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Thoracic Aortic Aneurysm and Dissection Increasing Prevalence and Improved Outcomes Reported in a Nationwide Population-Based Study of More Than 14 000 Cases From 1987 to 2002

Christian Olsson, MD; Stefan Thelin, MD, PhD; Elisabeth Ståhle, MD, PhD;
Anders Ekblom, MD, PhD; Fredrik Granath, PhD

Background—Current knowledge of prevalence, incidence, and survival in thoracic aortic diseases (aneurysm and dissection) is based on small studies from a dated era of treatment and diagnostic procedures. The objective of the present study was to reappraise epidemiology and long-term outcomes in subjects with thoracic aortic disease in a large contemporary population.

Methods and Results—All subjects with thoracic aortic aneurysm or dissection identified in Swedish national healthcare registers from 1987 to 2002 were included in the present study. Of 14 229 individuals with thoracic aortic disease, 11 039 (78%) were diagnosed before death. Incidence of thoracic aortic disease rose by 52% in men and by 28% in women to reach 16.3 per 100 000 per year and 9.1 per 100 000 per year, respectively. Operations increased 7-fold in men and 15-fold in women over time. Of the 2455 patients who underwent operation, 389 (16%) died within 30 days, with older age and thoracic aortic rupture as risk factors. In Cox analysis, increasing age was the only variable associated with long-term mortality. Both short- and long-term mortality improved over time. In patients who underwent operation, actuarial survival (95% CI) at 1, 5, and 10 years was 92% (91% to 93%), 77% (75% to 80%), and 57% (53% to 61%), respectively. The cumulative incidence of thoracic aortic reoperations was 7.8% at 10 years.

Conclusions—The prevalence and incidence of thoracic aortic disease was higher than previously reported and increasing. The annual number of operations increased substantially. Surgical (30-day) and long-term survival improved significantly over time to form a growing cohort of patients needing counseling, management decisions, operations, and extended postoperative surveillance. (*Circulation*. 2006;114:2611-2618.)

Key Words: aneurysm ■ aorta ■ dissection ■ epidemiology ■ surgery ■ survival

Aneurysm and dissection are the principal thoracic aortic diseases (TADs), and they have principles and techniques of surgical treatment in common. Management remains a challenge in elective as well as emergency cases. The decision when and if to operate, based on the balance of surgical risk and hazard of aortic rupture, may be difficult in elective cases. With thoracic aortic rupture, on the other hand, mortality is exceedingly high, ie, 94% to 100%.^{1,2} When rupture is imminent, as in acute proximal aortic dissection, outcome of surgical treatment in terms of operative mortality and morbidity has not improved substantially in the past decades despite the progress of medical and surgical treatment³⁻⁵ and was recently reported by the International Registry of Aortic Dissection to be 25%.⁵

The prevalence and incidence of TAD, outcome of surgical treatment, and long-term outcome irrespective of initial management all affect the burden imposed on medical healthcare systems by patients with TAD. Current population-level knowledge of incidence and outcomes is paramount to

Clinical Perspective p 2618

improve resource allocation and to guide postoperative surveillance and medical management. Today, however, knowledge is largely based on noncontemporaneous studies limited in size, spanning 3 decades, or dating from an era before the widespread use of computed tomography and echocardiography as reliable diagnostic methods for case ascertainment.^{1,6-12} The purpose of the present study was to investigate the prevalence, incidence, and mortality of TAD managed with or without surgery in a large, nationwide, contemporary population. Primary outcome measures were death within 30 days from diagnosis or operation, long-term death, and reoperation.

Methods

National Registers

By assignment of a unique 12-digit personal identification number derived from date of birth and a 4-digit control number, every

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From the Department of Cardiothoracic Surgery (C.O., S.T., E.S.), Uppsala University Hospital, Uppsala, and the Department of Internal Medicine (A.E., F.G.), Clinical Epidemiology Unit, Karolinska Institutet, Stockholm, Sweden.

Correspondence to Christian Olsson, MD, Thoraxkliniken, Akademiska sjukhuset, SE-75185, Uppsala, Sweden. E-mail christian.olsson@surgsci.uu.se
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individual residing in Sweden is readily identified in several nationwide administrative and medical registers maintained by the Swedish Board of Health and Welfare. The national Hospital Discharge Register includes administrative and medical information from all hospitalizations, including patient name and identification number, date of admission and discharge, as well as diagnostic and procedural codes according to the *International Classification of Diseases (ICD)* and the Nordic Classification of Surgical Procedures, respectively. The Cause of Death Register includes ICD code-based information on every deceased individual and is promptly and continuously updated. By Swedish law, individuals who died unexpectedly outside hospital care shall undergo forensic autopsy, and results are reported to the Cause of Death Register. Nationwide population census and vital statistics, categorized by age groups and sex, are reported annually by the National Bureau of Statistics.

Patients, Data Collection, and Definitions

All individuals diagnosed with TAD in Sweden (population \approx 8.7 million) during a 16-year period (1987–2002) were identified by retrieving data from the Hospital Discharge Register. The identification was based on ICD, 9th revision (ICD-9), diagnostic codes (main code 441) through 1996, and ICD, 10th revision (ICD-10), codes (main code I71) from 1997, with simultaneous revisions of the Nordic Classification of Surgical Procedures codes. TADs are separated by unique codes for aneurysm, dissection, and rupture in the ICD system, but acute dissection is not separated from chronic. Individuals succumbing to TAD without prior clinical diagnosis were identified in the Cause of Death Register using identical criteria. Patients undergoing operations on the thoracic aorta were identified by the combination of ICD diagnostic codes and Nordic Classification of Surgical Procedures procedural codes in the Hospital Discharge Register. After identification in the Hospital Discharge Register or Cause of Death Register, subject data were made anonymous before data analysis. Imaging studies, surgical notes, and autopsy reports were not available for review. The diagnostic coding was at the discretion of the treating physician, based on general and unchanged definitions: aneurysm was defined as dilatation of the aorta including all wall layers, with a diameter exceeding 5 cm or 50% increase; aortic dissection was defined as separation of the aortic wall layers, with resulting true and false lumens, or intramural hematoma; thoracic aortic rupture was defined as contained or free extravasation of blood from the aorta to tissues or cavities. Reoperation was defined as a new operation on any part of the thoracic aorta at a subsequent hospitalization at least 30 days after the primary operation in 30-day surgical survivors.

Statistical Methods

In calculations of incidence, the age- and sex-adjusted Swedish population as derived from the annual census served as the denominator. In calculations of relative risk (RR) for TAD, a Poisson distribution of events was assumed. Accordingly, Poisson regression methods were used to evaluate associated variables and control for overdispersion. Standardized mortality ratio (SMR), the ratio of observed to expected number of deaths, served as a measure of relative survival. The number of expected deaths in the observed population was calculated by multiplying the numbers of person-years at risk according to each 5-year age group, sex, and calendar year, by the corresponding age, sex, and year-specific mortality rates in the general population. The 95% CIs of the SMR were calculated under the assumption that the observed number of deaths followed a Poisson distribution. Multivariable logistic regression models were used to evaluate factors associated with 30-day mortality, and resultant odds ratios are presented with 95% CIs. Cox proportional hazards analysis was used to identify variables associated with long-term outcomes. Resulting hazard ratios are presented with 95% CI. Trend tests for time periods were performed by numerically scoring the periods 1 to 4 and include the periods as a continuous variable in the models. The nonfatal event of reoperation, less well suited for analysis by actuarial methods, was analyzed by the cumulative incidence. The same variables as for survival were analyzed by Cox proportional hazards to establish variables inde-

TABLE 1. Characteristics of Individuals With Thoracic Aortic Disease (Dissection or Aneurysm) in Sweden, 1987–2002

Variable	n (%)
Male/female	8864 (62)/5365 (38)
Mean age, y (SD)	70 (12)
Aortic dissection	4425 (40)
Operated	823 (19)
Nonruptured aortic aneurysm	4379 (40)
Operated	1326 (30)
Thoracic aortic rupture	2235 (20)
Operated	297 (13)

pendently associated with risk of reoperation. All analyses were performed using the Statistical Analysis System (SAS) package, version 9.1 (SAS Institute Inc, Cary, NC).

The study was approved by institutional board review and by the regional ethics committee. The authors had full access to the data and take responsibility for the integrity of the data. All authors have read and agreed to the manuscript as written.

Results

Incidence of Thoracic Aortic Aneurysm and Dissection

Study subjects are characterized in Table 1. Overall, 14 229 individuals with a diagnosis of TAD were identified. Of this group, 3190 individuals (22%) did not reach a hospital alive; diagnosis was made at autopsy. These individuals were included in calculation of incidence and excluded from further analysis. From 1987 through 2002, the incidence increased significantly in both sexes. As illustrated in Figure 1A, the increase was more pronounced in men, from 10.7 per 100 000 per year in 1987 to 16.3 per 100 000 per year in 2002 (52% increase) compared with women, 7.1 per 100 000 per year in 1987 and 9.1 per 100 000 per year in 2002 (28% increase). The median age at diagnosis decreased from 73 years in the 1987–1990 period to 71 years in the 1999–2002 period ($P<0.0001$).

In Poisson regression analysis of incidence, the RR of thoracic aortic aneurysm or dissection was strongly related to age. Assigning RR 1 to indicate for ages \leq 29 years, the RR (95% CI) in individuals aged 30 to 39 years was 3.9 (3.1 to 4.8); 40 to 49 years 9.0 (7.5 to 10.8); 50 to 59 years, 26.4 (22.3 to 31.3); 60 to 69 years, 65.2 (55.3 to 76.8) and \geq 70 years, 136.8 (116.4 to 160.8). For men, RR was 2.3 (2.2 to 2.3) compared with women.

Operations for Thoracic Aortic Aneurysm and Dissection

A total of 2455 operations on the thoracic aorta were performed. In 1344 cases (55%), operation was performed at the primary hospitalization upon diagnosis. In another 564 cases (23%), operation was performed within 1 month of diagnosis. In all cases, 2290 (90%) subjects were operated on within 1 year of diagnosis. The annual incidence of operations on the thoracic aorta increased slowly in men from 0.8 per 100 000 per year in 1987 to 1.9 per 100 000 per year in 1996 and thereafter increased 3-fold over a 5-year period to 5.6 per 100 000 per year in 2002, for an overall 7-fold

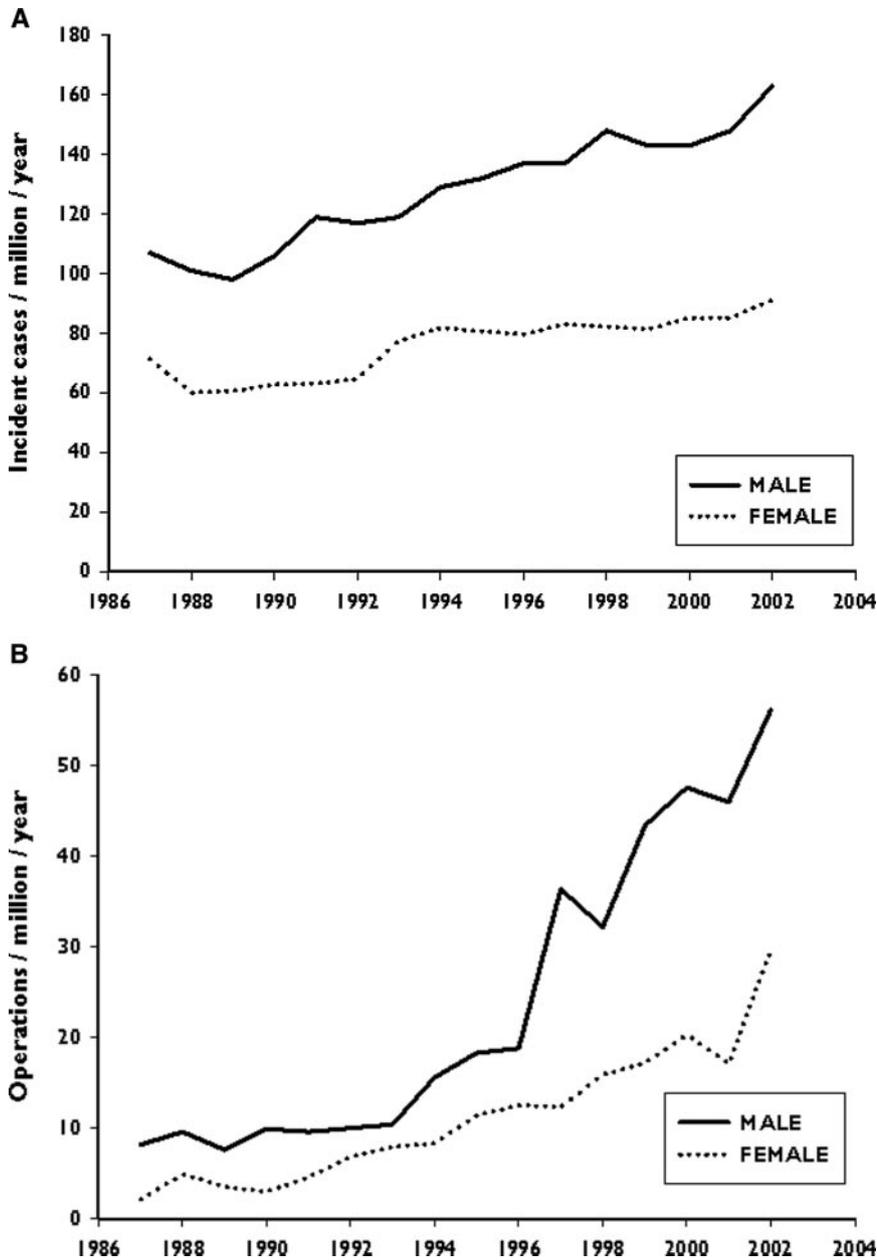


Figure 1. A, Incidence of thoracic aortic aneurysms and dissection in the Swedish population (men and women), 1987–2002 (cases per million). B, Operations for thoracic aortic aneurysms and dissection in the Swedish population (men and women), 1987–2002 (operations per million).

increase (Figure 1B). In women, slower progress was noted, but overall the operative incidence increased 15-fold from 0.2 per 100 000 per year in 1987 to reach 3.0 per 100 000 per year in 2002. The median age at operation increased from 61 years in the 1987–1990 period to 63 years in the 1999–2002 period ($P=0.0007$).

The likelihood of undergoing operation was more than double in men than in women: RR 2.4 (95% CI, 2.2 to 2.6). Overall, the RR rose sequentially over the years included in the present study to reach a high of 8.1 (95% CI, 5.9 to 11.1) for 2002 ($RR_{1987}=1$). Unlike the incidence, RR of operation did not increase linearly with increasing age but peaked in the 60 to 69 years age group: 46.0 (95% CI, 35.8 to 59.0).

Short-Term Mortality

For subjects who reached a hospital alive, the unadjusted short-term (30-day) mortality was 3698 of 11 039 (34%).

Overall 30-day mortality was higher for thoracic aortic rupture and dissections than for aneurysms (Table 2). Compared with younger age groups, 30-day mortality was increased in subjects aged ≥ 60 years. Compared with the 1987–1994 period, short-term mortality decreased for all subjects and operated subjects alike from 1995 on (trend test $P<0.001$ in both cases). In the 2455 subjects who underwent a surgical procedure, 30-day surgical mortality was 22% for aortic dissections, 7.6% for nonruptured thoracic aortic aneurysms, and 35% for thoracic aortic rupture.

Long-Term Mortality

Among operated subjects, 2066 subjects (84%) survived >30 days after operation (Table 3). During follow-up, 439 subjects died, which gives an actual survival of 66% (1627 of 2455) after operation. Aortic events were the leading cause of long-term death (39%), followed by other cardiovascular

TABLE 2. Variables Associated With 30-Day Mortality in All Subjects Alive at Presentation and Subjects Operated for Thoracic Aortic Aneurysm or Dissection

Variable	All (N=11 039)		Operated (N=2455)	
	30-Day Mortality (%)	Odds Ratio (95% CI)	30-Day Mortality (%)	Odds Ratio (95% CI)
Male	33	1	17	1
Female	35	1.08 (0.98 to 1.19)	14	0.75 (0.58 to 0.97)
Age				
29 years	13	1	4.5	1
30 to 39 years	16	1.29 (0.67 to 2.48)	8.5	1.78 (0.45 to 7.0)
40 to 49 years	19	1.38 (0.78 to 2.45)	8.1	1.42 (0.40 to 5.13)
50 to 59 years	21	1.54 (0.90 to 2.65)	11	2.39 (0.71 to 8.08)
60 to 69 years	27	2.17 (1.28 to 3.69)	18	4.33 (1.30 to 14.4)
≥70 years	41	4.11 (2.44 to 6.94)	21	5.64 (1.69 to 18.8)
Aortic dissection	37	1	22	1
Nonruptured aortic aneurysm	10	0.19 (0.17 to 0.21)	7.6	0.27 (0.21 to 0.35)
Thoracic aortic rupture	71	3.84 (3.43 to 4.30)	35	1.71 (1.26 to 2.31)
1987 to 1990	42	1	25	1
1991 to 1994	39	0.97 (0.85 to 1.11)	20	0.66 (0.42 to 1.04)
1995 to 1998	31	0.71 (0.62 to 0.82)	16	0.53 (0.36 to 0.80)
1999 to 2002	26	0.63 (0.55 to 0.73)	13	0.47 (0.32 to 0.68)
Total	34	...	16	...

Odds ratio with 95% CI in multivariable logistic regression analysis.

events (31%), malignancy (9%), and other (21%). For long-term survivors, initial diagnosis did not influence long-term survival appreciably (Figure 2, Table 4). In Cox analysis, only age ≥60 years was independently associated with long-term mortality, whereas later year of operation decreased the hazard of death, *P* for trend=0.014 (Table 3).

TABLE 3. Variables Associated With Long-Term Mortality in 2066 Subjects Operated for Thoracic Aortic Disease (Dissection or Aneurysm) Surviving >30 Days

Variable	Hazard Ratio (95% CI)
Female	1
Male	1.12 (0.92 to 1.37)
Age	
29 years	1
30 to 39 years	1.33 (0.39 to 4.56)
40 to 49 years	2.15 (0.75 to 6.18)
50 to 59 years	2.63 (0.95 to 7.26)
60 to 69 years	5.75 (2.12 to 15.5)
≥70 years	8.59 (3.17 to 23)
Aortic dissection	1
Nonruptured aortic aneurysm	1.03 (0.84 to 1.27)
Thoracic aortic rupture	1.02 (0.73 to 1.42)
Operation year	
1987 to 1990	1
1991 to 1994	0.98 (0.72 to 1.32)
1995 to 1998	0.83 (0.61 to 1.13)
1999 to 2002	0.67 (0.47 to 0.95)

Hazard ratios with 95% CI from Cox proportional hazards analysis.

The SMR, which expresses the overmortality of TAD, was 3.3 (95% CI, 3.2 to 3.4) for all patients. For operated subjects, SMR was significantly lower: 2.9 (95% CI, 2.6 to 3.2). SMR in operated subjects was higher for the younger patient groups, and for women (3.5 [95% CI, 3.0 to 4.0] versus 2.6 [95% CI, 2.2 to 2.9] for men), but not significantly affected by diagnosis: dissection, 2.8 (95% CI, 2.4 to 3.3); nonruptured aneurysm 3.0 (95% CI, 2.6 to 3.3); thoracic aortic rupture 2.7 (95% CI, 2.0 to 3.6).

Reoperations

Eighty-seven individuals (mean age 58±14 years, 56% men) underwent a reoperation on the thoracic aorta, followed by a second reoperation in 10 patients, and a third in 1 individual, for a total of 98 reoperations. The cumulative incidence of reoperations reached 5% at 5 years and 7.8% at 10 years, as illustrated in Figure 3A. The incidence of reoperation was similar regardless of initial diagnosis (Figure 3B). Overall, 16 reoperations (18%) were performed on the same segment of the aorta as the primary operation, whereas 31 reoperations (36%) were performed on a different segment. The segment operated on was unknown in 26 of the primary operations and 18 of the reoperations. Surgical (30-day) mortality at first reoperation was 13 of 87 (15%). In Cox analysis, no variables were independently associated with risk of subsequent reoperation.

Discussion

The present, large, contemporary, nationwide, population-based study of the prevalence, incidence, and mortality of TAD (aneurysms and dissection) was undertaken to establish the incidence of TAD and the secular trends for incidence,

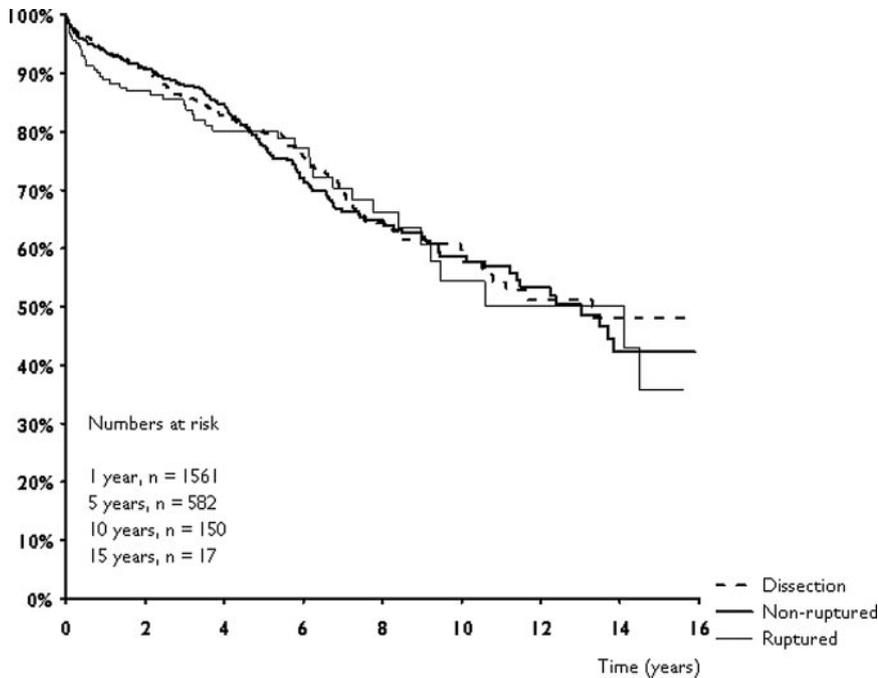


Figure 2. Actuarial (Kaplan-Meier) survival in subjects surviving >30 days after operation for aortic dissection, nonruptured thoracic aortic aneurysm, and thoracic aortic rupture.

operations, and results, primarily in patients who underwent surgery. The present study yielded several interesting findings. The incidence of TAD has been steadily increasing since 1987, reaching 16.3 per 100 000 per year for men and 9.1 per 100 000 per year in women in 2002. The design of the present study did not allow conclusions regarding the true incidence of TAD. The increase was probably largely due to improved diagnostics and case ascertainment.¹⁰ The present findings represent a conservative estimate of the trend for TAD. Irrespective of underlying mechanism, the prevalence is increasing, and healthcare providers will face increased TAD case load and will need strategies for conservative as well as surgical management.

Operations on the thoracic aorta increased even more dramatically but in an opposite distribution; 7-fold in men and almost 15-fold in women in the period from 1987–2002. The increasing number of operations performed annually probably reflected a more active attitude toward surgery as well as eventual surgical treatment in follow-up cases with nonruptured TAD. However, only 10% of surgical candidates in this investigation had operation postponed beyond 1 year from diagnosis.

The crude 30-day mortality was substantially lower in operated compared with nonoperated patients, irrespective

of age, sex, and diagnosis. Apart from a lower 30-day mortality in 1987, which is assumed to result from inferior case ascertainment and conservative selection of surgical candidates, 30-day mortality decreased continuously with time. Surgical 30-day mortality decreased by more than half (from 25% to 13%) during the study period. Long-term survival after operation also improved with more recent year of operation, adding to the growing cohort of postoperative surveillance cases. Interestingly, there were no differences in long-term survival for patients with acute TAD (dissection, ruptured aneurysm) compared with chronic TAD. If the operation was successful, it neutralized the effect of diagnosis on prognosis (Figure 2).

In the seminal Olmsted County study by Bickerstaff et al,¹ a TAD incidence of 5.3 of 100 000/year is reported. For patients with dissection, long-term survival is 7.0% compared with 79% in the present study, and for patients with nonruptured aneurysms, long-term survival is 19.2% compared with 76%. The Olmsted County study was largely undertaken in an early treatment era and before computed tomography and transthoracic echocardiography; the findings are obsolete and their use in comparisons with, for example, contemporary surgical results should be discouraged.¹³ Clouse et al⁶ find an incidence of thoracic

TABLE 4. One- to 15-Year Actuarial Survival in Subjects Surviving >30 Days From Operation for Thoracic Aortic Disease (Aneurysm or Dissection)

Years	Survival (95% CI)			
	All Operated Subjects	Aortic Dissection	Nonruptured Aneurysm	Ruptured Aneurysm
1	92 (91 to 93)	93 (91 to 95)	92 (91 to 94)	88 (82 to 92)
5	77 (75 to 80)	79 (75 to 83)	76 (72 to 79)	78 (70 to 84)
10	57 (53 to 61)	59 (52 to 65)	56 (50 to 62)	50 (34 to 63)
15	43 (29 to 51)	48 (37 to 57)	41 (32 to 50)	35 (17 to 54)

Percentages with 95% CI ($\chi^2=1.87$, $df=2$, $P=0.39$ for log-rank test).

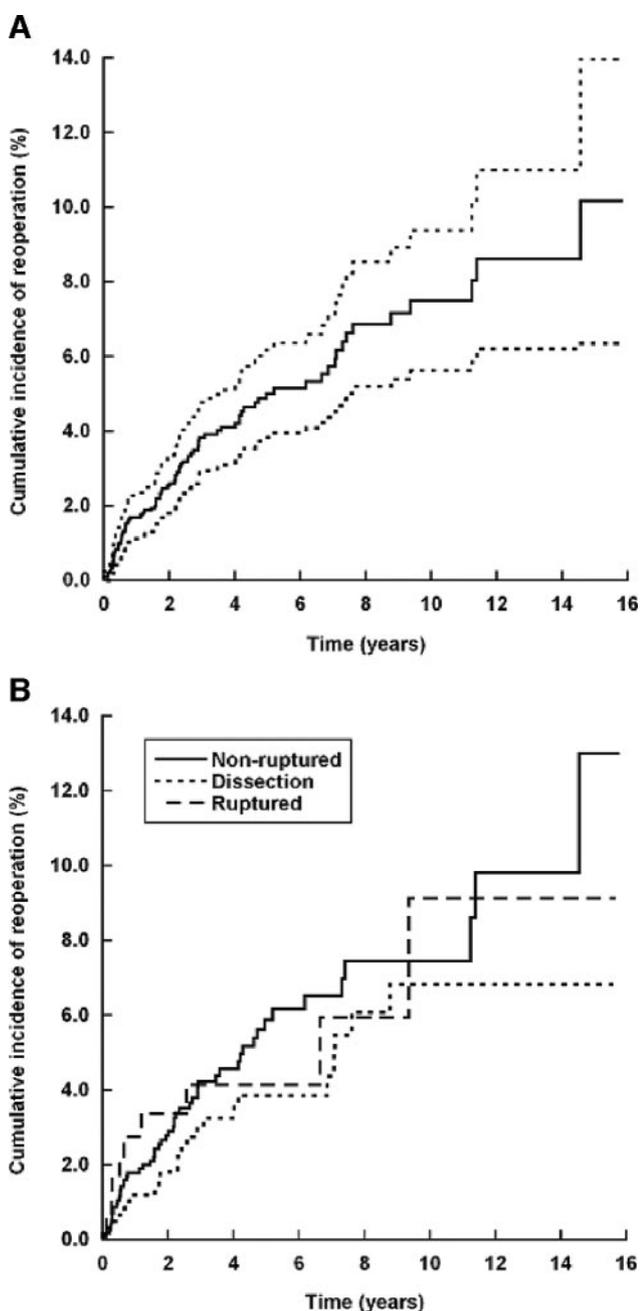


Figure 3. A, Cumulative incidence of reoperation after operation for TAD. Dotted lines represent 95% CI. B, Cumulative incidence of reoperation after operation for TAD, aneurysm, or thoracic aortic rupture. $P=ns$ (log-rank test).

aortic aneurysms of 10.4 of 100 000 per year in a study of 133 patients with a 5-year survival of only 56%. The same group finds an incidence of 2.2 to 4.9 of 100 000 per year of aortic dissection and ruptured thoracic aneurysms in a recent article that includes 67 patients from the same population during a 15-year period ending in 1994.⁷ The present findings were judged more reliable and useful because of the much larger and contemporary source population. Yu et al⁹ examined 5654 cases of aortic dissection in Taiwan and found a 4.3 of 100 000 per year incidence. Operation was undertaken in 20%, but mortality

at 1 and 6 months was higher in the surgically treated group, crossing at 6 years: 56.5% (operated) versus 46.1% (unoperated) and still substantially worse than in the present study. Their finding of an increased hazard of aortic events beginning 5 years after surgery is consistent with the finding in this study of a substantial ($\approx 20\%$) attrition rate between 5 and 10 years of follow-up, irrespective of diagnosis. Again, the need for closer surveillance, even removed in time from operation to avoid lethal aortic rupture, is indicated.

Among recent, less comprehensive, single-center experiences in high-volume institutions, surgical (in-hospital or 30-days) mortality is 1.7% to 14% for thoracic aortic aneurysms^{14–16} and 5.3% to 24% for aortic dissection.^{12,17–21} On the other hand, the International Registry of Aortic Dissection investigators report 25.1% hospital mortality in 526 patients operated for acute type A aortic dissection in a recent 1996–2001 series.⁵ Apparently, surgical mortality can be reduced in individual experienced centers, but results in larger multicenter settings with unselected patients probably more accurately reflect contemporary outcomes of surgical treatment for TAD. Long-term survival was nearly identical in hospital survivors from different settings, suggesting similar features in a majority of operated TAD patients. In the present study, cardiopulmonary and cerebrovascular events accounted for 35% of late deaths, indicating substantial comorbidity. Presumably, hypertension was prevalent not only in the 39% of cases with aorta-related causes of death.^{1,22} Follow-up practices of operated TAD patients must include monitoring of the entire cardiopulmonary system, and not neglect treatment regimens for hypertension, coronary artery disease, heart failure and arrhythmia.

The incidence of reoperation after thoracic aortic operations, aneurysms, and dissections alike was $<8\%$ at 10 years in the present study, and is previously reported to be in the 5% to 39% interval.^{23–25} Reoperation is not a hard end point; definitions vary, as do indications, and an unknown number of patients either refuse or are not considered candidates for reoperation. Patients with an anticipated need for reoperation may succumb prematurely, and a rapidly increasing proportion of patients is diverted to less invasive catheter-based therapy. Of importance to interpreting surgical outcomes, reoperation on the same aortic segment due to complications must be separated from scheduled reoperation on downstream segments of the aorta, known at presentation or detected during follow-up. In the present study, reoperation on a different aortic segment was more common, which indicates a more widespread aortic disease (as with extensive aortic dissection and diffuse aneurysmal disease or aortic dilatation) and emphasizes the need for continuous imaging surveillance of the entire aorta.

Endovascular stent-graft repair of distal thoracic aortic disorders, popularized by the Stanford group,²⁶ was introduced in Sweden in the late 1990s. Its use has increased rapidly in the last few years; very few subjects in the present study underwent catheter-based therapy. The application of this procedure in a broad spectrum of condi-

tions (traumatic injury, aneurysm, dissection, malperfusion) and its expanding indications, including distal aortic reintervention in previously operated subjects, holds promise of further improved outcomes and improved prognosis for coming generations of TAD patients.

Limitations

ICD coding of diseases is not infallible, and misclassifications have likely occurred between the different forms of TAD, and the validity of diagnostic coding was not specifically verified. It has been shown in national audits of surgical diseases²⁷ that the accuracy of coding is 85% to 95%, however. The seriousness of TAD along with stable and reproducible diagnostic definitions gives reason to believe that there were few false-positive cases (study subjects without correct diagnosis). The number of false-negatives, ie, subjects with TAD who were not included by the present study criteria, depends on case ascertainment, which evolved over time. The various anatomic location of aortic pathology was problematic, because discrimination between ascending, arch, and descending/thoracoabdominal TAD was not feasible. There may be differences in the natural history, surgical outcomes, and long-term outcomes depending on anatomy.²⁸ This way of presentation has been adopted in several previous reports.^{1–3} Likewise, dependable classification of dissections as acute or chronic could not be performed. The present study focused on long-term outcomes in operated subjects, because the cohort of unoperated subjects was very heterogeneous.

The observational, register-based design of the present study did not allow inferences about the treatment of choice for TAD (eg, surgical or nonsurgical). However, indirect support for surgical treatment emerged: overall and short-term surgical mortality improved over time, parallel with an increase in surgical activity. SMR was lower for surgically treated individuals. Surgical treatment produced survivors of the otherwise often lethal thoracic aortic rupture, and long-term survival was equal regardless of preoperative diagnosis. Finally, a limited number of reoperations were needed, and only a fraction of these were related to local recurrence or complication.

Conclusion

The present study is the most comprehensive study on TADs to date. A higher incidence than previously reported was found, along with a continuing increase over time. Annually performed operations increased 7- to 15-fold over time, predominantly in women. The results of surgical treatment improved over time: 30-day as well as long-term survival improved and was far better compared with earlier eras. With improving outcomes, surgical therapy should be contemplated more often in individuals with TAD. Regardless of underlying mechanism, the number of cases of TAD will continue to increase, demanding larger resources, improved decision-making, and guidelines for prolonged follow-up.

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Disclosures

None.

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CLINICAL PERSPECTIVE

Knowledge of the prevalence and overall long-term outcome of thoracic aortic diseases, specifically aneurysms and dissections, has until now been based on small sample populations with limited follow-up. Investigation of an entire nationwide population of ≈ 8.7 million people over 16 years demonstrated large increases in the annual number of cases and operations. Both short-term and long-term mortality improved, and for operated cases the long-term survival was identical for aneurysms, dissections, and aortic ruptures. The cumulative incidence of reoperation reached 8% at 10 years and was independent of initial diagnosis. With improved diagnostic procedures and case ascertainment, as well as improved survival, the cohort of individuals with diagnosed or surgically treated thoracic aortic disease is constantly growing, which warrants continuous follow-up with medical therapy, imaging studies, and reintervention. Whereas the design of the present study does not allow conclusions on the optimal treatment strategy, it is of note that age was the only variable independently associated with long-term survival, that overall survival was better with surgical treatment, and that surgery conferred similar survival for elective and emergency cases, all of which points to a benefit of early surgical treatment when possible.

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