Contemporary results after surgical repair of type A aortic dissection in patients aged 80 years and older: a systematic review and meta-analysis

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Abstract

Objective: The benefits of surgical treatment of type A aortic dissection (AAD) in patients aged 80 years and older are questioned by the perceived high operative risk of these patients. This issue has been investigated in the present meta-analysis of observational studies. Methods: Studies on surgical repair of AAD in patients aged 80 years and older were identified up to January 2011. The results were expressed as pooled proportions with 95% confidence interval (95% CI). Results: Pooled analysis showed that patients aged 80 years and older included in six studies had a significantly higher risk of immediate postoperative mortality compared with younger patients (risk ratio 2.32, 95% CI 1.47–3.66, p < 0.0001, pooled estimates 45.7% vs 19.5%). Analysis of data retrieved from nine studies reporting on the results of surgical treatment of AAD in a total of 308 patients aged 80 years and older showed a pooled mortality rate of 36.7% (95% CI 23.8–51.8%, 111/308 patients). The pooled stroke rate was 11.9% (95% CI 7.3–18.7%, 37/347 patients). Pooled analysis of data from two studies evaluating patients surgically or medically treated showed a non-significant reduced risk of immediate postoperative death after surgery (risk ratio 0.42, 95% CI 0.14–1.29, pooled estimates: 25.2% vs 59.0%). Conclusions: Immediate postoperative survival rates after surgery for AAD in patients aged 80 years and older are satisfactory. These findings suggest a confident approach toward emergency repair of AAD in this fragile patient population. Further data on the intermediate survival and quality of life of these patients are, however, needed to better establish the role of emergency surgery for AAD in octogenarians and nonagenarians.

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1. Introduction

The increase of life span results in a growing number of octogenarians requiring major surgery. In Finland, prospects indicate that the number of people older than 80 years will increase from 4.6% in 2009 to 9.1% in 2030 (http://tilastokeskus.fi/org/index_en.html). Notwithstanding the awareness of the operative risk of octogenarians, advances in surgical and anesthesiological techniques as well as in perioperative care make major surgery safer also in patients aged 80 years and older. Type A aortic dissection (AAD) is a severe life-threatening condition that, if left untreated, is associated with a high overall mortality [1]. Although it is associated with a rather low mortality among young patients [1], the role of surgery in the treatment of patients aged 80 and older with AAD is still controversial, as immediate results can be frustrating [2].

Thus, the analysis of current outcome of patients aged 80 years and older undergoing surgery for AAD is of value to assess any possible benefit of surgical treatment of this severe condition. These issues will be investigated in the present meta-analysis of observational studies.

2. Materials and methods

2.1. Literature search

An English-language literature search was performed through PubMed for any study on aortic dissection published from January 2000 to January 2011, aiming at those studies evaluating the outcome of the surgical management of AAD in patients aged 80 years and older. We limited the search to articles published during the last decade to avoid the bias of including studies evaluating repair techniques and methods of cerebral protection nowadays possibly considered suboptimal. The term employed in the search was: ‘aortic dissection’. Books as well as reference list of obtained articles were searched as well.

Only prospective and retrospective observational studies published in English language as full articles and reporting on...
the outcome of patients who underwent surgery for AAD have been included in the present analysis. The language of the articles was defined as reported in PubMed. We did not include in this study data unpublished or reported only in abstract. We excluded those studies reporting on <10 patients as well as case and technical reports. We applied the guidelines for Meta-analysis of Observational Studies in Epidemiology [3].

2.2. Data collection

Three authors (FB, FV, and VB) searched for the articles potentially dealing with the topic. Two investigators (FB and FV) abstracted data from all eligible studies using a standardized Excel file. Three authors (FB, FV, and VB) retrieved data on study design and size, patient demographics and in-hospital mortality. The included data were
2.3. Data extraction and study outcomes

Data on preoperative variables, methods of cerebral protection and the extent of surgical repair (i.e., replacement of the ascending aorta, hemiarch replacement and total arch replacement) were extracted from the articles. Immediate postoperative survival and stroke were the main outcome endpoints of this study and the related data were extracted accordingly. Immediate postoperative mortality was defined as any in-hospital or 30-day mortality, as reported in the studies. Pooled analysis of intermediate survival was planned and related data were extracted as well. Stroke was defined as a permanent cerebral ischemic event. As most of studies report only on permanent cerebral ischemic events, transient ischemic attack/reversible ischemic neurological deficit, despite being a major postoperative complication, was not considered as an outcome endpoint of this study.

We aimed to evaluate the immediate postoperative mortality as well as stroke in patients aged 80 years and older versus younger patients. Furthermore, we evaluated the immediate mortality in patients treated surgically versus those medically treated. Sensitivity analyses were performed when feasible.

2.4. Statistical analysis

Statistical analysis was performed using Metaanalyst Beta 3.13 software (http://tuftscaes.org/meta_analyst/) [4]. The results were expressed as pooled proportions (%) with 95% confidence interval (95% CI). Heterogeneity across the studies was evaluated using the I² test. Because heterogeneity was anticipated among the observational studies, analysis was performed a priori by a random effects model (DerSimonian–Laird). A p < 0.05 was considered statistically significant.

3. Results

The literature search yielded 2959 articles and 10 [2,5–13] were pertinent to this issue and provided data on the outcome of patients aged 80 years and older, who underwent surgical repair of AAD (Table 1). The results of the literature search are summarized in Fig. 1.

3.1. Immediate postoperative mortality

Six studies [2,5,6,8,10,12] reported on the immediate postoperative mortality in patients aged 80 years and older as well as in younger patients. Pooled analysis showed that patients >80 years old had a significantly higher risk of

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Fig. 2. Forest plot of pooled risk ratio of immediate postoperative mortality in patients aged 80 years and older versus younger patients who underwent surgical repair of type A aortic dissection (risk ratio 2.32, 95% CI 1.47–3.66, p = 0.0001).
immediate postoperative mortality as compared with younger patients (risk ratio 2.32, 95% CI 1.47–3.66, \(I^2\) 78.1%, \(p < 0.0001\); Fig. 2). Such a difference remained significant also when two studies [5,13], including only septuagenarians in the control group, were excluded from the pooled analysis (risk ratio 2.66, 95% CI 1.42–4.99, \(I^2\) 81.5%). Risk difference of immediate postoperative mortality between patients aged more than 80 years and younger patients was 26.2% (95% CI 6.4–46.1%, \(I^2\) 86.5%, \(p < 0.0001\)), older patients having had a pooled immediate mortality of 45.7% (95% CI 29.3–63.1%) versus 19.5% (95% CI 14.7–24.7%) among younger patients.

Pooled analysis of data retrieved from nine studies reporting on the results of surgical treatment of AAD in an overall of 308 patients aged 80 years and older showed a pooled mortality rate of 36.7% (95% CI 23.8–51.8%, \(I^2\) 44.1%, 111/308 patients, Fig. 3).

### 3.2. Cerebrovascular complications

Analysis of data retrieved from five studies [2,5,7,9,13] showed a pooled stroke rate of 11.9% (95% CI 7.3–18.7%, \(I^2\) 32.1%, 37/347 patients) (Fig. 4).

Data on postoperative stroke in patients aged 80 years and older versus younger patients were available only in two studies [2,5], and pooled analysis showed similar stroke risk in these two groups (risk ratio 1.10, 95% CI 0.70–1.73, \(I^2\) 0%, 18/107 patients vs 95/607 patients, respectively).

### 3.3. Immediate outcome after surgical versus medical treatment

Two studies [8,11] reported data on the immediate postoperative mortality among patients \(\geq 80\) years old surgically or medically treated. Surgical treatment was associated with a non statistically significant reduced risk of immediate postoperative death (risk ratio 0.42, 95% CI 0.14–1.29, \(I^2\) 76.5, 16/60 surgically treated patients vs 36/61 medically treated patients, pooled estimates: 25.2% vs 59.0%).

### 3.4. Impact of extent of surgery and methods of cerebral protection

The large heterogeneity as well as lack of data on extent of surgery and methods of cerebral protection prevented us from performing sensitivity analyses.

### 3.5. Intermediate survival

We did not perform pooled analysis of intermediate survival because it was reported in only three studies with few patients at risk during the interval of interest. Among operative survivors, 3-year survival was 100% in one study [7], whereas 5-year survival was 48% and 73%, respectively, in the other two studies [12,13] (Table 1).
4. Discussion

The main limitation in the clinical decision making about the management of a patient aged 80 years and older requiring major surgery is often the lack of evidence on the benefits of any intervention, particularly in the emergency setting. It was the lack of clear data on the value of treatment of AAD in these patients that motivated the present study. Denial of surgical treatment for patients aged 80 years and older requiring emergency cardiac surgery may unlikely lead to medico-legal consequences, as the malignant nature of AAD in octogenarians and nonagenarians is usually clear to relatives. Despite this, surgeons called upon to evaluate the possibility of surgical treatment for AAD face a major ethical and clinical dilemma: to operate or not to operate? The severity of such a vascular catastrophe, the burden of resources required for its treatment, the perceived highly increased risk of perioperative mortality and major complications associated with surgical treatment, as well as the perceived limited expectancy of life of octogenarians and nonagenarians may easily indicate a nihilistic approach as the most reasonable one in these very high-risk patients. Taking into consideration also the finite nature of life, these reasons may intuitively indicate a non-operative philosophy in the management of octogenarians and nonagenarians presenting at emergency department with an AAD. However, the present pooled analysis suggests that the efforts in treating patients >80 years old presenting with AAD are not in vain, at least in terms of immediate and intermediate survival. In fact, about 65% patients may survive the operation and, despite there being scanty data regarding it, their intermediate survival can be rather satisfactory (Table 1). Furthermore, the pooled rate of stroke was nearly 11%, but this figure can be underestimated as a number of patients might have experienced major neurological event, which likely remained undiscovered because of significant early mortality.

One of the most important findings of this pooled analysis is the difference in the immediate outcome between surgically and medically treated patients. We were able to extract specific data on this issue only from two studies evaluating 121 patients [8,11], and surgical treatment was associated with a reduced pooled risk of immediate postoperative death (risk ratio 0.42, 95% CI 0.14–1.29), which anyway failed to reach statistical significance. The pooled estimate of immediate postoperative mortality was 25.2% among surgically treated patients, whereas it was 59.0% among those medically treated. Power analysis indicates that for a risk reduction of 50%, 42 patients in each study group would have been enough to detect a statistically significant difference (power 80%, alpha = 0.05). Indeed, the difference in terms of absolute mortality was statistically significant (chi-square test: p < 0.0001). Despite the lack of statistical significance in the pooled analysis, the difference in clinical terms is rather large and seems to support surgical treatment in these patients.
The results of this meta-analysis must be viewed in the light of a number of limitations. The lack of specific data on the extent and type of surgical procedure as well as on the method of cerebral protection represent the main limitation of the present study. This prevented us from performing a sensitivity analysis about the impact of different surgical and anesthesiological methods on the outcome this fragile patient population. This is an important issue, as surgical and anesthesiological methods may have marked impact on the impact of this severe condition, particularly in very high-risk patients. Besides these, there is a lack of information about preoperative patient selection. Even if immediate postoperative results were consistent along all, but one study [2], major biases in terms of patient referral and selection inevitably existed along these studies and, indeed, might have resulted in a trend toward better results in well-selected patients. Preoperative patient selection cannot be easily quantified and may be influenced by a number of imponderable factors, such as a possible nihilist approach of a few surgeons called upon to treat high-risk patients. Therefore, we should seriously consider the possibility of having encountered too optimistic results, as reported in the retrieved studies. This is even more evident when we consider that a large number of patients who underwent surgery have, very likely, experienced major complications other than postoperative death or stroke. Analysis of a recent study by Hata and colleagues [11] indicates that a number of octogenarians, who may survive after surgery for AAD, may indeed become bedridden or severely depressed. In fact, not infrequently, major complications may arise in these fragile patients and require prolonged treatment and rehabilitation, which are not always followed by a happy end as in the case of Dr Michael E. DeBackey [14,15]. Thus, surgery for AAD in these high-risk patients may not be harmless to the patients and their families [15]. The decision-making process in patients aged 80 years and older requiring major surgery raises major ethical issues, which must be always taken seriously into account in a sound surgical judgment [15].

In conclusion, immediate survival rates of patients aged 80 years and older after surgery for AAD are satisfactory. There are few data suggesting also good intermediate survival, which further support a confident approach toward emergency repair of AAD in this fragile patient population. More data on the burden of treatments, the intermediate survival, and quality of life of these patients are needed to better establish the role of emergency surgery for AAD in octogenarians and nonagenarians.

References


