

Machine learning to predict outcomes of type B aortic dissection patients following thoracic endovascular aortic repair

Submission date 12/04/2025	Recruitment status No longer recruiting	<input type="checkbox"/> Prospectively registered <input type="checkbox"/> Protocol
Registration date 17/04/2025	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 16/04/2025	Condition category Circulatory System	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Thoracic endovascular aneurysm repair (TEVAR) in patients with type B aortic dissection (TBAD) may entail postoperative risks. Nevertheless, there is no adopted predictive tool for assessing patients' outcomes. This study seeks to employ machine learning (ML) to develop a predictive model that predicts 1-year mortality following TEVAR. This study aimed to construct a predictive model for 1-year mortality in TBAD patients utilizing ML methodologies. The study's significance is underscored by its potential to facilitate timely interventions and treatments, thereby contributing to a reduction in the mortality rate among TBAD patients.

Who can participate?

Patients diagnosed with TBAD at Changhai Hospital (Shanghai, China) from January 2011 to June 2023.

What does the study involve?

This retrospective cohort study included TBAD patients who underwent TEVAR between January 2011 and June 2023. A total of 57 preoperative demographic variables were considered as input features. The primary outcome was all-cause mortality at one year. Data were split into training (70%) and test (30%) sets. Five machine learning models were developed to predict outcomes, with the area under the curve (AUC) serving as the primary metric for model evaluation. Shapley Additive Explanations (SHAP) were utilized to assess the significance of the clinical features in the output model.

What are the possible benefits and risks of participating?

No benefits and risks provided at registration

Where is the study run from?

Department of Vascular Surgery, Changhai Hospital of the Navy Medical University, China

When is the study starting and how long is it expected to run for?

July 2020 to June 2023

Who is funding the study?
The National Natural Science Foundation of China, China

Who is the main contact?
Prof Jian Zhou, zhoujian1_3@163.com

Contact information

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Additional identifiers

Protocol serial number

National Natural Science Foundation of China ref: 82270513

Study information

Scientific Title

Construction and evaluation of an early warning model for prognostic adverse events in acute aortic dissection

Study objectives

This study aimed to construct a predictive model for 1-year mortality in TBAD patients utilizing ML methodologies. The study's significance is underscored by its potential to facilitate timely interventions and treatments, thereby contributing to a reduction in the mortality rate among TBAD patients.

Ethics approval required

Ethics approval required

Ethics approval(s)

approved 24/08/2020, Shanghai Changhai Hospital Ethics Committee (No.168, Changhai Road, Yangpu District, Shanghai, 200433, China; +86-21-31162338; changhaiec@126.com), ref: CHEC-Y2020-042

Study design

Observational single-center retrospective cohort study

Primary study design

Observational

Study type(s)

Prevention, Treatment

Health condition(s) or problem(s) studied

Prediction of 1-year all-cause mortality in thoracic aortic dissection (TBAD) patients undergoing thoracic endovascular aortic repair (TEVAR)

Interventions

This retrospective cohort study evaluates thoracic aortic dissection (TBAD) patients who underwent thoracic endovascular aortic repair (TEVAR) between January 2011 and June 2023. A total of 57 preoperative demographic variables are considered as input features. The primary outcome focuses on all-cause mortality at one year. Data are split into training (70%) and test (30%) sets. Five machine learning models are developed to predict outcomes, with the area under the curve (AUC) serving as the primary evaluation metric. Shapley Additive Explanations (SHAP) are utilized to assess the clinical significance of features in the final model.

Intervention Type

Procedure/Surgery

Primary outcome(s)

1-year all-cause mortality measured using data collected from a retrospective cohort thoracic aortic dissection (TBAD) patients who underwent thoracic endovascular aortic repair (TEVAR) between January 2011 and June 2023 at one timepoint

Key secondary outcome(s)

There are no secondary outcome measures

Completion date

01/06/2023

Eligibility**Key inclusion criteria**

Patients diagnosed with TBAD at Changhai Hospital (Shanghai, China) from January 2011 to June 2023.

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Not Specified

Lower age limit

18 years

Upper age limit

110 years

Sex

All

Total final enrolment

1335

Key exclusion criteria

1. Cases of traumatic aortic injury and iatrogenic aortic dissection
2. The presence of Turner syndrome, Marfan syndrome, Ehlers-Danlos syndrome, bicuspid aortic valve, giant cell arteritis, ankylosing spondylitis, Behçet's disease, or Takayasu arteritis
3. A history of previous aortic surgical interventions
4. A documented history of malignancy
5. A lack of baseline data

Date of first enrolment

24/08/2020

Date of final enrolment

01/06/2023

Locations

Countries of recruitment

China

Study participating centre

Department of Vascular Surgery, Changhai Hospital of the Navy Medical University

No. 168, Changhai Road, Yangpu District

Shanghai

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Sponsor information

Organisation

Changhai Hospital

ROR

<https://ror.org/02bjs0p66>

Funder(s)

Funder type

Government

Funder Name

National Natural Science Foundation of China

Alternative Name(s)

Chinese National Science Foundation, Natural Science Foundation of China, National Science Foundation of China, NNSF of China, NSF of China, National Nature Science Foundation of China, Guójiā Zìrán Kēxué Jījīn Wěiyuánhùi, , NSFC, NNSF, NNSFC

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

China

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and analysed during the current study will be available upon request from the corresponding author, Prof Jian Zhou, zhoujian1_3@163.com

IPD sharing plan summary

Available on request