

Coronary Artery Surgery Results 2002 in Japan

Yukiyasu Sezai, MD, Yukihiro Orime, MD, and Saeki Tsukamoto, MD

Over the past 30 years, we have reported on status and outcome of coronary artery bypass surgery in Japan. This report is focused on surgery performed last year, from January 1 to December 31, 2002. A total of 13,474 cases underwent coronary artery bypass grafting (CABG) of these, 12,552 underwent CABG only. The operative mortality for patients who underwent CABG only was 2.04% in 2002. Mortality for initial elective CABG was 1.02%. These are the best results obtained since surveys were started. The percentage of elderly patients undergoing coronary artery bypass surgery is rising annually. In 2002, 44.4% of patients were aged 70 years or older and 6.9% were aged 80 years or older. Mortality in elderly patients undergoing initial elective surgery is decreasing, with a mortality of 1.3% for patients aged 70 years or older and 2.0% for patients aged 80 years or older. Since 1996, the number of off-pump CABG (OPCAB) cases remarkably increased annually. This less-invasive procedure was performed on 5,628 patients in 2002, which is 41.8% of the total number of CABG cases. (*Ann Thorac Cardiovasc Surg* 2004; 10: 266–71)

Key words: coronary artery bypass grafting (CABG), arterial graft, off-pump CABG (OPCAB)

Introduction

The Japanese Association for Coronary Artery Surgery (JACAS) has been conducting surveys of the status of coronary artery surgery since 1970, the time of its predecessor organization.¹⁻⁵⁾ The most recent survey was coronary artery surgery performed in the year from January 1 to December 31, 2002. Completed questionnaires were returned by 262 institutions with cardiac surgery departments. This report describes a summary of advances in coronary artery surgery in Japan based on the status of coronary artery surgery over the past year and a review of the results of previous surveys.

Operative mortality is defined as any death within 30 days after the day of surgery. Operative mortality by patient characteristics was examined by χ^2 statistics.

From Department of Cardiovascular Surgery, Nihon University School of Medicine, Tokyo, Japan

Received January 30, 2004; accepted for publication February 24, 2004.

Address reprint requests to Yukihiro Orime, MD, PhD: Department of Cardiovascular Surgery, Surugadai Nihon University Hospital, 1-8-13, Kanda-Surugadai, Chiyoda-ku, Tokyo 101-8309, Japan.

Outcome according to Urgency and Times of Surgery

A total of 13,474 patients underwent coronary artery bypass surgery in 2002. Of these, 12,552 underwent coronary artery bypass grafting (CABG) only. The other 922 patients underwent additional procedures for myocardial infarction or other complications at the same time.

Surgical outcome of last year (2002) is shown in Fig. 1. The horizontal axis shows the type of surgery (that is, whether it was elective or emergency and whether it was initial or redo) and the percentage of patients who underwent each type of surgery. The vertical axis shows the mortality for each type of surgery. The operative mortality was 1.02% for initial elective surgery (10,546 cases), which is better than that (1.33%) of previous surveys (in 2001) and is the best clinical result over the past 30 years. It was 7.63% for initial emergency surgery (1,625 cases), 3.88% for redo elective surgery, and 23.91% for redo emergency surgery, which still indicates high mortality.

Change in Number of Grafts in CABG

Figure 2 shows the change in the number of grafts in CABG.

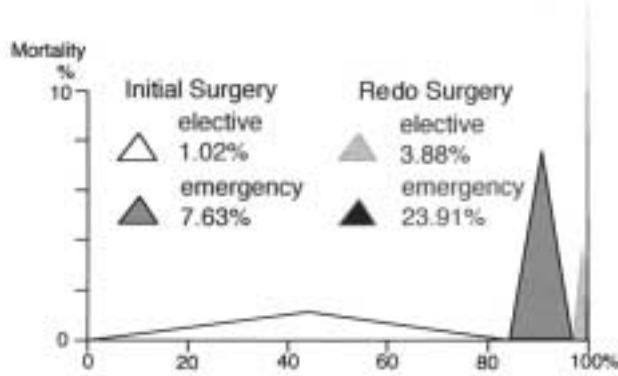


Fig. 1. Outcome according to urgency and times of surgery (isolated CABG in 2002: 12,552 cases).

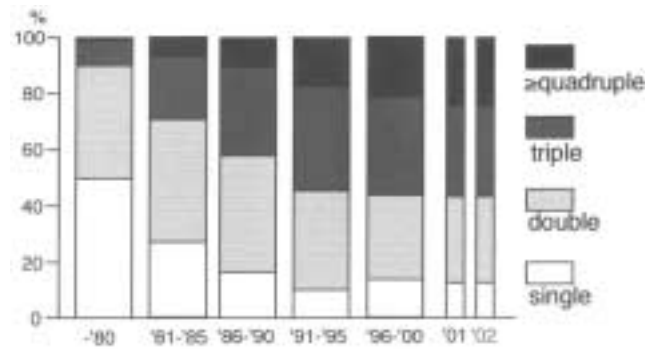


Fig. 2. Changes in number of grafts in CABG.

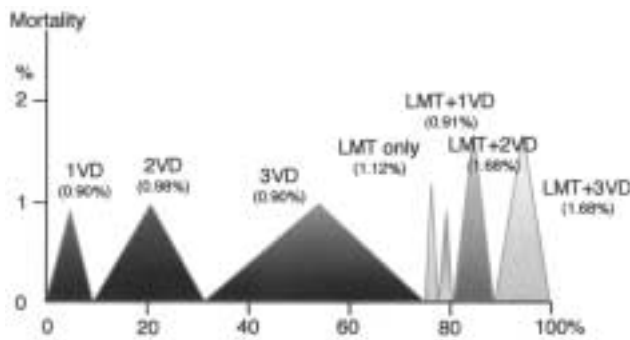


Fig. 3. Outcome according to number of diseased vessels (10,546 initial elective surgery).

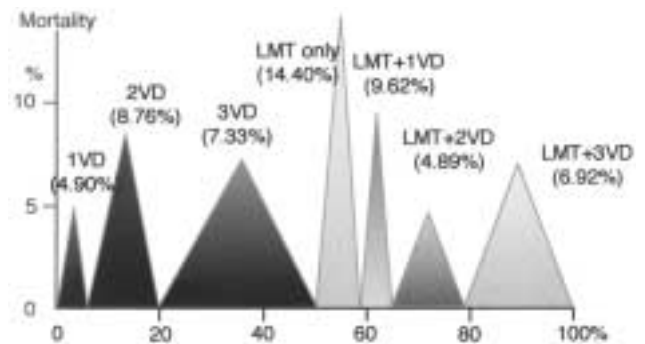


Fig. 4. Outcome according to number of diseased vessels (1,652 initial emergency surgery).

The horizontal axis shows each period, the left bar shows before 1980 and the right two bars show 2001 and 2002.

Of 12,552 patients who underwent CABG only in the last year (2002), one graft was used in 13.3%, two grafts in 29.1%, three grafts in 33.8%, and four or more grafts in 23.8%. The mean number of grafts was 2.68, where four or more grafts are counted as four grafts. This is the same value as the previous mean of 2.68 grafts.

Prior to 1980, approximately half of bypass operations were single-vessel, and single- and double-vessel bypass accounted for 90% of cases. Since then, there has been an annual trend toward multi-vessel bypass. However, the most recent survey shows that although four-vessel bypass is becoming more common, the percentage of patients undergoing single-vessel bypass, which had been falling, has again increased.

Outcome according to Number of Diseased Vessels: Initial Elective Surgery

Outcome according to the number of diseased vessels for

initial elective cases is shown in Fig. 3. The horizontal axis shows number of diseased vessels (that is, whether it was one, two or three vessel disease, concomitant with left main trunk: LMT) and the percentage of patients. The vertical axis shows the mortality for each type of disease.

Three vessel disease without LMT lesion was the most common disease, indicating 43.2% of all types. The patients without LMT were 74.9% of all cases. The operative mortality rate was 0.92% for the patient without LMT, on the other hand, 1.32% for the cases with LMT.

Outcome according to the Number of Diseased Vessels: Initial Emergency Surgery

Figure 4 shows outcome according to the number of diseased vessels for initial emergency cases. In 2002, initial emergency CABG was performed in 1,625 patients and the mortality of those was 7.63%, which is better than that (9.39%) of previous survey (in 2001).

Three vessel disease without LMT lesion was the most common disease, 31.5% of all types, however, the pa-

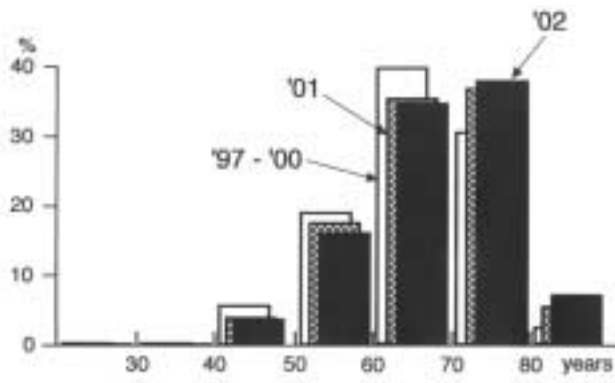


Fig. 5. Age distribution (total number).

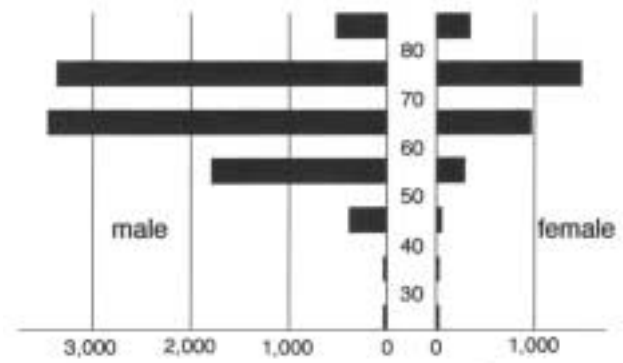


Fig. 6. Age distribution according to gender (total number).

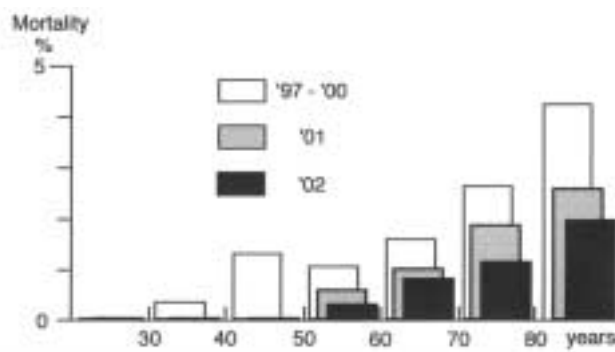


Fig. 7. Mortality according to age (initial elective surgery).

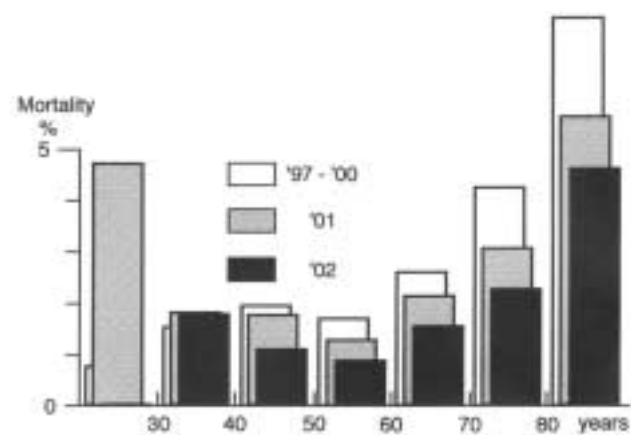


Fig. 8. Mortality according to age (total number).

tients without LMT was 49.3%, which is much different compared to the initial elective cases. The operative mortality rate was much worse than in those initial elective cases, indicating 7.40% for patients without LMT and 7.87% for the cases with LMT.

Age Distribution

A survey of outcome according to age was started in 1997. The results presented are a summary for the past four years (from 1997 to 2000), 2001 and 2002. Examination of age distribution in decades shows that most patients were in their 70s, followed by those in their 60s, which demonstrates an increase in elderly cases. The patients who are older than 70 years are 44.4% of all cases, which is an increase of 37.6% compared with the previous survey in 2001. Patients over 80 have increased from 5.4% to 6.9% (Fig. 5).

Age Distribution according to Gender

Figure 6 shows the age distribution according to gender of all cases. Seventy-five point six percent of all cases are

male. Examination of gender distribution in decades shows that most patients were in their 60s in men, in contrast, in their 70s in women.

Surgical Outcome according to Age: Initial Elective Surgery

Figure 7 shows operative mortality for each period. The results for the past four years (from 1997 to 2000) of the patients are shown in the background, the results in 2001 are shown in the middle ground, and the results in 2002 are shown in the foreground. Operative mortality decreased year by year. Although the higher with increasing age the mortality, the mortality was 1.13% in their 70s and 1.99% in their 80s, indicating improvement of surgical results.

Surgical Outcome according to Age: All Cases

Surgical outcome of all cases according to age is shown

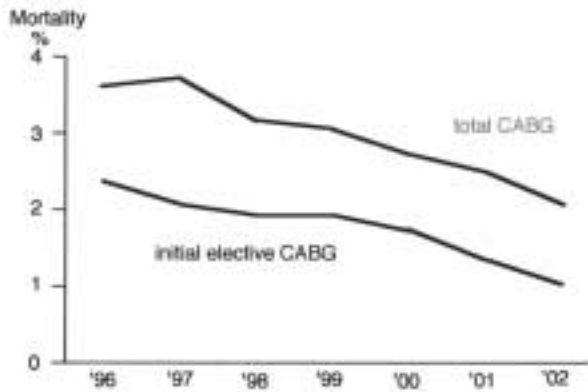


Fig. 9. Changes in mortality of CABG.

in Fig. 8. The results for each period are shown the same as in Fig. 7. Because the results for emergency cases are added to those of Fig. 7, the mortality patients younger than 40 was higher than those of Fig. 7. However, the operative mortality was improving year by year.

Changes in Operative Mortality

Changes in mortality since 1996 is shown in Fig. 9. The clinical results remarkably improved annually, operative mortality of CABG only cases decreased to 2.04% and that of initial elective patients decreased to 1.02% in 2002.

Off-pump Coronary Artery Bypass Grafting (OPCAB)

Figure 10 shows changes in the procedure without cardiopulmonary bypass, so called off-pump coronary artery bypass grafting (OPCAB). According to the surgical approach, those cases were divided into four procedures; left thoracotomy, minimally invasive direct coronary artery bypass (MIDCAB), median sternotomy and others. OPCAB has become more common since 1996. The most recent survey shows a further increase, with 5,628 patients undergoing this type of bypass, which is 41.8% of all CABG cases.

The number of patients undergoing off-pump bypass using median sternotomy has increased annually, indicating 95.9% of all OPCAB cases in 2002. On the other hand, CABG via a small left thoracotomy, or MIDCAB, has become less common since peaking in 1998.

Number of OPCAB Cases according to Facilities

OPCAB was performed in 234 facilities of all 262 insti-

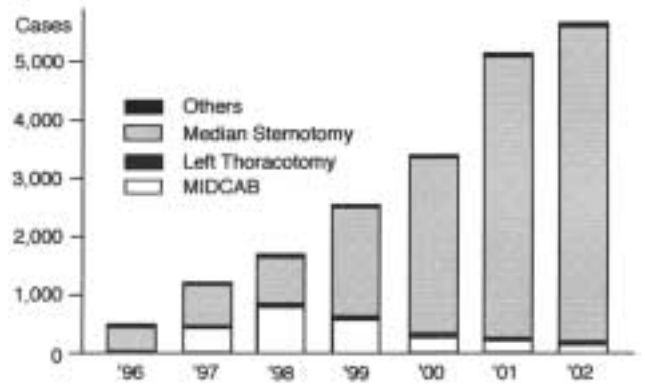


Fig. 10. Off-pump coronary artery bypass grafting (OPCAB).

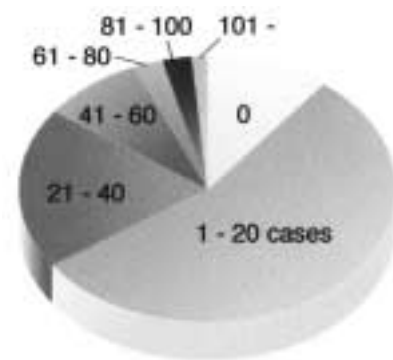


Fig. 11. Number of OPCAB cases in respective institutions.

tutions, which returned completed questionnaires. The number of CABG cases according to facilities are shown in Fig. 11. In more than half of the facilities, less than 20 cases of OPCAB were performed. The largest number of OPCAB procedures in one facility was 280 cases.

Surgical Outcome for OPCAB

Figure 12 shows changes in the surgical outcome of OPCAB. In this Figure, the mortality of all OPCAB cases and median sternotomy OPCAB are shown. Both of them remarkably decreased annually, indicating the lowest mortality, 1.23% for all OPCAB, in 2002.

Surgery for Left Ventricular Aneurysm

Surgical outcome for left ventricular aneurysm is shown in Fig. 13. The pie chart shows the outcome over the last year (2002), and the chain line shows changes in mortality over each five-year period, 2001 and 2002. Surgery for left ventricular aneurysms was performed on 220 pa-

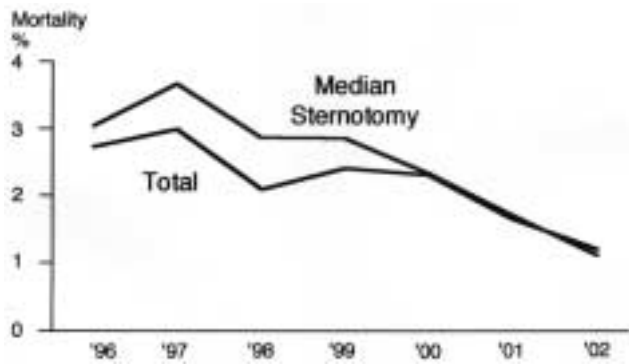


Fig. 12. Changes in mortality for OPCAB.

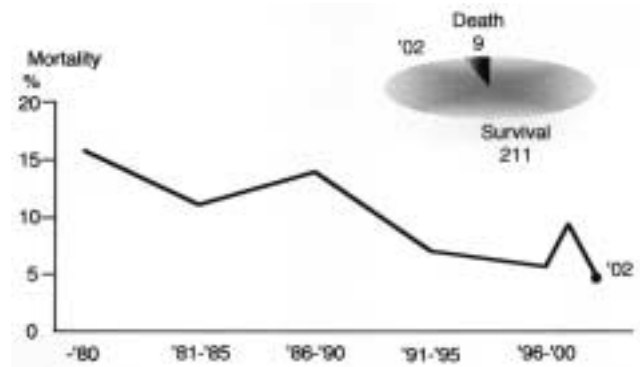


Fig. 13. Changes in mortality for left ventricular aneurysms.

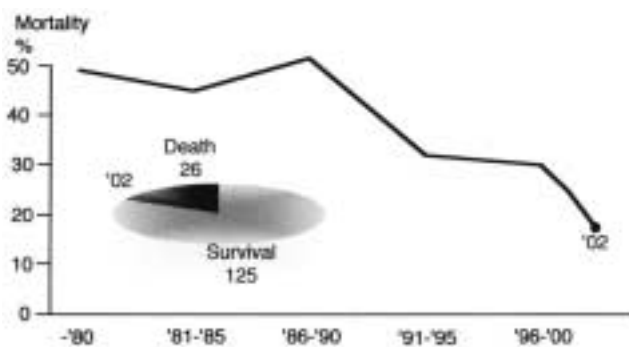


Fig. 14. Changes in mortality for ventricular septal perforation.

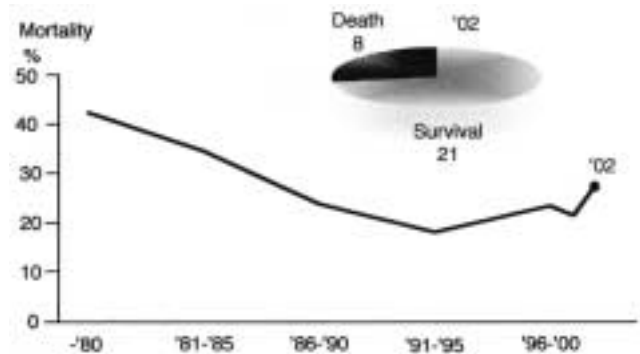


Fig. 15. Changes in mortality for left ventricular papillary muscle rupture.

tients in the last year. The operative mortality was 4.1%. The outcome of this type of surgery has always been better than for other myocardial infarction complications, but it has improved further.

Surgery for Ventricular Septal Perforation

Surgery for ventricular septal perforation (VSP) was performed on 151 patients in the last year, with an operative mortality of 17.2% which is the lowest. The result of this procedure remarkably improved especially in the recent two years (Fig. 14).

Surgery for Left Ventricular Papillary Muscle Rupture

Surgery for left ventricular papillary muscle rupture was performed on 29 patients in the last year. It is less common than other complications. Mortality has increased in the last decade, indicating a worsening mortality of 27.6% in 2002 (Fig. 15).

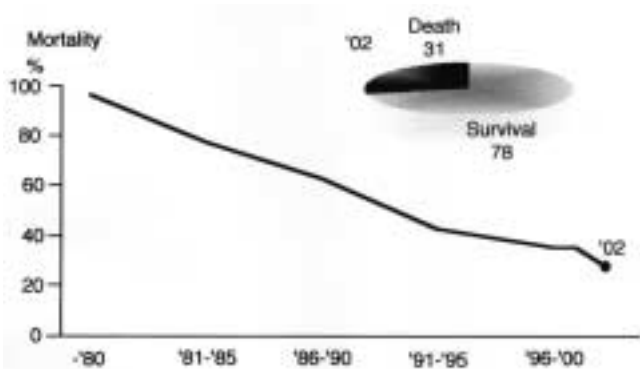


Fig. 16. Changes in mortality for cardiac rupture.

Surgery for Cardiac Rupture

Last year, 109 patients underwent surgery for cardiac rupture. Prior to 1981, most patients did not survive. Mortality has decreased each year since then and is currently 28.4%. However, this complication has the highest mortality (Fig. 16).

Conclusions

1. In conclusion, the operative mortality for patients who underwent coronary artery bypass surgery only was 2.04% in 2002. Mortality for initial elective surgery was 1.02%. These are the best results obtained since surveys were started.

2. The percentage of elderly patients undergoing coronary artery bypass surgery is rising annually. In 2002, 44.4% of patients were aged 70 years or older and 6.9% were aged 80 years or older. Mortality in elderly patients undergoing initial elective surgery is decreasing, with a mortality of 1.3% for patients aged 70 years or older and 2.0% for patients aged 80 years or older.

3. OPCAB has become more common since 1996. The most recent survey shows a further increase, with 5,628 patients undergoing this type of bypass in 2002, which is 41.8% of all CABG cases.

Acknowledgments

We would like to take this opportunity to thank the doctors at all of those 262 institutions for taking part in this survey. This report would not have been possible without the assis-

tance of many institutions and doctors. Unfortunately, however, fewer and fewer institutions are returning questionnaires. Future cooperation would be greatly appreciated, as the survey is an important means of determining the status of coronary artery surgery in Japan. Finally we also thank Ms. Eiko Yuzawa and Ms. Yukiko Sugiyama, the secretaries of our department, without whose invaluable assistance, this report could not have been completed.

References

1. Sezai Y, Kitamura S, Harada Y, et al. Results of coronary artery surgery in Japan. *Rinsho Kyobu Geka* 1989; **9**: 53–62.
2. Sezai Y, Hasegawa T, Kitamura S, et al. Surgical management of acute myocardial infarction in the 24 hours—the Japanese experience. In: D`Alessandro LC ed.; *Heart Surgery* 1991. Rome: Casa Editrice Scientifical Inermazionale, 1991; pp. 417–24.
3. Sezai Y. Coronary artery surgery status in Japan. In: Sazai Y ed.; *Advances in Coronary Artery Surgery*. Tokyo: Axcel Springer Japan, 1997; pp. 3–12.
4. Sezai Y, Tsukamoto S. Coronary artery surgery results 1996. *Ann Thorac Cardiovasc Surg* 1998; **4**: 103–6.
5. Sezai Y, Orime Y, Tsukamoto S. Coronary artery surgery results 2000. *Ann Thorac Cardiovasc Surg* 2002; **8**: 241–7.