

ARTERIOPLASTY IN DIFFUSE CORONARY ARTERY DISEASE IS A SAFE ALTERNATIVE

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ABSTRACT

Objective: To assess the efficacy of coronary arterioplasty in patients who have more aggressive and diffuse coronary artery disease.

Method and Patients: This is a retrospective observational study of cases performed over nine year period (Jan 2000-Dec 2008). Thirty five patients, with diffuse coronary disease had arterioplasty. Their peri-operative course was compared with a similar number of patients with matching profile but relatively better coronaries.

Results: Fourty arterioplasties were performed in 35 patients. There were 30 males and 5 females. Mean age was 53.46. Clamp time and ventilation time in ICU was longer in this group compared with control group. Need for ionotropic support and ICU stay were same in both groups. There was no other morbidity or any mortality in either group. Follow-up for six months was complete. Patients remained active and symptom free.

Conclusion: Coronary arterioplasty is a safe and effective alternative, in a group of patients who have diffuse coronary disease.

Key Words: Coronary arterioplasty, diffuse coronary disease, CABG surgery, coronary endarterectomy.

INTRODUCTION

Patients with diffuse coronary artery disease is a difficult group in whom complete revascularization with simultaneous patency of grafts poses a surgical challenge. It has been reported that incomplete revascularization of the left anterior descending artery (LAD) results in higher mortality than when other coronary arteries are left ungrafted¹. Coronary reconstruction is a more attractive option. Other alternatives are multiple grafts to cover skip areas, or accept poor run-off or incomplete revascularization. Considering the immediate and late post-operative problems of coronary endarterectomy, many surgeons now prefer coronary reconstruction without endarterectomy. Patch reconstruction of the diseased coronary artery with either the internal mammary artery or another conduit is an attractive option.

Diffuse coronary artery is now more frequently treated surgically. Coronary artery reconstruction with endarterectomy was a previous practice. Although it gave acceptable results early and late problems related to endarterectomy remained. The technique of long open endarterectomy has been described²⁻⁴, but post-operative intimal hyperplasia proves to be the major drawback of this technique^{5,6}. Coronary reconstruction without endarterectomy is an attractive option because it avoids removing the protective endothelium from the coronary artery. This helps to reduce the coronary events and improve long term results.

The purpose of the present retrospective study was to review the early clinical efficacy of our modified technique of long segmental coronary arterioplasty in diffusely diseased cases using IMA or vein patch.

METHOD AND PATIENTS

Retrospective review of coronary artery bypass grafting, from January 2001 & December 2008 was done. Four hundred and seventy five patients had

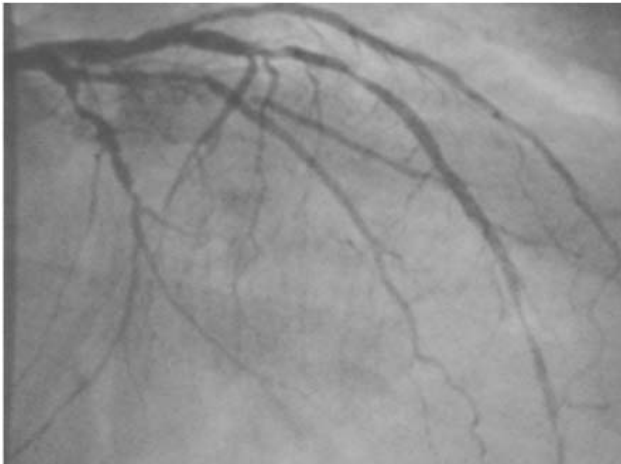
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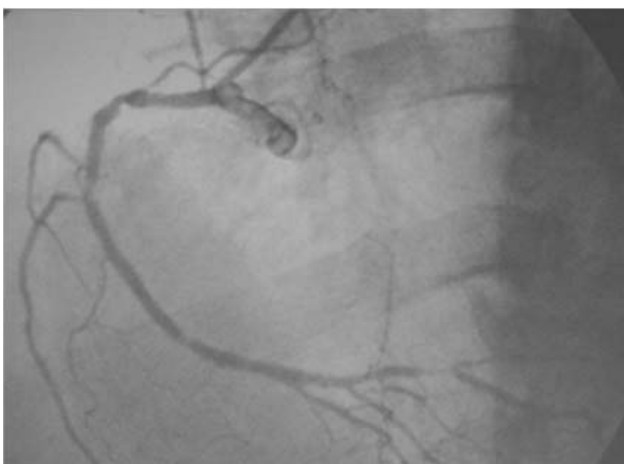
coronary artery bypass surgery performed. Of these, 35 patients had diffuse disease who qualified for patch arterioplasty. Patch arterioplasty was considered suitable in them because the vessels had at least one further lesion in the mid or distal course (Fig I,II). Skipping this later lesion would either mean incomplete revascularization, poor run-off, or early graft closure. Decision to undertake patch arterioplasty was, in majority of cases preoperative, on reviewing the angiogram prior to surgery. These cases were matched with randomly picked similar number of cases with matching profile and risk stratification.

Fig. 1



Diffusse LAD disease needing arterioplasty

Fig. 2



Diffusely diseased right coronary artery needing arterectomy

Technique of Surgery

All cases with diffuse coronary disease were performed under conventional cardiopulmonary bypass support. Anaesthesia was induced with thiopentone sodium and maintained with Isoflorane inhalation. A median sternotomy is performed, LIMA and Sephenous veins are harvested. Diluted Sodium Nitropruside solution is injected onto the harvested IMA to reverse vasospasm. Sephenous vein is preserved in sangious normal saline solution. The pericardium is opened, Cardiopulmonary bypass is established in the usual fashion with Aortic and two stage venous cannula.

Aortic root vent was used in all cases. Antigrade cold blood cardioplegia enriched with glucose and buffered with soda bicarb was used, with topical ice slush. Atheromatous plaques on the artery are observed carefully through the adventitia or palpated by a finger. If a distal occlusive disease is present, and the lumen is deemed appropriate for grafting, arteriotomy just distal to the disease is made.

Incision is then carried backwards through the plaque which is laid open, with clear proximal and distal lumens are seen beyond it. Internal mammary artery or sephenous vein conduit is prepared to a matching length. Anastomosis is carried out using 7/0 double ended polypropylene suture mounted on 8 mm round body needle, with heal first technique in a single continuous running fashion. A meticulous attention was devoted to avoid redundant patch, which may promote loss of kinetic energy and cause sluggish flow.

RESULTS

Over a period of nine year 35 patients underwent coronary arterioplasty. There were 30 males and 5 females in arterioplasty group, whereas 29 males and 6 females in the control group(FigIII). Mean age in arterioplasty group was 53.46(SD±9.11) and in the

Table-I

Age Comparison			
Group	Age Range	Mean	Std. Deviation
Arterioplasty n=35	37-68	53.46	9.115
Control n=35	35-69	54.34	7.853

Fig. III

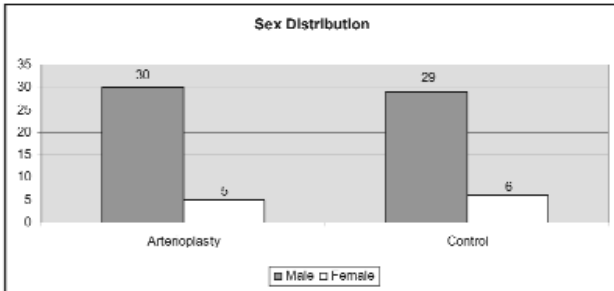


Fig. IV

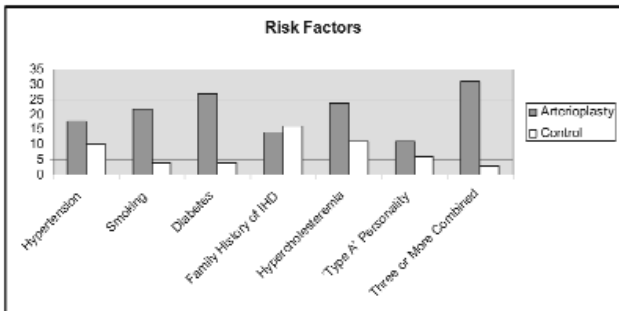
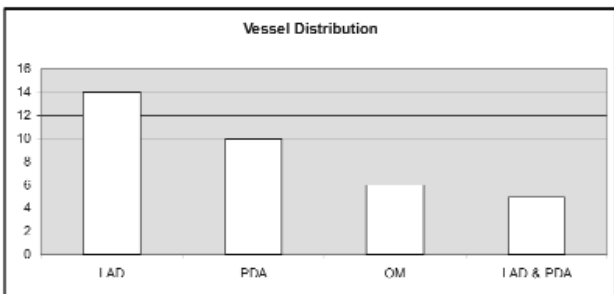


Fig. V



control group was 54.34(SD±7.85) (Table I). in arterioplasty group. Risk factors in the patients with aggressive coronary disease were clearly more prevalent compared to those with the control group(Fig IV). Altogether 40 vessels needed arterioplasty. Fourteen in LAD, 10 in PDA, 6 in OM, and 5 in both LAD and PDA simultaneously (Fig V). All arteriotomies in LAD area were covered with extended internal mammary artery on-lay patch graft, and others by sphenous vein patch graft. Cross clamp time was longer if arterioplasty was carried out (50 ± 5 mins vs 36 ± 5 mins in control group)(Fig VI). Need for ionotropes in both groups was about the same. Patients with arterioplasty though had longer clamp time and more aggressive disease, weaning from bypass was easy There was no added need for ionotropes, or intra aortic balloon assist, or need for temporary pacing on weaning of bypass or in the ICU(FigVII). This presumably was due to complete

Fig. VI

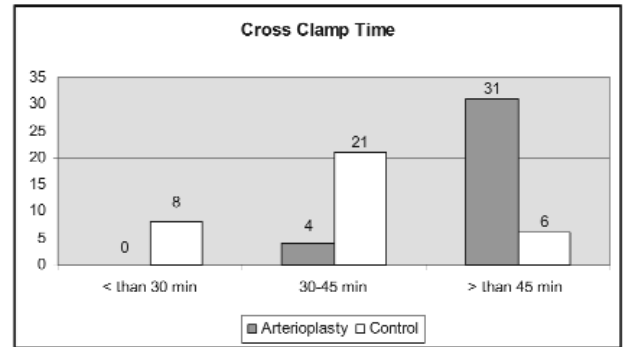


Fig. VII

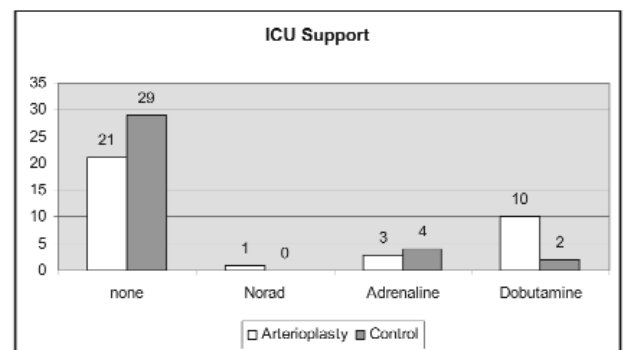
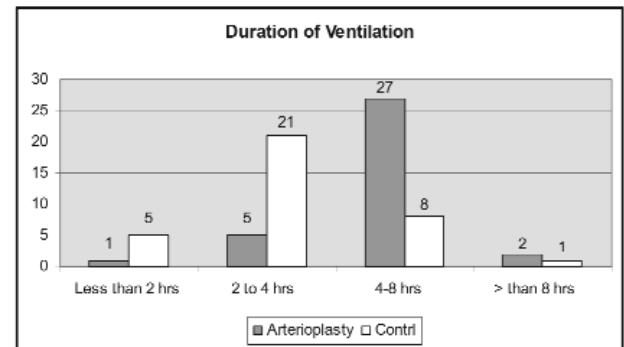


Fig. VIII



revascularization of the myocardium. However, eight patients needed defibrillation on removal of cross-clamp. In all other instances, heart came back with spontaneous contractions which improved to go on to sinus rhythm. Arterioplasty patients needed slightly longer ventilation than the control group (Fig VIII). Except for one patient, who developed multifocal ventricular ectopics for a brief period, others did not experience any arrhythmias. All the patients remained in ICU for 48 hours as a normal procedure, and were then shifted to ICU. There was no difference in postoperative course between the two groups. There was no morbidity or mortality during the stay.

Patients were followed up in out patient clinics for atleast six months. All were alive and well. The arterioplasty patients had an exercise test, all patients successfully completed Bruce protocol and were fully active and functional in their normal daily activities. Repeat angiograms to assess arterioplasty and graft run off were offered to patients. However all of them declined, citing economic reasons hence were not pushed. They were all strictly counseled for reduction of risk factors, and warned against return of disease in case of neglect.

DISCUSSION

Coronary artery bypass grafting has changed substantially with surgeons often facing more advanced atherosclerotic burden. Consequently, achieving complete coronary revascularization has become more challenging in an increasing proportion of patients.

In those patients who have multiple risk factors, as also evident in our cohort, aggressive disease leads to incomplete revascularization. Concurrently, it leads to poor runoff in coronary beds, associated with a greater risk of reduced long-term graft patency with a potential decrement in survival¹. After the establishment of percutaneous coronary interventions, discrete lesions are dealt in the cath labs. And increasing number of patients with a diffusely diseased are referred for CABG.

Conventionally diffusely diseased coronary arteries were treated with endarterectomy⁷. But the results from early series of endarterectomy were not satisfactory. In the literature, the patency rate at 1 year of the venous graft with endarterectomy has been quoted between 56 and 90%⁸⁻¹⁰. Arterioplasty is a simple alternative to the more aggressive endarterectomy. There are risks of damage to branching system, incomplete removal of the core leading to acute occlusion of graft, activation of thrombotic process leading to acute or early graft closure, and finally neointimal hyperplasia compromising the graft run-off. Arterioplasty however has the advantage of retaining normal intima with clear proximal and distal lumens. This ensures free proximal and distal blood flow and possibility of graft flow compromise is circumvented.

In our short series, patients did not need any additional inotropic support or longer ICU stay after arterioplasty despite a longer ischaemia time. This implied that diffusely diseased area did not remain ischaemic any more. Similarly these patients were active and symptom free on follow-up. Ideally, repeat coronary angiogram was needed to objectively confirm effectiveness of arterioplasty, but all the patients desisted from it citing economic issues. We did not have such funding whereby we could repeat coronary angiogram to see the graft run-off. We therefore settled for stress testing and got a reasonable idea of patient's functional class.

CONCLUSION

In conclusion, we feel that coronary arterioplasty is a safe and effective alternative, in a group of patients who have diffuse coronary disease. It ensures complete revascularization of the distal territory with a very good run-off. This, therefore, ensures longer graft patency better functional class.

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