 cm. Visipaque 320 contrast agent was used, which was injected via the MEDRAD Avanta automatic injector. Contrast injection parameters were flow rate 2 ml/s and volume 4 ml. A total of 120 ml of contrast agent was given. To confirm the results of AA, ultrasound contrast agent SONOVIEW was used. Monitoring of contrast flow through the myocardium was done with a SIEMENS ultrasound device.

CASE STUDY

The patient, 65 years old, is hospitalized at the Department of Interventional Cardiology for an invasive cardiac procedure under the diagnosis of hypertrophic obstructive cardiomyopathy. The patient is in a normal state of consciousness and orientation, communicative and eupnoic at rest. Denies allergies. He does not consume alcohol or tobacco. On admission TA 108/70 mmHg, pulse 76/min, Lungs: auscultation shows normal breathing sounds with signs of obstructive and stagnant phenomena. Heart: arrhythmic action, clear tones, no presence of noise. Abdomen is soft and painless. Extremities symmetrical with oedema of both legs. ECG on admission fr 83/min means CLK.

An invasive coronary angiography is performed through the right transradial approach, which verifies the orderly coronary system (Figure 1 and 2).

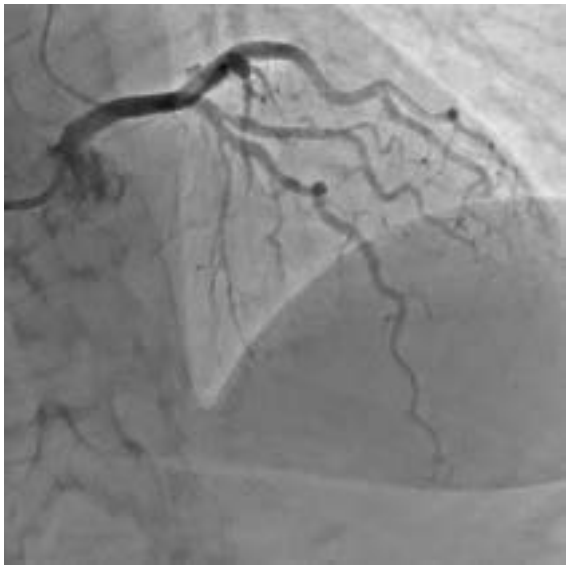

Fig. 1.

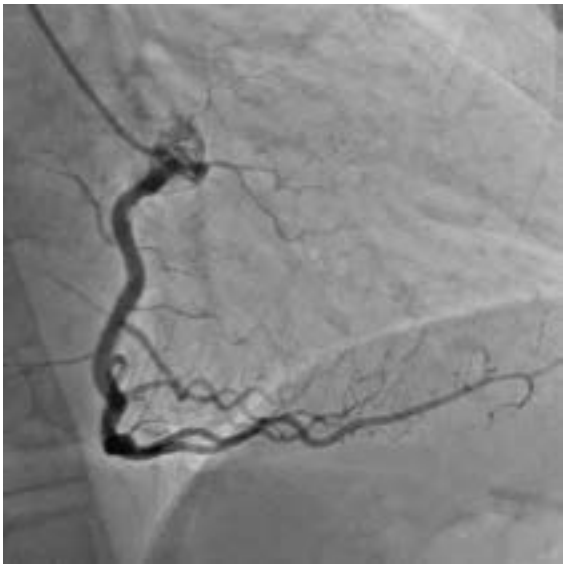

Fig. 2.

Using the left transradial approach, a pigtail catheter is placed in the LV and connected to a hemodynamic monitoring system. A temporary ES heart electrode was placed through the right transfemoral approach. Using the right transradial approach, the LCA is probed with an EBU guiding catheter 3.5 (Figure 3).

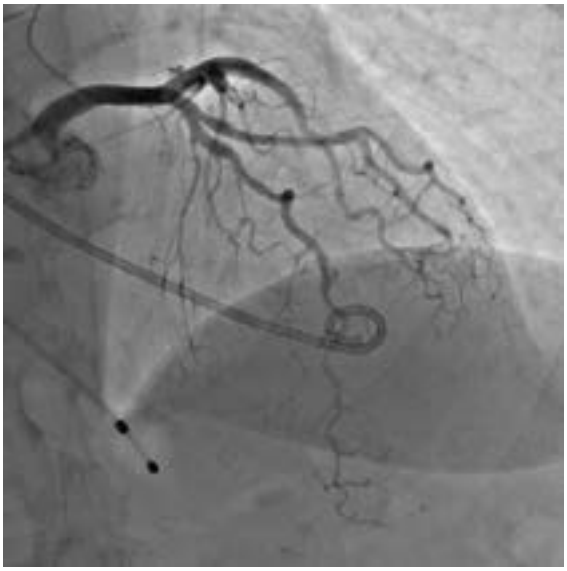

Fig. 3.

The hemodynamic monitoring system measures pressure gradients that go up to 100 mmHg post-extrasystolic (Figure 4).

Fig.4.

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Then the BMW interventional wire is inserted into the strong S2 and an OTW balloon 2.0x15mm is placed. The wire is pulled out and the balloon is then inflated to 14 atm (Figure 5 and 6).

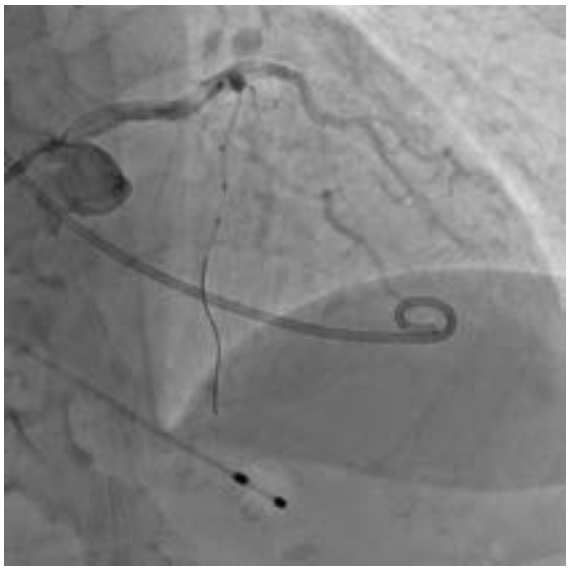

Fig. 5.

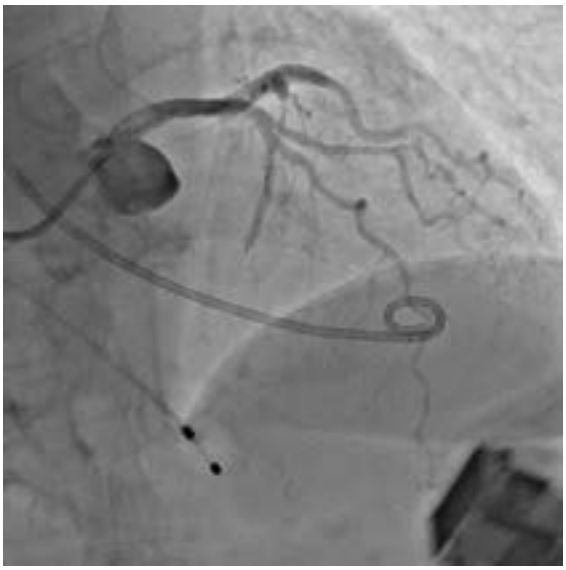

Fig. 6.

This is followed by the injection of a mixture of contrast and agitated saline solution through the balloon, which confirms complete occlusion of S2 without complete return of contrast, and echocardiographically verifies the opacification of the basal IV septum (Figure 7 and 8). This is followed by the administration of 3 ml of 96% alcohol in separate injections of 1 ml each, followed by rinsing with saline solution.

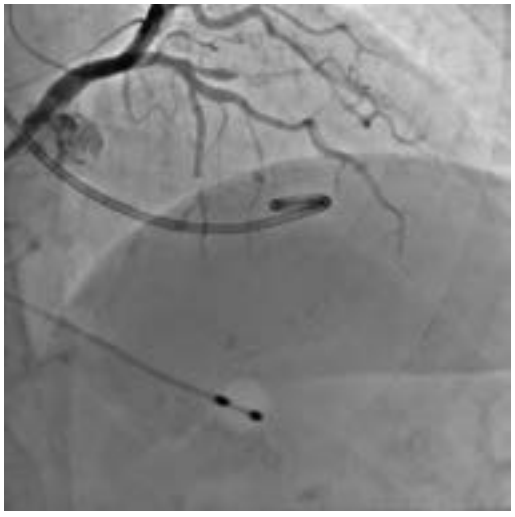

Fig. 7.

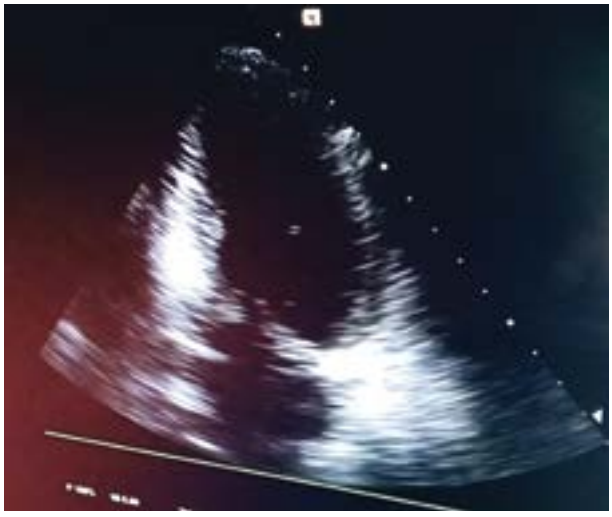

Fig. 8.

Clinically expected appearance of precordial pain and reperfusion arrhythmias with a satisfactory drop in gradient and angiographic appearance of S2 after ablation (Figure 9). Other parts of the left coronary basin are intact as before the procedure.

Fig. 9.

Echocardiography after the procedure: The left atrium is dilated and elongated. Mitral valve morphologically sclerotically changed, functionally mild to moderate MR 2+ (VC 4 min). The left ventricle has regular dimensions, with concentrically hypertrophic walls. Type 3 SAM is verified. Preserved left ventricular systolic function (EF 60%). Diastolic dysfunction is changed by type of restriction (E 1.7 m/s, VRT 2.7 m/s). Aorta in the visible ascending part has normal dimensions. Aortic valve is tricuspid with sclerotically altered velum, with regular velocity of anterograde flow. A PG of 20 mmHg is verified above the LVOT, which increases to 45 mmHg during the Valsava maneuver. The right ventricle has regular dimensions. Tricuspid valve is morphologically regular with TR 2+. Pericardium is normal. Conclusion: Hypertrophic obstructive cardiomyopathy. Condition after alcoholic septal ablation. Compared to the previous finding, a significant drop in the pressure gradient over the LVOT is verified.

On the sixth post-procedural day, due to the rapid form of FA, antiarrhythmic therapy is prescribed during the on-call period, and shortly after, it enters a symptomatic form of bradyarrhythmia, after which a temporary VVI is placed via the right VCF. The cardiac electrostimulation department decides to install a permanent pacemaker.

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DISCUSSION

The hypothesis that production of ischemia or cooling of an arrhythmogenic area or pathway could interrupt tachycardias was tested by subselective catheterization of the coronary artery supplying the site of origin of ventricular tachycardia (9 patients), the accessory pathway (2 patients) and the site of origin of atrial tachycardia (1 patient). Ventricular tachycardia was reproducibly terminated and reinduction was temporarily prevented in 8 of the 9 patients by occlusion of the artery or administration of iced isotonic saline. Block in the accessory pathway was obtained in 1 of the 2 patients with Wolff-Parkinson-White syndrome. Selective cooling through the atrioventricular nodal artery in 1 patient terminated his circus movement tachycardia. Reproducible termination of a continuous atrial tachycardia was obtained by cooling of the atrial branch supplying the site of origin of the arrhythmia. These data demonstrate the feasibility of identification and selective catheterization of the coronary artery branch supplying blood to an arrhythmogenic area or pathway and suggest a new possibility for treatment of tachycardias by permanently blocking the blood supply to the site of origin or pathway of a tachycardia. [3]

Catheter ablation of persistent atrial fibrillation (AF) has limited success. Procedural strategies beyond pulmonary vein isolation have failed to consistently improve results. The vein of Marshall contains innervation and AF triggers that can be ablated by retrograde ethanol infusion. To determine whether the vein of Marshall ethanol infusion could improve ablation results in persistent AF when added to catheter ablation. The Vein of Marshall Ethanol for Untreated Persistent AF (VENUS) trial was an investigator-initiated, National Institutes of Health-funded, randomized, single-blinded trial conducted in 12 centres in the United States. Patients (N = 350) with persistent AF referred for first ablation were enrolled from October 2013 through June 2018. Follow-up concluded in June 2019. Of the 343 randomized patients (mean [SD] age, 66.5 [9.7] years; 261 men), 316 (92.1%) completed the trial. Vein of Marshall ethanol was successfully delivered in 155 of 185 patients. At 6 and 12 months, the proportion of patients with freedom from AF/atrial tachycardia after a single procedure was 49.2% (91/185) in the catheter ablation combined with vein of Marshall ethanol infusion group compared with 38% (60/158) in the catheter ablation alone group (difference, 11.2% [95% CI, 0.8%-21.7%]; P = .04). Of the 12 secondary outcomes, 9 were not significantly different, but AF burden (zero burden in 78.3% vs 67.9%; difference, 10.4% [95% CI, 2.9%-17.9%]; P = .01), freedom from AF after multiple procedures (65.2% vs 53.8%; difference, 11.4% [95% CI, 0.6%-22.2%]; P = .04), and success achieving perimitral block (80.6% vs 51.3%; difference, 29.3% [95% CI, 19.3%-39.3%]; P < .001) were significantly improved in vein of Marshall-treated patients. Adverse events were similar between groups. Among patients with persistent AF, addition of vein of Marshall ethanol infusion to catheter ablation, compared with catheter ablation alone, increased the likelihood of remaining free of AF or atrial tachycardia at 6 and 12 months. Further research is needed to assess longer-term efficacy. [4]

There is little information regarding long-term mortality comparing the 2 most common procedures for septal reduction for obstructive hypertrophic cardiomyopathy (HCM), alcohol septal ablation (ASA), and septal myectomy. We evaluated outcomes of 3,859 patients who underwent ASA or septal myectomy in 3 specialized HCM centres. All-cause mortality was the primary endpoint of the study. This study sought to compare the long-term mortality of patients with obstructive HCM following septal myec-

tomy or ASA. In the study cohort, 585 (15.2%) patients underwent ASA, and 3,274 (84.8%) underwent septal myectomy. Patients undergoing ASA were significantly older (median age: 63.0 years [IQR: 52.7-72.8 years] vs 53.7 years [IQR: 44.9-62.8 years]; P < 0.001) and had smaller septal thickness (19.0 mm [IQR: 17.0-22.0 mm] vs 20.0 mm [IQR: 17.0-23.0 mm]; P = 0.007). Patients undergoing ASA also had more comorbidities, including renal failure, diabetes, hypertension, and coronary artery disease. There were 4 (0.7%) early deaths in the ASA group and 9 (0.3%) in the myectomy group. Over a median follow-up of 6.4 years (IQR: 3.6-10.2 years), the 10-year all-cause mortality rate was 26.1% in the ASA group and 8.2% in the myectomy group. After adjustment for age, sex, and comorbidities, the mortality remained greater in patients having septal reduction by ASA (HR: 1.68; 95% CI: 1.29-2.19; P < 0.001). In patients with obstructive hypertrophic cardiomyopathy, ASA is associated with increased long-term all-cause mortality compared with septal myectomy. This impact on survival is independent of other known factors but may be influenced by unmeasured confounding patient characteristics. [5]

A best evidence topic in cardiac surgery was written according to a structured protocol. The question addressed was whether surgical septal myectomy (SM) is more beneficial than alcohol septal ablation (ASA) in patients with hypertrophic obstructive cardiomyopathy. Altogether 218 articles were found using the reported search, of which 15 studies represented the best evidence to answer the clinical question. There were 14 observational studies and 1 meta-analysis study. The authors, journal, date and country of publication, patient group studied, study type, relevant outcomes and results of these articles are tabulated. Surgical SM was generally performed in younger patients whereas percutaneous ASA was favoured in patients with advanced age and significant co-morbidities. In a large study comprising 716 patients, the reduction of median residual left ventricular outflow tract (LVOT) gradient at 3 months was comparable after ASA (102 ± 52-10 mmHg) and SM (92 ± 39-9 mmHg). The New York Heart Association (NYHA) functional class and symptomatic improvement for either approach was comparable. Findings from the meta-analysis study showed that patients who underwent ASA had a higher incidence of post-procedure device implantation (odds ratio 3.09; P < 0.00001), as reported in 6 other studies. The risk of permanent pacemaker insertion during follow-up (FU) varied between 2.4-12.5% in SM and 1.7-22.0% in ASA. Isolated surgical myectomy and ASA are safe and effective in abolishing outflow obstruction, although the resolution of LVOT pressure gradient is more complete with surgery. The post-procedural and late mortality rates between the 2 groups are consistently low and comparable in carefully selected patients. Nonetheless, ASA is associated with the increased likelihood of complications such as permanent pacemaker implantation, early sustained-VT and VF, and re-intervention. Overall, when performed by experienced cardiologists and surgeons, both techniques are safe and effective in most cases and therefore treatment should be offered based on patient choice.[6]

Surgical myectomy and alcohol septal ablation (ASA) aim to decrease left ventricular outflow tract (LVOT) gradient in hypertrophic cardiomyopathy (HCM). Outcome of myectomy beyond 10 years has rarely been described. We describe 20 years of follow-up of surgical myectomy and 5 years of follow-up for ASA performed for obstructive HCM. We studied 171 patients who underwent myectomy for symptomatic LVOT obstruction between 1972 and 2006. In addition, we studied 52 patients who underwent ASA for the same indication and who declined surgery. Follow-up of New York Heart Association (NYHA) functional class, echocardiographic

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data, and vital status were obtained from patient records. Mortality rates were compared with expected mortality rates of age- and sex-matched populations. Surgical myectomy improved NYHA class (2.74±0.65 to 1.54±0.74, p<0.001), reduced resting gradient (67.4±43.4mmHg to 11.2±16.4mmHg, p<0.001), and inducible LVOT gradient (98.1±34.7mmHg to 33.6±34.9mmHg, p<0.001). Similarly, ASA improved functional class (2.99±0.35 to 1.5±0.74, p<0.001), resting gradient (67.1±26.9mmHg to 23.9±29.4mmHg, p<0.001) and provoked gradient (104.4±34.9mmHg to 35.5±38.6mmHg, p<0.001). Survival after myectomy at 5, 10, 15, and 20 years of follow-up was 92.9%, 81.1%, 68.9%, and 47.5%, respectively. Of note, long-term survival after myectomy was lower than for the general population [standardized mortality ratio (SMR)=1.40, p<0.005], but still compared favourably with historical data from non-operated HCM patients. Survival after ASA at 2 and 5 years was 97.8% and 94.7%, respectively. Short-term (5 year) survival after ASA (SMR=0.61, p=0.48) was comparable to that of the general population. Long-term follow-up of septal reduction strategies in obstructive HCM reveals that surgical myectomy and ASA are effective for symptom relief and LVOT gradient reduction and are associated with favourable survival. While overall prognosis for the community HCM population is similar to the general population, the need for surgical myectomy may identify a sub-group with poorer long-term prognosis. We await long-term outcomes of more extensive myectomy approaches adopted in the past 10 years at major institutions.[7]

Alcohol septal ablation (ASA) for hypertrophic obstructive cardiomyopathy (HOCM) has emerged as a lesser invasive alternative to surgical myectomy over the past decade. The purpose of this study is to analyse all the published literature on outcomes and complications after ASA. MEDLINE and PubMed were searched for all available published literature on ASA (June 1996-June 2005) using the terms hypertrophic obstructive cardiomyopathy (HOCM), alcohol septal ablation for hypertrophic obstructive cardiomyopathy, alcohol septal ablation for HOCM, alcohol septal ablation (ASA), transcoronary alcohol septal ablation for hypertrophic obstructive cardiomyopathy (TASH), transcoronary alcohol septal ablation for HOCM, nonsurgical septal reduction therapy (NSRT), and percutaneous transcoronary septal myocardial ablation (PTSMA). A total of 42 published studies (2,959 patients) were analysed. Mean age was 53.5 (35.4-72) years with a mean male to female ratio of 1.17. Mean follow-up was 12.7 +/- 0.3 months (1.5-43.2). Absolute ethanol (3 mL) was injected in 1.2 septal perforator arteries. On average, serum CK peaked at 964 units. At 12 months, there was a sustained decrease in resting and provoked LVOT gradient (65.3-15.8 and 125.4-31.5 mmHg, respectively) accompanied by reduction in basal septal diameter (20.9-13.9 mm), improvement in NYHA Class (2.9-1.2), and increase in exercise capacity (325.3-437.5 seconds). Early mortality (within 30 days) was 1.5% (0.0-5.0%) and late mortality (beyond 30 days) was 0.5% (0.0-9.3%). Other complications include ventricular fibrillation (2.2%), LAD dissection (1.8%), complete heart block requiring permanent pacemaker (10.5%), and pericardial effusion (0.6%). A repeat ASA was performed on 6.6% of patients and 1.9% of patients underwent surgical myomectomy with resolution of symptoms. Literature to date suggests that ASA results in acute and intermediate-term favourable clinical and echocardiographic outcomes. A randomized controlled trial is needed to compare ASA and myomectomy in order to determine which technique provides maximal benefit.[8]

CONCLUSION

We present the case of an elderly patient with symptomatic obstructive hypertrophic cardiomyopathy. Despite the modification of drug therapy, significant obstructive pressure in the outflow tract of the left ventricle still persisted. After adequate preparation, septal alcohol ablation is performed with echo control of the procedure. Postprocedurally, the dynamics of cardioselective enzymes are monitored with ultrasound verified hypokinesis of the S2 irrigation area. Due to intermittent complete AV block, a permanent electrostimulator is implanted. At the control examination, echo verified normal pressure in the outlet tract of the left ventricle with preserved systolic function of the same. The patient reports a post-procedural significant improvement in tolerance to physical exertion. ASA is preferred due to the often significant comorbidities in elderly patients, due to the fact that it is not necessary to put the patient under general anesthesia and that the post-procedural recovery is incomparably faster compared to surgical intervention. Because of the above, ASA should not be considered as an alternative to surgical intervention. Depending on the center, the training of the team as well as the experience of the same, it is necessary to carry out the selection of patients.

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