Editorial

Thoracic Aortic Aneurysm Repair: Improvement in Operative Results and its Background

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Western influences on diet and the extended life span of Japanese have resulted in an increased incidence of hyperlipidemia and atherosclerotic disease, such as coronary artery occlusion and aortic aneurysm. The recent increase in the incidence of aortic aneurysm, both true and dissecting, is of great concern. Ten to fifteen years ago, the results of thoracic aortic aneurysm repair were usually poor, but, recently, there has been a significant improvement in outcome. This improvement is believed to be a result of the cooperation between cardiac surgeons and vascular surgeons, and advancements in prosthetic aortic materials, surgical instruments, supportive care, and operative methods. Table 1 shows particularly notable reports of the evolution of cardiovascular and vascular operations on the aorta. The first important milestone in aortic aneurysm repair was the technique of suturing and handling arteries, which was studied by Carrel shortly after the turn of the 19th century.[1] Gross[6] presented the second milestone, which was the use of aortic homografts to replace deficiencies following excision of the aorta. The third important contribution was made by Edwards and Tapp,[9] who introduced a permanent circular crimp in the construction of a tubular graft. This was a significant improvement in that it prevents kinking in cases where a prosthesis must bend, as in the aortic arch. Cardiac surgeons have contributed to the improvement in thoracic aortic aneurysm repair in the areas of myocardial protection, cardiopulmonary bypass, and preservation of organs, such as the brain and kidney, in addition to improvements in prosthetic materials, supportive care, and operative methods. Ringed, impregnated, and stented grafts have been recent topics of study in the advancement of prosthetic aortic materials.[13,15-17] In particular, development of the impregnated graft has contributed to improved operative results. Protection of the brain and spinal cord is a major concern because cerebrovascular and spinal cord complications are the main cause of death following thoracic aortic aneurysm repair. High ischemic sensitivity and no reliable method of evaluating brain and spinal cord function during surgery cause of no definite prevention of such complication. Recently, we have used selective cerebral perfusion or retrograde cerebral perfusion for brain protection. Both are studied intensively in Japan, and the recent incidence of cerebrovascular accidents is 3-10%, which are acceptable results. There have also been experimental and clinical studies of spinal cord protection, but the results have been unclear, particularly regarding complete blood distribution of the spinal cord and difficulty in identifying the main blood supply.

Recent operative mortality in low-risk cases is less than 10%, but it is still high in high-risk cases (elderly patients, those with dysfunction of another organ, and emergency cases with shock). We must work hard to improve operative results for such cases, with consideration for quality of life and expense.

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Table 1. Development of the aortic surgery

1. Insertion of sewing needle in an aneurysm to try to induce thrombosis (1831)[2]
2. Development of the techniques of suture and handling of arteries (1902)[1]
3. Ligation of aneurysm arteriorrhaphy for aneurysm (1923)[3,4]
4. First excision of a post coarctation aneurysm and end-to-end repair (1947)[5]
5. First clinical use of an aortic homograft to replace deficiencies following excision of the aorta (1949)[6]
6. First repair of an aortic aneurysm with a homograft (1950)[7]
7. First repair of an infrarenal abdominal aneurysm with a homograft in Japan (1952)[8]
8. Replacement of an abdominal aortic aneurysm with plastic filer, Vinyon-N (1952)[1]
9. Development of Dacron and Teflon prostheses with a crimp (1955)[9]
10. First clinical use of flexible knitted Dacron grafts for aortic aneurysm repairs (1958)[10]
11. Repair of the ascending aorta for acute aortic dissection (1963)[11]
12. Complete replacement of the ascending aorta with a composite valve graft (1968)[12]
13. Development of the ringed graft (1978)[13]
14. Replacement of the aortic arch and leaving a graft lying free in the descending aorta for a subsequent descending aortic repair, the so-called "elephant trunk" technique (1983)[14]
15. Development of impregnated Dacron prostheses (1984)[15]
16. First clinical use of a stented graft for repair of an infrarenal abdominal aortic aneurysm (1991)[16]
17. First clinical use of a stented graft for thoracic aortic aneurysm repair (1994)[17]

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