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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

Registration date
17/04/2025

Overall study status
Completed

Last Edited
16/04/2025

Condition category
Circulatory System

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] 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

Type(s)
Principal investigator

Contact name
Prof Jian Zhou

Contact details
No. 168, Changhai Road, Yangpu District
Shanghai
China
200433
+86 13818896067
zhoujian1_3@163.com

Type(s)
Scientific

Contact name
Dr Kaiwen Zhao

Contact details
No. 168, Changhai Road, Yangpu District
Shanghai
China
200433
+86 15821678296
zkwgly@163.com

Type(s)
Public

Contact name
Ms Shuangshuang Li

Contact details
No. 225, Changhai Road, Yangpu District
Shanghai
China
200438
+86 13611826460
lishuangshuangfy@163.com

Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

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
China
200433

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 Wěiyuánhuì, , 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