

Present State of Therapeutic Strategies for Thoracic Surgical Diseases in Japan

JMAJ 52(2): 117–121, 2009

Koichi TABAYASHI,*¹ Shinichiro MIYOSHI,*² Harushi OHSUGI*³

I. Cardiovascular Surgery

Introduction

This article discusses the present state and characteristics of diagnoses and therapeutic strategies for cardiovascular diseases in Japan, focusing on 1) US-Japan comparison of the number and results of surgical operations, 2) the present state of low-invasive treatment for heart diseases, and 3) cerebral protection during aortic arch repair.

1) US-Japan comparison of the number and results of surgical operations for important heart and great vessel diseases

The surgical procedures covered by this comparative review was coronary artery bypass grafting (CABG) for ischemic heart disease, aortic valve replacement (AVR) for aortic stenosis or aortic regurgitation, mitral valve replacement (MVR) for mitral regurgitation or mitral stenosis, mitral valve plasty (MVP), and surgery for thoracic aortic aneurysm.

The number of CABG cases ranged from 150,000 to 160,000 in the U.S., as compared with 17,000 to 21,000 in Japan. The relative scarcity of surgical cases per population in Japan presumably reflects the distribution of cases between percutaneous coronary intervention (PCI) and surgery, the difference in dietary habits, and other factors. Operative mortality rates were similar: 2.1–2.6% in the U.S. and 2.2–2.7% in Japan. When the proportion of on-pump CABG (ONCAB) vs. off-pump CABG (OPCAB) and the corresponding operative mortality rates in 2006 were compared,

these were 79.1% vs. 20.9% and 2.0% vs. 1.8% in the U.S. and 38.5% vs. 61.5% and 3.4% vs. 2.0% in Japan, revealing a distinctive high rate of OPCAB in Japan.

The number of AVR cases showed notable increasing tendencies in both countries, probably reflecting population aging. Operative mortality rates were about 3% in both countries.

The number of MVR cases in the U.S. tended to decrease until 2004 and increased thereafter, returning in 2006 to the level in 2002. On the other hand, the number of MVR cases in Japan remained largely constant. Operative mortality rates were similar in both countries at about 5% and tended to be higher than those of AVR.

The number of MVP cases showed an increasing trend of plasty in both countries. In particular, the rate of increase has been remarkably high in the U.S. after 2004. Operative mortality rates were favorable, remaining below 2% and lower than those of valve replacement.

Surgery for thoracic aortic aneurysm, excluding stent graft placement, was performed in similar numbers of cases in both countries, indicating that the use of this operation was distinctively higher in Japan. In the comparison regarding the proportion of each operative site on thoracic aortic aneurysm and operative results, ascending aortic replacement comprised the largest proportion in the U.S., while ascending aortic repair and aortic arch replacement constituted similar percentages in Japan, indicating that aortic arch repair was performed more frequently in Japan as compared with the U.S. The mortality rates in ascending

*1 Professor, Department of Cardiovascular Surgery, Graduate School of Medicine, Tohoku University, Miyagi, Japan (ktaba@mail.tains.tohoku.ac.jp).

*2 Professor, Department of Cancer and Thoracic Surgery (Surgery II), Graduate School of Medicine, Okayama University, Okayama, Japan (smiyoshi@md.okayama-u.ac.jp).

*3 Associate Professor, Department of Gastroenterological Surgery, Graduate School of Medicine, Osaka City University, Osaka, Japan (m9940141@msic.med.osaka-cu.ac.jp).

aortic replacement and aortic arch repair did not differ between Japan and the U.S., while the results of thoracic descending aortic and thoraco-abdominal aortic repair were better in Japan.

2) Present state of low-invasive therapies for heart diseases

a. Off-pump coronary artery bypass grafting (OPCAB)

The proportion between OPCAB and ONCAB (on-pump coronary bypass grafting) differs greatly between Western countries and Japan, OPCAB comprising 20–30% in the former and 61.5% in the latter. The percentage of OPCAB in Japan showed an increasing trend from 46.2% to 55.2%, 60.3%, 60.6%, and 61.5% during the period from 2002 to 2006. Although the cause of this large difference in the percentage of OPCAB between Western countries and Japan has not been clarified, possible factors that may be related to this situation include the report of higher subsequent revascularization rate of OPCAB patients in the comparison of results after 3 years or more, the fact that OPCAB requires higher technical proficiency than ONCAB, and the reliability of complete revascularization.

The types of grafts used in CABG are divided broadly into arterial grafts, which include internal thoracic artery, radial artery, right gastroepiploic artery, and venous grafts (great saphenous vein). The use of arterial grafts has been increasing because of their better patency in the remote post-operative period. While some reports recommend the use of arterial grafts only, others consider that the use of arterial grafts in 2 branches is sufficient in the bypass grafting involving 3 or more branches. The remote postoperative patency rate of venous grafts from great saphenous vein differs between Japan and Western countries. While the 5- and 10-year patency rate is 83.4% and 73.6% in the former, it is 75% and 61% in the latter.

b. Percutaneous aortic valve replacement

This procedure was first attempted clinically by Cribier et al. in 2002. There are 3 methods of approach to the aortic valve, including the antegrade transseptal approach via the vein, the retrograde approach via the femoral artery, and the approach via the apex of heart. While the use of this procedure has been increasing in Western countries, postoperative complications occur in

approximately 20% of cases. This procedure has not been practiced clinically in Japan.

3) Cerebral protection during aortic arch replacement

Profound or deep hypothermic circulatory arrest (HCA), retrograde cerebral perfusion (RCP), and antegrade selective cerebral perfusion (SCP) are the 3 methods that have been used to date. Each of these has advantages and drawbacks. While HCA does not require complicated circuitry and provides good visibility of the field of operation, its drawbacks include the limitation in the duration of circulatory arrest and the need to achieve profound or deep hypothermia. RCP provides good visibility of the field of operation and the possibility of removing embolizing material from the cerebrovascular system, but it has drawbacks such as the need for profound or deep hypothermia, the limitation in the duration of RCP, and the potential for the development of cerebral edema. SCP does not require deep hypothermia, has longer safe and permissible limit of duration than HCA or RCP, and allows for preservation of autoregulation of the cerebral blood flow, but it requires complicated circuitry and poor visibility of field of operation. While HCA and RCP were the methods selected previously in Western countries, the high occurrence of cerebral complications, in particular transient cerebral impairment, led to the recent shift towards the use of SCP. On the other hand, SCP has been the principal method used in Japan. Although RCP was used actively for a period, the mainstream has returned to the use of SCP recently. Recent comparative evaluation of the 3 methods has established a consensus that SCP is the safest method for cerebral protection during aortic arch replacement, supported by substantial contribution of Japanese researchers and physicians.

Concluding remarks

This article reviews a US-Japan comparison of the number and results of surgical operations for cardiovascular diseases, the practice of low-invasive treatment for ischemic heart disease and aortic valve disease in a comparison between Western countries and Japan, and the recent practice of cerebral protection during aortic arch repair.

—Koichi TABAYASHI

II. The Respiratory System

Surgery for primary lung cancer in Japan

Since 1986, The Japanese Association for Thoracic Surgery has conducted annual surveys of institutions that perform thoracic surgery to reveal the number of procedures performed according to operative category, which are conducted by sending questionnaires to certified teaching hospitals. According to the annual registry report, the number of primary lung cancer patients who underwent surgery increased more than 4 times from 6,421 in 1986 to 26,531 in 2006,¹ with the latter amount accounting for 44.8% of the total number of general thoracic surgery procedures. Thus, primary lung cancer is one of the most important diseases facing general thoracic surgeons in Japan.

Since 1997, 30-day mortality and hospital mortality rates have been added to the items presented in the questionnaire. In 1997, those were 0.8% and 2.3%, respectively,² while they fell to 0.4% and 0.9%, respectively, in 2006.¹ According to a study conducted in the United States that analyzed 9,093 pulmonary resection procedures for primary lung cancer using the Society of Thoracic Surgeons database from 1999 to 2006, the 30-day mortality rate was 2.3%.³ Furthermore, a French report using data from a nationally representative thoracic surgery database obtained between 2002 and 2005 of 7,480 patients who underwent lung resection noted that 2.4% died during the same hospital admission.⁴ Thus, by comparing the

30-day mortality and hospital mortality rates with other western countries, lung cancer surgery seems to be safely performed in Japan.

The long-term prognosis of patients who underwent resection of lung cancer was studied by the Japanese Joint Committee of the Lung Cancer Registry using data from 13,010 patients who underwent lung cancer surgery at 320 certified teaching hospitals in 1999.⁵ The 5-year survival rates for those with non-small cell lung cancer according to pathologic stage were 83.9% for IA, 66.3% for IB, 61.0% for IIA, 47.4% for IIB, 32.8% for IIIA, 29.6% for IIIB, and 23.1% for IV. The results of this registry study represent findings based on the largest series ever published and are considered to be extremely good.

The Japanese Association for Chest Surgery was established in 1984 in recognition of the growth of the specialty of general thoracic surgery. That Association also independently created and developed a system for training, examination, and certification, which is now managed by a Joint Committee consisting of members of The Japanese Association for Chest Surgery and The Japanese Association for Thoracic Surgery. Most cases of lung cancer surgery are performed by a certified general thoracic surgeon or under their supervision. These early attempts to create a certification system for general thoracic surgeons may have led to world-leading results in Japan for lung cancer surgery.

— Shinichiro MIYOSHI

References

1. Ueda Y, Fujii Y, Udagawa H. Thoracic and cardiovascular surgery in Japan during 2006. Annual report by the Japanese Association for Thoracic Surgery. *Gen Thorac Cardiovasc Surg.* 2008;56:365–388.
2. Yasui H, Osada H, Ide H, et al. Thoracic and cardiovascular surgery in Japan during 1997. Annual report by the Japanese Association for Thoracic Surgery. *Jpn J Thorac Cardiovasc Surg.* 1999;47:237–251.
3. Boffa DJ, Allen MS, Grab JD, et al. Data from the society of thoracic surgeons general thoracic surgery database: The surgical management of primary lung tumors. *J Thorac Cardiovasc Surg.* 2008;135:247–254.
4. Falcoz PE, Conti M, Brouchet L, et al. The thoracic surgery scoring system (Thoracoscore): Risk model for in-hospital death in 15,183 patients requiring thoracic surgery. *J Thorac Cardiovasc Surg.* 2008;133:325–332.
5. Asamura H, Goya T, Koshiishi Y, et al. A Japanese lung cancer registry study: Prognosis of 13,010 resected lung cancers. *J Thorac Oncology.* 2008;3:46–52.

III. The Esophagus

The standard method in the surgical treatment for esophageal cancer in Japan involves dissection in the 3 regions of neck, chest, and abdomen, which was advocated in the mid-1980s. The 5-year survival rates published in 2002 were 70.2% for UICC-pSt 0, 64.5% for pSt I, 51.5% for pSt II A, 34.4% for pSt II B, 19.8% for pSt III, 13.7% for pSt IV A, and 5.5% for pSt IV B, and the 10-year survival rates were 54.3%, 44.7%, 38.9%, 23.0%, 19.4%. 9.0%, and 0%, respectively. Figure 1 shows the trends in treatment methods during the past 10 years based on a survey conducted by the Japanese Association for Thoracic Surgery (JATS), which in 2006 compiled answers from 516 insti-

tutions across Japan. In 2006, esophagectomy was performed in 6,445 cases. Squamous cell carcinoma represented 92% of these cases, and the percentage of adenoma remained low at 5% as a distinctive trait in Japan. Operative results have been improving year by year. The operative mortality rate was 1.2% and the in-hospital mortality rate was 3.1% in 2006. Compilation of the 21,020 cases of radical treatment for esophageal cancer conducted by JATS members from 2000 to 2004 revealed a significant negative correlation between the hospital volume and the in-hospital mortality rate, suggesting a need for centralization and integration of facilities. The Japan Esophageal Society (JES) started a system for esophagus specialist accreditation this year. On the other hand, video-assisted thoracoscopic sur-

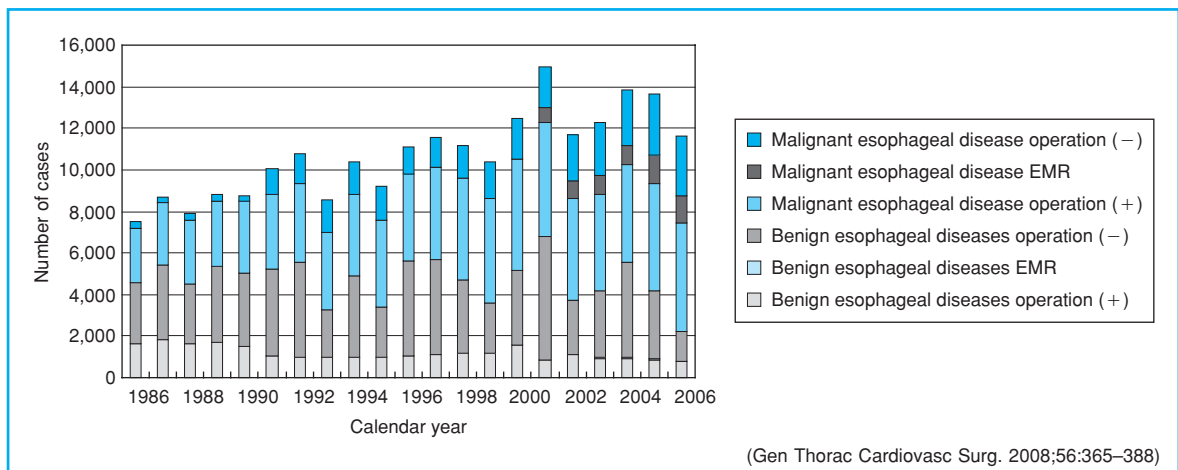


Fig. 1 Annual trend of in-patients with esophageal diseases

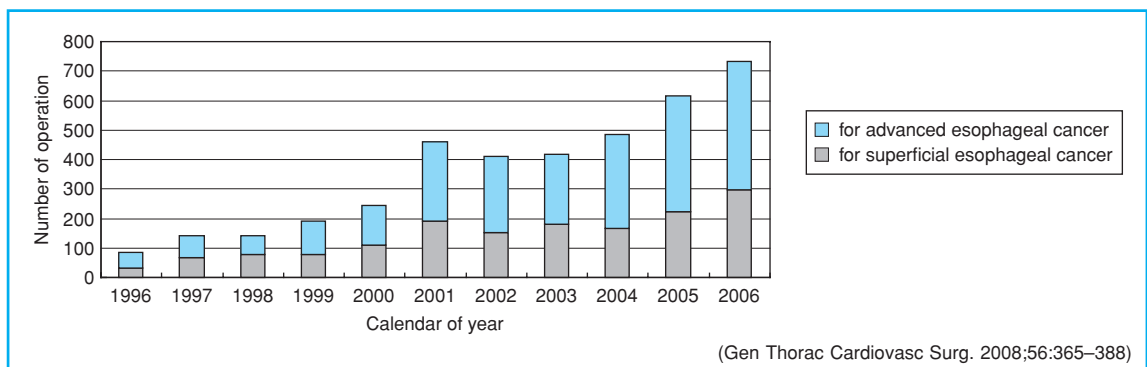


Fig. 2 Annual trend of video-assisted esophagectomy for esophageal malignancy

gery for esophageal cancer has been practiced since the mid-1990s, and the procedure has been spreading gradually in recent years (Fig. 2). However, there still are variations in the accuracy of procedures at different medical institutions. In response to this problem, the Japan Society for Endoscopic Surgery (JSES) has been conducting technical evaluation and accreditation of thoraco-

scopic surgical procedures using unedited video records since 2005 for the purpose of promoting standardization and widespread use of these procedures. JATS, JES, and JSES are providing training seminars, hands-on seminars, and animal labs aiming at the enrichment of esophageal surgery education.

—Harushi OHSUGI