

OPCAB in patients on hemodialysis

Revascularização do miocárdio sem circulação extracorpórea em pacientes submetidos à hemodiálise

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Abstract

Objective: To analyze the hospital outcomes of patients, with chronic renal insufficiency on hemodialysis, submitted to OPCAB.

Method: Fifty-one patients with chronic renal insufficiency were submitted to OPCAB. Hemodialysis was performed on the day before and the day after the operation. Myocardial revascularization was performed using LIMA's suture and suction stabilization.

Results: Fifty-one patients, with an average age of 61.28 ± 11.09 years, were analyzed. Thirty-one patients (58.8%) were female. The predominant functional class was IV in 21 (41.1%) of the patients. The left ventricle ejection fraction was dire in 21 (41.1%) patients. The mean EUROSCORE of this series was 7.65 ± 3.83 and the mean number of distal anastomosis was 3.1 ± 0.78 per patient. The average time of mechanical

ventilation was 3.78 ± 4.35 hours and the mean ICU stay was 41.9 ± 13.8 hours, while the average hospitalization was 6.5 ± 1.31 days. In respect to complications, 9 (17.6%) of the patients developed atrial fibrillation and one (1.9%) patient presented with a case of ischemic stroke but had a good recovery during hospitalization. There were no deaths in this series.

Conclusion: Chronic renal patients submitted to hemodialysis were always a high risk population for myocardium revascularization. In this series, the absence of extracorporeal circulation appeared to be safe and efficient in this special subgroup of patients. The operations were performed with low indices of complications, absence of deaths and relatively low stays in the ICU and in hospital.

Descriptors: Myocardial revascularization. Renal insufficiency, chronic. Renal dialysis.

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Resumo

Objetivo: Analisar evolução hospitalar dos pacientes portadores de insuficiência renal crônica (IRC) em hemodiálise, submetidos a operação sem circulação extracorpórea (CEC).

Método: Cinquenta e um pacientes portadores de IRC foram submetidos à operação sem CEC. A hemodiálise foi realizada no dia anterior à operação e no dia seguinte. A revascularização do miocárdio foi realizada com ponto de LIMA e estabilizador por sucção.

Resultados: A idade média foi de 61,28±11,09 anos e 31 (58,8%) pacientes eram do sexo feminino. A classe funcional predominante foi a IV em 21 (41,1%) dos pacientes. A fração de ejeção do ventrículo esquerdo era ruim em 21 (41,1%) pacientes. O EUROSCORE médio desta série de pacientes foi de 7,65±3,83. O número médio de artérias coronárias

revascularizadas foi de 3,1±0,78 por paciente. O tempo médio de ventilação mecânica foi de 3,78±4,35 horas. A permanência média na CTI foi de 41,9±13,8 horas, enquanto a média de permanência hospitalar foi de 6,5±1,31 dias. Quanto às complicações, nove (17,6%) pacientes desenvolveram FA e um (1,9%) apresentou quadro de AVC isquêmico, com boa recuperação durante a internação. Não houve óbito nesta série.

Conclusão: Pacientes renais crônicos submetidos à hemodiálise sempre foram uma população de alto risco para revascularização do miocárdio. A ausência de CEC, aparentemente, cursa com baixos índices de morbimortalidade nesta população.

Descritores: Revascularização miocárdica. Insuficiência renal crônica. Diálise renal.

INTRODUCTION

Chronic renal failure patients on hemodialysis who require coronary artery bypass grafting (CABG) are a subgroup of patients with a high morbid-mortality rate [1]. There is a strong relationship between renal disease and cardiovascular disease; in chronic renal failure patients on hemodialysis, 44% of the cases die due to cardiovascular disease [2]. The death rate in chronic renal failure patients after acute myocardial infarction is as high as 70% [3]. Angioplasty provides a lower success rate, longer hospitalization, a higher incidence of more severe heart events and a lower one-year survival rate [4]. Many articles cite chronic renal failure as an adverse factor in the evolution of patients submitted to CABG with mortality rates ranging between 0 and 36% but with the majority of works reporting between 10% and 15% [5-10]. Among patients who survive hospitalization, the quality of life is restricted, and there is a significant long-term mortality rate varying between 32% and 71% over five years [5,8,9].

There are many theories to explain the reason for the high morbid-mortality rates in chronic renal failure patients [11-13], with one of the most accepted causes being the bad quality of the distal bed of coronary arteries [14,15]. The majority of cardiovascular surgeons agree that arteries with bad distal beds increase the mortality rate in CABG surgery. Although the majority of groups understand that chronic renal failure patients on dialysis should not be rejected outright for CABG, many feel that the quality of life and associated risk factors should be taken into account when indicating surgery [9].

The objective of this study was to retrospectively analyze the hospital evolution of chronic renal failure patients on dialysis submitted to off-pump CABG surgery.

METHOD

In the period from January 2002 and September 2005, a retrospective study was performed involving 51 patients with chronic renal failure participating in a dialysis program and submitted to off-pump CABG. Hemodialysis was performed the day before surgery and on the first postoperative day. The anesthetic procedure was the same as is routinely utilized in the service [16] however with more care in respect to the dosage of muscle relaxant and, in particular, in relation to the quantity of fluids taken. On completing anesthetic induction, grafts were harvested in the normal manner [16,17].

The dose of heparin utilized was 2.5 mg/kg. Before starting the distal anastomosis, a 2-0 ethibond suture with a 3 cm by 60 cm cotton strip was applied to the pericardium (Lima suture technique) between the inferior vena cava and the right inferior pulmonary vein [18] with the aim of enabling access to all the vessels of the heart with as little hemodynamic instability as possible. Routinely the distal anastomoses were performed first. A 4-0 prolene suture, supported by a small piece of silicone, was utilized to temporarily occlude the proximal portion of each artery during anastomosis. To obtain stability of the region, a suction stabilizer (Octopuss System, Medtronic Corporation) was employed. Normally, the anastomoses start with the right coronary artery and its branches, followed by the circumflex artery and its branches and finally the anterior descending artery and its branches. On completing the distal anastomoses with the systolic artery pressure at around 100 mmHg, the ascending aorta is partially clamped and the proximal anastomoses are performed in the conventional manner. After removing the partial clamp from

the aorta, the heparin is reversed to 75% of its initial dose, the procedure is concluded and the patient is transferred to the intensive care unit.

RESULTS

A total of 512 patients with chronic renal failure undergoing dialysis, with ages ranging from 38 to 78 years old and a mean of 61.28 ± 11.09 years, were analyzed. Thirty patients (58.8%) were women and 21 (41.2%) were men. In respect to the risk factors for coronary disease, all the patients suffered from hypertension, 33 (64.7%) presented with high cholesterol levels, 26 (50.9%) were diabetics and 8 (15.6%) were smokers. Table 1 illustrates the distribution of risk factors.

Table 1. Risk factors for coronary disease

Risk factors	n	%
Hypertension	51	100
Dyslipidemia	33	64.7
Diabetes	26	50.9
Smokers	8	15.6

The most common Functional Class was Class IV observed in 21 patients (41.1%), followed by Functional Class II in 17 (33.3%), Class III in 11 (21.5%) and finally Class I in 2 patients (3.9%). Figure 1 illustrates the Functional Class.

The left ventricle ejection fraction was higher than 50% in 11 patients (21.5%), between 35 and 50% in 19 (37.2%) and less than 35% in 21 (41.1%). Figure 2 shows the distribution of the left ventricle ejection fraction among the 51 patients studied:

The average EUROSCORE [19] of this series was 7.65 ± 3.83 ranging between 3 and 18 points. The total number of revascularized coronary arteries was 156 with a mean of 3.1 ± 0.78 coronary arteries per patient ranging between 2 and 5. Seven patients (13.7%) had previously been submitted to CABG. The mean duration of assisted ventilation was 3.78 ± 4.35 hours (Range: 0 to 18 hours). The average stay in the ICU was 41.9 ± 13.8 hours (range: 18 to 78 hours). The mean hospital stay was 6.5 ± 1.31 days (Range: 5 to 10 days).

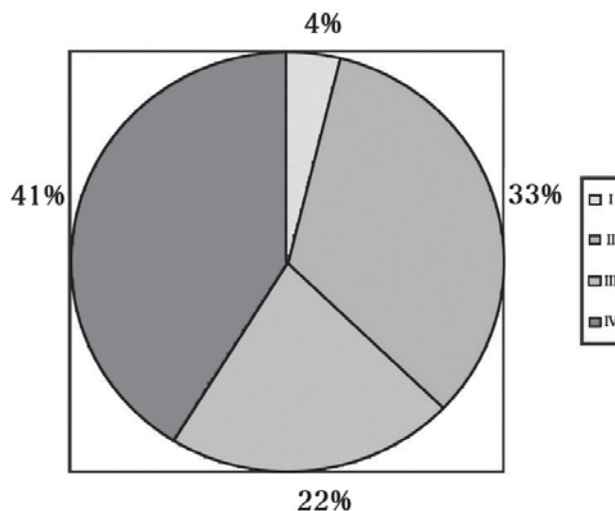


Fig. 1 – Preoperative functional class

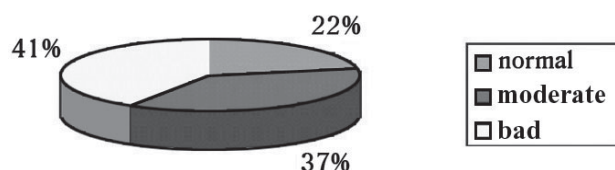


Fig. 2 – Preoperative left ventricular function

One patient presented with an ischemic stroke with good evolution; one patient required a re-operation due to bleeding; one patient presented with electrocardiographic alterations compatible to lateral acute myocardial infarction without hemodynamic variations and nine patients evolved with atrial fibrillation. No deaths occurred in this series.

DISCUSSION

Patients in end phase renal disease present with an accelerated rate of atherosclerosis and a higher mortality rate due to coronary artery disease. Cardiovascular disease is responsible for approximately one third of deaths of patients on hemodialysis. There is a consensus among heart surgeons that the degree of distal lesion of coronary arteries is an important factor in predicting morbidity and mortality in CABG. A recent study [20] demonstrated that the distal involvement of the anterior descending artery of the circumflex artery and its marginals is a strong independent

factor for mortality after coronary procedures. The results obtained with angioplasty in chronic renal failure patients on dialysis are not satisfactory with an above normal incidence of restenosis. Kahn et al. [21] published a study in which 17 patients with chronic renal failure and dependent on dialysis were submitted to angioplasty with an initial success after the procedure of 96%. Twelve patients were reevaluated after 6 months and the incidence of restenosis at the previously dilated sites was 81%. In a similar article published by Koyonagi et al. that compared coronary transluminal angioplasty with CABG, restenosis after angioplasty was 70%. In the same article, the patency of the arterial grafts was 100% among the 23 operated patients without in-hospital deaths but there were four late deaths; one due to myocardial infarction and the other three due to hemorrhagic strokes. Batiuk et al. [22] evaluated 25 patients who underwent on-pump CABG all with chronic renal failure and depending on dialysis. The in-hospital mortality was 20%. Kan & Yang [23] presented a study in which 23 dialytic patients submitted to on-pump CABG were analyzed with a mortality rate of 8.7% against 4.3% in a control group. Off-pump CABG operations have already shown benefits in high-risk subgroups of patients [24-26]. However few studies have presented the real benefits of off-pump CABG in chronic renal failure patients on dialysis. Tabata et al. [27] presented a series of 65 chronic renal failure patients with 19 on hemodialysis all operated on without cardiopulmonary bypasses. The mortality rate was 1.5% for the hemodialysis group versus 1.2% for the non-dialytic patients. The authors concluded that chronic renal failure is not a risk factor for off-pump surgeries. In our series, there were no deaths and the incidence of significant complications was also small, limited to one stroke and one case of acute myocardial infarction. The dose of heparin, a little higher than recommended by other authors, is the same that we normally use in off-pump procedures, without observing thrombotic phenomenon in any patients, with incidences of bleeding due to alterations in the coagulation also being very low.

Gradually we have reduced the dose of heparin. The number of revascularized coronary arteries in our series was 3.1 ± 0.78 per patient and thus similar to published on-pump series proving that even without cardiopulmonary bypass, total CABG in high risk patients is possible. The postoperative evolution was very satisfactory with the mean assisted ventilation duration (3.78 ± 4.35 hours), mean stay in ICU (41.9 ± 13.8 hours) and the mean hospital stay (6.5 ± 1.31 days) very similar to conventional patients. The tactic adopted to perform dialysis on the day before and the day after the procedure was efficient with no patients requiring hemodialysis outside the pre-established period.

Chronic renal patients undergoing dialysis that need CABG were always a subgroup of patients that represent a

challenge for the cardiovascular surgery teams. Off-pump surgeries, apparently course to low morbid-mortality rates in this population, at least in the evaluated series. Revascularization was complete and the time of stay in the ICU and hospital were compatible to those of patients without chronic renal failure.

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COMMENTS

Rui Manuel de Sousa Sequeira Antunes de Almeida

I would like to thank the Organizing Committee of the 33rd Brazilian Congress of Cardiovascular Surgery for the invitation to comment on the scientific work of Dr. Rodrigo M. Milani of the Cardiovascular Surgery Group of PUC in Paraná. Taking this opportunity I would also like to thank the author for sending the article to me promptly so that I had the opportunity to not only assess the excellent results obtained by this group in off-pump surgery of a high-risk group of patients but also to elaborate this comment and congratulate them on their outstanding work and results.

When we analyze international publications, such as the work by Wijeyesundera et al. [1], we see that randomized studies analyzing off-pump coronary artery bypass grafting (CABG), with the exception of atrial fibrillation, identify no

statistical differences and even present a reduction in the mortality rate, percentage of strokes and acute myocardial infarction. There is however, an increase in the necessity of another CABG in the following two-year period.

Sergeant et al. [2] stated that the clinical relevance of the reduction in deaths and the use of hemodialysis were only significant in large trials and could not be applied to surgical groups with small numbers of patients.

Liu et al. [3] analyzed a group of 279 patients with chronic renal failure (CRF) and on dialysis submitted to CABG and demonstrated that there was a three-fold risk of death as well as mediastinitis when compared to a control group. Faced with these data, several groups published their own results of off-pump procedures.

In an article by Fukushima et al. [4], the authors presented similar results to the team of Dr. Milani in patients with CRF on dialysis submitted to off-pump CABG and without aortic clamping however the number of revascularized arteries was lower than a second group that used cardiopulmonary bypasses and also lower than this current work.

Another point highlighted by the authors is that patients submitted to CABG have a better evolution to those submitted to percutaneous transluminal angioplasty (PTA). This affirmation is also reported in the publication of a trial – APPROACH – Alberta Provincial Project for Outcomes Assessment in Coronary Heart Disease [5]. This group demonstrated that, in relation to a group of CRF patients in general, both on dialysis and not, their 8-year survival rate was 85.5% for the surgical control group and 80.4% for PTA. The results were 44.8% and 32.7% respectively for these patients when on hemodialysis.

Thus, is it really correct that CABG increases the survival rate of CRF patients on dialysis? Dewey et al. [6] showed that, in a regressive analysis, the use of on-pump CABG was a predicting factor for immediate death however, over the long-term this group had a better survival rate to those submitted to off-pump CABG due to a more complete revascularization. This long-term survival rate was observed both for diabetic patients and non-diabetic patients.

Thus, the question asked in the title of this work continues to be pertinent as in this work the excellent results are obtained during hospitalization of the patients and so a long-term evaluation should be made comparing outcomes with a control group.

I would like to ask the author some questions in order to further clarify this issue:

- 1) What was the percentage of patients on dialysis submitted to off-pump CABG?
- 2) What was the mean length of dialysis before the procedure?
- 3) What are the mean values of hemoglobin in the study group?
- 4) Why in the surgical technique does the team start

with revascularization of the right coronary artery, the branches of the circumflex and then the anterior interventricular arteries and not the inverse?

5) What types of grafts were used and in what percentages?

Again I would like to congratulate Dr. Milani and his group for their scientific contribution and I am looking forward to see the follow-up results of this group of 51 patients.

Thank you.

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The reply of Dr. Rodrigo Milani

I would first like to thank Dr. Rui for his encouraging comments.

In respect to his questions, over the last five years all chronic renal failure patients, on dialysis or not, were submitted to off-pump coronary artery bypass grafting.

In this series, all were on dialysis for at least six months, with a mean hemoglobin value of less than 10 with at least one internal thoracic artery being used for all patients.

We did not start the revascularization by the anterior

interventricular branch as some groups recommend as, in our view, once the anastomosis of the left thoracic artery is completed to the anterior interventricular branch, it is more difficult to approach the circumflex artery, specifically those vessels that are more posterior, as the internal thoracic artery can be accidentally pulled and thus damage the anastomosis.

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