Surgical Approach for Repair of Descending Thoracic Aortic Aneurysms and Postoperative Respiratory Function

Kiyohiro Oshima, Susumu Ishikawa, Yoshiro Hamada, Kazuhiro Sakata, Tetsuya Koyano, Motoi Kano, and Yasuo Morishita

Second Department of Surgery, Gunma University School of Medicine, 3-39-22 Showa-machi, Maebashi, Gunma 371-8511, Japan

Abstract Good exposure and the minimization of lung and thorax injuries are important objectives of surgery for descending thoracic aortic aneurysm (DTAA). In this study, three surgical approaches for DTAA were compared to assess postoperative respiratory function. The subjects were 21 patients with DTAA, three of whom had a thoracoabdominal aneurysm. The mean age was 61 years, and there were 12 men and 9 women. The causes of aneurysm were atherosclerosis in 16 patients, chronic dissection in 4, and traumatic pseudoaneurysm in 1. All the patients underwent femoro-femoral partial cardiopulmonary bypass. The DTAA was replaced with a prosthetic graft in 18 patients and repaired with a patch graft in 3. Three approaches were selected, namely, posterolateral thoracotomy (PL group, \( n = 12 \)), median sternotomy combined with anterolateral thoracotomy (M group, \( n = 5 \)), and spiral incision (S group, \( n = 4 \)). There were no significant differences in operation time, cardiopulmonary bypass time, intraoperative blood loss volume, or water balance. The duration of respiratory support and intensive care unit stay were significantly (\( P < 0.05 \)) longer in the M group than in the other two groups. The alveolar-arterial oxygen difference (AaDO\(_2\)) and respiratory index (RI) levels immediately after surgery were also significantly (\( P < 0.05 \)) higher in the M group than in the PL group. There were no significant differences in AaDO\(_2\) and RI levels 12 and 24 hours after surgery among the three groups. These results suggest that posterolateral thoracotomy is a desirable surgical approach for DTAA repair in view of the fact that it has the least effect on postoperative respiratory function.

Key words Surgical approach · Thoracic aortic aneurysm · Postoperative respiratory function

Introduction

Respiratory dysfunction is a well-documented complication following surgical repair of a descending thoracic aortic aneurysm (DTAA). Therefore, it is important to minimize injury to the lung and thorax as well as to obtain good exposure during DTAA repair. This study was conducted to compare the postoperative respiratory function after three surgical approaches to repair DTAA.

Patients and Methods

Between 1991 and 1999, we performed DTAA repair using a femorofemoral partial cardiopulmonary bypass on 21 patients, 3 of whom had thoracoabdominal aneurysms. Patients with aortic arch aneurysm or ruptured DTAA were excluded from this study. The patients ranged in age from 24 to 73 years, with a mean age of 61 years, of whom 12 were men and 9 women. The causes of the aneurysm were atherosclerosis in 16 patients (76%), chronic dissection in 4 (19%), and trauma in 1 (5%). The DTAA was replaced with prosthetic grafts in 18 patients and repaired with a patch graft in 3.

Three approaches were selected for DTAA repair, namely, posterolateral thoracotomy (PL group, \( n = 12 \)), median sternotomy combined with anterolateral thoracotomy (M group, \( n = 5 \)), and spiral incision (S group, \( n = 4 \)). We compared the postoperative pulmonary function among the three groups to determine the optimal approach for DTAA repair in this regard. The duration of respiratory support, and perioperative alveolar-arterial oxygen difference (AaDO\(_2\)) and respiratory in-
dex ( = AaDO₂/PaO₂, RI) were used as parameters to evaluate pulmonary function.

**Statistical Analysis**

Data are presented as mean ± standard error of the mean. One-way analysis of variance with pairwise comparison by the Fisher method was used after the Bartlett test, and differences were considered to be significant at a P value of less than 0.05.

**Results**

There were no significant differences in the mean age of the three groups, being 56 ± 4 years in the PL group, 65 ± 2 years in the M group, and 63 ± 3 years in the S group. No operative or 30-day mortality occurred, and there was no incidence of phrenic nerve injury and/or an elevated diaphragm. All of the patients were weaned off the respirator after the operation.

There were no significant differences among the three groups in the operation time or cardiopulmonary bypass time. The duration of postoperative respiratory support in the M group was 211 ± 62 h, which was significantly (P < 0.05) longer than 66 ± 17 h in the PL group and 50 ± 6 h in the S group. The time required in the intensive care unit was 13 ± 4 days for the M group, which was also significantly (P < 0.05) longer than 5 ± 1 days for the PL group and 6 ± 1 days for the S group (Table 1).

There were no significant differences in preoperative PaO₂, PaCO₂, AaDO₂, and RI levels among the three groups. The AaDO₂ level immediately after surgery in the M group was 183 ± 30 mmHg, which was significantly (P < 0.05) higher than 108 ± 15 mmHg in the PL group. The AaDO₂ level 12 h after surgery in the M group was 168 ± 38 mmHg, which was slightly higher than 139 ± 15 mmHg in the PL group and 133 ± 19 mmHg in the S group. However, there was no significant difference in AaDO₂ levels 12 and 24 h after surgery among the three groups (Fig. 1).

The RI level immediately after surgery in the M group was 1.9 ± 0.8, which was significantly (P < 0.05) higher than 0.6 ± 0.1 in the PL group. The RI level 12 h after surgery in the M group was 1.9 ± 0.7, which was slightly higher than 1.1 ± 0.1 in the PL group and 0.9 ± 0.2 in the S group. However, there was no significant difference in RI levels 12 and 24 h after surgery among the three groups (Fig. 2).

**Discussion**

It is important to minimize intraoperative bleeding, as well as prevent spiral cord and organic ischemia and