ALTERNATIVES IN CORONARY BYPASS TECHNIQUES

Hakkı Akalın* Carlos Del Campo**

Aorto-coronary bypass surgery has now been in existence for a decade and a half (5). It has been a welcomed armamentarium in the treatment of coronary artery disease. Even the most conservative physicians who were originally opposed to this concept have come to accept that, in selected patients, this is an effective tool in treating angina pectoris (4,9). It has revolutionized the management of patients with coronary artery disease.

Long term results depend to a large measure on the risks of surgery which in turn depend in part to the surgical skills of the teams involved. The other determinants of surgical results are, of course, left ventricular function and the extent of atherosclerosis (1). Recent reports comparing medical and surgical management point to the importance of technical quality in the interpretation of surgical results (4). It is not fair to compare mediocre surgical results with the natural history of coronary artery disease (9).

By and large, the techniques have been well standardized and accepted (7,8). There are, however, minor personal differences in the handling of certain steps in the operation (7,8,11).

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* Associate Professor. Deparment of Thoracic and Cardiovascular Surgery. Medical School of Ankara University (Former Clinical Assistant, University Hospital, UWO, London, Ontario, Canada)

** MD, FRCS (C), Deparment of Thoracic and Cardiovascular Surgery. Victoria General Hospital, Halifax, NS, Canada (Former Chief Resident, University Hospital, UWO, London, Ontario, Canada)

A — Myocardial preservation

B — Anastomotic technique

C — Selection of arterial sites

D — Selection of conduits

MYOCARDIAL PRESERVATION :

Most surgeons now operate under moderate systemic hypothermain, in the range of 28-32°C, although a minority still either use normothermia or profound hypothermia (1,2,7,8,11).

It is also generally agreed that aortic occlusion is best in that it gives a quiet, dry field. To protect the myocardium during this anoxic period, the most popular technique is to infuse cold cardioplegic solution into the aortic root (1,6,11). Alternatively, a small number of surgeons use intermittent aortic occlusion (11). Myocardial surface cooling is sometimes used as an adjunct (1,2). However, since the heart is manipulated and elevated frequently during grafting procedures, the cooling fluid in the pericardium is usually not efficient. Cold packs or pads have been used instead. We use UH solution (500 ml Lactated Ringers solution, 10 mEq KCI, 12.5 mEq of $NaHCO_3$, 12 ml 2 % lidocaine, 17 ml 50 % dextrose ,125 mg of Solu-cortef, pH 7.7) at 4°C and 300 mmHg pressure. The initial infusion is 500 ml after each distal anastomosis.

Regardless of the method of myocardial protection used, however, expeditious operations should be emphasized since myocardial injury is time-related.

The most important reason for venting the left ventricle is to prevent left ventricular distention. It also provides for a dry operative field and reduces the rate of myocardial rewarming. However, its greatest disadvantage is the possibility of air embolism as well as myocardial damage (11).

Anastomotic Techniques :

All obstructed (75 %) coronary arteries with distal artery diameter more than 1-1.5 mm are grafted. The concept of complete revascularization should be based more on the areas supplied by these vessels rather than by the number of arteries grafted (11). The number of grafts constructed should be weighed against the time expended so that the cost-benefits, so to speak, are effective. Arteriotomies range from 4 mm to 15 mm (2,7). UH preference is 7-8 mm. The anastomotic techniques commonly employed are : interrupted and continuous with or without fixation points (12). Either heel or toe may be sutured first. The interrupted technique gives more accurate placement of sutures, but is more time consuming (11,12). The continuous suture is favored by us with placement of 3-4 bites at the toe first before lowering the vein into the artery. A 6-0 polypropylene suture is used. For sequential grafts a side-to-side anastomosis is used. Some surgeons prefer a diamond-shaped anastomosis (12).

The aortic anastomosis is constructed with 5-0 polypropylene sutures, in a continuous manner after creating a 4-5 mm orifice in the aorta with a punch.

The use of optical magnification is an individual choice (1,2,11) We do not routinely use this aid.

The question of whether sequential grafting is superior to individual grafts is still being debated (3,11). UH choice is for individual grafts, unless the vein is not of sufficient leght or the aortic root is too short.

Selection of Arterial Sites :

As a rule, the site selected for arteriotomy is immediately distal to the obstruction. In the circumflex artery, however, it is usually more accessible to graft the marginal branches.

Selection of Conduits :

The most popular conduit, of course, is the autogenous saphenous vein (1,2,3,7,8,10,11,12). In instances where this vein is not suitable,

the short saphenous vein, cephalic vein, long saphenous vein allograft, Gore-tex or Dardik Biograft can be used in that order of preference (10) The internal mammary artery gives excellent long term results (7,11). Its shortcomings are : 1) only 2 proximal arteries can be grafted; 2) it is more time-consuming; and 3) there are more instances of sternal dehischence (11).

SUMMARY

Alternatives In Coronary Bypass Techniques

In summary, we have outlined the various alternative surgical techniques in the management of aorto-coronary bypass. It is by no means an exhaustive review. These techniques have been in use at University of Western Ontario.

It is difficult to ascertain the «best» method of dealing with a particular problem. The whole operation is a series of numerous small procedures and each surgeon has his own way of dealing with each and arriving at a satisfactory result. There is probably no «best» technique, indeed it might not be desirable. But the surgeon who has mastered these various methods would be best equipped to deal with emergencies.

Although important, surgical technique is not the only determinant of good surgical results. The proper selection of patients, superior anasthetic management as well as improved post-operative care have all contributed to bringing the operative mortality down to a minimum. It is hoped that with more technical refinements, this mortailty can be even further reduced.

ÖZET

Aorto-koroner bypass uygulamalarında çeşitli alternatif cerrahi teknikler ortaya konulmuştur. Bu incelemede tüm tekniklerin ayrıntılı bir şekilde gözden geçirildiği iddia edilmemektedir. Bu teknikler

UWO da uygulanan tekniklerdir. Tatminkar bir cerrahi sonuç elde edlmesinde; cerrahi teknik, uygun hasta seçimi, superior anastezik uygulama ve yeterli bir post-operatif bakım önem kazanmaktadır. Tüm bunların üstün bir düzeye getirilmesi ile mevcut düşük mortalite daha da azaltılacaktır.

REFERENCES

1. Coles JG, Del Campo C, Ahmed SN, Corpus R, MacDonald AC, Goldbach MM, Coles JC : Improved long-term survival following myocardial revascularization in patients with severe left ventricular dysfunction J Thorac Cardiovasc Surg, 81 : 846, 1981.

2. Cooley DA : Revascularization of the ischemic myocardium. J Thorac Cardiovasc Surg, 78 : 301, 1979.

3. Hanna ES, Ellertson DG, Jones, RJ, Crew JR : Coronary artery revascularization. Texas Heart Institute Journal, 9 : 293, 1982.

4. Heupler FA jr : Current Medical Management Versus Coronary Arterial Bypass Grafting in Patient with Stable Angina Pectoris. Am J Surg, 141 : 651, 1981.

5. Hurst JW : Update I. The Heart. 1979. McGraw-Hill Book Company. New York page : 122.

6. McDonagh PF, Laks H : Use of cold blood cardioplegia to protect against coronary microcirculatory injury. J Thorac Cardiovasc Surg, 84 : 609, 1982.

7. Miller DW jr, Hessel EA, Winterscheid LC, Merendino KA, Dillard DH : Current practice of coronary artery bypass surgery. J. Thorac Cardiovasc Surg, 73 : 75, 1977.

8. Miller DW jr, Ivey TD, Bailey WW, Johnson DD, Hessel EA : The practice of coronary artery bypass surgery in 1980. J Thorac Cardiovasc Surg, 81 : 423, 1981.

9. Proudfit WL, Bruschke AVG, Sones FM : Ten year study of 601 non-surgical cases. Prog Cardiovasc Dis, 21 : 53, 1978.

10. Silver GM, Katske GE : Clinical experiences with the stabilized human umbilical vein in coronary bypass surgery. Vascular Surgery, 14 : 192, 1980.

11. Ullyot DJ : Current controversies in the conduct of the coronary bypass operation. Ann Thorac Surg, 30 : 192, 1980.

12. Young JN, MacMillan JC, May IA, Iverson İ, Ecker RR : Internal configuration of saphenous-coronary anastomoses as studied by the cast-injection technique. J Thorac Cardiovasc Surg, 75 : 179, 1978.