Original Article

The Long-term Follow-up Results of Elective Surgical Treatment for Abdominal Aortic Aneurysms

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This study was aimed at evaluating early and long-term follow-up results of surgical reconstruction of infrarenal abdominal aortic aneurysms (AAA). A consecutive series of 392 patients who underwent elective abdominal aortic repair from 1974 to 2000 was reviewed retrospectively. The mean age was 69.8 years (range 34-90), with 329 males and 63 females. The hospital mortality rate was 3.8% (15/392). Of the 203 patients that died during the follow-up period, 28% (56/203) were due to atherosclerotic diseases and 25% (51/203) were malignancies. The Patients whom underwent AAA surgery associated with ischemic heart disease had a 5-, 10-, and 15-year survival rate of 62%, 30%, and 9%, respectively. On the other hand, a survival rate of those not associated with ischemic heart disease were 71%, 38%, and 16%. The patients associated with aortoiliac occlusive disease in AAA surgery had a 5-, 10-, and 15-year survival rate of 51%, 11%, and 0%; those without aortoiliac occlusive disease had a survival rate of 72%, 43%, and 18%, respectively. There were statistically significant differences between the ischemic heart disease and the non-ischemic heart disease, the aortoiliac occlusive disease and the non-aortoiliac occlusive disease in long-term survival rates respectively. These findings demonstrate that AAA patients associated with ischemic heart disease or aortoiliac occlusive disease are at a higher risk than those with AAA alone. Therefore, AAA patients with aortoiliac occlusive disease and or ischemic heart disease should be managed more intensively before, during and after the operation. (Ann Thorac Cardiovasc Surg 2002; 8: 38–41)

Key words: abdominal aortic aneurysm, aortoiliac occlusive disease, ischemic heart disease, long-term survival rate

Introduction

Recently, elective operations for abdominal aortic aneurysm (AAA) have been performed safely. However, the long-term results are not yet satisfactory. The purpose of this study is to evaluate the early and late results after elective surgical treatment of AAA, and the long-term relative survival rate.

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Materials and Methods

From April 1974 to August 2000, three hundred ninety two (392) consecutive patients underwent elective AAA surgery at Hyogo College of Medicine Hospital. These patients were evaluated retrospectively. The mean age was 69.8 years (range 34-90), with 329 males and 63 females (5.2:1). The age and gender of the patients were examined for influence on actuarial survival and on relative survival rates. Survival rates related to ischemic heart disease (IHD) and aorto-iliac occlusive disease (AIOD) was also investigated. IHD was diagnosed by past history and present illness as chest pain, and or ischemic ECG changes.[1] In this IHD group, coronary artery graphy (CAG) was performed on 92 cases (67%). These 92 cases

Table 1. Preoperative risk factors among patients undergo ing repair of infrarenal non-ruptured abdominal aortic aneurysm (AAA)(n=392)

Risk factors	Cases (rate)
Hypertension	270 (69%)
IHD	138 (35%)
AIOD	81 (21%)
Diabetes	45 (11%)
Cerebrovascular accident	45 (11%)
Hyperlipidemia	43 (11%)

IHD: ischemic heart disease; AIOD: aorto iliac occlusive disease.

Table 3. Hospital mortality rate with and without IHD or AIOD

			2 analysis
	With	Without	p value
IHD	9/138 (6.5%)	6/254 (2.4%)	=0.076
AIOD	8/81 (9.9%)	7/311 (2.3%)	<0.005

IHD: ischemic heart disease; AIOD: aorto iliac occlusive disease.

Table 2. Causes of hospital death

	Cases
Bowel necrosis	6
Respiratory failure	3
Myocardial infarction	2
Gastric bleeding	3
Brain bleeding	1
Total	15

Table 4. Causes of late death (n=203)

	Cases (rate)
Atherosclerotic change	56 (28%)
Myocardial infarction	23 (11%)
Brain infarction	23 (11%)
Other aneurysms	10 (5%)
Malignant diseases	51 (25%)
Respiratory failures	21 (10%)
Heart failures	16 (8%)
Senility	19 (9%)
Sudden death	9 (4%)

were classified as: one- or two- vessel disease; three-vessel disease or left main trunk (LMT); percutaneous coronary artery intervention (PCI) or coronary artery bypass grafting (CABG) group. The PCI, CABG group is AAA patients with PTCA or CABG procedure. AIOD was diagnosed angiographically as over 75% or long segmental 50% stenotic lesions at the iliac and or femoral artery, in addition to an ankle pressure index of below 0.6.

The demographically matched expected survival rate was calculated from Japanese life tables published by the Ministry of Health and Welfare.[2)] Survival rates were presented as in the Kaplan-Meier actuarial survival method. Statistical significance of divergent survival between each subgroup was examined with the log-rank test. The relative survival rate was estimated from observed and expected survival data. Categorical data were analyzed with the χ^2 test.

Preoperative risk factors are listed in Table 1. Thirty five percent of patients show IHD, and 21%, AIOD.

Results

The overall hospital mortality rate was 3.8% (15/392). Major causes of hospital death were bowel necrosis and others were listed in Table 2. Patients with recognized AIOD had a significantly higher hospital mortality rate of 9.9% (8/81) than without AIOD of 2.3% (7/311) ($p<0.005$). IHD tended to increase the mortality rate, but there was not a significant difference ($p=0.076$) (Table 3). The mean postoperative follow-up period was 5.5 years (range 2 months - 21.2 years). The follow-up rate was 97.5% (10 lost cases). Of the 203 deaths that occurred during the follow-up period, 28% (56/203) were due to atherosclerotic disease and 25% (51/203) were malignant. Others were listed in Table 4.

The mean age of all patients was 69.8 years, and the expected ten and fifteen year survival rates were 64% and 47% respectively. The observed was 35% and 14%, resulting in a relative survival rate of 55% and 29%, respectively. Long-term survival rate of surgical treatment was lower than expected (Fig. 1).

One hundred thirty nine patients had IHD prior to the aneurysm repair. These patients experienced a 5-, 10-, and 15-year survival rate of 62%, 30%, and 16%, respectively. On the other hand, non-IHD patients experienced a survival rate of 71%, 38%, and 9%, respectively (Fig. 2). There was a statistically significant difference between the IHD and the non-IHD patients in long-term survival rates. ($p<0.05$) In IHD patients, CAG was performed in 92 cases (67%). These patients were classified as: one- or two-vessel disease in 52; 3 or LMT disease in 17; and PTCA or CABG procedure in 23, but there were no differences in the three groups. CAG was performed in only

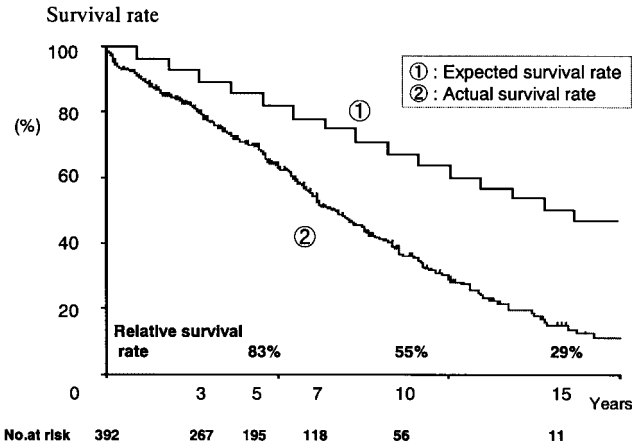

Fig. 1. Expected and observed 15-year survival rate for patients with AAA.

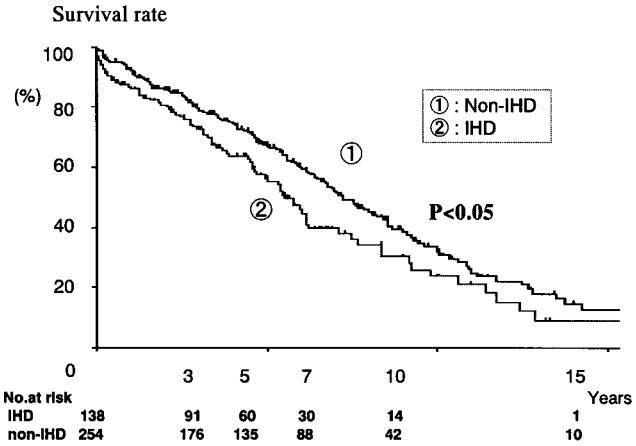

Fig. 2. Observed survival rate of AAA surgery associated with or without ischemic heart disease.

2/3 patients in the IHD group which may have led to this outcome.

Eighty-one patients had AIOD. These patients had observed 5-, 10-, and 15-year survival rates of 51%, 11%, and 0%, respectively. And the non-AIOD patients had survival rate of 72%, 43% and 18%, respectively (Fig. 3). There was a statistically significant difference between the AIOD and the non-AIOD patients ($p<0.0001$).

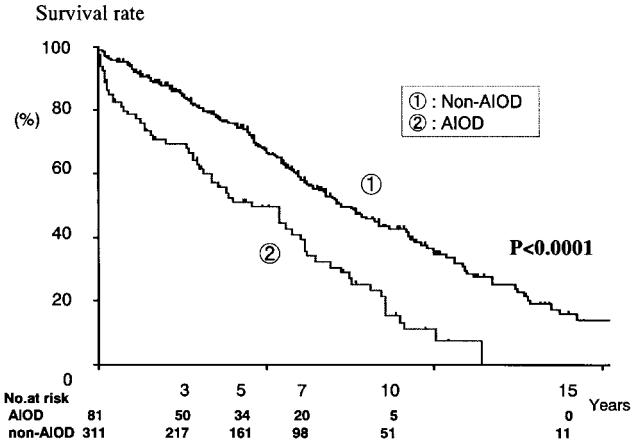

Fig. 3. Observed survival rate of AAA surgery associated with or without aortoiliac occlusive disease.

Discussion

Elective aneurysm repair clearly prolongs life expectancy of patients with AAA larger than 5.0 cm in diameter.[3] An operative mortality of 3.8% is similar to previous reports.[4-6] Despite improved surgical techniques and anesthesiology, this portion has not been reduced significantly over the years. One of the major causes of operative deaths is cardiac disease.[7,8] Case selection based on cardiac assessment, combined with more extensive coronary intervention, might reduce the operative mortality further.[7,9] This is particularly important in patients who undergo the operation at a more advanced age. In this study, combined AIOD increases early and late mortality rates, because the preoperative evaluation of IHD was not adequate in patients with AIOD due to intermittent claudication.

An overall 10-year survival rate of 35% agrees with previous reports.[5,6] The mortality rate rose to 50% when compared with an age and sex matched population. This demonstrates the occurrence of a potentially lethal disease other than the AAA itself in these patients. Additional atherosclerotic lesions coexist more frequently and increase the mortality rate.

Ischemic heart disease was recognized preoperatively in 35% of the patients. There is a little difference in other reports.[7,9,10] Hertzer et al. reported that angiographically normal coronary arteries was only 6% of the patients for aneurysm repair.[11] The incidence of ischemic heart disease depend upon the modes of the coronary artery investigation. Coronary arteriography is highly sensitive. It is, however, invasive and expensive for patients. Routine use of CAG is, therefore, usually not recommended.[9,12] Dipyridamole-thallium scanning appears to be a safe and effective method to evaluate coronary artery diseases.[12-14] Identifying patients with ischemic heart disease is important because their operative risk is increased and long-term survival reduced, when compared to the non IHD patients. This finding has also been reported in much of the literature.[7,15]

AIOD was recognized in 21% of the patients preoperatively. The preoperative evaluation of IHD was inad-

equate in AIOD patients, in which exercise-induced ECG studies could not be obtained because of claudication. Therefore, AAA associated with AIOD is very important, so that one of their operative risks is increased and the long-term survival rate markedly reduces when compared to those patients without AIOD. Preoperative coronary arteriography should be strictly performed in AIOD patients to prevent early and late cardiac death. Therefore, AAA associated with AIOD should be considered as one of the complexities of the syndrome.

Conclusion

This study strongly suggests that the operative risk of AAA associated with AIOD and or IHD is higher than AAA alone. Therefore, in AAA with AIOD, and or IHD should be evaluated more carefully, during the perioperative period.

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