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REVIEW ARTICLES

Role of Percutaneous Septal Ablation in Hypertrophic Obstructive Cardiomyopathy

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Abstract:

HCM is a relatively common genetic mediated primary cardiac disease which may cause sudden death in the young including competative athlets.PTSMA is an alternative therapeutic option for surgical septal myomectomy who are high risk for surgery and presented with severe disabling symptoms due to marked LV outflow obstruction. PTSMA is performed by injection of 1 to 4 ml of 96% to 98% ethanol into the target artery in 0.5 to 1.0 ml aliquots at 1 ml/min. Selection of patients for PTSMA includes those with severe symptoms refractory to maximum medical management associated with LV outflow gradient ≥ 50 mm Hg and basal septal thickness ≥ 18 mm. Successful outcome following septal ablation by LV outflow gradient often reduced to < 20 mm of Hg and improved from symptomatic standpoint.

Introduction:

HCM is a relatively common genetic disease with important clinical consequences, including sudden death in the young[1,2]. It is estimated that progression to NYHA functional classes III/IV associated with obstruction to LV outflow occurs in about 10% of HCM patients who are limited largely by exertional dyspnea, chest pain-and fatigue[2].

The traditional first line of therapy to improve quality of life in HCM patients with symptoms and outflow obstruction has been administration of negative inotropic agents, including ß-blockers, verapamil, and disopyramide[1,2]. Although symptoms can be controlled by drug treatment, a small minority of patients may become disabled and refractory to maximum medical management, and consequently eligible for major therapeutic interventions that target relief of obstruction and mitral regurgitation[1].

However, experience with surgery has been limited a small number of patients.[1,2] Long-term outcome of HCM patients due to LV outflow obstruction may lead to progressive disabling symptoms and death related to heart failure.

Therapeutic options in Obstructive HCM:

Many countries with large numbers of HCM patients do not have ready access to such surgical expertise, and some patients are not optimal candidates for operation. Therefore, alternative therapeutic options for surgical candidates with HCM have justifiably been pursued[1,3].

There has been considerable interest over the past few years in a percutaneous method for relieving obstruction and symptoms that has been referred to in the literature by several names and acronyms[3-9]. This procedure uses conventional interventional methodology currently available for treating atherosclerotic coronary artery disease to create necrosis of the anterior basal septum by introducing absolute alcohol directly into a proximal septal perforator artery, ultimately reducing LV wall thickness, enlarging the outflow tract and reducing mechanical impedance to LV ejection. Therefore, percutaneous transluminal septal myocardial ablation (PTSMA) may mimic the morphological and hemodynamic effects of surgical myectomy.

PTSMA Technique:

The presence or absence of significant epicardial coronary artery disease, particularly in the left anterior

descending (LAD) coronary artery, is documented by angiography. The baseline gradient is measured by use of an end-hole pigtail catheter, assuring that the level of obstruction is subaortic(LVOT). For patients in whom the outflow gradient is either absent or small under the basal conditions, the magnitude of provocable obstruction is most appropriately assessed with physical exercise.

Of particular importance is proper selection of the target septal perforator. The optimal method is unresolved; some operators favor a pressure and fluoroscopic-guided technique in which balloon occlusion of the septal artery is followed by fluoroscopy to identify proximal septal tissue that is the target for ablation.[4] Most other PTSMA practitioners utilize myocardial contrast echocardiography to identify the appropriate septal perforator, which involves 2-dimensional echocardiographic monitoring during introduction of 1 to 2 mL of echo or angiographic contrast through the distal lumen of a balloon dilation catheter[5,6]. Contrast echocardiography enhances the effectiveness and safety of PTSMA by avoiding arteries that supply distant regions of myocardium, as well as by limiting the number of arteries intervened, the frequency of complete heart block requiring permanent pacemaker, the amount of alcohol injected (and creatine phosphokinase levels), and fluoroscopy time. After identification of the most appropriate perforator, balloon occlusion is followed by contrast injection through the coronary guide catheter as well as the distal balloon port to document complete cessation of flow between the distal septal artery and LAD.

PTSMA is performed by injection of 1 to 4 mL of 96% to 98% ethanol into the target artery in 0.5 to 1.0 mL aliquots at 1 mL/min. Reduced amounts of ethanol and slower infusion minimizes complications, particularly high grade atrioventricular block[2,4-9]. In the laboratory, the goal of PTSMA is acute reduction in resting and/or provoked gradient by 50% or to <20 mm Hg. The immediate post-ablation gradient reduction is probably due to alcohol-mediated septal necrosis and stunning, a mechanism distinct from the septal thinning and ventricular remodeling that is associated with progressive gradient reduction on long-term follow-up[5-9].

Clinical Results:

PTSMA has not been subjected to randomized clinical trials against the septal myectomy in patients with severe symptoms and outflow obstruction. However, observational data from US and European centers over short follow-up periods are reasonably consistent, attributing a number of favorable effects to PTSMA that generally parallel that of surgery, including gradual and progressive reduction in outflow gradient over 3 to 12 months and alleviation of symptoms[4-6].

In a comparative non-randomized study at 2 independent institutions, myectomy and alcohol ablation showed a similar degree of gradient reduction[5]. Another comparative analysis from a single institution showed both surgery and PTSMA to substantially reduce outflow gradients, but to a greater degree with surgery[7]. A third nonrandomized study showed surgery and PTSMA to afford similar benefit in reducing LV outflow gradient, both acutely and after 1 year; however, surgical myectomy out-performed PTSMA with respect to improvement in exercise capacity[8].

Complications

There is greater appreciation for identifying the most appropriate septal vessel for intervention and using smaller amounts of alcohol (introduced more slowly) creating more limited areas of myocardial necrosis and scarring[4,6,10]. PTSMA-related mortality has been reported at up to 4%, but in experienced centers is currently 1% to 2%[7-9]. Conduction abnormalities are relatively common complications of PTSMA, with permanent right bundle branch block and transitory heart block in about 50% and high-grade atrioventricular block requiring permanent pacemakers in 5% to 20%. Particular concern regarding complete heart block relates to its occasional unheralded occurrence after PTSMA, mandating inpatient monitoring for 4 to 5 days. A profound complication is anterior myocardial infarction due to ethanol reflux from the septal perforator down the LAD, avoidable by scrupulous balloon positioning. Other rare complications include coronary dissection, perforation, and thrombosis.

Selection of patient for PTSMA:

Selection of patients for PTSMA includes those with severe symptoms (ie, NYHA functional classes III or IV) refractory to maximal medical management associated with a LV outflow gradient ≥50 mm Hg at rest or after provocation (with physiological exercise) and basal septal thickness 18 mm. PTSMA is not indicated in the nonobstructive form of HCM

Limitations and Unresolved Issues:

Although PTSMA has found a place in the therapeutic armamentarium of HCM, several important considerations persist. The first issue concerns the potential long-term consequences of the intramyocardial

septal scar (often transmural) intentionally produced by PTSMA (and which is not a consequence of septal myectomy)[1,3].

It is counterintuitive to promote PTSMA as a treatment intervention to reduce risk for sudden death in HCM. Therefore, it is most prudent to discourage PTSMA in young adults (and especially children) when the surgical option is available.

A second major area of concern is the large number of PTSMA procedures performed over a relatively short period of time, unavoidably suggesting a lower threshold in recommending this procedure than for surgery. There have been an estimated 3000 PTSMA procedures performed worldwide in just 5 years. Therefore, PTSMA has probably been performed at a rate of 10 to 30 times that of surgery during this time. PTSMA derives understandably from the relative ease with which PTSMA can be performed compared with surgery, involving shorter postoperative recovery and less discomfort. However, it should be underscored that even in experienced hands, PTSMA may incur morbidity and mortality similar to that of septal myectomy.

Conclusions:

Alcohol septal ablation is a newer therapeutic modality in which alcohol is infused in a septal perforator arteries, producing a controlled myocardial infarction of the proximal septum. There fore subsequent wall thinning and remodelling of the basal septum region induced by the infarction result in reduction of the outflow tract obstruction. Septal ablation has been an attractive catheter- based treatment alternative to surgical septal myomectomy who are high risk for surgery, post operative complications and comorbidities & who presented with severe disabling symptoms refractory to maxium medical management due to marked LV outflow obstruction. The initial results from several centers have reported successful short-term outcomes following septal ablation. The outflow gradient is reduced from a mean of 60 to 70 mm of mercury often to <20 mm of mercury. Most (80-85%) patients improved from symptomatic standpoint. There were no major complications other than transient complete heart block requiring temporary pacing for 2 days and patient may discharged 5 days after ablation.

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