Treatment of Advanced Coronary Atherosclerosis

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As you know, it has become one of the leading health problems of our aging population in the U. S. Various approaches over the years have been considered. First of course was the usual medical approach for treatment of the end-results of years of atherosclerotic build up in the coronary circulation. This approach is still the major approach for treatment. As far as control goes, we have tried to single out all the various risk factors and zeroed in on control or elimination—such things as control of diabetes, hypertension, hyperlipidemia, tobacco consumption, lack of exercise, extreme repetitive chronic stress etc. Notwithstanding all of this, we were still left with advanced coronary artery disease and resultant disability that needed something more to stem the rapid course toward death.

Many years ago, I believe at the Cleveland clinic, surgical approaches were started for revascularization of the myocardium—first with opening the chest and the pericardium, sprinkling talcum powder on the heart, and then hoping this would cause a marked revascularization and recapillarization of the myocardium. As time went on, it was obvious the procedure was worthless. At a later date the well known mammary artery transplant into the myocardium was attempted. Finally, a double blind careful study was done on this group and it was found out that it, too, was worthless. Around about 1965-1966, a new procedure was attempted—called saphenous vein by-pass coronary artery graft. Portions of the saphenous vein were sewn into the coronary system selectively by-passing near blocked or blocked areas. At the beginning only one graft was used but as technique improved, up to

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four grafts were used bypassing severely compromised areas in the heart. Also as time went by, mortality from the procedure improved so that now it is minimal. At the present time the procedure is commonly done in all our hospitals which have open heart surgical theatres so that many thousands of operations are done annually.

In the past 2-3 years, the carefully controlled statistics have been compiled on the relative efficacy of this procedure on controlling morbidity and mortality from coronary heart disease. One recent paper reported on a five year follow-up from surgery that there had only been a 10% failure rate within the first year—i. e., 10% of the grafts had fibrosed over and become incompetent and that at the end of five years, at least 80-85% of the grafts were still functioning.

In the American J. of Cardiology, Vol. 42, #5, Nov. 1978, is the report of a study by five doctors from the famous Baylor College of Medicine, Houston, Tx. This is a follow-up on 1,144 patients who had the bypass surgery and were contacted 5-6½ years after surgery. 1000 of the patients were men with a mean age of 50.1 years. They were picked for surgery because the coronary lesions showed over 70% reduction in luminal diameter. 3.8% of the patients had had congestive heart failure without angina, 21% had had both heart failure and angina. Unstable angina was present in 13%. Previous myocardial infarct had occurred in 59%. Single vessel disease present in 20%, double vessel disease in 38.6%, triple vessel disease in 32.9% and greater than 50% stenosis of left main coronary artery in 8.7%. Incidentally, this is the pathology that is becoming increasingly clear as the real killer and the one that demands surgical intervention more than any other disturbed physiology in the heart. The operative mortality in this group was 4.6% but if you excluded the mainstem left coronary disease group, mortality was reduced to 3.8% and the overall crude year survival rate was 89%. All groups had over 5 year survival rates of 92-81% (ranging from 1-3 vessel disease). The left main coronary artery disease group had 81.4% survival. The graft patency rate varied among groups from 86-94%. Late survival of all patients with reasonably good preoperative left ventricle function was normal compared with the expected number of survivors in the general U.S. population. With poor ventricular function, survival was impaired but still superior to that reported with medical treatment only.

Although this operation has gained wide acceptance, its efficacy on prolonging life of patients with multivessel coronary disease has remained uncertain, except in the small group of patients with stenosis of left main coronary (8.7%) in which it has been shown to

produce superior late survival rates. In conclusion, then, the aim of this study which I have been quoting you, was to determine the influence of the operation on late survival of multivessel coronary disease victims over 5 years postoperative. I believe the careful study is rather convincing.

In another study called the Veterans Administration Cooperative Study that was done around the same time, the results were quite inferior to the ones claimed in this study. These authors claim the reason for that is that the Veterans group had a higher perioperative mortality rate (5.6%), and the low graft patency rate (69%) with 88% having one patent graft but only 54% having all grafts patent as compared to the Baylor group where 86-94% patency was claimed. In other words, many patients in Veterans group had at last two vessel residual disease post operatively and thus remained in a high risk category. Also it only involved studying 113 patients.

Another study was done of results at the Texas Heart Institute, a competing medical facility in Houston, between 1969-1973 on 3,044 patients. The average age of the patients was 53. Of this group, 17% had single bypass, 49% double, and 31% triple, and 2% four or more. The other Texas group had 59% with three or more grafts compared to this group of 33%. The risk experience was nearly as favorable as in the first group mentioned above.

Another discussion on coronary bypass surgery is given in a paper by McIntosh et al in Circulation, Volume 57, Page 405, 1978, entitled "First decade of Coronary Artery By Pass surgery and grafting, a review". This is probably the most in-depth discussion and analysis on the subject to date. Many points are brought out and I will try to summarize this lengthy paper:

1. Over half a million people have had this operation to date. The average cost is \$10,000 to \$15,000, and about 5/8ths of this money goes to the doctors and the rest to the hospital.
2. Some centers go so far as doing surgery after just the simple diagnosis of anatomically demonstrable CAD by angiography, even if the patient is completely asymptomatic.
3. Adverse effects of the surgery include perioperative myocardial infarction (very low at this time), acceleration of the rate of progression of the disease in the native circulation in large numbers of patients (due to fibrotic changes around the anastomotic areas of the

implant), occlusion of the graft occurs in 36% or more after three years (great divergence of opinion on this as I have already mentioned above), the occlusion when it occurs seems to involve right coronary or circumflex branches over left coronary:

4. There is no convincing evidence that the procedure prevents or postpones premature death (again, much evidence pro and con on this).
5. Contrary to expectations, rehabilitation benefits as a result of this surgery appear to be few.

One must bear in mind that this paper was written by a prestigious Cardiology group in Houston, at the Methodist Hospital associated with Baylor College of Medicine where the enthusiastic surgeons hang out. These men suggest the following indications for this surgery:

1. It is the most effective treatment for the relief of angina which is refractory to currently available medical management. There is at present no conclusive data to support concept this surgery is superior to adequate medical management (that is working !) to prevent or even ameliorate other signs and symptoms of Incipient Heart Disease, such as infarction, arrhythmias and congestive heart failure.
2. With the exception of left main coronary artery disease and those with total occlusion of right coronary and over 70% of left anterior descending coronary, there is inadequate data to justify premise that this surgery prolongs life.
3. Inadequate data to support this is that this surgery prevents occurrence of sudden death better than intensive medical treatment does.
4. No evidence to justify this surgery in asymptomatic patient.
5. There is considerable data indicating CAD incidence decrease (as I noted above) in this country due in part to modification of life style.

In another paper discussed, (American Journal of Cardiology, Volume 40, Page 291, August 1977), one that is specifically directed to surgical versus medical treatment of principally left main coronary disease, the Hahnemann Medical College and hospital in Philadelphia makes the following statements:

1. Before deciding on medical versus surgical treatment of left coronary artery disease, the status of the left ventricle and the status of the distal coronary artery circulation must be assessed.

2. Results of this surgery in patients with reasonably good left ventricular function show symptoms can be dramatically decreased at an acceptable surgical risk and that these patients live longer than comparable patients treated medically.
3. The outlook of patients with left main coronary artery disease and poor left ventricular function is poor indeed with either medical or surgical treatment. Surgery carries a higher risk but it may improve survival.

Incidentally, the Veterans Cooperative Study referred to above makes the unequivocal statements that patients with significant left main coronary disease have better results when treated surgically rather than medically. They felt the prognosis of these patients treated medically, especially those with additional right coronary disease and left ventricular dysfunction, was very poor and 43% of them in their study were dead after 18 months of study.

A very recent publication on this subject with reference particularly to just left coronary artery bypass surgery is entitled, "Operative Risk Factors with left main Coronary Artery Disease" done by part of the group of the so-called Collaborative Study in Coronary artery surgery in the New England Journal of Medicine, Volume 303, October 23, 1980. The study was done on 1172 selected patients by 75 doctors at 30 prestigious institutions around the United States. The results showed that aortocoronary bypass surgery in patients with left main coronary artery disease can be performed with left main coronary artery disease can be performed with a low mortality (4.2%) and that patients at high risk can often be identified before surgery. As I mentioned earlier, this type of coronary disease is referred to as the real killer and probably has one of the highest priorities for bypass surgery.

I want to conclude this discussion by mentioning one very new surgical procedure that has come along for the treatment of single or specific reachable coronary artery lesions. After this I will briefly mention the medications used for possible reduction of coronary atherosclerosis. The surgical procedure is called PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY—500 cases have been treated so far in the United States. The procedure involves introducing a catheter through the femoral artery as in coronary angiography, the catheter has an expandable balloon on the end and the balloon inflates in a cylindrical shape rather than a ball shape. It was first used in Zurich in femoral and renal soft atheromatous lesions. Angiography and cinematography has to be done first to find suitable candidates because it is basically to be used in solitary lesions that are soft and

non calcified. It does involve transient occlusion of the artery. The idea is to compress the soft lesions and spread out sub-endothelially. Only in 2/3rds of cases can the lesion be reached with the catheter. When the procedure is done, there must be a standby operating room ready to do coronary bypass surgery if anything goes wrong in the procedure and the artery is occluded. This appears to me as brave kind of surgery but I suppose most new procedures including bypass surgery was felt to be brave and bold when it first started. No follow-up is available yet on this procedure.

And finally, one final word about drug therapy of coronary atherosclerosis. The theory here is that drugs will substantially lower lipid absorption and deposition within the body. There has been much controversy about this. But it does seem as though certain drugs will not only lower circulating blood lipid levels, principally cholesterol, but also relieve the person with far advanced ischemic heart disease and severe angina. A prestigious group of American Internists who put out a bi-monthly newsletter called "The Medical Letter" recently noted the following drugs:

1. Clofibrate (Atromid-S)—limited to patients not responding to diet who fail to respond to other lipid lowering drugs and who are at high risk for coronary disease.
2. Cholestyramine [Questran] and Colestipol [Colestid].—These are bile acid binding resins and are much more effective than clofibrate in lowering serum cholesterol, up to 20–30%. The disadvantage is that they are less well tolerated causing constipation, nausea, vomiting, flatulence and diarrhoea. They can also interfere with absorption of such things as chlorthalidzide, digoxin, tyroxine. Their action can be potentiated by giving niacin or neomycin concurrently.
3. Niacin —occasionally associated with cardiac arrhythmias. Patients dislike the flushing effects and pruritus and G. I. cramps. Has been shown to cause hyperpigmentation, glucose intolerance and hyperuricemia and possible liver toxicity.
4. Neomycin—it is a nonabsorbable aminoglycoside antibiotic. Given in doses of 0.5–2.0 gm / day reducing cholesterol 20–30% and if given in conjunction with cholestyramine or clofibrate may reduce cholesterol up to 40%. Well tolerated. Can be nephrotoxic.

Conclusion:

If used, the combination of cholestyramine with niacin or neomycin seems the best regimen. Their effectiveness in reducing mortality from CAD remains unproven. Finally, platelet disaggregating drugs is another approach to reduce Coronary Artery Disease. Such drugs combat thromboxin-A- and serotonin, two substances released when platelets aggregate to go on to start the infarction process. Downstream embolization from such aggregation has been reported to occur.