USE OF INTERNAL MAMMARY ARTERY GRAFT IN THE ELDERLY

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216 patients 65 years of age or older, underwent coronary artery bypass grafting (CABG). Left internal mammary artery was used in 182 of these patients. Despite its excellent long-term results and superior patency rates, many cardiac surgeons avoid using internal mammary artery (IMA) in elderly patients. In this study, the operative mortality rate was significantly lower in IMA patients when compared with the control group (3.2% vs 5.5%). Postoperative hospitalization was significantly shorter in IMA group, compared with that of saphenous vein graft (SVG) group (9.55±2.8 days vs 13.6±4.5 days p<0.05). The mean follow-up was 18 months and the morbidity due to IMA grafting did not adversely affect the outcome. The quality of life was also better in the IMA group.

Excellent results can be obtained by using IMA graft in elderly patients as in younger patients.

Key Words: Internal mammary artery, elderly, CABG.

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Life expectancy has progressed steadily during the 20th century. The elderly population (over the age of 65) has increased proportionally, and the geriatric group has assumed to be of increasing importance in medical practice. With advancing age, the prevalence of coronary artery disease increases sharply. Coronary artery disease accounts for approximately half of all deaths in the elderly [1]. Because the elderly population is increasing, a larger number of elderly patients with symptomatic coronary artery disease refractory to medical therapy are considered candidates for coronary artery bypass grafting (CABG). The efficacy of CABG in the elderly has been shown in various studies in spite of increased complications [2,3].

Although the internal mammary artery (IMA) is the graft of choice for CABG due to its superior patency rates and improved clinical results over the sapheneos vein grafts (SVG)[5], doubts about the adequacy of flow, difficulties in preparation of IMA pedicle, and performance of the anastomosis, and the increased risk for perioperative complications have resulted in preferential use of SVGs in the elderly[4-7]. The role of IMA graft in elderly patients is still in question and must be defined.

Since 1988, the use of left IMA has become a routine practice in our department. This study was undertaken to compare the results of coronary artery bypass grafting with IMA grafts or vein grafts only in patients older than 65 years.

Materials and Methods

Between April 1988 and February 1992, 1136 patients underwent CABG at GATA Medical Center, Ankara. Of these 1136 patients, 216 (19%) were 65 years old or older with a mean age of 68.3, and an age range of 65 to 75 years. 182 patients (84.2%) received left IMA grafts, and 34 (15.7%) received SVGs only. There were 187 men and 29 women. The clinical profile of these patients is shown in table I. Any patient undergoing CABG in combination with another surgical procedure was excluded from this study. IMA was not used in patients with left ventricular failure, hemodynamic instability, and complications of cardiac catheterization, when the arterial graft was considered inadequate by the surgeon, or when the sternum was osteoporotic.

After a median sternotomy, the left IMA was dissected with a wide pedicle including pleura, extrapleural fat and surrounding veins. The pleura was intentionally entered during harvesting the IMA. The dissection was performed in large part with electrocautery and occlusion of side branches of the IMA with titanium hemoclips. Cardiopulmonary bypass was instituted with a membrane oxygenator (Terumo Copiox or Cobe). Mild to moderate hypothermia, cold crystalloid potassium cardioplegia (Plegisol, Abbott lab.) and topical myocardial cooling with cold saline solution were employed for myocardial protection. All distal coronary anastomoses were accomplished initially during a single period of aortic cross-clamping; proximal anastomoses were done after release of the cross-clamp. Postoperative care included mechanical ventilation and routine hemodynamic monitoring of arterial blood pressure, pulmonary artery pressure, central venous pressure and cardiac output. Intraoperative and postoperative information recorded on all patients including the number of grafts, the use of IMA, the duration of cross-clamping and cardiopulmonary bypass, the total operation time, the incidence of reoperation for bleeding, the amount of bleeding, the duration of postoperative ventilation, the incidence of sternal wound infection, the need for inotropic support, the length of postoperative hospital stay, and the operative mortality rate (defined as death within the first 30 days after operation or

Variable	IMA Group	SVG Group	p Value*
Total patients	182	34	
Mean age (yr)	68.2±3.0	69.1±4.1	NS
Male (%)	88.6	77.7	p<0.05
Smoking History (%)	70	68	NS
Prior MI (%)	36	41	NS
Hypertension (%)	18	26	p<0.05
Functional Class (NYHA) (Mean)	2.2±0.6	2.6±0.8	p<0.05
LVEDP (mmHg) (Mean)	12.2±4.5	14.1±6.3	NS
CASS Score (Mean)	8.8±3.2	9.4±4.3	NS
Number of diseased vessels (Mean)	2.5±0.6	2.4±0.7	NS

Table I: Clinical Profile of Patients.

IMA: Internal mammary artery; SVG: Saphenous vein graft;
NS: Not significant
MI: Myocardial infarction; NYHA: New York Heart Association; LVEDP: Left ventricular end-diastolic pressure; CASS: Coronary artery surgery study
*p values <0.05 indicate a statistically significant difference between groups.

death occuring at any time during the same hospitalization after operation). All surviving patients were seen in follow-up to determine the functional class, presence of angina, and quality of life at 2 months, 6 months, and 1 year, and annually thereafter. Follow-up information was 99% complete.

Data are reported as the mean±standard error of mean. All variables were considered univariately using either a chi square test for categorical variables or student's t test for continuous variables. A p value less than 0.05 was considered statistically significant. Statistical analysis were made using the Microstat (Ecosoft Inc.) statistical software package.

Results

A review of our bypass cases shows that 19% of patients (n=216) were 65 years of age or older. 84.2% of this group (n=182) had received a left IMA graft. The preoperative characteristics of both groups were not significantly different. Intraoperative variables of number of distal anastomoses, cross-clamp time, cardio-pulmonary bypass time and total operation time were not significantly different between the two study groups (Table II). Operative mortality was significantly higher in patients receiving vein grafts only (5.8% vs 3.2% p<0.05). The occurrence of perioperative myocardial infarction was not significant between the two groups (1.9% vs 2.0%). Sternal wound infection was seen in two patients. The use of inotropic agents was significantly higher in the IMA group compared with the SVG group (36% vs 20% p<0.05). Postoperative ventilation time averaged 15.7±4.5 hours in the SVG group and 13.7±1.7 hours in the IMA group. The total chest tube drainage was significantly more in the IMA group (1253.2 ± 777.6 ml vs 783.4 ± 197.6 ml, p<0.05). Average postoperative hospital stay was significantly longer for SVG group compared with that of IMA group (13.6±4.5 days vs 9.55 ± 2.8 days, p<0.05). Reoperation for bleeding was higher in the IMA group (4 patients vs 0 patient). The incidence of respiratory complications (atelectasis and pleural effusion) was significantly higher in the IMA group (48% vs 31%, p<0.05).

The total operation time was 201.7+10.5 min. in the IMA group and 197.0+13.8 min. in the SVG group; this was not a statistically significant difference. The mean follow-up period was 18 months. 94% of 182 patients were free of angina in the IMA group. In the IMA group, 171 patients were in NYHA class I and 5 in class II, whereas for SVG group patients the corresponding numbers were 19 and 9 respectively. Three patients in the IMA group and 2 patients in the SVG group died due to cardiac causes after discharge.

Table II: Operative and Postoperative Data.

Variable	IMA Group	SVG Group	p*
CPB time (min)	84.3±31.6	86.1±29.5	NS
Crossclamp time (min)	42.3±16.5	45.4±18.3	NS
Total operation time (min)	201.7±10.5	197.0±13.8	NS
Distal anastomoses (mean)	3.0±1.2	3.4±1.5	NS
Chest tube drainage (ml)	1253.2±777.6	783.4±197.6	p<0.05
Ventilation time (hours)	13.7±1.7	15.7±4.5	NS
Postoperative hospital stay (days)	9.55±2.8	13.6±4.5	p<0.05

NS: Not significant
CPB: Cardiopulmonary bypass; IMA: Internal Mammary Artery; SVG: Saphenous vein greft.
*p values<0.05 indicate a statistically significant difference between groups.

Discussion

The projected life expectancy for the population of 65 years of age and older is approximately more than 20 years in developed countries[8] and is gradually increasing in our country. Symptomatic coronary artery disease represents a great percentage of the heart disease in the elderly[1]. Many studies have shown that CABG can be performed in the elderly with acceptable operative mortality and morbidity [2,3,7,9].

It has been established that increased age is a significant risk factor for operation in general[10]. Careful patient selection and improvements in anesthetic management, surgical technique, and postoperative care have gradually decreased the magnitude of operative risk in the elderly[10]. Long-term follow-up has shown superior patency of IMA grafts compared to SVGs[11,12]. Ten-year patency of IMA grafts ranges from 69% to 95%[7]. The data from the Montreal Heart Institute suggests an approximately 53% patency rate of SVG at ten years, whereas approximately 90% patency rate has been reported for the IMA grafts. The IMA graft also carries a decreased need for reoperation and fewer late cardiac events[13]. Although, IMA is the graft of choice for CABG; many cardiac surgeons are reluctant for using IMA because of the short projected life expectancy of elderly patients, left ventricular hypertrophy or dysfunction, left main coronary artery disease, postoperative complications, and unstable hemodynamics[5,7,14].

The operative mortality rate has been reported between 0% and 21% in elderly patients undergoing coronary artery bypass grafting alone[7,15,16]. The operative mortality rate of 3.2% for patients receiving IMA grafts in this study is comparable with that in younger patients undergoing CABG, this supports the need for vigorous treatment of coronary artery disease in elderly patients.

The harvesting of internal mammary artery graft did not significantly prolong total operation time in our study and is not considered as a drawback for using of IMA.

The complications seen with greater incidence in patients receiving IMA grafts; namely bleeding, pleural effusion, and atelectasis did not adversely effect the outcome in our patients.

The relatively high incidence of atelectasis and pleural effusion in our patients could be attributed to the opening of the pleura routinely and deserves further investigation. The development of sternal wound complications is one of the major theoretical disadvantages of using IMA[17], we have encountered two cases of sternal wound infection in this group of patients.

The duration of hospital stay for coronary artery bypass grafting was significantly longer for patients 65 years old and elder (13.3 ± 0.2 days) compared with that of patients less than 65 years of age (11.4 ± 0.4 days) in CASS study[18]. The duration of hospital stay for pateints receiving IMA grafts in our series was signigicantly shorter (9.55 ± 2.8 days) compared with that of patients receiving SVGs (13.6 ± 4.5 days) ($p<0.05$).

The SVG group could be accepted as a highly selective group in which the percentage of female sex is higher. The better results in the IMA group could partly be attributed to these facts, and deserves further study with a larger patient population.

The quality of life postoperatively, and long-term symptom free period are as important as the operative survival in assessing the feasibility of CABG in patients over 65 years of age and older. The postoperative functional class of patients receiving IMA was significantly better in our series. This finding would also support the use of IMA graft in this group of patients.

In conclusion, the age alone should not exclude a patient from IMA grafting. The results of this study support the policy of routine IMA grafting in patients older than 65 years who require coronary artery bypass grafting.

References

1- Konnel WB, Thom TJ: Declining cardio-vascular mortality. Circulation 1984; 70:331-334.

2- Gardner TJ, Greene PS, Raykiel MF, et al: Routine use of the left internal mammary artery in the elderly. Ann Thorac Surg 1990: 49;188-194.

3- Elayda MA, Hall RJ, Gray AG, Mathus VS, Cooley DA: Coronary revascularization in the elderly patients. J Am Coll Cardiol 1984: 3;1398-1403.

4- Barner HB, Standeven JV, Reese J: Twelve-year experience with internal mammary artery for coronary artery bypass. J Thorac Cardiovasc Surg 1985: 90; 668-675.

5- Olearchyk AS, Magovern JG: Internal mammary artery grafting: Clinical results, patency rates and long-term survival in 883 patients. J Thorac Cardiovasc Surg 1986:92;1082-1087.

6- Zeff RH, Kongtahworn C, Iannone CA, et al: Internal mammary artery versus saphenous vein graft to LAD coronary artery. Ann Thorac Surg 1988: 45;533-536.

7- Azariades M, Fessler CC, Floten S, Starr A: Five-year results of coronary artery bypass grafting for patients older than 70 years: Role of internal mammary artery. Ann Thorac Surg 1990:50;940-945.

8- Berry E. B, Acree P. W. Davis D.J, Sheely C, Cavin S: Coronary artery bypass operation in septuagenarians. Ann Throc Surg 1981; 31: 310-313.

9- Horvath KA, DiSesa JV, Peigh PS, Couper GS, Collins JJ, Cohn LH: Favorable results of coronary artery bypass grafting in patients older than 5 years. J Thorac Cardiovasc Surg 1990: 99;92-96.

10- Gann D, Colin C, Hildner FJ, Samet P, Zahr W, Greenberg J: Coronary artery bypass surgery in patients seventy years of age and older. J Thorac Cardiovasc Surg 1977: 73;237-241.

11- Singh RN, Sosa JA, Green EG: Long-term fate of the internal mammary artery and saphenous vein grafting. Ann Thorac Surg 1983:86:359-363.

12- Lytle BW, Cosgrove DM, Saltus Gl, Taylor PC, Loop FD: Multivessel coronary revascularization without saphenous vein: Long-term results of bilateral internal mammary artery grafting. Ann Thorac Surg 1983: 36;540-547.

13- Loop FD, Lytle WB, Cosgrove DM, et al: Influence of the internal mammary artery graft on 10-year survival and other cardiac events. N. Engl J Med 1986: 314;1-6.

14- Cosgrove DM, Loop FD, Lytle BW, et al: Does mammary artery increase surgical risk. Circulation 1985: 72 (Suppl 2);170-174.

15- Kirklin JW, Kouchoukos NT, Blackstone EH, Oberman A: Research related to surgical treatment of coronary artery disease. Circulation 1979:60;1613-1618.

16- Knapp WS, Douglas JS, Ctaver JM, et al: Efficacy of coronary artery bypass grafting in elderly patients with coronary artery disease. Am J Cardiol 1981: 47;923-930.

17- Sethi GK, Copeland JG, Moritz T, Henderson W, Zadina K, Goldman S: Comparison of postoperative complications between saphenous vein and IMA grafts to LAD coronary artery. Ann Thorac Surg 1991: 51;733-738.

18- Rose DM, Gelbish J, Jacobowitz IJ, et al: Analysis of morbidity and mortality in patients 70 years of age and over undergoing isolated coronary artery bypass surgery. Am Heart J 1985: 110;3431-3446.