Acute type A aortic dissection repair in elderly patients†

Pietro G. Malvindi*, Amit Modi, Szabolcs Miskolczi, Markku Kaarne, Clifford Barlow, Sunil K Ohri, Steven Livesey, Geoffrey Tsang and Theodore Velissaris

Wessex Cardiothoracic Centre, Southampton University Hospital NHS Trust, Southampton, UK

* Corresponding author. Wessex Cardiothoracic Centre, Southampton University Hospital NHS Trust, Tremona Road, Southampton SO16 6YD, UK.
Tel: +44-238-0796234; fax: +44-238-0794526; e-mail: pmalvin@tin.it (P.G. Malvindi).

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Abstract

OBJECTIVES: We evaluated our experience in acute type A aortic dissection (ATAAD) repair in elderly patients. The role of clinical presentation and surgical strategies in determining patients’ outcome was further assessed.

METHODS: A retrospective analysis of patients over 75 years who underwent emergency repair of ATAAD at our institution during 2000–13 was performed. Forty-five patients (mean age = 79 ± 3 years; 26 females) were identified. Aortic dissection was complicated in 17 (37%) patients with new neurological deficit (n = 5), cardiac tamponade (n = 12), acute myocardial infarction (n = 5) and acute renal failure (n = 2). The ascending aorta was replaced in all patients and hypothermic circulatory arrest was employed in 22 patients. The aortic replacement needed extension to the hemiarch in 11 patients and the aortic valve was replaced in 9 patients; in 3 cases, full root replacement was performed.

RESULTS: The in-hospital mortality rate was 15% (n = 7). Preoperative acute neurological deficit was the only independent risk factor for mortality (P = 0.03). Age >80 years old per se was not associated with a poor outcome. Surgical strategies and extension of aortic wall resection did not affect the operative mortality. The postoperative course was complicated in 23 (52%) patients. During the median follow-up of 57 months, there were 4 late deaths. The cumulative 1-, 5- and 8-year survival rates were 82, 76 and 67%, respectively.

CONCLUSIONS: Emergency surgical repair of ATAAD in elderly patients resulted in an acceptable early mortality rate and satisfactory intermediate survival. Preoperative acute neurological deficit predicts a worse outcome. Advanced age alone should not be considered as a contraindication to AAD repair.

Keywords: Aortic dissection • Aorta/aortic • Aortic operation • Geriatric

INTRODUCTION

Until recently, based on previous evidence of poor postoperative outcome [1, 2], the indication of emergency surgical repair for acute type A aortic dissection (ATAAD) in elderly patients has been questioned. The reported in-hospital mortality ranged from 16 to 30% in septuagenarians [3, 4] and was up to 80% for patients aged >80 years old [1, 2, 5]. The operative risk has been reported as unacceptably high, especially in cases of ATAAD with a complicated presentation, such as neurological deficit, acute renal failure or pericardial tamponade [5, 6].

However, the outcome of conservative management in this condition is dismal [7, 8], with an early mortality rate of more than 60% and 1-year survival rate of 10%. While surgical repair for ATAAD in elderly patients is still a matter of debate, surgeons are more frequently facing an ageing population with a good level of physical activity, functional independence and an advanced life expectancy associated with a more preserved clinical and functional status [9]. Promising recent evidence of improving postoperative mortality and morbidity [8, 10–12], coupled with a worldwide shift in the population towards older age, suggests that surgical treatment would need to be offered to more elderly patients.

In this study, we evaluated our results in ATAAD repair in patients aged above 75 years and we assessed the role of preoperative clinical presentation and surgical strategies in predicting early outcome and mid-term survival.

PATIENTS AND METHODS

Patient population

Between November 2000 and November 2013, 45 consecutive patients aged above 75 years underwent emergency repair of ATAAD in our institution. Diagnosis was made by contrast-enhanced...
CT scan in all patients and coronary angiogram was not performed. Patients with a diagnosis of chronic type A aortic dissection and all cases of iatrogenic aortic dissection were excluded. The records of these patients were retrospectively reviewed. The mean age of the patients was 79 ± 3 years (range 75–89 years), 16 patients were >80 years old (35%) and 26 (57%) were female. The presentation of aortic dissection was complicated preoperatively in 17 (37%) cases by at least one of the following: myoccardial ischaemia (n = 5; defined as significant changes on ECG or positive troponin), cardiac tamponade (n = 12), cerebral stroke (n = 5; defined as the presence of a persistent loss of neurological function caused by an ischaemic event with or without confirmation by CT scan), respiratory failure needing mechanical ventilation (n = 3), acute renal failure (n = 2; defined as a creatinine level of >200 µmol/l in patients with known normal renal function or presentation with oligo/anuria). One patient had previously undergone an aortic valve replacement.

This study is a retrospective outcome evaluation from our pre-existing database with prospective data entry.

Surgical technique

The surgical technique used in our institution has been previously described [13]. Following arterial cannulation in the common femoral artery (38 patients) or axillary artery (4 patients), a median sternotomy was performed (3 patients with Type 2 De Bakey AAD had aortic arch cannulation). A two-stage venous cannula was inserted into the right atrium and cardiopulmonary bypass was established. The core temperature was initially cooled down to 32°C. The distal ascending aorta was clamped and the ascending aorta was transected to assess the presence of an intimal tear and the anatomy of the aortic root and aortic valve. Cold blood cardioplegia was delivered intermittently directly in the coronary ostia. The decision to reconstruct rather than replace the aortic root and valve was made intraoperatively by the surgeon. The ascending aorta distal to the sinotubular junction was replaced in all patients with a gelatin-impregnated Dacron graft of appropriate size. The distal aortic anastomosis was performed with or without hypothermic circulatory arrest, depending on the extent of distal aortic resection; all patients with an intimal tear extending into the aortic arch received an open distal anastomosis under hypothermic circulatory arrest. In cases where the entry tear was limited to the ascending aorta, a closed distal anastomosis was performed while the aorta remained clamped. One patient had coronary artery bypass grafting (a single venous graft on a dissected LAD). Table 1 reports the operative procedures performed. Cell salvage was employed in all cases. Since 2009, cerebral oximetry has been used during aortic procedures to detect cerebral malperfusion and was used in 25 patients in this cohort.

The mean CPB time was 153 ± 73 min (range 75–491 min) and the mean duration of aortic cross-clamping time was 87 ± 30 min (range 53–209 min).

Follow-up and data collection

The median follow-up was 57 months (range 1–144 months) and is 100% complete for all-cause mortality. Because of the age of these patients, many were lost to clinical or radiological follow-up. Hospital records were retrospectively reviewed for all patients. Follow-up was completed by review of the online database system, Hospital Integrated Clinical Support System database (Ascribe Ltd, Bolton, UK) and patient records.

### Table 1: Type A aortic dissection repair: operative procedures

<table>
<thead>
<tr>
<th>Operative procedure</th>
<th>No. of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascending aortic replacement</td>
<td>14 (30%)</td>
</tr>
<tr>
<td>+AV resuspension</td>
<td>10 (22%)</td>
</tr>
<tr>
<td>+AV resuspension + hemiarch replacement</td>
<td>6 (14%)</td>
</tr>
<tr>
<td>+AV replacement</td>
<td>6 (14%)</td>
</tr>
<tr>
<td>+AV replacement + ARR</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>+Hemiarch</td>
<td>4 (9%)</td>
</tr>
<tr>
<td>+AV replacement + ARR + hemiarch replacement</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>+AV resuspension + TAR</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>+CABG</td>
<td>1 (2%)</td>
</tr>
</tbody>
</table>


Statistical analysis

Fourteen preoperative risk factors and intraoperative variables were entered in a univariate analysis (Student’s t-test, χ² or Fisher’s exact test as appropriate) to determine whether any single variable influenced hospital mortality and development of postoperative complications. These variables were: gender; age >80 years; presentation with myocardial ischaemia, cardiac tamponade, cerebrovascular accident, mechanical ventilation and acute renal failure; open distal anastomosis; aortic valve replacement; aortic root replacement; hemiarch/arch replacement; CPB time; and cross-clamp time. Each variable with a P-value of less than 0.2 on univariate analysis was subsequently entered in a logistic regression analysis model to identify independent predictors of mortality and postoperative complications. Survival rates were calculated using the Kaplan–Meier method. Univariate comparisons between groups for late deaths were performed with the log-rank test.

Statistical analyses were performed using the Stat-View Statistical Software Package 5.0 (SAS Institute, Inc., Cary, NC, USA), NCSS 2001 (Number Cruncher Statistical System, Kaysville, UT, USA).

### RESULTS

#### Hospital mortality

The in-hospital mortality rate was 15% (n = 7). Three patients had a perioperative extensive diffuse brain injury; 1 patient developed multiorgan failure in the early postoperative period and 2 patients died of sepsis and renal failure. One patient died during the rehabilitation course because of duodenal perforation (postoperative day 31). On univariate analysis, preoperative acute neurological deficit was the only statistically significant risk factor for in-hospital mortality (P = 0.01) and it was confirmed as an independent risk factor upon logistic regression analysis (P = 0.03; Table 2).
Hospital morbidity

The postoperative course was complicated in 23 (52%) patients. Early reoperation for excessive bleeding or tamponade was necessary in 7 (15%) patients. Ten (21%) patients suffered a new postoperative cerebrovascular accident; 2 of them died in hospital and 1 in the early phase after discharge (3 months); furthermore, 1 patient showed only a partial recovery. Mechanical ventilation >72 h and need for tracheostomy occurred in 12 (26%) and 5 (11%) patients, respectively. Five (11%) patients sustained postoperative sepsis. Acute renal failure occurred in 8 (17%) patients and renal replacement therapy was required in 2 of those patients. Renal function subsequently recovered in all these patients. In 1 case, the course was complicated by deep sternal wound infection.

Any of the preoperative and intraoperative variables emerged as risk factors for the development of postoperative complications (Table 3).

Survival and late outcome

The mean ICU length of stay and total hospital stay among survivors were 8 ± 9 and 20 ± 13 days, respectively.

The median follow-up time was 57 (range 1–144) months and was 100% complete. There were 4 late deaths that occurred at 3, 62 and 88 months after the operation. Cumulative 1-, 5- and 8-year survival rates (including hospital mortality) were 82, 76 and 67%, respectively (Fig. 1).

There was no significant difference in survival between patients who presented with and without complicated acute aortic dissection (5-year 72 vs 78%, respectively; log-rank test \( P = 0.69 \); Fig. 2). However, if one concentrates specifically on patients with preoperative cerebral stroke, the hospital survival rate was only 40% (2/5). Of the 2 survivors, one had a persisting neurological deficit that only partially recovered and the other one made a complete neurological recovery and was alive at 30 months, although he required a late reoperation for graft infection.

Open/closed distal anastomosis

A closed distal anastomosis on aortic cross clamp was performed in 23 patients, whereas an open distal anastomosis was constructed in
the remaining 22 patients. As expected, there was a significant difference between the two groups in terms of CPB time, 115 ± 29 vs 201 ± 83 min, respectively \( (P = 0.0001) \). The mean circulatory arrest time in the patients undergoing an open distal anastomosis was 28 ± 10 min; 13 patients underwent deep hypothermic circulatory arrest without cerebral perfusion and were cooled down to a core temperature of 19 ± 4°C, while in 9 cases retrograde or antegrade cerebral perfusion was established and patients were cooled down to a temperature of 22 ± 4°C.

Patients who underwent a closed distal anastomosis were older (79.9 vs 78.0 years, \( P = 0.026 \)) and there were no other differences in preoperative characteristics between the two groups. A higher rate of postoperative prolonged mechanical ventilation was found in patients who underwent hypothermic circulatory arrest \( (P = 0.05, \text{Table } 4) \), no other differences in outcome emerged between the two groups and the performance of an open distal anastomosis was not a significant factor for mortality or major morbidity (Tables 2 and 3).

**COMMENT**

The question of whether complex emergency surgery should be offered to high-risk elderly patients needs to be guided by evidence and not only by limited personal experience. ATAAD is a classic example of life-threatening disease where prompt surgical treatment offers a significantly higher chance of survival.

The debate about the indications and outcome of repair of ATAAD in elderly patients is still open. Table 5 summarizes the outcomes of surgery in elderly patients from various published series. The argument of limited life expectancy, a high rate of co-morbidities with disappointing initial results \( [1, 2] \) and reports of poor outcomes (in-hospital mortality rate ranging from 40 to 80%) \( [14] \) led to suggestions that it was not reasonable to offer surgical therapy to elderly patients, especially when they were above 80 years old. Two different analyses from the International Registry of Acute Aortic Dissection (IRAD) reported that age >70 years was an independent risk factor for in-hospital mortality with an odds ratio \( \text{(OR)} \) of 1.73 \( [3, 7] \). Similarly, recent studies \( [4] \) found that octogenarians had a significantly higher 30-day mortality in comparison with patients between 70 and 80 years (34.9 vs 15.8%, \( P < 0.0001; \text{OR } 3.23 \)). Interestingly, all these papers described a significant difference in survival between patients who underwent surgical repair and those who were deemed inoperable or those who refused surgery and were treated conservatively. Hospital mortality was significantly lower after surgical management compared with medical therapy \( [3] \) for patients between 70 and 80 years (29.7 vs 54.7%, \( P = 0.001 \)) and also for patients between 80 and 90 years (37.9 vs 55.2%, \( P = 0.188 \)). A very high rate of in-hospital mortality after conservative treatment was also reported by Matsushita \( et al. \) \( [8] \) and Hata \( et al. \) \( [15] \) (64 and 61%, respectively) with an extremely poor survival rate of 10% at 1 year \( [8] \). Even considering the bias that the medically treated cohort might include sicker and very high-risk patients, surgical repair would appear to represent a better option for all patients with type A AAD regardless of age. A similar conclusion was drawn by a meta-analysis of 10 studies published between 1985 and 2009 \( [16] \). The difference in early mortality between surgically (25.2%) and medically (59%) treated patients was not statistically significant, but it seems important enough to support a surgical approach even though there are limited data about the intermediate outcome and postoperative quality of life for patients undergoing surgery \( [16] \).

### Table 4: Univariate analysis of distal anastomosis techniques on postoperative complications

<table>
<thead>
<tr>
<th>Variables</th>
<th>Univariate P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-exploration</td>
<td>0.85</td>
</tr>
<tr>
<td>Mechanical ventilation &gt;72 h</td>
<td>0.05</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>0.53</td>
</tr>
<tr>
<td>Cerebral stroke</td>
<td>0.9</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>0.85</td>
</tr>
<tr>
<td>Renal replacement therapy</td>
<td>0.26</td>
</tr>
<tr>
<td>Sepsis</td>
<td>0.53</td>
</tr>
</tbody>
</table>

### Table 5: Summary of data reported on early mortality and late survival in patients aged 70 years and older who underwent type A acute aortic dissection repair

<table>
<thead>
<tr>
<th>Authors (year of publication) (study period)</th>
<th>Age (years)</th>
<th>Patients</th>
<th>In-hospital mortality (%)</th>
<th>Late survival, 5-year (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neri ( et al. ) ( [1] ) (1985–99)</td>
<td>&gt;80</td>
<td>24</td>
<td>83.3</td>
<td>-</td>
</tr>
<tr>
<td>Caus ( et al. ) ( [2] ) (1988–99)</td>
<td>&gt;80</td>
<td>11</td>
<td>45.5</td>
<td>48</td>
</tr>
<tr>
<td>Santini ( et al. ) ( [6] ) (1990–2004)</td>
<td>&gt;75</td>
<td>40</td>
<td>30</td>
<td>80*</td>
</tr>
<tr>
<td>Chavanon ( et al. ) ( [14] ) (1990–2004)</td>
<td>&gt;80</td>
<td>16</td>
<td>56.3</td>
<td>-</td>
</tr>
<tr>
<td>Ryński ( et al. ) ( [4] ) (2006–09)</td>
<td>70–80</td>
<td>381</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>Piccardo ( et al. ) ( [5] ) (2000–10)</td>
<td>&gt;80</td>
<td>79</td>
<td>44.3</td>
<td>32</td>
</tr>
<tr>
<td>Klici ( et al. ) ( [11] ) (2004–11)</td>
<td>&gt;80</td>
<td>31</td>
<td>16.1</td>
<td>-</td>
</tr>
<tr>
<td>Tang ( et al. ) ( [10] ) (2005–11)</td>
<td>&gt;80</td>
<td>21</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Matsushita ( et al. ) ( [8] ) (2004–11)</td>
<td>&gt;75</td>
<td>124</td>
<td>4.8</td>
<td>79.1</td>
</tr>
</tbody>
</table>

*Excluding in-hospital mortality.
Our experience suggests that surgical repair of ATAAD in elderly patients over 75 years can be performed with acceptable results. The in-hospital mortality rate of 15% is similar to that reported in recent papers [11, 15]; furthermore, age >80 years old was not found as an independent predictor of early postoperative death. Excellent mortality rates have also been reported by Tang et al. [10] (no predisharge death in 21 patients >80 years old) and, in a larger cohort of 124 patients aged above 75 years, by Matsushita et al. [8] (4.8%). Our follow-up data reveal cumulative 1-, 5- and 8-year survival rates (including hospital mortality) of 82, 76 and 67%, respectively; similar findings have been demonstrated previously as well as a sustained benefit in quality of life, and emotional and social well-being [8, 10, 17]. All these recent evidences, despite the limitations of arising from single institutional experiences and from small patient populations, showed that aortic dissection repair in the elderly can be performed with good early and late outcomes and would suggest that advanced age per se should not be considered a contraindication to surgical treatment of ATAAD.

A compromised preoperative status plays a major role in affecting the early outcome in patients with ATAAD, being the main predictor of in-hospital death [6, 7, 18] or significantly worse postoperative course [5]. The presentation with the onset of new cerebral stroke is an independent predictor of mortality (P = 0.03) on multivariate analysis. Brain injury at presentation is often related to a more severe involvement of the aortic arch and its branches, adversely affecting hospital survival of patients with ATAAD and, in clinical practice, it could potentially influence the decision to treat a patient conservatively rather than surgically. Recent analysis from IRAD [17] and GERAADA [19] reported that patients with preoperative cerebral complications who underwent surgical repair often demonstrated a reversal of neurological deficit and showed a better outcome compared with patients treated medically. However, our limited experience in this series was not favourable. Five patients presented with preoperative stroke and were operated upon. Three died postoperatively in hospital and of the 2 survivors, only 1 achieved complete reversal of right-sided weakness. The second patient had a partial recovery of left-sided hemiparesis and was able to ambulate with the aid of a stick.

Cardiac and renal malperfusion did not emerge as risk factors for mortality or increased morbidity after the operation. We believe that the limited size of our population did not enable the complete characterization of the impact of the malperfusion syndromes. Furthermore, we did not report any case with an obvious ongoing visceral ischaemia. This could be explained by the possible lack of referral from peripheral hospitals or a denied indication in cases with sustained, prolonged and generalized malperfusion leading to evident clinical signs of abdominal ischaemia.

The presentation with a complicated ATAAD did not affect the 5-year survival rate in our series; this finding is surprising and may strengthen the suggestion that, once recovered from the acute phase, a good outcome could be achieved in these patients. However, we should consider that our population did not include cases with prolonged splanchnic ischaemia, which notoriously affects more consistently the early and mid-term outcome [20]. Furthermore, the limited size of the population and the small number of events during follow-up limits the statistical robustness in comparing these two groups of patients.

The postoperative morbidity rate in our series was high (52%). We registered 10 (21%) cases of new postoperative cerebrovascular accidents. Of these patients, 3 died in the early postoperative period, 2 were discharged to a long-term neurorehabilitation programme and 1 made only a partial recovery. It may be argued that the prevalent choice for a closed distal anastomosis or deep hypothermic circulatory arrest could have led to such a high postoperative stroke rate; however, our finding is in keeping with the stroke rate previously reported in elderly patients [16-17%] [4, 11]. There is no evidence of significantly higher risk of postoperative cerebrovascular complications in patients aged over 80 years versus younger patients [4, 16], but neurological deficits are associated with a worse intermediate outcome in the elderly [10].

Whether the distal anastomosis during surgical repair of aortic dissection should be performed in an open or closed fashion remains debatable. Most surgeons favour an open distal repair of aortic dissection [21], although there is no evidence that this technique carries an early [13] or long-term survival benefit or a lower incidence of future reoperations [22, 23]. An open distal repair is always necessary in the presence of an intimal tear penetrating the arch, and allows excellent visualization during construction of the distal anastomosis, the extension of resection to additional distal tears into the hemiarch, a more extensive reapproximation of the intimal flap and the prevention of injuries of a fragile aortic wall at the clamp site [19], thus avoiding catastrophic intraoperative haemorrhage. The complete resection of additional distal tears may reduce the rate of incidence of a persistent false lumen and the avoidance of clamp injuries may prevent the occurrence of distal aortic false aneurysm. In our experience, the decision to perform the distal repair as an open distal anastomosis under circulatory arrest or as a closed anastomosis using the aortic cross clamp was guided by the location and the extent of the intimal tear and the need for arch resection. In 23 patients, the tear was found to be limited to the ascending aorta and the repair was performed with a closed distal anastomosis, therefore avoiding circulatory arrest. Twenty-two patients needed an open distal anastomosis. The only possible advantages of the closed technique are the avoidance of moderate or profound hypothermia and circulatory arrest, and a shorter bypass time as there are no periods of systemic cooling and rewarming. In this specific surgical setting involving severely ill old patients, a major reduction of bypass time and the avoidance of hypothermic circulatory arrest could offer a better chance in preserving functional organ reserves; however, there was no significant difference in postoperative morbidity according to an open or closed anastomosis strategy apart from a tendency for increased postoperative mechanical ventilation time in patients who underwent the circulatory arrest. Moreover, the use of circulatory arrest and the extent of distal aortic repair did not emerge in our analysis as risk factors for in-hospital mortality, which is in agreement with previous studies [4, 6, 8] and the evidence in the general AAD population that moderate hypothermic arrest and antegrade cerebral perfusion are associated with better short- and long-term survival [24] and a significant reduced risk of postoperative neurological deficits [25].

Our strategy for proximal repair consisted of supracoronary ascending aortic replacement in most of the cases. Adjunctive aortic valve and aortic root replacement were performed in case of diseased aortic valve leaflets and a destroyed or severely enlarged aortic root. Patients receiving a more extensive proximal repair did not show an increased rate of early mortality or postoperative complications, which is in keeping with previous studies [4, 10]. Even though a more radical proximal or distal repair was not associated with higher in-hospital mortality and morbidity, the aim of surgical repair during acute aortic dissection is to save the patient’s life by resolving tamponade and malperfusion and preventing ascending aortic rupture. More extensive procedures
should be reserved only for cases of severe proximal tissue disrup-
tion or for the presence of a tear extending distally towards the
arch.

LIMITATIONS OF THE STUDY

This was a retrospective study from a single institution over a
13-year period. All data were however collected from a prospect-
ively completed institutional database. The population is limited
to 45 patients, but represents a consecutive series of patients who
had acute spontaneous aortic dissection (iatrogenic aortic dissec-
tion and chronic dissection were excluded from this analysis) and
represents one of the biggest reported series in this particular
group of patients (Table 5).

The encouraging results from our experience and the most
recent published series may be affected by a clinical selection
with the exclusion of very high-risk patients who may not have
been referred for surgery because of their presenting state or co-
morbidities. Also, because of the retrospective nature of the study,
we do not have any information on patients who may have been
turned down for surgery or died before arriving at the operation
theatre. Despite this possible bias, almost one-third of the patients
in our series presented with a malperfusion-related complication
or haemodynamic instability and this is in keeping with other
described series.

CONCLUSIONS

Repair of ATAAD in elderly patients seems to follow the same
rules as the general aortic dissection population. The preoperative
clinical presentation and the presence of complications are the
major determinants on patients’ survival. Complicated AAD carries a
higher postoperative risk, but the very poor outcome of conservative
medical treatment suggests that the surgical option should always
be offered to these patients. Preoperative stroke in particular pre-
dicts a poor early and late outcome, and this may have to be taken
into account when deciding how to treat those patients.

Our data demonstrate that emergency surgery for acute type A
aortic dissection in elderly patients can be performed with excel-
 lent early and late outcomes and that therefore advanced age per-
se should not be a contraindication to what is potentially life-
saving surgery.

Conflict of interest: none declared.

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Effect of cerebral protection strategy on outcome of patients with Stanford
analysis of deep hypothermic circulatory arrest versus moderate
hypothermic circulatory arrest with selective antegrade cerebral perfu-
APPENDIX. CONFERENCE DISCUSSION

Dr G. Esposito (Bergamo, Italy): In our experience in such surgical situation, the use of transoesophageal echo is of paramount importance. In fact, we need, of course, to confirm the initial diagnosis of extension of the dissection that could really change, in negative terms of course. We can decide to be more aggressive or not in the face of this type of the diagnosis. So I did not understand very well from the paper, but could you confirm that you use, as a standard procedure transoesophageal echo in the operating theater?

Dr Malvindi: Yes, this is correct. We routinely insert the probe as soon as the patient is intubated and on the table.

Regarding the impact of the new TOE findings on the surgical decision-making, usually TOE has a minor role on the decision in distal repair and the choice for the arterial cannulation site.

Our policy for the distal repair is based most of the times on the tear location and extension. Therefore, the final decision is taken during the direct inspection of the ascending aorta and the aortic arch.

TOE can detect the progression of the flap to the abdominal aorta but in our experience, this finding is not going to affect our preference for common femoral artery cannulation. Furthermore, it can reveal a malperfusion of the brain vessels or prominent perfusion in the false lumen. But again, for everything regarding the distal repair or arch vessels, we base our decision on the bilateral radial artery continuous monitoring, and the results of NIRS.

TOE plays a major role on the assessment of the proximal aorta with the new evaluation of the CT findings in terms of size and extension of the flap into the root. Moreover, TOE is able to give us a dynamic view of the mechanism of aortic regurgitation.

This is important because we perform, I would say, a high rate of proximal conservative repair, 85% of patients in this population and 70–75% of conservative root repair in our general population. So its (TOE) value is mostly related to the study of the proximal aorta.

Dr Esposito: The other question, very briefly, is that you describe, of course, and you conclude that the new onset of cerebral stroke is associated with higher in-hospital mortality. I want to ask you, previous onset of cerebral wall stroke can be a point to refuse the patient especially when he is elderly, 75 or 80.

Dr Malvindi: Considering the number I have presented, it’s mathematics to say that 60% of patients presenting with new cerebral stroke died. It’s a very bad result, and it’s not surprising since this finding has been already extensively reported in the general and elderly population. However, I believe that we are not always going to refuse these patients. Some considerations: first we need to look at our experience analysing the cause of death of the patients.

So, three patients with new onset of cerebral stroke died. What is the cause? One patient had extensive brain damage after the operation as proven by postoperative CT. The second patient died of a low cardiac output, and the third of abdominal complications on postoperative day thirty-one.

So, of course, all these patients presented with a stroke, not a general neurological deficit, a defined stroke, but neurological injury had a different impact on the final outcome of these patients so this is the first consideration.

Second consideration: it’s important to understand the mechanism and the context. Sometimes we can accept patients with isolated neurological symptoms and then maybe have an almost incidental finding of aortic dissection. Sometimes we can accept patients with neurological problems having a sustained generalized malperfusion. These are two different scenarios and it was reported from an International Registry analysis that there is a different impact on the early and mid-term outcome.

Third consideration, about the general population, recent analyses from the International Registry, and the German registry reported that in patients with neurological deficit, not only cerebral stroke but general neurological deficit, medical management carries a very poor outcome. These patients do not survive, while when operated, they could achieve a brain injury reversal in up to 60 to 80% of the cases. I cannot say from our data, it’s a small population, if elderly patients could have a similar rate of recovery, but we believe that since the neurological presentation is not just one of the signs of a generalized malperfusion, it could be worthwhile to offer a chance to these patients.

Dr C. Hagl (Munich, Germany): One more specific question. Let’s imagine an 86-year-old patient entering your hospital in the middle of the night. He is hemodynamically stable but intubated. You don’t know anything about his neurology, he has no hematopericardium. What do you do? Do you start an operation right away in the night? Do you wait until the next day or you don’t do anything before you have an idea concerning his neurology?

Dr Malvindi: Patient is stable without any sign of?

Dr Hagl: He’s stable, just a dissection in the ascending aorta. Again, he has no hematopericardium, no catecholamines.

Dr Malvindi: But you are wondering about his neurological status?

Dr Hagl: We don’t know. He is on the ventilator.

Dr Malvindi: It’s easier; maybe we can ask something more. We can take some time in this case if the patient is completely stable, there are no pericardial effusions.

Dr Hagl: That’s the question.

Dr Malvindi: So maybe it’s fine to understand better, but it could be difficult. Usually all the patients just come straightaway to the theatre, but in this case it would be nice to investigate the patient since he’s stable.

Dr Esposito: It’s a strange situation because the open anastomosis now looks to be the standard technique and guidelines. Some people do still the cross-clamp and go with the distal anastomosis, no?

Dr Malvindi: They don’t say, but in the International Registry, we’ve got 10% of closed (distal anastomosis). There was a centre in the USA that reports 30% of closed distal anastomosis in the elderly.