

Surgical Treatment of Ventricular Tachyarrhythmia. Which one is the Ideal Patient?

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ABSTRACT: Ischemic heart disease is the main cause of congestive heart failure. Left ventricular aneurysm resection has been recommended to treat congestive heart failure, fatal arrhythmias, to prevent thromboembolic complications, and angina. We describe our experience with left ventricular aneurysmectomy, preserving the elliptical form, with heart beating continuously. Many patients had indication of cardiodesfibrillator implant prior the surgery and 70% became free from this device after the aneurysmectomy. The method is safe, reproducible, with low mortality and morbidity.

DESCRIPTORS: tachyarrhythmia, left ventricle aneurism, implantable cardiodesfibrillator.

INTRODUCTION

Treatment of ischemic heart disease continues to be a challenge with more patients presenting with congestive heart failure. For many years, left ventricular aneurysm resection has been recommended in patients with coronary disease as treatment for heart failure, angina, thromboembolic complications or to control arrhythmias. Here we will describe our experience with left ventricular aneurysmectomy with continuous beating heart, in all of these indications.

Heart failure is a progressive disorder that develops after an initial myocardial injury that impairs normal cardiac performance. Virtually all forms of heart disease can lead to heart failure. However, manifestations of coronary atherosclerosis remain the primary etiology. Consequently, the evolution of heart failure after ischemic disease follows a sequence connecting vessel to muscle to form. Symptoms from this adverse geometric process evolve from a spectrum of neuroen-

docrine, pharmacologic and electrical factors, whose measurement and subsequent treatment decrease heart failure complications and prolong survival.

Although the treatment of acute coronary artery disease has undergone significant improvement in recent years, with thrombolysis or primary percutaneous transluminal angioplasty, the associated decrease of morbidity and mortality has resulted in an increasing incidence of patients who survive acute ischemic injury and later develop heart failure, life threatening arrhythmias or both. As pointed by Athanasuleas et al.¹ in the Restore study, despite angiographical successful early reperfusion, late left ventricular dilation develops in twenty percent of patients as a consequence of no-reflow phenomena. This process avoids transmural scarring and often causes subendocardial or trabecular scarring in a non homogeneous way. Intraoperative findings usually demonstrate a thin rim of subepicardial myocardium of little functional impor-

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tance, primarily because of dominant underlying scar. Anyway, cardiac death and combined events rate were significantly higher among these patients either.

BACKGROUND

Simultaneous direct myocardial revascularization with ventricular reconstruction, even though resection and direct closure, declined operative mortality. But classic linear aneurysmectomy had been useful to treat dyskinetic ventricles but not akynetic scars and, by this method, the septum was never approached.

Jatene² and Dor et al.³ reported two techniques that allowed a more anatomical reconstruction of left ventricular shape for dyskinetic or akinetic areas following myocardial infarction in the left anterior descending artery. The guiding principle is that cardiac architecture departs from the normal and efficient elliptical form, by changing dimensions toward a less efficient spherical configuration. These new approaches involve surgical ventricular restoration that rebuilds the spherical structure toward more normal geometric configuration and treat the septum if it is involved. Both techniques provides arrhythmias control also^{2,4}.

Jatene², by palpation of the beating ventricle, has defined the transition between contracting and non contracting muscle. So, he kept the heart beating to get this aim. But Buckberg⁵ has considered the value of the beating heart approach as a very efficient cardioprotective method. Adopting this method, he found reduced incidence of low output syndrome, less use of intra aortic balloon pump, with little inotropic support and that mechanical assist devices were not needed.

We share doctor Buckberg's point of view. When we began to face left ventricular aneurysms, what we observed was better cardiac performance when we do not perform surgery on cardiac arrest. So, we have done left ventricular aneurysmectomy without aortic cross-clamp, with continuous beating heart as a cardioprotective method.

METHODS

There were sixty three patients with mean age fifty two years old, ranged from twenty eight to seventy six years. There were fifty eight percent male and forty two percent female.

The indications for operation were isolated congestive heart failure in thirty four percent; congestive heart failure paired with angina pectoris in forty eight percent; in fourteen percent the primary indication was tachyarrhythmia. In three percent: heart failure, angina and arrhythmia, and in one percent: heart failure, angina and embolism. So, congestive heart failure was present in eighty six percent.

The mean left ventricular ejection fraction was twenty nine percent. Forty seven percent of patients

ranged from fifteen to thirty five; seventeen percent ranged from thirty six to forty five; and thirty six percent an ejection fraction more than forty five percent.

Indications for Operations:

Isolated Congestive Heart Failure (CHF) 34%
CHF+Angina 48%
Tachyarrhythmia 14%
CHF+Angina+Tachyarrhythmia 3%
CHF+Angina+embolism 1%
Congestive Heart Failure 86%

There are nine patients with tachyarrhythmia, some recovered from sudden death, and all of them submitted, before the operation, to an electrophysiologic study that confirmed an arrhythmogenic focus.

In functional class two, we observed twenty eight percent of our patients; in class three, fifty seven percent and in class four, fifteen percent. So, there were seventy two percent of our patients in class three or four.

Angina class according Canadian Cardiovascular Society was: thirty six percent in class one, forty one percent in class two, seventeen class three and six percent with instable angina.

The ventriculogram analysis allowed us classify sixty two percent patients as with dyskinetic scar and thirty eight percent with akinetic scar.

Thirty eighth patients were operated on aneurysmectomy associated with off pump coronary artery bypass graft that was done before aneurysmectomy. Twenty five were operated on isolated aneurysmectomy.

Surgical technique

All patients are submitted to cardiopulmonary bypass, avoiding aortic clamping.

The apex of the contracting ventricle is elevated by wet pads.

The epicardial surface of the infarcted anterior segment is incised parallel to the anterior descending artery. The inside of the left ventricle is carefully inspected for thrombi.

Palpation the margins of contractility delineates the nonviable segments including septum.

An encircling polypropylene suture is placed into endocardium to exclude the infarcted tissue.

This purse string is tightened as much as possible, forming a round or oval ring, a surgical neck. If necessary, a patch is then sewn with continuous suture but in majority of cases, like this one, it wasn't necessary cause the opening was secured obliterated by the arrested and nonfunctional ventricular tissue that will be extraventricular to the left ventricle closure. We

use to do direct closure of the remaining nonviable tissue, with interrupted suture over Dacron strips, that obliterates the opening ventricle and provides security against bleeding. When the septum was involved, it was treated with interrupted sutures to reinforce it.

RESULTS

The medium length of cardiopulmonary bypass was sixty five minutes. The intensive care unit length of staying ranged from two to eight (fifteen) days. Ventilatory assistance varied from zero, when patients were extubated at operating room, to ninety six hours. The medium length of hospital staying was twelve days.

Intra aortic balloon pump assistance was necessary in six patients. One of them preoperatively because of low cardiac output syndrome. Unfortunately this patient is here as one of the two deaths. We observed vasoplegia in two patients that needed use of vasopressors. One patient presented coagulopathy and was necessary surgical revision. Two deaths, one as we have informed and one as a result of pulmonary embolism.

Relatively to thrombus, it was present in forty seven percent. It was removed cautiously and safely. There was no evidence of systemic thromboembolism.

In ninety percent, the surgical procedure for ventricular restoration was based on principles of geometric reconstruction. And in ten percent, the patients underwent linear reconstruction.

All nine patients with tachyarrhythmia before the operation were submitted to another eletrophysiology study after the corrective surgery, and only three received an Implantable Cardiodesfibrilator, 4% of all patients.

CONCLUSIONS

The described surgical procedures for ventricular restoration in patients with ischemic cardiomyopathies

evolved from previous works to Jatene, Dor and others. What is fundamental is to restore the elliptical shape to optimize mechanical efficiency. Besides this concept, we think that:

- The technique of beating open ventricle must be used for myocardial protection rather than cardioplegic methods to avoid ischemia and to allow prompt resumption of ventricular function after repair, which may shorten the duration of cardiopulmonar bypass.
- In a beating heart, precise anatomic exclusion of the akinetic or dysknetic segment can be performed according to the palpation and visual inspection by the surgeon. There is no visual distinction between the contractile and noncontractile regions if there is trabecular or non homogenous scar when cardioplegia is used.

Coronary revascularization must be performed off pump, with intracoronary shunt to avoid even though regional ischemia.

Many patients with tachyarrhythmia were sent to our service to implant a cardiodefibrillator (ICD), considering the left ventricular aneurysm not feasible to be excised, to be too large, or do not have neck, or the poor left ventricle ejection fraction.

With the technique of continuous beating heart we did not have any restriction to surgery, we could operate all the patients safely with low mortality and morbidity.

The operation to treat tachyarrhythmias was successful in 70% of the patients, only 30% needed a ICD after the surgery.

We think that these two strategies perform the ideal cardioprotective method: off pump revascularization and beating open ventricle to treat ischemic left ventricular aneurysms.

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RESUMO: A doença isquêmica do coração é a maior responsável pelos casos de Insuficiência Cardíaca. A ressecção do aneurisma de ventrículo esquerdo tem sido preconizada para tratar a insuficiência cardíaca, controlar arritmias fatais, prevenir tromboembolismo e tratar a angina. Descrevemos um método original de tratamento dos aneurismas do ventrículo esquerdo, mantendo a forma elipsoidal do VE, com o coração batendo ininterruptamente. Vários pacientes foram enviados para implante de cardiodesfibrilador e 70% deles foram curados com a cirurgia de ressecção do aneurisma do VE, confirmado por estudo eletrofisiológico pré e pós-operatório. O método se mostrou seguro, reproduzível e com baixa mortalidade e morbidade.

DESCRITORES: aneurisma ventrículo esquerdo, taquiarritmia, cardiodesfibriladores.

Rivetti LA, Campagnucci VP. Tratamiento quirúrgico de las taquiarritmias. ¿Quién es el paciente ideal? Relampa 2011;24(1):18-21.

RESUMEN: La enfermedad isquémica del corazón es la mayor responsable de los casos de Insuficiencia Cardíaca. La resección del aneurisma de ventrículo izquierdo ha sido preconizada para tratar la insuficiencia cardíaca, controlar las arritmias fatales, prevenir el tromboembolismo y tratar la angina. Hemos descrito un método original de tratamiento de los aneurismas del ventrículo izquierdo, manteniendo la forma elipsoidal del VE, con el corazón latiendo sin interrupción. Se han enviado a varios pacientes para implante de cardiodesfibrilador y el 70% de ellos se han curado con la cirugía de resección del aneurisma del VE, confirmado por estudio electrofisiológico pre y postoperatorio. El método se ha mostrado seguro, reproducible y con baja mortalidad e morbilidad.

DESCRIPTORES: aneurisma ventrículo izquierdo, taquiarritmia, cardiodesfibriladores.

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