

Local versus General Anesthesia for Thoracic Endovascular Aortic Repair in Patients with Acute Type B Dissection



**Aortic
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Background and Objective

- Thoracic endovascular aortic repair (TEVAR) is a minimally invasive treatment option for aneurysm or dissection of the descending aorta
- TEVAR is usually performed under general anesthesia (GA) due to advantages of a motionless surgical field and possibility of hemodynamic manipulations
- However, GA is associated with inherent risks, especially for patients with aortic disease who are often elderly and with cardiopulmonary or cerebrovascular comorbidities
- Use of local anesthesia (LA) in endovascular aortic repair (EVAR) of abdominal aortic aneurysms has shown less cardiopulmonary morbidity, shorter length of stay, and fewer complications, despite comparable mortality to GA
- Prior sporadic reports suggest use of LA in TEVAR can avoid tracheal intubation and mechanical ventilation, and possible risks and complications of GA

Background and Objective

- Up to date, clinical experience with TEVAR under local anesthesia is very limited and confined to case reports, small cohorts, or registry data from surgical societies (e.g. VQI or ACS-NSQIP)
- Studies are even scarce on use of local anesthesia in TEVAR for acute type B aortic dissection (ATBAD), few with data on late outcomes
- Since 2016, our team have been using LA in TEVAR for patients with ATBAD
- We hypothesize that use of LA in TEVAR may achieve similar hemodynamic manipulation, less physiological disturbance, and enhanced recovery as compared to GA
- The **objective** of this study was to compare the early and late outcomes of TEVAR under LA versus GA in patients with ATBAD

Patients and Methods

- From 01/2016 to 12/2021, we performed TEVAR on 247 patients with ABTAD (mean age 52.9 ± 12.6 years; 78.9% male)
 - 44 under general anesthesia
 - 203 under local anesthesia
- Method of LA: local lidocaine infiltration + sedation with i.v. dexmedetomidine + analgesia with butorphanol or dezocinelidocaine
- ASA classification IV, 79.8%; malperfusion, 3.6%; and urgent TEVAR, 2.8%
- **Follow-up**: 100% complete at mean 3.2 ± 1.8 years
- Two groups were compared in respect to early outcomes, survival, reintervention, and late adverse events (a composite of endoleak, retrograde type A dissection and distal aortic dilation)
- Risk factors for all-cause mortality and late adverse events were identified with Cox regression

Baseline Characteristics

| Variable | Whole series (n = 247) | Local anesthesia (n = 203) | General anesthesia (n = 44) | P value |
|---------------------------------------|---------------------------|-------------------------------|--------------------------------|---------|
| Age, year | 52.9 ± 12.6 | 52.8 ± 12.3 | 53.3 ± 14.3 | 0.824 |
| Male gender, n (%) | 195 (78.9%) | 157 (77.3%) | 38 (86.4%) | 0.183 |
| Body mass index, kg/m ² | 25.2 ± 3.6 | 25.2 ± 3.8 | 25.3 ± 2.8 | 0.839 |
| Urgent operation, n (%) | 7 (2.8%) | 6 (3.0%) | 1 (2.3%) | 1.000 |
| Hypertension, n (%) | 180 (72.9%) | 146 (71.9%) | 34 (77.3%) | 0.469 |
| Smoking, n (%) | 125 (50.6%) | 103 (50.7%) | 22 (50%) | 0.929 |
| Alcohol use, n (%) | 70 (28.3%) | 61 (30%) | 9 (20.5%) | 0.200 |
| Prior cerebrovascular accident, n (%) | 36 (14.6%) | 27 (13.3%) | 9 (20.5%) | 0.223 |
| Hyperlipidemia, n (%) | 23 (9.3%) | 18 (8.7%) | 5 (11.3%) | 0.818 |
| Diabetes, n (%) | 12 (4.9%) | 10 (4.9%) | 2 (4.5%) | 1.000 |
| Congestive heart failure, n (%) | 3 (1.2%) | 2 (1.0%) | 1 (2.2%) | 0.446 |
| Chronic kidney disease, n (%) | 2 (0.8%) | 2 (1.0%) | 0 (0) | 0.532 |
| COPD, n (%) | 2 (0.8%) | 2 (1.0%) | 0 (0) | 1.000 |
| Lower extremity ischemia, n (%) | 6 (2.4%) | 3 (1.5%) | 3 (6.8%) | 0.122 |
| Superior mesenteric ischemia, n (%) | 3 (1.2%) | 2 (1.0%) | 1 (2.2%) | 0.456 |

Values are expressed as mean ± standard deviation, or n (%). COPD, chronic obstructive pulmonary disease

Anesthesia Data

| Variable | Whole series (n = 247) | Local anesthesia (n = 203) | General anesthesia (n = 44) | P value |
|--------------------------------|---------------------------|-------------------------------|--------------------------------|---------|
| ASA classification IV, n (%) | 197 (79.8%) | 159 (78.3%) | 35 (79.5%) | 0.430 |
| Anesthesia start | | | | |
| heart rate, bpm | 76.1 ± 10.3 | 76.8 ± 10.6 | 73.0 ± 8.4 | 0.026 |
| systolic blood pressure, mmHg | 132.0 ± 20.0 | 134.1 ± 20.3 | 122.5 ± 15.5 | <0.001 |
| diastolic blood pressure, mmHg | 75.2 ± 13.3 | 75.9 ± 13.6 | 71.5 ± 11.6 | 0.044 |
| During anesthesia | | | | |
| heart rate, bpm | 73.2 ± 13.8 | 73.7 ± 14.5 | 70.7 ± 10.2 | 0.186 |
| systolic blood pressure, mmHg | 122.1 ± 17.0 | 122.9 ± 17.4 | 118.6 ± 14.2 | 0.129 |
| diastolic blood pressure, mmHg | 68.2 ± 9.3 | 68.8 ± 9.2 | 65.3 ± 9.3 | 0.024 |
| End of anesthesia | | | | |
| Visual analog scale (0-10) | NA | 1.2 ± 0.4 | 0 | NA |
| Ramsay sedation scale (0-6) | NA | 3.2 ± 0.5 | 6 | NA |

Values are expressed as mean ± standard deviation, or median (interquartile range), or n (%)
 ASA, American Society of Anesthesiologists; NA, not applicable

Procedural Details

| Variable | Whole series (n = 247) | Local anesthesia (n = 203) | General anesthesia (n = 44) | P value |
|---|---------------------------|-------------------------------|--------------------------------|---------|
| Time of anesthesia, min | 93.3 ± 52.6 | 84.0 ± 26.5 | 136.3 ± 101.1 | 0.001 |
| Time of procedure, min | 74.3 ± 50.9 | 65.5 ± 25.6 | 114.8 ± 98.6 | 0.002 |
| Intraoperative fluid infusion, mL | 607 ± 362 | 515 ± 156 | 1032 ± 642 | <0.001 |
| Intraoperative bleeding, mL | 20 (0 – 65) | 20 (0 – 50) | 52.5 (41 – 99) | <0.001 |
| Conversion to general anesthesia, n (%) | 0 (0) | 0 (0) | NA | NA |
| Size of stent graft, mm | 32.9 ± 2.8 | 32.9 ± 2.7 | 33.0 ± 3.2 | 0.813 |
| Length of stent graft, mm | 190.8 ± 16.8 | 190.5 ± 17.1 | 192.3 ± 15.1 | 0.525 |
| Number of aortic zones covered, n (%) | | | | 0.360 |
| ≤2 zones | 189 (76.5%) | 153 (75.4%) | 36 (81.8%) | |
| 3-5 zones | 58 (23.5%) | 50 (24.6%) | 8 (18.2%) | |

Values are expressed as mean ± standard deviation, or median (interquartile range), or n (%)

NA, not applicable

Early Outcomes

| Variable | Whole series (n = 247) | Local anesthesia (n = 203) | General anesthesia (n = 44) | P value |
|------------------------------------|---------------------------|-------------------------------|--------------------------------|---------|
| Intraoperative endoleak, n (%) | 10 (4.0%) | 6 (3.0%) | 4 (9.1%) | 0.147 |
| Operative mortality, n (%) | 5 (2.0%) | 2 (1.0%) | 3 (6.8%) | 0.041 |
| Stroke, n (%) | 3 (1.2%) | 1 (0.5%) | 2 (4.5%) | 0.083 |
| Spinal cord ischemia, n (%) | 2 (0.8%) | 1 (0.5%) | 1 (2.2%) | 0.325 |
| Acute kidney injury, n (%) | 2 (0.8%) | 2 (1.0%) | 0 (0) | 1.000 |
| Limb ischemia, n (%) | 4 (1.6%) | 2 (1.0%) | 2 (4.5%) | 0.147 |
| Early reintervention, n (%) | 2 (0.8%) | 2 (1.0%) | 0 (0) | 1.000 |
| Need for additional surgery, n (%) | 3 (1.2%) | 1 (1.0%) | 2 (4.5%) | 0.083 |
| Other complications, n (%) | 7 (2.8%) | 4 (2.0%) | 3 (6.8%) | 0.209 |
| Length of ICU stay, hour | 4 (2.2 – 23) | 3 (2 – 20) | 31 (22 – 47.5) | 0.001 |
| Length of stay, day | 23.7 ± 10.8 | 22.8 ± 10.5 | 27.9 ± 11.5 | 0.040 |

Values are expressed as n (%), or mean ± standard deviation, or median (interquartile range)

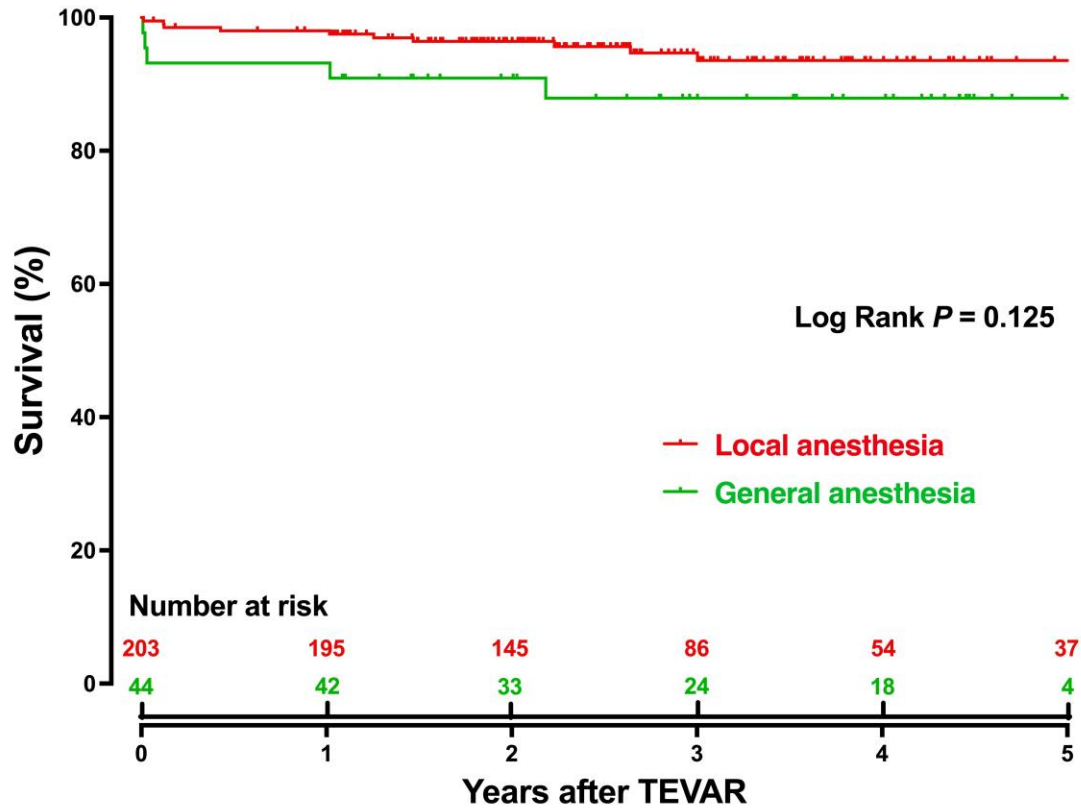
Late Outcomes

| Variable | Whole series (n = 242) | Local anesthesia (n = 201) | General anesthesia (n = 41) | P value |
|---|---------------------------|-------------------------------|--------------------------------|--------------|
| Duration of follow-up, year | 3.2 ± 1.8 | 3.2 ± 1.8 | 3.3 ± 1.5 | 0.569 |
| Late death | 10 (4.1%) | 8 (4.0%) | 2 (4.9%) | 0.227 |
| <i>Late adverse events, n (%)</i> | | | | |
| endoleak | 4 (1.7%) | 3 (2.3%) | 1 (3.8%) | 1.000 |
| retrograde type A dissection | 4 (1.7%) | 2 (1.6%) | 2 (7.7%) | 0.134 |
| distal aortic dilatation | 11 (4.5%) | 7 (5.5%) | 4 (15.4%) | 0.095 |
| Late reintervention, n (%) | 5 (2.1%) | 2 (1.6%) | 3 (7.3%) | 0.035 |
| <i>Kaplan-Meier estimates at 5 years</i> | | | | |
| Survival, % | 91.8 (85.7 – 95.4) | 93.6 (88.0 – 96.7) | 87.9 (73.1 – 94.8) | 0.125 |
| Freedom from adverse events, % | 83.9 (74.8 – 90.0) | 89.0 (80.2 – 94.0) | 62.4 (31.4 – 82.5) | 0.015 |

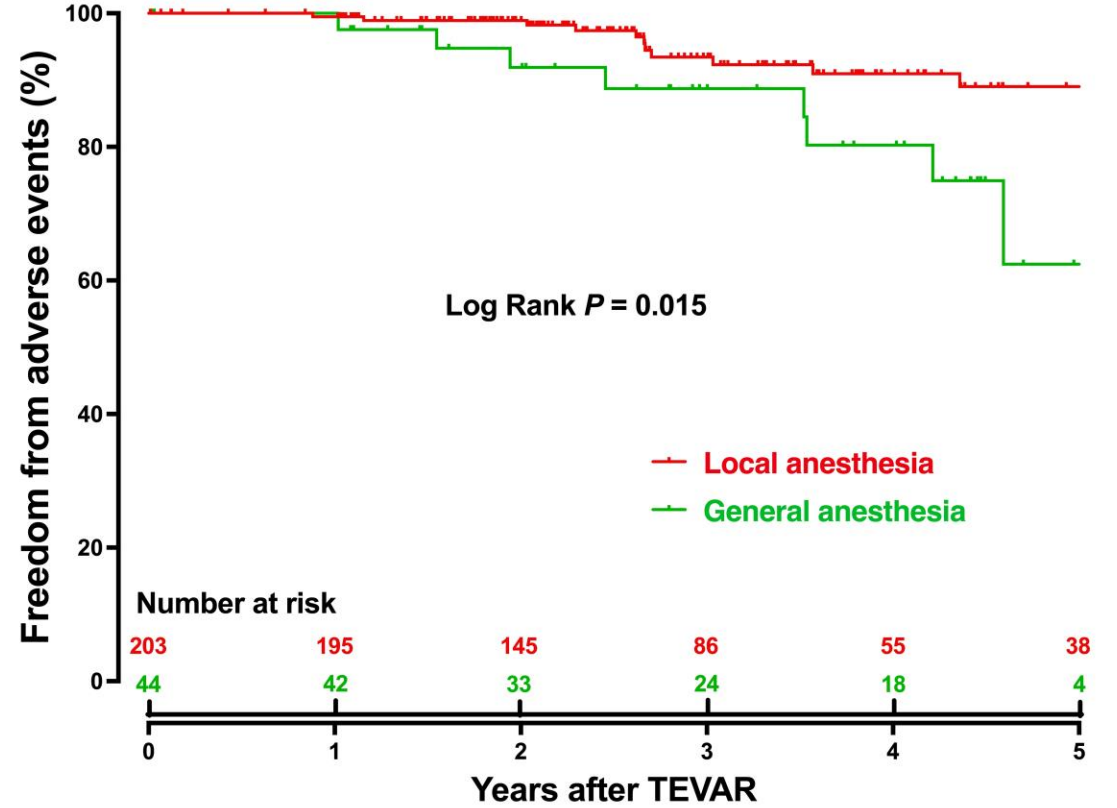
Values are expressed as mean ± standard deviation, or n (%), or % (95% confidence interval) for Kaplan-Meier estimates

Time-to-Event Outcomes

Survival: Local vs General Anesthesia



Late Adverse Events: Local vs General Anesthesia



Late adverse events was a composite of endoleak, retrograde type A dissection, and distal aortic dilation

Predictors of Death and Late Adverse Events

| Endpoint / Risk factor | Hazard ratio | 95% confidence interval | P value |
|---|--------------|-------------------------|---------|
| <i>All-cause mortality</i> (n = 15) | | | |
| anesthesia (local vs general) | 0.365 | 0.120 – 1.110 | 0.076 |
| size of stent graft, mm | 1.228 | 1.035 – 1.457 | 0.019 |
| 3-5 zones covered vs ≤ 2 zones covered | 3.540 | 1.238 – 10.128 | 0.018 |
| <i>Late adverse events</i> (n = 19) | | | |
| anesthesia (local vs general) | 0.242 | 0.089 – 0.656 | 0.005 |
| 3-5 zones covered vs ≤ 2 zones covered | 2.965 | 1.032 – 8.522 | 0.044 |

Late adverse events was a composite endpoint consisting of endoleak, retrograde type A dissection, and distal aortic dilation

Conclusions

- In this series of patients with acute type B dissection, TEVAR under local anesthesia achieved shorter time of anesthesia and procedure, less physiological disturbance and blood loss compared to TEVAR under general anesthesia
- TEVAR under local anesthesia was also associated with lower early mortality, shorter length of ICU and hospital stay, and fewer late reinterventions and adverse events compared to general anesthesia
- These results suggest that the use of local anesthesia should be considered more frequently in selected patients with ATBAD undergoing TEVAR