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Comparison of patency between radial artery and saphenous vein in a coronary artery bypass grafting post operative with return of the symptoms

Comparação da perviedade entre artéria radial e veia safena em pacientes em pós-operatório de cirurgia de revascularização miocárdica com retorno dos sintomas

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Abstract

Objective: **To compare the patency of radial artery and saphenous vein in patients with recurrence of symptoms after coronary artery bypass grafting (CABG).**

Methods: **Retrospective study. From January 1998 to December 2005, there were 469 CABGs using radial artery among grafts at Hospital Vera Cruz, Belo Horizonte/MG. Among these, 94 patients had ischemic changes in the early or late postoperative and were restudied with coronary angiography. The grafts were divided into three groups: internal thoracic artery (ITA), radial artery (RA) and saphenous vein (SV), and were stratified according to severity of injury: without serious injury (<70%), severe obstruction (70% - 99%) and occlusion.**

Results: **In 94 patients restudied, we used 86 ITA grafts, 94 of AR and 111 of SV. Out of the 86 ITA grafts; 73 (84.88%) had no serious injuries, out of the 94 RA grafts 55 (58.51%) were without serious injuries and out of the 111 SV grafts, 73 (65.76%) were free of serious lesions. Statistical difference (*P* = 0.001) was found between the RA and SV grafts with higher patency of the SV. Women had a worse outcome regarding the patency of the RA (65.7% and 40.7%) with *P* = 0.006. As for the revascularized coronary artery, there were differences between the grafts used for the right coronary artery, with best results of the SV (*P* = 0.036).**

Conclusion: **The RA showed a worse outcome than the SV as the second graft in CABG, especially in women and when anastomosed in the right coronary artery.**

Descriptors: **Myocardial revascularization. Radial artery. Thoracic artery. Saphenous vein.**

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Resumo

Objetivo: **Comparar a perviedade da artéria radial e veia safena em pacientes com retorno dos sintomas após cirurgia de revascularização do miocárdio (CRVM).**

Métodos: **Estudo retrospectivo. No período de janeiro de 1998 a dezembro de 2005, foram realizadas 469 CRVMs com o uso da artéria radial dentre os enxertos, no Hospital Vera Cruz, em Belo Horizonte/MG. Destes, 94 pacientes apresentaram alterações isquêmicas no pós-operatório recente ou tardio e foram reestudados com cineangiocoronariografia. Os enxertos foram divididos em três grupos: artéria torácica interna (ATI), artéria radial (AR) e veia safena (VS), e foram estratificados segundo a gravidade das lesões: sem lesão grave (<70%), obstrução grave (70% a 99%) e oclusão.**

Resultados: **Nos 94 pacientes reestudados, foram utilizados 86 enxertos de ATI, 94 de AR e 111 de VS. Dos 86 enxertos de ATI, 73 (84,88%) se encontravam sem lesões graves; dos 94 enxertos de AR eram 55 (58,51%) e dos 111 enxertos de VS, 73 (65,76%) estavam livre de lesões graves. Houve diferença estatística (*P*= 0,001) entre os enxertos de AR e VS com maior perviedade da VS. As mulheres apresentaram pior resultado quanto à perviedade da AR (65,7% e 40,7%) com *P*= 0,006. Quanto à artéria coronária revascularizada, houve diferença entre os enxertos usados para artéria coronária direita, com melhor resultado da VS (*P*= 0,036).**

Conclusão: **A AR mostrou-se com pior resultado que a VS como segundo enxerto na CRVM, principalmente em mulheres e quando anastomosada na coronária direita.**

Descritores: **Revascularização miocárdica. Artéria radial. Artéria torácica interna. Veia safena.**

INTRODUCTION

The coronary artery bypass grafting (CABG) began in the late 60s [1]. One of the biggest advances in CABG was the use of the internal thoracic artery (ITA) anastomosed to the left anterior descending branch (AD) of the left coronary artery [2,3], proven in the 80s, as the gold standard in CABG because of its higher patency in the medium and long term compared to the saphenous vein (SV). Consequently, these studies have led surgeons to search for new arterial grafts [4], such as right internal thoracic artery, radial, gastroepiploic [5] and inferior epigastric [6].

The radial artery (RA) appeared as a good option, but there is still no proof of its superiority over the SV [7-11].

In our department, we had the impression of greater occlusion of the RA grafts, and this was the reason that motivated this study.

This study aimed to evaluate retrospectively the patency of the radial artery and the saphenous vein, based on coronary angiography in patients with recurrent symptoms or positive test for myocardial ischemia.

METHODS

This study was approved by the Ethics and Research Committee of the Hospital Vera Cruz.

From January 1998 to December 2005 were held 1116 CABGs in our service, among these, 469 with the use of radial artery as one of the grafts.

The dissection of the RA was made after completion of the Allen modified test preferentially in the non-dominant upper limb. The incision was made from the antecubital fossa to the wrist, exposing the brachioradialis fascia. The fascia was opened with electrocautery and with the aid of a self-static retractor; the brachioradialis muscle was separated from the radial flexor of the carpus, exposing the RA. The dissection of the RA branches was made with scissors and ligation with haemostatic clips, preserving the radial veins close to the graft. Their ends were ligated and divided. We proceeded with the proximal cannulation of the RA with catheter Jelco No. 22 and infusion with saline solution with heparin and other with papaverine under low pressure. Then it was soaked in papaverine solution which was maintained until their implantation. It was then performed synthesis by planes of the forearm and compressive bandaging.

The dissection of the SV was made in the usual way with ligation of its branches with an unabsorbed wire.

The dissection of the ITA has done in a pedicled manner and not skeletonized in all cases.

We analyzed the coronary angiographies of patients previously revascularized with the use of RA and recurrence of symptoms in our hospital during the period of 1998 to 2005. The group consisted of 94 restudied patients.

The indications for these studies were: angina pectoris, positive exercise test for ischemia, scintilography or stress echocardiogram suggesting myocardial ischemia.

Grafts were separated into three groups: ITA, SV and RA. At restudy the grafts were stratified depending on the

severity of the lesions found in the postoperative period: without serious injury (<70%), severe obstruction (70% to 99%) and occlusion.

All results were subjected to statistical tests of hypotheses regarding each parameter studied with the use of SPSS 14.0 program. Continuous variables were analyzed by Student t test or nonparametric equivalent (Mann Whitney test), and the categorical variables by Chi-square and, when it was not possible we used the Fisher exact test and exact chi-square of Monte Carlo. For all analysis, the level of significance was 5% ($P = 0.05$).

RESULTS

In 94 patients restudied with coronary angiography, we used 86 ITA grafts, 94 of RA and 111 of SV (Figure 1).

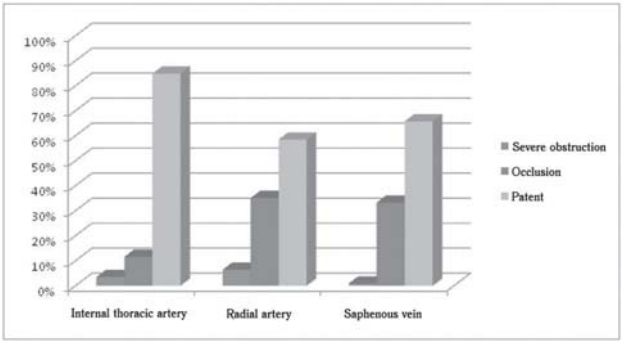

Fig. 1 - Analysis of the grafts restudied

Of these patients, 67 (71.28%) were men and 27 (28.72%) women. The average age was 59.19 years (34-77 years). The average time of restudy was 2.88 years (0-8 years).

Of the 86 ITA grafts, 73 (84.88%) had no serious injuries, three (3.49%) with severe obstruction and 10 (11.63%) occluded. Of the 94 RA grafts, 55 (58.51%) had no serious injuries, six (6.38%) with severe obstruction and 33 (35.11%) occluded. Of the 111 SV grafts, 73 (65.76%) had no serious injuries, one (0.9%) with severe obstruction and 37 (33.33%) occluded ($P = 0.001$).

The analysis above shows the difference between grafts with $P = 0.001$, i.e., there is statistical difference between them. Analyses were made on the residues to determine which difference is statistically significant. If the difference between the residues is more than 2 or less than -2, it is statistically significant.

Through the residue analysis, it was observed that there was no occlusion difference between the grafts of the radial artery and the saphenous vein, but there was a higher patency statistically significant ($P = 0.001$) of the SV in relation to the RA.

The patency of the RA is worse in females (40.7%) compared with males (65.7%), with $P = 0.006$ (Table 1, Figure 2).

In the comparison between RA and SV per revascularized coronary artery, there was statistically significant difference when anastomosed in the right coronary artery (RCA) with a higher patency of the SV (70.73%) compared to the RA (46.67%), with $P = 0.036$ (Table 2, Figure 3).

Table 1. Analysis of grafts by gender

Grafts used	Female	Male	Total	*P* Value
ITA				
Occlusion	2 (8.3%)	7 (11.5%)	9 (10.6%)	0.281(*)
Obstruction	2 (8.3%)	1 (1.6%)	3 (3.5%)	
Without serious injury	20 (83.4%)	53 (86.9%)	73 (85.9%)	
Total	24	61	85	
Radial				
Occlusion	16 (59.3%)	17 (25.4%)	33 (35.1%)	0.006 (*)
Obstruction	0 (0.0%)	6 (9.0%)	6 (6.4%)	
Without serious injury	11 (40.7%)	44 (65.7%)	55 (58.5%)	
Total	27	67	94	
Saphenous vein				
Occlusion	13 (40.63%)	24 (30.38%)	37(33.33%)	0.5562 (**)
Obstruction	0 (0.0%)	1 (1.27%)	1 (0.90%)	
Without serious injury	19 (59.38%)	54 (68.35%)	73 (65.77%)	
Total	32	79	111	

ITA: Internal thoracic artery

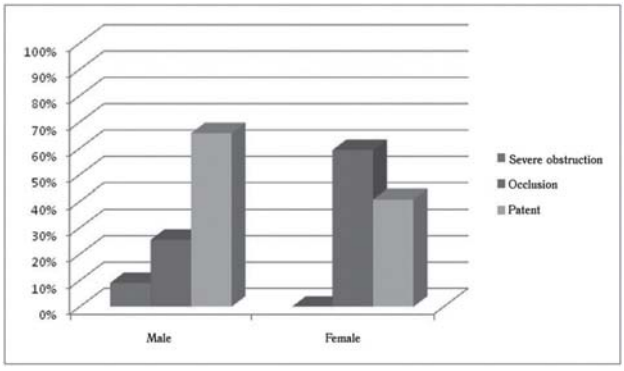

Fig. 2 - Analysis of the results of the radial artery by gender

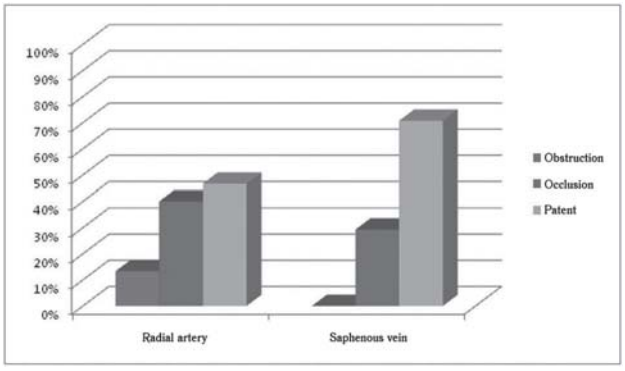

Fig. 3 - Analysis between radial artery and saphenous vein anastomosed in the right coronary artery

Table 2. Analysis between radial artery and saphenous vein in relation to target-coronary artery

Target-coronary	Radial	Saphenous vein	Total	*P* Value
AD				
Without serious injury	2 (50%)	3 (75%)	5 (62.5%)	1.000(*)
Occlusion	2 (50%)	1 (25%)	3 (37.5%)	
Obstruction	0	0	0	
Total	4 (100%)	4 (100%)	8 (100%)	
DI				
Without serious injury	13 (76.47%)	22 (66.67%)	35 (70%)	0.830 (**)
Occlusion	4 (23.57%)	10 (30.30%)	14 (28%)	
Obstruction	0	1 (3.03%)	1 (2%)	
Total	17 (100%)	33 (100%)	50 (100%)	
LM				
Without serious injury	12 (44.44%)	10 (47.62%)	22 (45.83%)	0.615 (**)
Occlusion	13 (48.15%)	11 (52.38%)	24 (50%)	
Obstruction	2 (7.41%)	0	2 (4.17%)	
Total	27 (100%)	21 (100%)	48 (100%)	
DD				
Without serious injury	3 (60%)	4 (80%)	7 (70%)	1.000 (**)
Occlusion	1 (20%)	1 (20%)	2 (20%)	
Obstruction	1 (20%)	0	1 (10%)	
Total	5 (100%)	5 (100%)	10 (100%)	
RCA				
Without serious injury	7 (46.67%)	29 (70.73%)	36 (64.29%)	0.036 (**)
Occlusion	6 (40%)	12 (29.27%)	18 (32.14%)	
Obstruction	2 (13.33%)	0	2 (3.57%)	
Total	15 (100%)	41 (100%)	56 (100%)	
SEQ.				
Without serious injury	18 (69.23%)	6 (85.71%)	24 (72.73%)	0.721 (**)
Occlusion	7 (26.92%)	1 (14.29%)	8 (24.24%)	
Obstruction	1 (3.85%)	0	1 (3.03%)	
Total	26 (100%)	7 (100%)	33 (100%)	

AD = Anterior descending branch, DI = Diagonal branch, LM = Left marginal branch, DD = Diagonalis, RCA = Right coronary artery, SEQ. = Sequential

DISCUSSION

In the early 90s, after optimistic restudies of RA grafts used in the 70s by Carpentier, in addition to advances in technical dissection and pharmacological handling of vasospasm, there was renewed interest in the RA as graft in CABG [12,13].

Several observational studies indicated higher patency of the RA compared to the SV [10,11]. Borger et al. [7] demonstrated lower mortality or cardiovascular event in 5 years, in patients undergoing CABG with two arterial grafts compared to those receiving only ITA and SV grafts. In contrast, in 2004, Khot et al. [8] showed reduced graft patency of RA when compared to ITA and SV grafts. In 2006, Locali et al. [9] performed a meta-analysis that showed no statistical difference in graft patency of the RA compared with SV grafts. They point out that all the studies analyzed showed bias, therefore, not allowing a definitive conclusion.

Considering that our institution is private, there is no possibility of re-study of patients in a systematic way if no symptoms appear.

In our study we analyzed coronary angiographies of patients with recurrence of symptoms or positive test for myocardial ischemia, which reduces the cases of silent ischemia. For this reason, we observed lower patency in all grafts analyzed (ATI: 84.88%, RA: 58.55% and SV: 65.76%), compared to the patency of grafts in asymptomatic patients, in the literature. The same aspect was observed by Buxton et al. [14] and Achouh et al. [15].

There was no statistical difference in the occlusion of the RA and SV grafts, although there is a higher rate of RA grafts with severe obstruction. This may occur due to the RA being more prone to vasospasm.

There was statistical difference in the RA grafts when comparing the genders, with poorer graft patency in women. This same aspect was observed by Lawton et al. [16] and supposedly for the smallest size of RA in women.

Statistical difference was found between the grafts when anastomosed in the RCA and its branches with higher patency of the SV. In 2009, Hadinata et al. [17] compared RA and SV anastomosed on the RCA or its branches. There was no statistical difference, although there was a higher failure of RA grafts when the coronary artery lesion was less than 80%, which was not observed in SV grafts.

As the database of our study was the surgical description and the coronary angiography, there is a limitation in accurate characterization of patients. However, as the grafts analyzed were from the same patients, they were subjected to the same risk of comorbidities and distal bed.

Data from this study, including a high failure rate of RA grafts in women when anastomosed in the RCA is important in guiding the choice of the second graft in CABG.

CONCLUSION

The patency of RA as a second graft in CABG is safe, but it has worse results than SV grafts, especially in women and when anastomosed in the RCA.

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