# ENDOVASCULAR STENT-GRAFTING FOR TREATMENT OF DESCENDING THORACIC AORTIC ANEURYSM: SOME INITIAL RESULTS

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**ABSTRACT**

***Objective:*** *To evaluate the results of stent-grafting for treatment of descending thoracic aortic aneurysm (dTAA).*

***Method:*** *prospective case series.*

***Results:*** *From April 2014 to April 2016, 30 patients with dTAA treated by endovascular surgery at Cho Ray hospital. Average age was 65.7 ± 11.4, oldest patient is 87 years old, youngest patient was 41 years old, 73.3% of patients is male. Chest pain 50%, hoarseness 16.7%. 63.3% supra-aortic arteries debranching (total debranching 16.7%, left subclavian-carotid artery transposition 46.6%). Left subclavian artery coverage 3.3%. Average operative time 151 ± 73.1 minutes. Stent-graft deployment success rate was 100%. Perioperative complication rate 3.3%. Perioperative mortality rate 3.3% due to respiratory failure. Average follow-up time was 12 ± 1.8 months. Endoleak Ia 3.4%, migration 3.4%, lower limb paraplegia 3.4%, follow-up mortality rate 6.9% due to aneurysm rupture.*

***Conclusion****: Endovascular surgery for treatment of dTAA has good results. Mortality and complications rate are low. Long-term result: need further evaluation.*

***Key words:*** *Stent graft, descending thoracic aortic aneurysm, artery debranching.*

## I. BACKGROUND

Open surgery in thoracic aortic aneurysm treatment is really still a big challenge for surgeons worldwide. The perioperative mortality and paraplegia rates in emergency surgery are 25 - 35% and 10 - 12.5%, in elective surgery are 2.8 - 12% and 2.8% - 5%.

In 15 recent years, the treatment of thoracic aortic aneurysm has undergone significant changes due to development of endovascular intervention. In 1987, Volodos performed the first case endograft treatment of thoracic aortic aneurysm in the world [3]. In 1994, Dake performed the first case to treat thoracic aortic aneurysm in the United States. This study was carried out to evaluate the initial results of endovascular intervention in thoracic aortic aneurysm treatment in Cho Ray hospital.

## II. METHODS

From April 2014 to April 2016, 30 patients with dTAA were selected in our prospective case series study. Our selective criteria are aneurysm diameter greater than 5.5 cm, symtomatic aneurysm, saccular aneurysm, aneurysm diameter growth above more than 0.5 cm in 6 months. Patients were excluded when having previous thoracic aortic endovascular or aortic dissection.

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*Preoperative assessment:* We collected clinical signs and symptoms, medical history, risk factors, morphology aneurysm: proximal, distal landing zone length and diameter, vascular access.

*Intraoperative asssessment:* General or local anesthesia, supra-aortic arteries debranching, procedure duration, complications such as aortic rupture, dissection, vascular access injury, distal emboli.

*Planned postoperative evaluation included complications such as:* mortality, stroke, myocardial infarction, heart failure, renal failure and technical-related : endoleak, migration, stent graft fracture, aneurysm rupture.

## III. RESULTS

### 3.1. Sample study characteristics

Male: 22 (73.3%) and female: 8 (26.7%). Average age was 65.7 ± 11.4, oldest was 87 y.o and youngest was 41 y.o.

Table 3.1 : Risk factors

| Risk factors | Number (n) | % |
|---|---|---|
| Hypertension | 27 | 90.0 |
| Dyslipidemia | 9 | 30.0 |
| CAD | 7 | 23.3 |
| Renal failure | 2 | 6.7 |
| CVA | 2 | 6.7 |
| COPD | 1 | 3.3 |
| Heart failure | 1 | 3.3 |
| Diabetes | 1 | 3.3 |

Table 3.2: Preoperative clinical symptoms

| Symptoms | Number (n) | % |
|---|---|---|
| Chest pain | 15 | 50.0 |
| Hoarseness | 5 | 16.7 |
| Abdominal pain | 1 | 3.3 |
| Dry cough | 1 | 3.3 |

### 3.2. Descending thoracic aortic aneurysm morphology characteristics

There were 20 case with fusiform dTAA (66.7%) and 2 patients with ruptured aneurysm Average aneurysm diameter was 64.63 ± 17.62 mm. The maximal aneurysm was 114 mm and minimal 38 mm (a saccular case). Average proximal sealing zone length was 28.06 ± 7.28 mm. All of patients have distal landing zone length greater than 20 mm. Proximal sealing zone diameter was 31.31 ± 4.01 mm.

### 3.3. Procedure and perioperative features

29 cases were elective (96.7%) and 1 case emergency due to aneurysm rupture. 76.7% cases were general anesthesia. 19 cases were perfomed supra-aortic arteries debranching in order to have appropriate sealing zone, in which 5 cases needed to have total debranching, 14 cases needed to have left carotid and left subclavian artery debranching. 1 case was intended left subclavian artery coverage.

Table 3.3 : Intraoperative and perioperative characteristics

| Characteristics | Average | Maximum | Minimum |
|---|---|---|---|
| Procedure duration (min) | 151 ± 73.1 | 450 | 60 |
| Number of graft | 1.53 ± 0.68 | 3 | 1 |
| Blood loss volume (ml) | 152.67 ± 173 | 1000 | 20 |
| Contrast volume (ml) | 94.8 ± 35.6 | 153 | 45 |
| Postoperative in-hospital stay (day) | 9.38 ± 6.52 | 30 | 1 |

### 3.4. 30-day postoperative results

Table 3.4: Intraoperative results

| Results | Number | Rate% |
|---|---|---|
| Successful deployment | 30 | 100 |
| Transfer to open surgery | 0 | 0 |
| Death | 0 | 0 |
| Complications | | |
| * Aortic rupture | 0 | 0 |
| * Aortic dissection | 0 | 0 |
| * Vascular access injury | 1 | 3.3 |
| * Carotid artery coverage | 0 | 0 |
| * Visceral artery coverage | 0 | 0 |

Table 3.5 : Perioperative mortality and complication rates

| Severe complications | Number | Rate % |
|---|---|---|
| Death | 1 | 3.3 |
| Myocardial infarction | 0 | 0 |
| Renal failure | 0 | 0 |
| Respiratory failure | 1 | 3.3 |
| Stroke | 0 | 0 |
| Paraplegia | 0 | 0 |
| Aneurysm rupture | 0 | 0 |
| Re-intervention | 0 | 0 |

In 30 – day postoperative, there was 1 patient died at day 2 because of respiratory failure, pneumothorax. Within 30 cases of successful deployment, there were 3 cases with endoleak type I (10%), 1 case endoleak type II (3.3%) and 1 case (3.3%) vascular access injury. No cases of migration, graft occlusion and carotid artery coverage were detected.

Table 3.6 : Perioperative results

| Results | N | Rate % |
|---|---|---|
| Successful | 29 | 96,7 |
| Unsuccessful | 1 | 3,3 |

### 3.5. Short-term results

Successful : 27 cases, 93.1%.

Unsuccessful : 2 cases, 6.9 % (2 patient died due to aneurysm rupture and type I endoleak).

## IV. DISCUSSION

In the study, 1 case was intervened urgently within 24 hours because of aneurysm rupture. 29 cases were elective interventions. This shows that endografting can be performed in any situation, whether emergent or elective intervention. The perioperative mortality rate of emergent open surgery for dTAA was 35-50%. Meanwhile, according to the results of many studies, the mortality rate of endografting has dropped from 4.3-17.1% [1].

In the treatment of dTAA, a common issue is supra-aortic arteries debranching. Debranching is mandatory if proximal neck length is less than 20 mm to create appropriate sealing zone. Our study has a higher rate of debranching than Glade, Bavaria, Matsumura due to the selective criteria of these studies, including those with proximal neck length at least 20 mm from left subclavian artery. There were 20 cases with proximal neck length less than 20 mm in our study. Supra-aortic debranching was performed in 19 cases and left subclavian artery coverage in 1 case. Of these, 14 cases were performed by left subclavian-carotid artery transposition and 5 cases by total debranching. The prevalence of left

subclavian artery coverage without debranching in our study was 3.3%. In endografting intervention, if sealing zone is located in zone 2, left subclavian artery coverage can be performed without left subclavian-carotid artery transposition. According to 2009 SVS Guidelines, if sealing zone is located in zone 2, left subclavian artery transposition should be performed routinely.

However, in the case of high surgical risk and the need for emergency intervention, left subclavian artery coverage is acceptable despite the high risk of stroke and left upper limb ischemia [4], [5], [6].

In our study, the perioperative mortality rate was 3.3%. Causes of death were defined as respiratory failure, pneumothorax, pneumomediastinum due to tracheal injury. Although our sample number is small, this finding also suggests that endografting in dTAA treatment has resulted in low perioperative mortality rate, as have some studies in the world. In 30-day postoperative, there were no complications such as myocardial infarction, renal failure requiring hemodialysis, stroke, lower limbs paraplegia. In open surgery, the rate of postoperative myocardial infarction is quite high from 10-23% due to complication of thoracic aorta clamping.

The purpose of endografting intervention for treatment of dTAA is to prevent aneurysm rupture, because of high mortality of this complication However, after successful intervention within 30 days, there was still an incidence of aneurysm rupture. Our study recorded 6.9% cases of aneurysm rupture. The incidence of aneurysm rupture in short-term and mid-term follow-up in many studies in the world was 2-10%, which was not statistically significant compared to open surgery. The most common cause of late aneurysm rupture is type I and type III endoleak.

## V. CONCLUSION

Endovascular surgery for treatment of dTAA has good results. Mortality and complications rate are low. Long-term result needs further evaluation.

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