

SURGICAL OPTIONS IN MYOCARDIAL INSUFFICIENCY

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Myocardial Insufficiency is becoming a big challenge in cardiology. Over 10% of all people aged over 65 years suffer from myocardial insufficiency in various degrees. The incidence will increase with aging. Overall the outcome is more or less equal to malignancies, the prognosis is poor.

The causes of myocardial insufficiency are manifold, due to coronary artery diseases, cardiomyopathy and rhythm disorders.

In 1985 WHO in Salzburg recommended establishing that the need for cardiac surgery was of 1,000 cardiac operations per million population, whereby the volume of coronary artery surgery is 70%, valve surgery 20%, congenital cases 6%, aortic dissections 2% and replacement by means of transplantation 1%, a statement which is still valid today.

The surgical options for treating myocardial insufficiency are:

- Coronary revascularization
- Valve correction
- Volume reduction in enlarged left ventricles
- Correction of the rhythm and finally
- Assisted circulation and replacement of the heart by means of transplantation and artificial heart.

Bypass surgery

Coronary revascularization bypass surgery is one of the best evaluated procedures in medicine. Bypass surgery has been routinely performed since 1967 and was introduced by Favaloro. The Golden Standard for revascularization is the use of the left internal mammary artery in combination with a saphenous vein. It is evident that arterial graft in form of the left internal mammary has the best patency and should be used in any case to revascularize the left anterior descending artery of the heart. The veins are quite good, but the patency is inferior to the arteries. There are still cases in which the grafts are still open after 20 years. The occlusion depends on the flow and uptake of blood by the myocardium and on the quality of the veins. As an alternative to the LIMA there are the *Arteria radialis* and the *Arteria gastroepiploica*.

A risk with bypass surgery is the age of the patient, which is increasing constantly in the population. The multimorbidity of the patients, due to diabetes,

previous stroke and concomitant diseases such as kidney failure, lung diseases and a low ejection fraction are also risks. During the operation myocardial infarction can occur as well as stroke and postoperative kidney and lung failure.

In 1985 the mean age was 64 years, the patients received 2.1 grafts, in elective cases mortality was 0.69%. Twenty-five years later the mean age is 78, the patients get 4.2 anastomosis, the mortality has increased up to 3%.

An alternative to bypass surgery is PCI (stenting). Stenting is also limited due to in-stent stenosis. A multicenter study (ARTS-Study) clearly demonstrated in the long term that bypass surgery in multivessel disease is superior to stenting. Repeat PCI increases with diabetes up to 30%.

Valve surgery

Valve surgery has a long history. It started with mitral stenosis without heart lung machine in the 1930s. Since 1962 a routine replacement of the valves has been performed. As prosthesis there are mechanical and biological valves in use. With a mechanical valve the problem is thromboembolism, in the biological valve it is calcification. The valves have to be properly selected per indication for every patient individually. In many cases mitral valve reconstruction is possible, especially when the valve is degenerated, has an enlarged ring or rupture of the chordae and the papillary muscles. Today 30% of aortic valve replacements require an additional revascularization, mainly in elderly patients.

The number of left ventricular aneurysmectomies after myocardial infarction is decreasing. This technique is for volume reduction by plication of the scar of the left ventricle or removing the scar and inserting a patch. The reduction of the quantity mirrors the positive effect of modern cardiology. Early revascularization – early re-opening of a vessel. Thirty years ago we saw 30–40 patients per year, today only 1 or 2 patients per year.

Assisted circulation

The eldest routine form of assisted circulation is intra aortic balloon pumping, a technique introduced in 1968, where 25% of the cardiac output can be overtaken by the balloon pump. A balloon is inserted in the descending aorta and driven according to the ECG. In the early 70s cardiopulmonary bypass was a risk in itself. Many patients could not be weaned from bypass. This was the incentive to develop a Left Ventricular Assist Device which is implanted transatrial to the ascending aorta. 100% of the left ventricular work can be overtaken. Now such Left Ventricular Assist Devices are used as a bridge to transplantation. The original idea of a Left ventricular Assist Device was to unload the heart until it could recover. In the last

decade many patients with cardiomyopathy caused by viral infections recovered, so that the device could be removed.

The total artificial heart with its first European clinical use in Salzburg 1986 is not the choice anymore. The driving systems are still too complicated. There are 3 areas of hazards: the valves, the biomaterial and the driving system. The first clinical cases of total artificial heart showed the feasibility but it is not desirable as an alternative to transplantation. An alternative could be Left Ventricular Assist Devices. There are some long-term experiences over five years now available. The limitation is still the driving system.

The transplantation introduced by Barnard in 1967 is a standard procedure in replacing a failing heart. The limits are still rejection and donor availability. These limits are not seen in artificial ventricles.

Conclusion

Overall modern cardiac surgery is an important tool for fighting myocardial insufficiency in the whole context of interventional cardiology. With an aging population the indications for assisted circulation are increasing. These small devices will be available to unload a failing heart.

The incidence of cardiac operations is constant with 1,000 operations per million/population in developed countries. In an aging population, even with all the multimorbidities, thanks to the improved techniques that give optimal results most patients can return to their normal lives.