Evaluating the Adequacy of Cardiovascular Risk Factor Control after Myocardial Revascularization Surgery

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Summary

Background: Cardiovascular risk factors (RF) for coronary artery disease (CAD) are responsible for the occurrence of cardiovascular events.

Objective: To estimate the percentage of patients submitted to myocardial revascularization surgery (MRS) that attains adequate control of modifiable RF at least six months after the surgery.

Methods: Data collection was based on the review of medical records and a clinical interview of 88 patients submitted to MRS between January and December of 2004 at a reference hospital for cardiovascular diseases. The patients were interviewed in the follow-up period, between six and twelve months after the surgical revascularization.

Results: Mean age was 63.1 ± 9.9 years; 51 patients (58%) were males, 86 (97.7%) were hypertensive, 38 (43.2%) were diabetic, 85 (96.6%) had hypercholesterolemia and 10 (11.4%) were smokers. Hypertension control (PA < 140 x 90 mmHg) was attained by 24.4% of the patients; cholesterol (LDL cholesterol < 100 mg/dl) and diabetes control (blood glucose levels < 110 mg/dl) levels were 30.6% and 31.6%, respectively. The use of antihypertensive drugs, hypoglycemic agents and statins, when indicated, were 96.5%, 92.1% and 78.8%, respectively. However, only 14.8% patients had their blood pressure, glucose and cholesterol levels within the limits accepted as adequate control.

Conclusions: Despite the frequent use of drugs to control hypertension, diabetes and hypercholesterolemia, a high proportion of patients still do not achieve the target levels of risk factor control recommended by current guidelines at least six months after revascularization surgery, which suggests there is a great potential for improvement in clinical practice. (Arq Bras Cardiol 2007;89(6):327-333)

Key words: Risk assessment; myocardial revascularization; disease prevention; control.

Introduction

The myocardial revascularization surgery (MRS), an invasive and highly complex procedure for the treatment of coronary atherosclerosis, promotes symptom relief, improves the tolerance to physical exercises and increases survival in the more severe cases of the disease[1]. After a while, however, these patients can present progression of the atherosclerosis in the native arteries as well as in the grafts, considering that the surgery exercises only a mechanical bypass action on the atherosclerosis plaques and does not act on the etiopathogenic factors of the disease. Hence, the implementation of preventive actions directed at the control of the risk factors (RF) related to the development of coronary artery disease (CAD) can prevent new acute ischemic events as well as promote the regression of the existing atherosclerotic plaques[2-4].

Between 1995 and 1996, the European Society of Cardiology carried out a study called EUROASPIRE[5], which evaluated the control of modifiable RF in patients that presented established coronary disease. After the publication of the new directives in 1998 for the secondary prevention in coronary patients, with lower cutoffs for the control of dyslipidemia, diabetes and hypertension[6], a new assessment was carried out, called EUROASPIRE II[7]; however, no improvements were observed regarding the practice of preventive measures after the MRS. In Brazil there have been no recent studies that evaluated the control of the malignant triad - hypertension, diabetes and dyslipidemia - following MRS after the publication of the last directives of the Brazilian Society of Cardiology, with more current recommendations for the control of RF[8-10].

The aim of this study is to evaluate the adequacy of the control of the main RF considering the most recent directive recommendations for patients submitted to MRS.

Methods

This is an ambispective observational study involving patients submitted to myocardial revascularization surgery in Hospital Portugues, a philanthropic hospital in the city of

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Salvador, state of Bahia, Brazil. This hospital has 8 beds that are exclusively reserved for the postoperative care of patients submitted to cardiovascular surgeries.

All of the patients submitted to the MRS in the year 2004 and were discharged from the hospital were considered eligible for the study. Of the 142 patients that were revascularized between January and December 2004, 12 died during the intra-hospital period. Of the 130 patients that were discharged from the hospital, 4 (3.1%) died before the telephone contact was established, 19 (14.6%) could not be contacted due to wrong telephone numbers and addresses in patients' files, 17 (13.1%) did not participate in the study due to the impossibility of attending the clinical interview caused by financial problems and only 2 (1.5%) refused to participate in the study. Therefore, 88 patients were contacted and accepted to participate in the study (82.2% of the adjusted participation rate, i.e., the percentage of participation among the survivors that were contacted). After the telephone contact, clinical interviews were scheduled to obtain the patients' written informed consent and provide complementary information.

Data regarding the hospital stay were collected retrospectively based on the systematical analysis of patients' files, using a standard form that contained information related to identification variables such as weight, diagnosis that led to the procedure, medical insurance, previous use of medications, presence of RF that were declared during hospital admission (hypertension, diabetes mellitus, hypercholesterolemia, cigarette smoking and family history of coronary disease), number of grafts performed, use of intra-aortic balloon pump, extracorporeal circulation (ECC), ECC time and number of days at the ICU.

All patients who declared having had a hypertension diagnosis or who used anti-hypertensive drugs were considered to be hypertensive. Similarly, patients who declared having had a diagnosis of diabetes or used oral antidiabetic drugs or insulin were considered diabetics; additionally, for the diagnosis of dyslipidemia, its diagnosis or the use of cholesterol-reducing drugs were taken into account.

The period between the surgery and the clinical interview varied from 6 months and 1 year. At the interview, some information regarding the presence of RF, as well as level of schooling, family income represented by the number of minimum wages, the number of assessments with the respective assistant physicians after the surgery and regular use of medications at the moment of the interview were confirmed. The patients were also asked questions regarding the habit of smoking, whether they practiced any physical activity (considered positive if the patient practiced at least 30 minutes of continuous aerobic activity 3 times a week) and their current weight. At the moment of the interview, the blood pressure was measured according to the recommendations of the V Brazilian Directives of Arterial Hypertension. Hypertension was considered to be controlled when pressure levels < 140 x 90 mmHg (or 130 x 80 mmHg for diabetics) were attained[8]. The abdominal circumference was measured as established by the I Brazilian Directives for the Diagnosis and Treatment of the Metabolic Syndrome[9], with the ideal circumference being < 90 cm for males and < 80 cm for females, according to the criteria of abdominal obesity for South America, as established by the International Diabetes Federation (IDF)[11]. The calculation of the body mass index (BMI) was made based on the weight and height provided by the patients, with a BMI ≥ 25 kg/m^2 being considered as overweight and BMI ≥ 30 kg/m^2 being considered obesity. The assessment of the lipid profile (total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides) and diabetes status (fasting glycemia) was made based on laboratory tests carried out in the 4 months prior to the interview. Regarding the control of hypercholesterolemia, the recommendations of the III Brazilian Directives of Dyslipidemia were considered (total cholesterol < 200, LDL < 100 mg/dl, HDL > 40 mg/dl or > 45 mg/dl for diabetics and triglycerides < 150 mg/dl)[10]. Regarding the diabetes status, an adequate control was considered when the glycemia was < 110 mg/dl, according to the directives of the International Diabetes Federation[11]. The diagnosis of the metabolic syndrome was attained using the criteria established by the I Brazilian Directives for the Diagnosis and Treatment of the Metabolic Syndrome[9].

This study was approved by the Ethical Committee in Research of Hospital Portugues and the data collection and interviews were conducted according to the Declaration of Helsinki.

The continuous variables were described as means, standard deviations (SD) and medians and compared by Mann-Whitney test, except for age between males and females and the number of medical consultations between patients using private health insurance or the Brazilian public health system (SUS), which were considered as presenting a normal distribution and compared by Student's *t* test for non-paired samples. The categorical variables were described by the distribution of absolute and relative frequencies, using the χ^2 test or Fisher's exact test to compare the proportions between non-paired samples, or the McNemar's test for paired samples. The level of statistical significance for all the associations at any level of analysis was set at 5%, two-tailed. Data analysis was carried out using the Epi Info software, version 3.3.2.

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Results

Eighty-eight patients with a mean age of 63.1 ± 9.9 years (Table 1) were studied. There was a male predominance of 58% (n=51), with a mean age of 62.4 ± 10.5 years and 42% of females (n=37), with a mean age of 64.1 ± 9.0 years. A total of 48.8% of the patients presented recent ischemic events and 63.6% of them were treated by the Brazilian public health system (SUS). The other clinical and demographic characteristics are shown in Table 1.

The follow-up interview was carried out, on average, after 8.8 months (range 4.8-14.2 months), with a median of 8.4 months.

The mean number of patients' assessments at the office after the hospital discharge was 4.1 ± 2.4 (range 0 – 10) with a median of 4 assessments. At the follow-up, all patients presented at least one cardiovascular risk factor, among hypertension, diabetes, dyslipidemia, family history of

coronary disease, BMI>25 or abdominal obesity. Sixty-nine patients (89.6%) presented metabolic syndrome; 82 patients (93.2%) used platelet antiaggregant drugs, 61 patients (69.3%) used beta-blockers, 48 (54.5%) used angiotensin-converting enzyme inhibitors (ACEI), 13 (14.8%) used angiotensin II AT1-receptor antagonists (AII antagonists) and 83 patients (96.5%) used at least one anti-hypertensive drug.

Among the dyslipidemic patients, 67 (78.8%) used statins and among the diabetic ones, 35 (92.1%) used oral antidiabetic drugs or insulin. In comparison to the pre-operative period, there was an increase in the use of statins of 60% (from 47.7% to 76.1%, P< 0.001) as well as of platelet antiaggregant drugs of 24% (from 75.0% to 93.2%, P< 0.001) (Chart 1). There was no significant difference between the pre and the postoperative periods for the other types of medications. The quantification of the continuous variables related to the RF is shown in Table 2. The intended control of hypertension was achieved by 21 patients (24.4%); of LDL cholesterol, by 26 patients (30.6%) and of glycemia, by 12 patients (31.6%), as shown in Table 3. Thirty patients (36.1%) were within the ideal weight range, 38 (43.2%) reported the regular practice of aerobic exercises and 70% of the smokers stopped smoking. Only 14.8% of the patients presented adequate levels of glycemia, LDL-cholesterol and BP, simultaneously.

There was no significant difference between males and females regarding the basal characteristics; however, there was an association between the female gender and a lower level of schooling (level of schooling ≥ complete High School of 27% *vs*. 47.1%, P=0.057). Among the men, a higher percentage of patients controlled for abdominal obesity was observed (59.5% *versus* 9.7%, P< 0.001) as well as for sedentarism (52.9% *versus* 29.7%, P< 0.05).

The patients who had private health insurance presented a significantly higher income (median of 7.0 *versus* 2.5, P<0.001), higher level of schooling (level of schooling ≥ complete High School of 62.5% *versus* 25.0%, P = 0.001) and

Table 1 - Clinical and demographic characteristics of patients submitted to myocardial revascularization surgery at Hospital Português in the year 2004 (Salvador, Bahia) (N=88)

	n	%	Mean	SD
Age (yrs)			63.1	9.9
Gender				
Male	51	58.0	62.4*	10.5
Female	37	42.0	64.1*	9.0
Family income (# minimum wages)			6.6	6.6
Health Insurance				
Public	56	63.6		
Private	32	36.4		
Schooling				
Illiterate / Unfinished Elementary school	47	53.4		
Finished Elementary School / Unfinished High School	7	8.0		
Finished High School / Unfinished College/University	23	26.1		
Finished College/University/Graduate School	11	12.5		
Diagnosis leading to the procedure				
Stable angina	25	31.3		
Unstable angina	22	27.5		
Acute Myocardial Infarction	17	21.3		
Congestive Heart Failure	9	11.3		
Asymptomatic	7	8.8		
Risk factors				
Arterial Hypertension	86	97.7		
Diabetes mellitus	38	43.2		
Dyslipidemia	85	96.6		
Smoking	10	11.4		
Family history of coronariopathy	41	47.7		

** Age in years.*

higher percentage of LDL-cholesterol control (48.4% *versus* 20.4%, P = 0.025) when compared to SUS patients. Obesity was more frequent among the patients with private health insurance (27.6% *versus* 7.4%, P = 0.025); however, SUS patients presented a higher percentage of overweight (57.4% *versus* 34.5%, P = 0.025) (Table 4). There was no significant difference between the two groups regarding the proportion of patients with controlled weight. ACEI use was more frequent among SUS patients (66.1% *versus* 34.4%, P = 0.004). The patients who had private health insurance used statins more frequently than SUS patients (87.5% *versus* 69.6%, P = 0.059) as well as AII antagonists (25.0% *versus* 8.9%, P = 0.06), although these differences are not statistically significant in relation to the *p* value defined by the study.

Discussion

The present study involved patients with elevated risk of new cardiovascular events, as in addition to the fact that they had undergone MRS, 48.8% of them had presented recent ischemic events and 11.3% presented left heart failure.

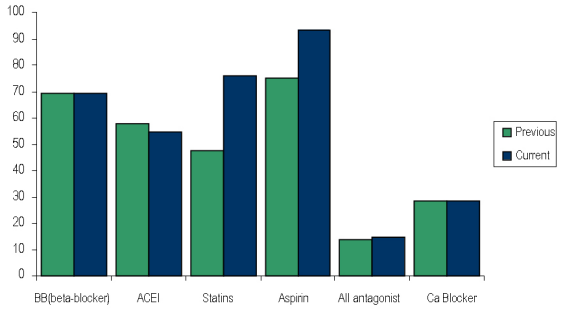

Chart 1 - *Use of cardiovascular medications in the pre- and postoperative periods (in percentage), in patients submitted to revascularization surgery at Hospital Português (Salvador, 2004).*

In spite of that, an elevated percentage of patients did not attain an adequate control of modifiable RF, such as hypertension, diabetes and hypercholesterolemia, after at least 6 months postoperatively. In this study, only 24.4% of the hypertensive patients were controlled, despite the regular use of at least one anti-hypertensive agent. For diabetes and dyslipidemia, the control levels were 31.6% and 30.6%, respectively. This fact is especially relevant when one considers the elevated prevalence of hypertension, diabetes and dyslipidemia in this study, which were 97.7%, 43.2% and 96.6%, respectively. It is worth mentioning that there was a high incidence of medication use in the present study, when compared to other studies, reaching 96.5%, 92.1% and 78.8% of treatment with anti-hypertensive drugs, hypoglycemiant drugs and statins, respectively. It is also noteworthy that, despite the pharmacological treatment considered to be effective for the control of the main RF (hypertension, diabetes and dyslipidemia), this control was attained by only a small number of patients. A study carried out in Turkey involving revascularized patients showed that only 24.2% of the patients used cholesterol-reducing drugs and 62.6% of them received anti-hypertensive treatment[12].

The majority of the studied patients presented low levels of schooling, with more than 50% of them having declared they were illiterate or had not completed Elementary School and whose median income was 4 minimum wages. Around 36% of the patients had private health insurance. These patients presented higher family income and higher level of schooling, which provided better financial resources to acquire the more expensive medications, such as statins and AII antagonists, as well as better knowledge regarding the disease and the need for preventive measures. These same factors might have influenced the better control of abdominal obesity and sedentarism among the male individuals, considering they had better levels of schooling. The difference observed regarding the use of ACEI can be explained by the fact that this type of

Table 2 - Quantification of continuous variables related to cardiovascular risk factors in patients submitted to myocardial revascularization surgery at Hospital Português in the year of 2004 (Salvador, Bahia)

	Mean	Median	SD	Range
Cholesterol total (mg/dl)	181.5	172.0	54.8	105-355
LDL Cholesterol (mg/dl)	104.8	104.0	38.1	36-210
HDL Cholesterol (mg/dl)	43.6	43.0	11.1	10.4-72.0
Triglycerides (mg/dl)	164.6	138.5	102.6	58-663
Glycemia (mg/dl)	123.0	102.8	55.5	51-338
Systolic Arterial Pressure (mmHg)	148.6	145.0	28.7	100-260
Diastolic Arterial Pressure (mmHg)	86.7	82.0	16.3	60-140
Body Mass Index (kg/m^2)	26.3	26.0	3.8	19.2-38.1
Abdominal circumference (cm)	**99.2**	**98.0**	**9.9**	**77-121**
Males	100.0	100.2	10.1	77-120
Females	98.0	96.0	9.7	80-121

LDL - low density lipoprotein; HDL - high density lipoprotein.

Table 3 - Cardiovascular risk factor control in the postoperative follow-up period in patients submitted to myocardial revascularization surgery at Hospital Português in the year 2004 (Salvador, Bahia)

Cardiovascular risk factor control	n	%
Smoking	7/10	70
Sedentarism	38/88	43.2
Abdominal Obesity*	8/73	11.0
BMI ≤ 25 kg/m²	30/83	36.1
Diabetes mellitus	12/38	31.6
Hypertension	21/86	24.4
Desirable lipid profile		
TC < 200 mg/dl	42/85	49.4
LDL < 100 mg/dl	26/85	30.6
Triglycerides < 150 mg/dl	32/86	37.2
HDL > 40 mg/dl (45mg/dl se DM)	29/86	33.7

*RF - risk factors; DM - diabetes mellitus; SAH - systemic arterial hypertension; TC - total cholesterol; LDL - low density lipoprotein; HDL - high density lipoprotein; * Using the criteria of abdominal obesity for South America (IDF, 2006).*

Table 4 - Frequency of risk factors in patients using the Public Health System or the Private Health System (Salvador, Bahia)

	Public health system (n=56)	Private health system (n= 32)
Hypertension	55 (98,2%)	31 (96,9%)
Diabetes mellitus	23 (41,1%)	15 (46,9%)
Dyslipidemia	54 (96,4%)	31 (96,9%)
Smoking	6 (10,7%)	4 (12,5%)
Obesity	4 (7,4%)	8 (27,6%)
Overweight	31 (57,4%)	10 (34,5%)
Abdominal Obesity *	28 (62,2%)	17 (60,7%)

** According to the criteria of the International Diabetes Federation for South America (IDF, 2006).*

medication is provided free of charge to SUS patients at the Basic Health Units. Another interesting point is that patients with private health insurance used other anti-hypertensive drugs, such as AII antagonists, more frequently than SUS patients.

The patients had, on average, four medical appointments during the follow-up period, i.e., on average one visit each two months, which is a higher number of visits than that indicated by the Brazilian directives for revascularization surgery[13]. This number of medical appointments, associated to the elevated frequency of drug use in the postoperative period without a satisfactory control might indicate that more qualitative approach measures are necessary to understand and correct the events that are in fact taking place.

Although the number of surgeries performed in the state of Bahia is small, much lower than the necessary one, the state is in the 14th place in Brazil and the 4th in the northeast region regarding the number of surgeries performed through SUS[14]. The procedures described in this study corresponded to 42.1% of the total number of MRS performed in SUS patients in the state of Bahia in the year 2004 (133 procedures). Hence, although the study was carried out in only one hospital in the state of Bahia, the number of patients who underwent surgery corresponded to a significant proportion of patients submitted to revascularization surgery in our state. The results obtained can very likely be generalized, as the healthcare access conditions to undergo this type of procedure are quite similar in all the northeastern states of Brazil, and perhaps, in several states of our country, in addition to the fact that the results obtained are in agreement with previous studies carried out in the state of Bahia and other countries worldwide[5,7,15].

In a study carried out in the city of Salvador, involving 104 patients with coronary artery disease (CAD), a lower prevalence of hypertension (67.3%) and diabetes (20.2%) was observed, but total mean cholesterol levels (222.9 mg/dl) and LDL-cholesterol (144.9 mg/dl) were noticeably above the limits considered to be acceptable[15]. Arterial hypertension control (BP < 140 x 90 mmHg) was demonstrated in 42.2%

of the patients as well as of overweight (BMI < 25 kg/m^2) in 37.6% of them, of hypercholesterolemia (TC< 200 mg/dl) in 31.8% and of LDL-cholesterol (LDL< 100 mg/dl) in 8.1% of the patients. However, these data were collected before the publication of the last recommendations for the control of cholesterol, in which the limits considered acceptable for the control were reduced[10].

Recently, a large multicenter study, the EUROASPIRE II, was carried out with the objective of verifying whether there was an improvement in the practice of preventive measures after the publication of directives that supported lower cutoffs for the control of RF[7]. According to this study, which involved 5,556 patients with CAD (myocardial ischemia, acute myocardial infarction or after undergoing angioplasty or MRS) in 15 European countries, a high prevalence of non-controlled RF could also be observed after 1.4 years of follow-up. After this period, a high rate of obesity (31.3%) and abdominal obesity (79.8%) was observed, 49.5% of the patients presented controlled BP levels (BP < 140 x 90 mmHg), 42.7% of them presented total cholesterol < 200 mg/dl and 13% of them presented glycemia levels < 110 mg/dl. Among the smokers, 34.4% stopped smoking. The low use of prophylactic drugs was also observed, with 86% of them using acetylsalicylic acid (ASA), 63% of beta-blockers, 38% of ACE inhibitors and 55.3% of statins.

Another study carried out in a cardiac surgical center in the UK, involving 214 revascularized patients, also showed the inadequate control of RF after one year of follow-up, including a worsening of BP control when compared to the preoperative period, with SAP ≥ 140 mmHg increasing from 40.1% to 60% and DAP ≥ 90 mmHg from 30% to 43%, with significant decrease in the use of important medications such as ASA, which decreased from 80.2% to 69.2% and beta-blockers, from 58.5% to 17%[16].

In recent years, a large effort has been made by the medical societies to improve the control of RF[17-20]. Despite the standardization, the difficulties to reach adequate control of RF still persist. Some studies suggest that coordinated actions, such as rehabilitation programs with emphasis on actions that involve psychological and social aspects, can be more efficient than isolated actions[21,22]. This more comprehensive perception in the postoperative period of MRS can be seen in the recommendations of the World Health Organization, which recommends cardiac rehabilitations programs defined as "the sum of necessary activities to assure the best possible physical, mental and social conditions so that the cardiac patient can resume, as much as possible, his or her place in the community life (apud HEDBÄCK, 2001)[23].

Another noteworthy point is that, in parallel with the low control of RF, an important number of patients did not undergo recent tests to evaluate LDL cholesterol (35.4% of the total) and glycemia control (13.2%), which suggests that the patients can be facing difficulties to have access to medical supervision and tests. This means there is little support to implement the change of important habits such as dietary alterations, practice of physical activities, stop smoking and alcohol consumption, and mainly, to adopt healthier lifestyles. These data suggest that more severe patients have access to complex hospital healthcare services within the necessary timeframe, which allows performing the surgery and survival; however, the continuity of these healthcare services at the level of outpatient follow-up is insufficient, as shown by the low frequency of RF control demonstrated by this study.

Some measures could be implemented aiming at improving the control of RF, such as the regular and broader supply of medications, free of charge, at the Basic Health Units (BHU), particularly the more expensive ones, such as statins, in addition to performing complementary assessments such as the evaluation of the lipid profile, glycemia and glycosylated hemoglobin at the BHU. The multidisciplinary follow-up through rehabilitation programs implemented by the government, following the recommendations established by the directives, could also be of great help in attaining this objective.

The main limitation of the present study consists in the fact that it involves only patients submitted to MRS in only hospital in the city of Salvador, Bahia. However, this is attenuated by the fact that the number of patients who underwent surgery corresponds to a significant percentage of patients who underwent MRS in our state, as mentioned before. Additionally, only two other hospitals in the city of Salvador offered MRS to patients from the public health system (SUS) during that year.

Another possible limitation would be the use of fasting glycemia to assess the diabetes control, instead of post-prandial glycemia or glycosylated hemoglobin. However, according to the IDF directives, this strategy is possible in settings that can provide only minimal care, as observed in our current situation. Some revascularized patients could not attend the interview, either due to lack of resources or to the difficulty to locate them, caused by insufficient information and wrong address and telephone number records. However, most of these patients lived in the countryside and were SUS patients, and thus it is unlikely that they were receiving better care than the patients in the study.

During the interview, the patients were asked about the medications they had been using, but no systematized method was used to evaluate treatment adherence, such as counting the remaining drugs. There was no record of the doses used and therefore, we cannot evaluate whether the control objectives were not attained due to the inadequate use of medication doses. The patients were not evaluated regarding the control of RF before the surgical procedure, considering that the start of the study corresponds to the moment of hospital admission for the surgery.

Conclusion

The control of cardiovascular risk factors has been carried out poorly in patients with coronary atherosclerotic disease that underwent myocardial revascularization surgery.

Despite the frequent use of medications for the control of hypertension, diabetes and hypercholesterolemia by most of the patients, this has not directly resulted in adequate control of the main cardiovascular risk factors, which suggests that there is a large space for improvement regarding preventive medical care directed at this group of patients.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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