

Late survival of patients submitted to elective abdominal aortic aneurysm open repair

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ABSTRACT

Background: The authors performed a review of patients who underwent surgery at a community hospital to determine the cause of late mortality, evolution of other aortic segments and graft-related complications.

Objectives: To report the late follow-up of a series of 76 patients submitted to elective abdominal aortic aneurysm open repair from March 1995 to January 2007.

Methods: Recruitment of patients for a follow-up visit; those who could not attend personally were contacted by telephone.

Results: Thirty-day operative mortality was 5.3%. Late survival obtained by life table was 95% in 1 year, 88% in 3 years and 72% in 8 years. Cardiovascular diseases were the main cause of late mortality, followed by malignant neoplasia. Dilatation of proximal aortic segment during follow-up occurred in 9.7% of the patients, and graft-related complications occurred in four cases (5.3%): one graft infection, one proximal pseudoaneurysm, one pseudoaneurysm of the iliac artery and one branch occlusion.

Conclusion: Open surgery for abdominal aortic aneurysm repair has good long-term outcome, similar to that in the national and international literature, and is a good option for patients who have a low surgical risk.

Keywords: Abdominal aortic aneurysm, surgery, survival analysis.

RESUMO

Contexto: Os autores fazem uma revisão dos pacientes operados em hospital privado para determinar a causa da mortalidade tardia, a evolução dos demais segmentos da aorta e as complicações relacionadas à prótese.

Objetivos: Relatar o seguimento tardio de uma série de 76 casos operados eletivamente para a correção de aneurisma de aorta abdominal, no período de março de 1995 a janeiro de 2007.

Métodos: Convocação dos pacientes para uma consulta de retorno e daqueles que não puderam comparecer pessoalmente através de contato telefônico.

Resultados: A mortalidade operatória em 30 dias foi de 5,3%. A sobrevida tardia obtida por curva atuarial foi de 95% em 1 ano, 88% em 3 anos e 72% em 8 anos. As doenças cardiovasculares foram a principal causa de mortalidade tardia, seguidas das neoplasias malignas. A dilatação de segmento de aorta proximal à correção cirúrgica ocorreu em 9,7% dos pacientes operados, e as complicações relacionadas à prótese ocorreram em quatro casos (5,3%), sendo uma infecção de prótese, um pseudo-aneurisma proximal, um pseudo-aneurisma em íliaca e uma oclusão de ramo.

Conclusão: A cirurgia aberta para correção do aneurisma de aorta abdominal apresenta bom resultado em longo prazo, semelhante ao da literatura nacional e internacional, sendo uma boa opção para o paciente que tenha um baixo risco cirúrgico.

Palavras-chave: Aneurisma da aorta abdominal, cirurgia, análise de sobrevida.

Introduction

Survival of patients with abdominal aortic aneurysm with a diameter greater than 7 cm is small, due to high incidence of rupture.¹ The main objective of surgical repair is to prevent the patient's death associated with aneurysm rupture. Indication of surgery essentially depends on the balance between immediate risk of aneurysm rupture and the risks associated with surgical repair. The cut-off point of 5.5 cm is believed to be the most appropriate for most patients nowadays.² The safer the technique, the more advantageous for the patient. On the other hand, surgical repair should also offer long-term outcomes, which overcome the patient's life expectancy, so that he does not need to be submitted to another procedure, greater and having more risks, at an older age. Introduction of endovascular procedures allowed a surgical alternative with lower operative mortality rate in patients with favorable anatomy, but with lower late durability, demanding higher reintervention rate. Late survival of patients submitted to aortic aneurysm repair in European countries and in the USA is well known,³⁻⁹ but in Brazil few studies have been published on this issue.¹⁰⁻¹² This study aims at presenting a 12-year follow-up of patients who underwent open surgery for abdominal aortic aneurysm repair in a Brazilian population receiving care at a medium-sized private hospital. Survival, cause of death and evolution of proximal aorta during follow-up are reported, and the results are compared to those in the literature.

Methods

A population of 76 patients submitted to aortic aneurysm repair from March 1995 to January 2007 was selected. Medical records were used to obtain information about aneurysm diameter, gender and age at the surgery. Information regarding survival was also obtained from medical records of patients who had returned less than 1 year from the survey or by telephone call/appointment for patients who had not returned for a medical visit for more than 1 year. During the study, 12

patients (15.8%) were considered lost, since information more recent than 1 year before the research could not be obtained. Result of the last imaging control (ultrasound, tomography or resonance) performed by the patient was also registered. All patients came from private offices and underwent surgery by the same team at a medium-sized hospital in the countryside of the state of São Paulo, Brazil. The results were tabled in Excel® (Microsoft 2003), and late survival was presented by life table¹³ (Table 1, Figure 1).

Table 1 - Table to perform survival curve

Intervals (months)	Patients at risk	Death	Duration	Lost	% Survival	% Cumulative	Standard error %
0-1	76	4	0	0	0.94	0.95	2.44
> 1-6	72	0	6	1	1.00	0.95	2.50
> 6-12	65	0	4	0	1.00	0.95	2.63
> 12-24	61	2	7	3	0.96	0.92	3.39
> 24-36	49	2	6	2	0.95	0.88	4.42
> 36-48	39	1	7	3	0.97	0.85	5.27
> 48-60	28	1	6	1	0.96	0.82	6.58
> 60-72	20	0	1	0	1.00	0.82	7.79
> 72-84	19	1	2	1	0.94	0.77	8.44
> 84-96	15	1	2	0	0.93	0.72	9.84
> 96-108	12	2	1	1	0.82	0.59	10.90
> 108-120	8	2	2	0	0.71	0.42	11.31
> 120	4	2	2	0	0.50	0.21	9.33

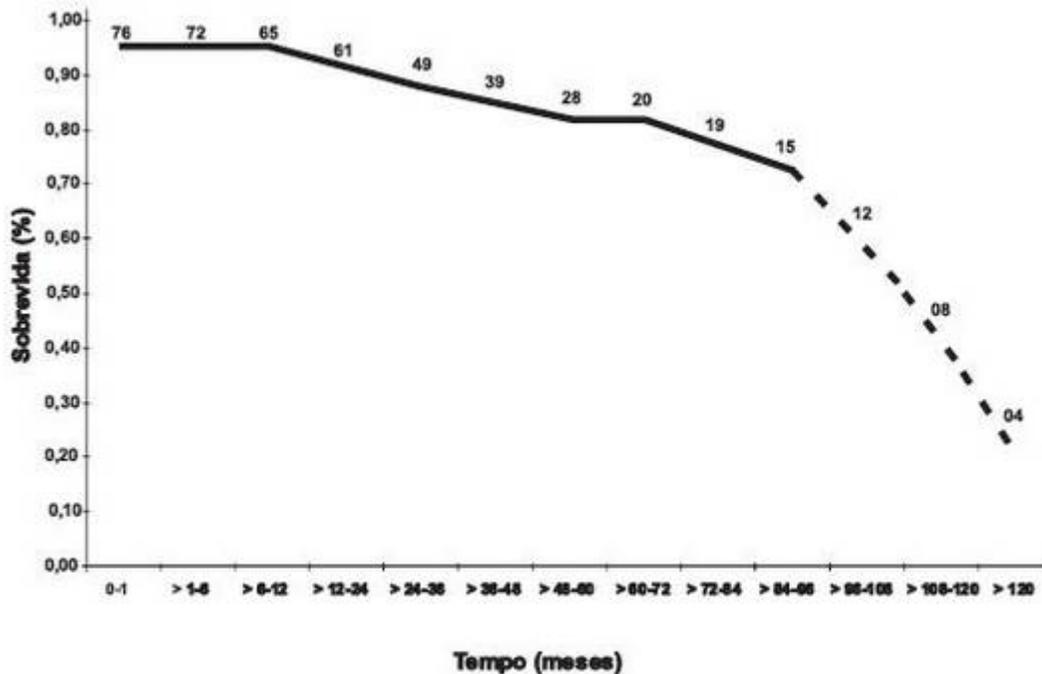


Figure 1 - Survival curve of patients submitted to abdominal aneurysm surgery by open surgery (1995-2007). The values above the curve represent the number of live patients at the beginning of the interval. The dotted line represents a standard error above 10%

Results

There were 67 male patients (90%) and nine female patients. The patients' mean age was 69 years (53-91), and mean size of aneurysms at surgery was 6 cm (3-18). In one case, aortic size was lower than 5 cm, but it corresponded to indication due to an iliac aneurysm larger than 3 cm. Thirty-day mortality rate was 5.3% (two patients due to acute renal insufficiency, one patient due to acute myocardial infarction and one patient due to systemic inflammatory reaction syndrome after a surgery in which there was prolonged ischemia of the lower limbs). Late survival of patients was 95, 88 and 72% in 1, 3 and 8 years and is presented in the survival curve (Figure 1); causes of death are presented in Table 2. Among survivors, seven (9.7%) had dilatation of other aortic segments, and one patient progressed to dilatation compromising the thoracoabdominal segment (171 months of follow-up). Another patient, who already had dilated proximal neck measuring 3.5 cm maintained this diameter at 27 months of follow-up, and five patients progressed with dilatation of the thoracic aorta; of these, only one was repaired by endovascular technique. Four patients (5.3%) progressed with graft problems – one infection at 6 months of follow-up, leading to removal of aortic graft and axillary-bifemoral bypass, who later died due to depressive status (19 months); one pseudoaneurysm rupture of proximal anastomosis at 120 months, in which the patient, even knowing about the pseudoaneurysm diagnosis, refused to undergo surgery; one pseudoaneurysm of the iliac branch anastomosis at 119 months, which was repaired by interposition of a new graft segment; and one asymptomatic thrombosis of the left branch of one graft 6 years after surgical repair.

Table 2 - Cause of death during follow-up of patients submitted to abdominal aortic aneurysm repair by open surgery (1995-2007)

Cause of death	Follow-up (months)	Age at death
Depressive status	19	83
Stroke	24	79
Unknown	28	67
Acute myocardial infarction	29	73
Malignant pulmonary neoplasm	48	73
Malignant renal neoplasm	58	76
Acute myocardial infarction + diabetes mellitus	80	69
Malignant neoplasm of the stomach	87	72
Acute myocardial infarction	101	77
Congestive heart failure	108	68
Alzheimer's disease	113	68
Rupture of proximal anastomosis pseudoaneurysm	120	80
Congestive heart failure + chronic renal failure	125	82
Congestive heart failure	213	84
Mean	82	75

Discussion

This study has a similar result to many series published in the literature.^{3-7,9-12,14-16} Global survival rate of patients submitted to surgery for aortic aneurysm repair is high (72% in 8 years). Even older patients (> 75 years) are benefited by surgery, since 86% of them were still alive after 4 years.

Only two patients (2.8%) died due to complications related to the graft (19 months and 10 years after the surgery), and only one patient died directly due to rupture of false aneurysm of proximal anastomosis in the aorta. Cause of late death in this series was related especially to cardiovascular complications (acute myocardial infarction, stroke and congestive heart failure), followed by malignant neoplasms. There was no difference in age between the group that died due to neoplasms or cardiovascular disease, and survival of these patients was nearly 7 years in average. However, a high occurrence of malignant neoplasms draws attention in this group of patients, which is in accordance with the literature.⁶

As to procedure durability, the present population reinforces the concept that conventional open surgery, with graft suture directly to the aorta, has excellent long-term result, with low incidence of graft complications (4.2% in 8 years). The most frequent complication was anastomotic false aneurysm, which can be detected by abdominal ultrasound and repaired at a suitable time. Infectious complication is rare, corroborating the fact that grafts for aneurysm repair should preferentially be maintained inside the abdominal cavity, avoiding the inguinal region, a conduct that was routinely followed in this series. The patient with graft infection in our population had duodenal compression syndrome by the superior mesenteric artery,¹⁷ and had to be submitted to two laparotomies, which we believe may have led to graft contamination. Branch thrombosis occurred in only one patient in the late follow-up (1.3%), although it is reported in 5% of cases in

the literature,³ probably because the distal arterial bed was patent in most of these patients.

For the patient, from the perspective of postoperative quality, the literature has shown that the quality of life of patients submitted to laparotomy is not lower than that of patients submitted to endovascular surgery, when analyzed by standardized questionnaires (Medical Outcomes Study Short-Form SF-36, Short-Form Health Survey SF-12 and Karnofsky Score for Functional Autonomy).¹⁸⁻²⁰ In addition, control of patients submitted to conventional surgery can be performed annually by simple abdominal ultrasound. Thus, more expensive examinations and use of potentially nephrotoxic contrast are avoided for these elderly patients.

The literature has demonstrated that, with time, dilatation of other segments of the aorta and pararenal aorta is a common fact, including the residual infrarenal neck.²¹ When the patient is submitted to endoluminal repair, the proximal neck below renal arteries grows around 1 mm a year over the first years of the implantation, and may result in proximal leakage and aneurysm rupture even after endovascular repair.^{14,22-26} Studies that reviewed the same problem in conventional surgeries report that, although this finding is also present after open surgery, it has no significant clinical meaning if the aortic diameter remains below 5 cm and it also does not result in false anastomotic aneurysm in most cases, confirming that graft fixation by suture is a safe repair method in the long term.^{27,28} Distal dilatation of iliac arteries, when aneurysm repair was performed by aorto-aortic graft, does not seem to be a reason for concern considering these patients' life expectancy.²⁹

Expectancy of durability for an endovascular device, according to manufacturers, is 10 years, but the reintervention rate for these patients is still high, around 15-30% in 3 years.^{7,8,30} Late reintervention rate in open surgeries is around 3.5 and 10% in 10 years.^{3,9,15} Studies analyzing cause of early rehospitalization after open aneurysm surgery reveals that most rehospitalizations are related to cardiac, gastrointestinal causes and presence of neoplasms.^{30,31}

An important finding of the present study is dilatation of the thoracic aortic segment during follow-up of these patients (7%). Other studies in the literature reinforce this finding, and 1-4% of the patients died due to rupture of these aneurysms.^{7,14}

Cao et al., in a recent study,⁷ comparing patients submitted to conventional and endovascular surgery, concluded that late survival of patients submitted to endovascular surgery (66.9% in 7 years) is equal to that of patients submitted to conventional surgery (67.1% over the same period). The problem of conventional surgery was higher initial mortality rate, which is higher than that of endovascular surgery. Other studies, however, show that mortality in endovascular surgery can be equal or even higher than that of conventional surgery, since indication is usually for high-risk patients.^{8,12,16} Another finding in Cao et al.'s series was the cause of late mortality, which was not related to aneurysm in patients submitted to conventional surgery; only one patient died due to iliac artery pseudoaneurysm, whereas the patients submitted to endovascular surgery had mortality rate of 1.1% related to aneurysm rupture, whose risk is considered around 2% in other studies.⁸ The reintervention rate for conventional surgery in that same study was 7.1% in 7 years, whereas reintervention for endovascular surgery was 49.4%.

Over the past years, there have been increasingly more frequent reports of laparoscopic repair,^{32,33} which associates benefits of open surgery to the fact of not performing laparotomy itself, including the development of mechanical graft suture methods at the aorta.^{34,35} Other possibilities to be considered are the association of endovascular technique and laparoscopic fixation by suture in the proximal neck³⁶ and endovascular mechanic suture.

Based on the findings of the present study, corroborated by findings in the literature, it is reasonable to propose open surgery (or laparoscopic) and follow-up using ultrasound as the first

choice for young patients with long life expectancy and with low surgical risk, until durability of these new stent-grafts is confirmed and a satisfactory late evolution close to 10 years is assured. Such technique should also be employed when the anatomy of the aorta and iliac arteries is not favorable to the endovascular technique, since the unfavorable anatomy increases persistent risk of rupture after endovascular repair.²⁵ For older patients, or in those with significantly higher comorbid conditions, endovascular repair undoubtedly has the advantage of lower operative mortality rates.

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