

Immediate and 5-Year Outcomes after Surgery in Patients with Left Main Coronary Artery Disease

RAÚL A. BORRACCI^{MTSAC}, MIGUEL RUBIO^{MTSAC}, ARNALDO MILANI, CARLOS BARRERO^{MTSAC}, VÍCTOR MAURO^{MTSAC}, ENRIQUE FAIRMAN^{MTSAC}, ADRIÁN A. CHARASK^{MTSAC}, RODOLFO A. AHUAD GUERRERO^{MTSAC}, GONZALO CORTÉS Y TRISTÁN[†], CARLOS A. RAPALLO^{MTSAC}

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Address for reprints:

Dr. Raúl A. Borracci
La Pampa 3030 - 1° B
(1428) Buenos Aires, Argentina
e-mail:
borracci@universia.com.ar

SUMMARY

Background

Coronary artery bypass graft surgery still remains as the treatment of choice of patients with left main coronary artery (LMCA) disease; however, there are few previous studies with local data on the outcomes of this type of surgery.

Objectives

To describe immediate and 5-year outcomes of a series of coronary surgeries in patients with LMCA disease.

Material and Methods

From 2003 to 2007, 174 consecutive coronary artery bypass graft surgeries to the LMCA were analyzed. The procedures had been performed by three Associated Surgical Centers. The following outcomes were assessed 30 days and 5 years after surgery: cardiovascular mortality, all-cause mortality, major cardiovascular events, need of a new revascularization and survival free of symptoms. Curves were compared with expected survival rates for the same age group and sex.

Results

Multiple lesions were present in 90.8% of patients. Mortality rate was 4.0% at 30 days, similar to the rate expected according to EuroSCORE (6.4%, OR = 0.62, 95% CI 0.21-1.78; p=0.333); major cardiovascular events included myocardial infarction (2.9%) and stroke (1.7%). Total follow-up was 506 patient-years (12 to 60 months) and involved 91% of patients. When cardiovascular mortality was considered, survival rate at 5 years was 83.7%, similar to the one expected in the general population. However, when all cause-mortality was considered, survival at 5 years decreased to 77.6% (p=0.436). During the same period, survival free of symptoms and of new revascularization was 72.2% and 88.1%, respectively.

Conclusions

In our series of patients subjected to coronary artery bypass graft surgery due to LMCA disease, operative mortality was somewhat lower than expected according to EuroSCORE, with rates of stroke and myocardial infarction between 1.7% and 2.9%. At 5-year follow-up, survival was similar to that expected in the general population for the same age group, and survival free of angina and revascularization was 72% and 88%. Finally, 90% of LMCA lesions were associated with multiple coronary obstructions, and these conditions are unlikely to be treated with angioplasty. The results analyzed in this study were consistent with the findings previously published in international bibliography.

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Key words > Left Main Coronary Artery - Thoracic Surgery Procedures - Survival

Abbreviations > S Stroke | LMCA Left main coronary artery

BACKGROUND

Coronary artery bypass graft surgery still remains as the treatment of choice of patients with left main coronary artery (LMCA) disease due to the favorable out-

comes reported at long-term follow-up. (1-4) The largest series of coronary artery bypass graft surgery for LMCA disease published during the last 10 years has reported 30-day mortality rates from 2.3% and 4.2%, and survival rates of 94% to 95%, 2 years after sur-

^{MTSAC} Full Member of the Argentine Society of Cardiology

[†]To apply as full member of the Argentine Society of Cardiology

gery; (5-9) however, these results might be influenced by the presence of comorbidities.

In addition, during the last years the use of percutaneous coronary interventions for LMCA disease has become a therapeutic option for a certain group of high-risk patients. (10-13) Although these preliminary trials have not demonstrated any advantage of angioplasty over surgery, immediate and long-term outcomes of both procedures should be compared to decide which is the most convenient method.

There are few previous studies with local data on long-term outcomes of coronary artery bypass graft surgery for LMCA disease. In our country, the SEGUIR I and II trials (14, 15) have demonstrated that survival of patients undergoing coronary surgery ranges from 93.5% to 87.8%, 1 and 4 years after surgery, respectively; however, these studies did not discriminate between LMCA disease and other coronary arteries.

The goal of the present study is to describe immediate and 5-year outcomes of a series of coronary surgeries in patients with LMCA disease, due to the necessity of becoming aware of the local results of coronary artery bypass graft surgery for LMCA disease and the lack of information regarding long-term outcomes.

MATERIAL AND METHODS

From 2003 to 2007, 174 consecutive coronary artery bypass graft surgeries to the LMCA were analyzed. The procedures had been performed by three Associated Surgical Centers. Lesions of the LMCA greater than 50% were included and those procedures combined with valve surgery were excluded. Demographic variables were analyzed and surgical outcomes were expressed as 30-day mortality and as major adverse cardiovascular events: postoperative myocardial infarction and stroke (S). Thereafter, immediate mortality and mortality combined with major cardiovascular events were analyzed in the subgroup of patients with unstable angina and in those who underwent urgent surgery. Univariate analysis was performed to find factors associated with in-hospital mortality. In addition, long-term follow-up until 5 years after surgery was analyzed by medical visits or telephone contact. Kaplan-Meier survival curves were constructed considering cardiovascular mortality, all-cause mortality, major cardiovascular events, need of a new revascularization and survival free of angina. Curves were compared with expected survival rates for the same age group and gender for a hypothetical population of the same size with a life expectancy of 80 years after excluding the effects of infant mortality, during a 5-year follow-up period. Statistical comparisons were performed using log rank test and odds ratios with 95% confidence intervals, calculated using SPSS 10.1 statistical software package. Finally, follow-up time was expressed as patient-years of observation and risk of events (cardiovascular mortality, all-cause mortality, new revascularization and angina) was expressed as cumulative incidence of events per 100 patient-years of follow-up.

RESULTS

A total of 174 surgeries were performed on patients with LMCA disease. Table 1 summarizes the general characteristics of the population and the immediate outcomes. In 90.8% (158/174) of patients, LMCA disease was associated with lesions of the left anterior descending coronary artery, the circumflex coronary artery and/or the right coronary artery. In particular, 63.2% (110/174) of cases had concomitant compromise of the right coronary artery or of the posterior descending coronary artery. In addition, the rate of previous angioplasty was 13.8% (24/174) and 2.3% (4/174) presented restenosis of the LMCA previously treated with this technique. The median number of grafts per patient was three; extracorporeal circulation was performed in 78.7% (137/174) of cases; mammary artery grafts were used in 98.3% (171/174) of patients, and we implemented fast-track cardiac surgery with immediate operating room extubation in 71.8% of cases (125/174). Mortality rate was 4.0% (7/174) at 30 days, similar to the rate expected according to EuroSCORE (6.4%, OR = 0.62, 95% CI 0.21-1.78; p=0.333); major cardiovascular events included postoperative myocardial infarction (2.9%, 5/174) and stroke (1.7%, 3/174). When the subgroup of patients who underwent urgent surgery was compared with those undergoing

Table 1. Population characteristics (n = 174)

Variables	n (%)
Age in years (mean, range)	64,6 (34-87)
Male gender	141 (81,0)
Diabetes	51 (29,3)
Hypertension	124 (71,3)
Obesity	32 (18,4)
CHF	23 (13,2)
Stroke	15 (8,6)
Pulmonary disease	19 (10,9)
Renal dysfunction	9 (5,2)
Carotid artery stenosis	11 (6,3)
Peripheral vascular disease	33 (19,0)
Unstable angina	113 (64,9)
Recent myocardial infarction	11 (6,3)
Reoperation	2 (1,1)
Moderate to severe LV dysfunction	52 (29,9)
Urgent surgery	36 (20,7)
EuroSCORE (%) (mean, 95% CI)	6,4 (5,2-7,6)
30-day Mortality	7 (4,0)
Complications	
Reoperation due to bleeding	4 (2,3)
Q-wave myocardial infarction	5 (2,9)
Stroke	3 (1,7)
Dialysis	2 (1,1)
Sternum infection	1 (0,6)

CHF: Congestive heart failure LV: left ventricular 95% CI: 95% confidence interval.

elective surgery, no significant differences were observed in 30-day mortality rate (8.3% versus 2.9%, OR = 3.05, 95% CI 0.51-17.2; $p = 0.156$) or in the combined event rate of death, reinfarction or stroke (11.1% versus 7.2%, OR = 1.60, 95% CI 0.39 - 6.06; $p = 0.492$). Outcomes of patients with unstable angina did not differ from patients with stable angina in terms of immediate mortality (3.5% versus 4.9%, OR = 0.71, 95% CI 0.13 - 4.16; $p = 0.697$) or combined events (6.2% versus 9.8%, OR = 0.61, 95% CI 0.17-2.16; $p = 0.382$). Univariate analysis of factors related with immediate mortality after surgery in patients with LMCA disease revealed that the history of heart failure was the only variable associated with increased risk of mortality (OR = 5.51, 95% CI 0.90 - 32.4; $p = 0.049$), while moderate or severe left ventricular dysfunction (OR = 3.51, 95% CI 0.63 - 20.7; $p = 0.106$) or previous stroke (OR = 4.74, 95% CI 0.57 - 32.3; $p = 0.113$) were at the limits of statistical significance.

Long-Term Follow-Up

Follow-up time was 506 patient-years (minimum 12 months, maximum 60 months), corresponding to 91% (158/174) of patients. When cardiovascular mortality was considered, survival rate at 5 years was 83.7%, similar to the one expected in the general population for the same age group calculated for a life expectancy of 80 years (Figure 1). However, when all causes of mortality, especially cancer and accidents, were considered, survival rate decreased to 77.6%; nevertheless, this difference was not statistically significant compared to expected survival ($p = 0.436$). Figure 2 illustrates the curves of survival free of angina and of new revascularization at 5 years (72.2% and 88.1%), respectively. The risk of cardiovascular death was 4.9 per 100 patient-years of observation; all-cause mortality rate was 6.4 per 100 patient-years; finally, the risks of new onset angina or of new revascularization were 3.0 and 1.9 per 100 patient-years, respectively.

DISCUSSION

Since the first report of 10 year-outcomes after coronary artery bypass graft surgery for LMCA disease was published in 1975, (16) three controlled clinical trials and several observational studies have demonstrated the benefits of surgery over conventional medical treatment for LMCA lesions. (1) Currently, the results of surgery and medical treatment have improved with the routine use of internal mammary artery grafts, antiplatelet therapy and statins; however, a meta-analysis has demonstrated a reduction of 66% in the risk of mortality 5 years after surgery. (1) The mean global survival in the prospective CASS trial (Coronary Artery Surgery Study) was 13.3 years after surgery among 1,484 patients with LMCA disease. (2)

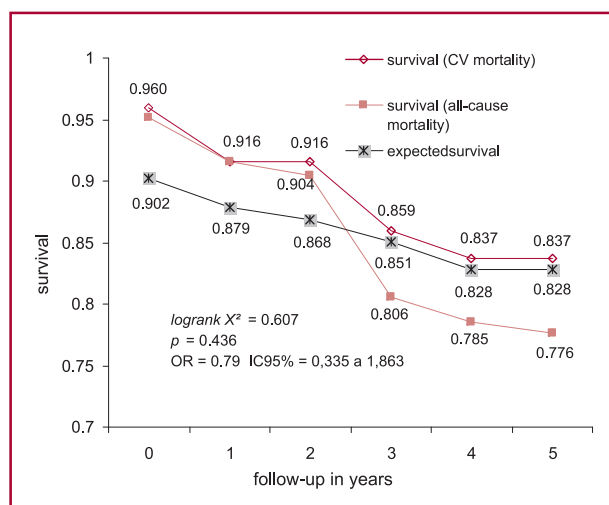


Fig. 1. Kaplan-Meier curves comparing survival of patients with LMCA lesions 5 years after surgery. Curves were constructed considering cardiovascular mortality, all-cause mortality and expected survival rates for the same age group and gender for the general population (life expectancy of 80 years) (the y axis scale does not start at 0).

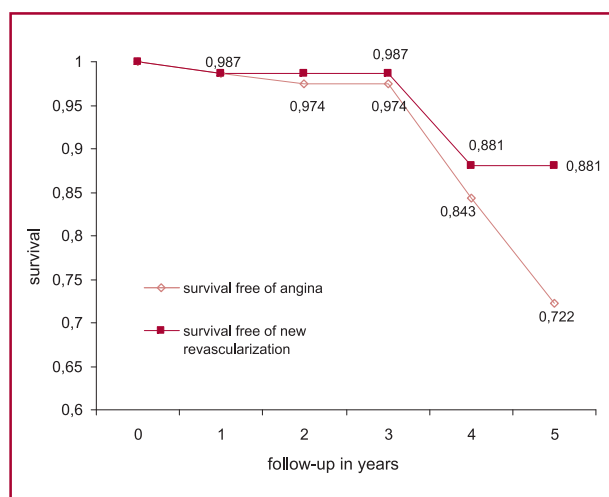


Fig. 2. Kaplan-Meier curve illustrating survival free of angina and of new revascularization (the y axis scale does not start at 0).

During the last 10 years, six studies, each of them with more than 300 patients, have reported the outcomes of patients with LMCA lesions. (5-9, 17) The total amount of surgeries performed in all these studies sums almost 11,000, and one-third were performed in an urgent fashion, with mortality rates ranging from 3% to 4.2% at 30 days. In our series, urgent surgery was less frequent (one-fifth of cases) with similar mortality rates (4.0%). We did not find significant

differences between the sub-group of patients with urgent surgery or unstable angina; however, when we compared immediate mortality associated or not associated with major events, the small size of the sample might lead to errors. In particular, urgent surgery might produce a 2-fold increase in the risk of mortality at 30 days. Although history of previous heart failure was the only factor related with immediate mortality, the sample size does not enable us to rule out other associated variables.

Nowadays, risk-adjusted models do not consider LMCA disease to be a predictor of operative mortality; however the Society of Cardiothoracic Surgery from the United Kingdom performed an analysis of a series of 22,000 patients showing mortality rates of 3% in patients with LMCA disease and of less than 2% for patients with absence of LMCA compromise ($RR \geq 1.5$). (9) Recently, two studies have reported survival rates of 94% and 95%, respectively, 2 years after surgery for LMCA disease. (6, 8) However, for all-cause deaths and cardiovascular deaths in our series rates were 87% and 92%, respectively, and the results may vary according to the burden of patients' comorbidities. In this sense, Ellis et al. (5) reported that mortality might vary from 4% in low risk patients to 40% in patients with multiple associated comorbidities 3 years after surgery for LMCA disease. It should be noted that we found no significant differences with survival rates expected for a hypothetical group with identical age and gender.

Studies performed in the angioplasty era also confirm that coronary surgery is still the most adequate treatment to improve global survival and survival free of nonintervention in the majority of patients with LMCA lesions, multi-vessel disease or proximal lesions of the left anterior descending coronary artery; (18-21) in addition, this strategy appears to be the most cost-efficient model in reducing risk among patients with diabetes. (22) In this sense, despite the advances of percutaneous coronary interventions for the treatment of LMCA disease in high-risk patients, guidelines from the ACC/AHA and the European Society of Cardiology recommend coronary artery bypass graft surgery as the treatment of choice for LMCA disease, based on favorable long-term outcomes. (23, 24)

The incidence of isolated LMCA disease is 6% to 9%, while in more than 80% of cases it is associated with multi-vessel disease; (12, 13) for this reason revascularization surgery may yield greater benefits than angioplasty. (4) Coincidentally, 90% of LMCA lesions in our study had associated stenosis in other coronary artery. Approximately 40% of LMCA lesions are calcified and distal, compromising the bifurcation of the left anterior descending artery and circumflex coronary artery; thus these high-risk complex lesions are unsuitable for angioplasty. (25, 26)

CONCLUSIONS

It is essential to know immediate and long-term outcomes of patients undergoing coronary surgery for LMCA disease and to compare them with those of angioplasty, considering that the gold standard for treatment has been coronary artery bypass surgery. This observational study has demonstrated an operative mortality rate somewhat lower than expected according to EuroSCORE, with rates of stroke and myocardial infarction between 1.7% and 2.9%. At 5-year follow-up, survival was similar to that expected in the general population for the same age group, and survival free of angina and revascularization was 72% and 88%, respectively. Finally, 90% of LMCA lesions were associated with multiple coronary obstructions, and these conditions are unlikely to be treated with angioplasty. The results analyzed in this study were consistent with the findings previously published in international bibliography.

SUMMARY

Resultados inmediatos y a los 5 años de la cirugía de pacientes portadores de lesión del tronco de la coronaria izquierda

Antecedentes

La cirugía de revascularización miocárdica se considera hasta el momento el mejor tratamiento para los pacientes portadores de enfermedad del tronco de la coronaria izquierda (TCI); pese a ello existen pocos datos locales que comuniquen los resultados de esta cirugía.

Objetivos

Describir los resultados inmediatos y a los 5 años de una serie de cirugías coronarias en pacientes con lesiones del TCI.

Material y métodos

En el período 2003-2007 se estudiaron 174 cirugías coronarias del TCI realizadas en forma consecutiva en tres servicios quirúrgicos asociados. Se analizaron los resultados quirúrgicos a los 30 días y en el seguimiento hasta 5 años, en los que se tuvieron en cuenta la mortalidad de causa cardiovascular y por otras causas, los eventos cardiovasculares mayores, la necesidad de nueva revascularización y la supervivencia libre de síntomas. Las curvas se compararon con la supervivencia esperada para el mismo grupo de edad y sexo.

Resultados

El 90,8% de los pacientes tuvieron lesiones múltiples. La mortalidad a los 30 días fue del 4,0%, similar a la esperada según el EuroSCORE (6,4%, $OR = 0,62$, $IC\ 95\% 0,21-1,78$; $p = 0,333$), y los eventos cardiovasculares mayores incluyeron 2,9% de infarto y 1,7% de accidente cerebrovascular (ACV). El seguimiento fue de 506 pacientes-años (12 a 60 meses) e involucró al 91% de los pacientes. Al considerar la mortalidad cardiovascular, la supervivencia a los 5 años fue del 83,7%, similar a la esperada en la población general. La

supervivencia en el mismo plazo descendió al 77,6% cuando se computaron todas las causas de muerte ($p = 0,436$). La supervivencia a los 5 años libre de angina y de nueva revascularización fue del 72,2% y del 88,1%, respectivamente.

Conclusiones

En este estudio observacional de pacientes operados con lesión del TCI se demostró una mortalidad quirúrgica algo inferior a la calculada con el EuroSCORE y una tasa de ACV e infarto de entre el 1,7% y el 2,9%. El seguimiento a 5 años mostró una supervivencia similar a la esperada en la población general para la misma edad y tasas de supervivencia libre de angina y de nueva revascularización de entre el 72% y el 88%. Por último, el 90% de los TCI se asociaron con lesiones coronarias múltiples, poco proclives al tratamiento con angioplastia. Los resultados analizados en este estudio fueron consistentes con los hallados en la bibliografía internacional.

Palabras clave > Tronco de la coronaria izquierda - Cirugía torácica - Supervivencia

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