Study plan

Transatlantic Registry of Type A Aortic Dissection (TARTAAD): Rationale, Design and Definition Criteria

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Glossary

CKD-EPI = Chronic Kidney Disease Epidemiology Collaboration

CSHA = Canadian Study of Health and Aging

E-CABG = European Coronary Artery Bypass Grafting registry

EKFC= European Kidney Function Consortium

TARTAAD = European Registry of Type A Aortic Dissection

KDIGO = Kidney Disease: Improving Global Outcomes

RBC = Red Blood Cell

TAAD = Type A Aortic Dissection

TARTAAD = Transatlantic Registry of Type A Aortic Dissection

Background

Acute Stanford type A aortic dissection (TAAD) is a life-threatening condition. Surgery is usually performed as an emergency or salvage procedure and is associated with increased postoperative early mortality and morbidity (1). Although early mortality has declined during the last years (2), it remains significant in the Western countries. The Nordic Consortium for Acute Type A Aortic Dissection registry including 1189 patients operated from 2005 to 2015 in 8 centers showed that 30-day mortality after surgery for acute TAAD was 18% (3). The multicenter, prospective German Registry for Acute Aortic Dissection Type A including 2137 TAAD patients operated from 2006 and 2010 documented a 30-day mortality of 16.9% (4). A more recent analysis of the Society of Thoracic Surgeon database including 7353 patients operated from 2014 and 2017 for acute TAAD reported a 30-day mortality of 17% (5). Furthermore, surgery for TAAD is often complicated by major adverse events such as stroke (5) and acute kidney failure (6), which may have a significant impact on late survival. In this scenario of significant postoperative mortality and morbidity, surgeons face the controversial issue of the extent of surgical repair for acute TAAD by avoiding a major surgical repair with its possible increased risk of early adverse events. However, limited aortic repair may expose the patient to the risk of late complications at the level of the aortic root (7), the aortic arch and/or the downstream aorta (8). We planned the multicenter Transatlantic Registry of Type A Aortic Dissection (TARTAAD) for a thoroughly evaluation of the early and late outcomes of acute TAAD after different surgical and perfusion strategies in patients operated at several European and North American cardiac surgery centers.

Methods

The TARTAAD is an observational registry, and its data will be retrospectively collected from centers of cardiac surgery located in European and North American countries. Data on consecutive patients with acute TAAD will be collected into a Microsoft Access datasheet (Redmond, Washington, USA) with pre-specified baseline, operative and outcome variables. The study population will be comprised of consecutive patients who underwent surgery for acute TAAD from January 1, 2010 to December 31, 2024. Permission to conduct this study has been granted the Ethics Committee of the Helsinki University Hospital, Helsinki, Finland (date May 21, 2025; diary number HUS/95/2025-9) and it will be asked from the institutional or national review board of each participating center according to its legislation.

Inclusion Criteria

- TAAD or intramural hematoma involving the aortic root/ascending aorta;
- Patients aged > 18 years:
- Symptoms started within **7** days before surgery;
- Primary surgical repair of acute TAAD;
- Any other major cardiac surgical procedure concomitant with surgery for TAAD.

Exclusion Criteria

- Patients aged < 18 years;
- Onset of symptoms > **7** days from surgery;
- Prior procedure for TAAD;
- Type non-A non-B aortic dissection;
- Retrograde TAAD (with primary tear located in descending aorta);

- Concomitant endocarditis;

- TAAD secondary to blunt or penetrating chest trauma.

Clinical and Operative Variables and Their Definition Criteria

Onset of symptoms to surgery

It refers to the time (in hours) between the onset of symptoms associated with TAAD and the start of surgery.

Estimated distance to hospital

Distance (in km) between the place where patients experience onset of symptoms associated with TAAD and the hospital where primary surgery was performed.

Nighttime surgery

It refers to a procedure which started between 20:00-08:00.

Preoperative laboratory parameters

Data on preoperative levels of creatinine (in micromol/L), hemoglobin (in g/L), platelet count (x10/L) and arterial lactate (in mmol/L) as measured immediately before the start of surgery.

Preoperative parameters of myocardial ischemia

Coronary malperfusion will be defined according to preoperative increased levels of troponin/CK-MB and/or ECG changes of myocardial ischemia. When cardiac biomarkers are measured, this information will be gathered.

Renal function

Baseline renal function will be classified according to the estimated glomerular filtration rate (eGFR) calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation (9) and the European Kidney Function Consortium (EKFC) equation (10). The severity of renal failure will be classified in different stages as listed in Table 1.

Table 1. Stages of chronic kidney disease.

Stages	**eGFR (mL/min/1.73 m^2)**
1	≥90
2	60-89
3a	45-59
3b	30-44
4	15-29
5	<15 or dialysis

eGFR, estimated glomerular filtration rate.

Genetic syndromes

Genetic syndromes may lead to aortopathies and TAAD (11). Information on any specific genetic syndrome associated with TAAD will be collected in this registry.

Family history of aortic dissection and aneurysm

It refers to dissection and/or aneurysm involving any segment of the aorta in first or second-degree relatives.

Prior aortic surgery

Any open surgery or endovascular repair on any segment of the aorta. Details on the type of procedure will be collected.

Prior cardiac surgery

Any prior surgery on any structure of heart. Details on the type of procedure will be collected.

Iatrogenic TAAD

TAAD secondary to any surgical or endovascular procedure performed within a week before surgery. Details on the timing and type of procedure will be collected.

Preoperative antithrombotic drugs

Exposure to any of the following antithrombotic drugs within 2 days from surgery: aspirin, clopidogrel, ticagrelor, prasugrel, ticlopidine, low-molecular weight heparin, unfractionated heparin, fondaparinux, direct oral anticoagulants and/or warfarin. When data on preoperative antithrombotic drugs were not available, this will be reported in the datasheet.

Arterial hypertension

Systemic arterial pressure > 150/80 mmHg or use of antihypertensive drugs.

Diabetes

Hyperglycemia requiring treatment with insulin or oral drugs.

Prior stroke

Any preoperative focal or global neurological syndrome caused by ischemia or hemorrhage not resolving within 24 h. It refers to a neurological event occurring any time, but excluding those acute neurological events related to TAAD.

Prior transient ischemic attack

Any preoperative focal or global neurological syndrome caused by ischemia or hemorrhage resolving within 24 h. It refers to a neurological event occurring any time, but excluding those acute neurological events related to TAAD.

Pulmonary disease

Use of bronchodilators and/or steroids for lung diseases (12).

Extracardiac arteriopathy

One or more of the following: lower limb claudication, critical limb ischemia, carotid occlusion or >50 % stenosis, major amputation for arterial disease, previous or planned intervention on the abdominal aorta or on the extremities or carotid arteries (12).

Prior myocardial infarction

History of myocardial infarction excluding to those events (coronary malperfusion) related to TAAD.

Prior percutaneous coronary intervention

History of percutaneous coronary intervention any time before surgery excluding those procedures resulting in iatrogenic TAAD.

Critical preoperative state

Critical preoperative state will be defined as one of the following conditions: 1) preoperative external cardiac massage any time before surgery, 2) cardiogenic shock requiring inotropes any time before surgery, 3) preoperative invasive mechanical ventilation before admission to the anesthetic/operating room and 4) preoperative acute renal failure (anuria or oliguria <10ml/hr) (12). Data on each of these conditions will be collected.

Urgency of the procedure

Urgency of the procedure will be classified in five categories whose definition criteria are summarized in Table 2.

Table 2. Urgency of the procedure.

Urgency	**Definition**
Urgent	Scheduled procedure performed in a patient with stable conditions during the index hospitalization
Emergency grade 1	Emergency procedure performed in a patient with stable conditions before the beginning of the next working day after decision to operate
Emergency grade 2	Emergency procedure performed for hemodynamic instability requiring inotropes before the beginning of the next working day after decision to operate – no cardiopulmonary resuscitation with external cardiac massage
Salvage grade 1	Salvage procedure: patients requiring cardiopulmonary resuscitation with cardiac massage between induction of anesthesia and initiation of cardiopulmonary bypass
Salvage grade 2	Salvage procedure: patients requiring cardiopulmonary resuscitation with external cardiac massage *en route* to the operating theatre or prior to induction of anesthesia

Penn Classification

The Penn Class of each patient will be derived considering the components of this risk classification (15).

Neurological status immediately before procedure

Data on derangements of neurological status such as unconsciousness before sedation, hemiplegia/hemiparesis, paraplegia/paraparesis, dysarthria/aphasia, vision disturbances, visuospatial neglect (individual fails to detect stimuli on a space that is contralateral to a hemispheric lesion), severe confusion, or intubated/sedated at arrival will be reported as separate variables.

Malperfusion

Malperfusion refers to acute organ ischemia secondary to aortic branch vessel hypoperfusion. This severe condition is usually classified based on clinical signs and symptoms (15,16). Herein, myocardial malperfusion will be defined as any changes in ST level in electrocardiogram and/or an increase in cardiac enzymes. Cerebral malperfusion will be defined as signs and symptoms related to acute preoperative stroke or cerebral hypoperfusion. Spinal malperfusion will be defined as acute paraparesis/paraplegia. Mesenteric malperfusion will be as sudden, mild-to-severe abdominal pain with or without nausea and vomiting, which is accompanied by rectal bleeding or bloody diarrhea in case of colon ischemia (17). Renal malperfusion will be defined as anuria/oliguria. Peripheral

malperfusion will be defined as loss of pulse with or without sensory or motor deficits of any limb.

Preoperative computed tomography findings

Preoperative computed tomography scans will be reviewed for evaluation of the extent of aortic dissection/intramural hematoma in different segments of the aorta and its branches. Dissection of the aortic branches will be defined as any intimal flap at the origin of the artery causing stenosis of any severity. This applies also to aortic branches perfused through the false lumen.

Data on maximal diameter of the aortic root, ascending aorta, aortic arch, descending aorta and abdominal aorta will be collected.

Intramural hematoma

Intramural hematoma is defined as a contained aortic wall hematoma within the media, but **without intimal flap formation**. Patients with intramural hematoma and concomitant intimal flap in any segment of the aorta will be classified as having typical aortic dissection.

Heart valve status and left ventricular function

Data from preoperative echocardiographic evaluation of the aortic valve, mitral valve and left ventricular function will be collected.

Arterial and venous cannulation sites

It refers to the primary cannulation sites. Any switch to other cannulation site before initiation of cardioplegia will be described.

Intraoperative findings

Data on the intraoperative findings of the pericardium, ascending aorta and aortic arch will be collected. The extent of aortic dissection at the level of the Valsalva sinuses and morphology of the aortic valve will be described. Injury of the coronary ostia will be classified as spontaneous when related only to dissection or iatrogenic when related to the procedure. Injury of the coronary ostia can be both spontaneous and iatrogenic.

Surgical repair

Data on the type of aortic root/ascending aorta and aortic arch surgical repair will be collected along with data on any major concomitant cardiac surgery procedure. Details of the level of aortic anastomosis and suture techniques will be documented.

Cardiopulmonary bypass parameters

Data on duration of myocardial ischemia, cardiopulmonary bypass, hypothermic circulatory arrest and retrograde or antegrade cerebral perfusion will be collected. When multiple periods of perfusion or organ ischemia have occurred, the total length of these periods will be reported. The lowest temperature during hypothermic circulatory arrest will be documented. Hypothermic circulatory arrest will be defined as the duration of discontinuation of systemic perfusion independently of the use and duration of antegrade or retrograde cerebral perfusion. Many colleagues may not agree with this definition criterion. However, this definition may be helpful from a statistical point of view to identify different perfusion strategies. The use and duration of antegrade or retrograde cerebral perfusion will be of help to further identify different strategies used at each participating center.

Outcomes and Their Definition Criteria

Intraoperative death

Death occurred in the operating room at the end of the index procedure.

Hospital death

All-cause death having occurred during the index hospitalization, i.e., at the institution where surgery for TAAD was performed.

Stroke

Acute episode of a focal or global neurological deficit with at least one of the following: change in the level of consciousness, hemiplegia, hemiparesis, numbness, or sensory loss affecting one side of the body, dysphasia or aphasia, hemianopia, amaurosis fugax, or other neurological signs or symptoms consistent with stroke duration of a focal or global neurological deficit ≥ 24 h; OR <24 h if available neuroimaging documents a new brain hemorrhage or infarct; OR the neurological deficit results in death (17). Stroke will be classified as ischemic, hemorrhagic or both.

Global brain ischemia

Diffuse hypoxic damage as diagnosed at brain imaging and electroencephalography.

Paraplegia/paraparesis

Bilateral weakness and/or multimodality sensory disturbance below the level of the ischemic spinal lesion.

Mesenteric ischemia

Abdominal pain with or without nausea and vomiting and rectal bleeding or bloody diarrhea (18). Diagnosis is made at imaging, endoscopy and/or surgery.

Sepsis

Sepsis is defined as severe systemic infection diagnosed in blood cultures, which may lead to life-threatening organ dysfunction.

Deep sternal wound infection/mediastinitis

Proven infection involving deep sternal wound tissues and/or mediastinum.

Acute Heart failure

Acute heart failure requiring prolonged postoperative treatment with inotropes (>24 hours) and/or mechanical circulatory support.

Mechanical circulatory support

The use of intra-aortic balloon pump (IABP) and/or venoarterial extracorporeal membrane oxygenation (VA-ECMO) for postoperative acute heart failure unresponsive to medical treatment. The configuration and duration of treatment of these salvage therapies will be documented.

Postoperative peak level of creatinine, dialysis and acute kidney injury

It will be defined according to postoperative change in serum creatinine levels and its severity will be stratified according to the Kidney Disease: Improving Global Outcomes (KDIGO) criteria (19) (Tab. 3). However, in view of the prolonged hospital treatment of TAAD patients, changes in serum creatinine level will be evaluated as occurring during the index hospitalization. We recognize that acute kidney injury can also be diagnosed according to urine output measure, however, this method is not feasible in retrospectively gathered data and this will not be considered in the present study. Dialysis will be defined as temporary when discontinued and permanent if continued at the time of discharge from the institution where the index surgery was performed.

Table 3. Definition criteria of postoperative acute kidney injury.*

Stages	**Serum creatinine**
1	1.5-1.9 times baseline OR ≥0.3 mg/dL (≥26.5 micromol/L) increase
2	2-2.9 times baseline
3	≥3.0 times baseline OR Increase to ≥4 mg/dL (≥353.6 micromol/L) OR Initiation of renal replacement therapy

*Changes in serum creatinine level occurring during the index hospitalization.

Perioperative bleeding

Data on the number of transfused units of red blood cell will be collected. The E-CABG bleeding classification has been proposed as a simple classification of perioperative bleeding (20) and it has been shown to be comparable to the Universal Definition of Perioperative Bleeding (21) in predicting early mortality (22). Herein we will adopt a simplified version of the E-CABG perioperative classification, which defines severe bleeding as reoperation for excessive intrathoracic bleeding and/or transfusion of more than 4 units of red blood cells (Table 4). The number of transfused units of red blood cells will be considered as the overall number of transfused units during the index hospitalization (both during the stay in the intensive care unit and in the ward).

Table 4. Simplified E-CABG perioperative bleeding classification (20).

Grades	Intervention for treatment of bleeding
0	No RBC transfusion or transfusion of 1 unit of RBCs
1	Transfusion of 2-4 units of RBCs
2	Transfusion of 5-10 units of RBCs and/or reoperation for intrathoracic bleeding
3	Transfusion of >10 units of RBCs

RBC, red blood cell.

Reoperation for bleeding

Chest reopening for excessive bleeding. It qualifies as a reoperation for bleeding also any reoperation for hemostasis in patients in whom the sternum was left open. Chest reopening

for hemodynamic instability without excessive bleeding, pericardial/pleural puncture or chest drain insertion for retained blood syndrome do not qualify as reoperation for bleeding.

Postoperative lowest level of hemoglobin

The lowest level of hemoglobin will be recorded as a further measure of perioperative bleeding.

Laryngeal nerve palsy

Injury of the recurrent laryngeal nerve injuries resulting in vocal cord paresis and in voice changes or hoarseness.

Tracheostomy

Tracheostomy performed any time during the index hospitalization.

Procedures for vascular complications

Any vascular and endovascular procedure for ischemic or bleeding complications.
These complications will encompass neurologic complications, mesenteric ischemia, upper and lower limb ischemia as well as bleeding from the aorta and its branches.

Length of stay in the intensive care unit

Overall length of treatment in the intensive care unit, including readmissions, at the institution where the primary surgery for TAAD was performed, i.e. during the index hospitalization.

Last follow-up date

It refers to the last date when the patient was reportedly alive or the date of her/his death.

Patients lost to follow-up

Patient will be considered lost to follow-up when no information is available on her/his survival status within the last 3 months of the date of data collection.

Reoperation data

Data on any surgical and/or endovascular reoperation on any segment of the aorta and/or aortic valve will be collected. Information on the aortic segments treated during reoperation/s will be collected along with the indication for repeated aortic procedure. Noteworthy, aortic reoperation will be classified as a prophylactic procedure when it was performed for completion of the primary procedure for aortic remodeling without evidence of TAAD-related complications.

Statistical Analysis

Statistical analyses will be conducted using Stata v. 15.1 (StataCorp LLC, Texas, USA) and SPSS v. 29.0 (IBM Corporation, Armonk, NY, USA) statistical softwares. Continuous variables and outcomes will be summarized as mean and standard deviation as well as median and interquartile range. Categorical variables and outcomes will be reported as counts and percentages. A $p<0.05$ will be set for statistical significance. Differences between the study groups will be evaluated using the Fisher's exact test, the Chi-square test, the linear-by-linear association test, the Mann-Whitney test and the Kruskal-Wallis test. The McNemar test and paired samples T-test will be used in case of analysis of paired groups. Propensity

score matching will be performed to balance treatment strategies for baseline differences. A propensity score will be estimated using a non-parsimonious multilevel mixed-effects logistic regression considering the cluster effect of the participating centers whose results may be affected by the referral pathway, surgical techniques and perioperative care. Multilevel mixed-effects logistic regression model will include all available baseline variables. One-to-one propensity score matching will be performed using a caliper width of 0.2 of the standard deviation of the estimated logit. Standardized differences <0.10 will be considered an acceptable imbalance between the matched cohorts. The estimated propensity score will be also included into regression models to adjust for multiple confounders or for analysis within its strata.

Logistic and linear regression analyses will be employed to identify independent risk factors for early adverse events with and without a stepwise approach. For the purpose of developing a risk scoring method from this registry, the study cohort will be randomly divided into two datasets, i.e. the derivation data set (75.0% of patients) and the validation data set (25.0% of patients). Univariate analysis will be performed on all candidate covariates of the derivation dataset to identify predictors of in-hospital mortality. Multiple logistic regression analysis will be then performed using the derivation dataset. A stepwise procedure with a bootstrap approach will be used, and 100 samples will be extracted with a size of 70% of the derivation dataset. A stepwise procedure will be applied to each sample (probability to stay = 0.05; probability to entry = 0.1). Variables selected in at least 50% of the stepwise procedures will be included in the regression model. Additional covariates were selected using a forward selection comparing the Akaike information criterion for the models with and without each covariate. The model with the lowest Akaike information

criterion will be selected for each forward step, until the inclusion of a new covariate determined an increase in the Akaike information criterion value. The model will be tested in the validation data set for calibration, using the Hosmer–Lemeshow test, and for discrimination using the receiver-operating characteristic curve analysis. A comparison of the predictive ability of the new score with the current risk scoring methods for prediction of in-hospital mortality will be performed in the overall dataset as well as in the validation dataset using the DeLong test. The improvement of discrimination of the new score will be estimated by calculating the net reclassification index and the integrated discrimination improvement.

Interinstitutional and between-surgeons differences in terms of early outcomes will be evaluated using logistic regression. The risk-adjusted rate of adverse binary events at each center will be estimated by dividing the observed number of adverse events by the expected number of adverse events, and by multiplying this ratio by the average event rate of the overall series. The expected numbers of adverse events will be calculated with logistic regression. The estimated risk-adjusted rates of adverse events will be summarized as odds ratios and their 95% confidence intervals in caterpillar plots with the x-axis ordered for increasing adjusted rates.

Data Management

The dataset will be anonymized and will not be shared between the participating centers to avoid any infringement of current privacy policies. Indeed, the Access datasheet was chosen for data collection to protect each institution’s data avoiding gathering all the data into a

web cloud. Data management and analysis will be conducted by the investigators of the Helsinki University Hospital, Finland. Investigators from other centers who are willing to accomplish their own studies for the TARTAAD will get the results of statistical analysis from the sponsor.

Co-authorship policy

Each center participating in the TARTAAD will be represented by two coauthors in the main coauthors' list of each article. The investigators who will accomplish their own study will have the right to list up to four coauthors from their Institution.

Strengths of the TARTAAD

This registry will include detailed data on patients' characteristics, operative strategies and outcomes from centers with large volume of cardiac surgery and significant experience in the treatment of acute and chronic aortic diseases. This may reduce the risk of bias related to limited experience in the surgical treatment of aortic diseases. This multicenter registry will allow recruiting of about 10 000 patients, which is expected to decrease the risk of type II errors.

Publication of the results

The TARTAAD is expected to provide data accomplish 42 studies. These studies will be submitted for publication in peer-review international journals in the fields of surgery and cardiology.

Funding

This study will be performed without external financial support.

Conflicts of interest

The principal investigators of the TARTAAD do not have any conflicts of interest related to the topic of these studies.

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Study Investigators. Comparison of two major perioperative bleeding scores for cardiac surgery trials: Universal Definition of Perioperative Bleeding in cardiac surgery and European Coronary Artery Bypass Grafting Bleeding severity grade. Anesthesiology. 2018 Dec;129(6):1092-1100.

Tentative list of studies:

1. Ascending aortic replacement versus total aortic arch replacement in patients with DeBakey type 1 aortic dissection.
2. Total aortic arch replacement in patients with and without tear involving the aortic arch.
3. Frozen elephant trunk repair and outcome after surgery for acute TAAD.
4. Early and late outcomes after conventional total aortic arch replacement versus the frozen elephant trunk repair of the aortic arch in patients with acute TAAD.
5. Outcome after the AMDS hybrid stenting system for surgical repair of acute TAAD.
6. Supracoronary versus aortic root replacement in patients TAAD involving the aortic root.
7. Partial surgical repair of TAAD-related dissected aortic root.
8. Safe time limits of hypothermic circulatory arrest without antegrade or retrograde cerebral perfusion for surgical repair of acute TAAD.
9. Prognostic impact of myocardial malperfusion in patients undergoing surgery for acute TAAD.
10. Vision loss/disturbances and outcome after surgery for acute TAAD.
11. Unilateral versus bilateral antegrade cerebral perfusions during hypothermic circulatory arrest for surgical repair of acute TAAD.
12. Risk score for prediction of early mortality after surgical repair of acute TAAD (Prof. J Kluin).
13. Outcome after surgery for type A intramural aortic hematoma.
14. Safe time limit of lower body hypothermic circulatory arrest during surgery for acute TAAD.

15. Severity of neurological status at referral and outcome after surgery for acute TAAD.
16. Postoperative outcome in patients with neurological complications after surgery for acute TAAD.
17. Mechanical circulatory support after surgery for acute TAAD.
18. Prognostic impact of clinical and radiological visceral malperfusion after surgery for acute TAAD.
19. Prognostic impact of spinal ischemia before and after surgery for acute TAAD.
20. Outcome after surgery for acute TAAD in patients with prior cardiac surgery.
21. Impact of delay from onset of symptoms to surgery on the outcome after surgery for acute TAAD.
22. Predictors and prognostic implications of perioperative bleeding in patients undergoing surgery for acute TAAD.
23. Predictors of postoperative stroke/global brain ischemia in patients undergoing surgery for acute TAAD.
24. Predictors and prognostic implications of acute kidney injury after surgery for acute TAAD.
25. Open versus cross-clamp distal aortic anastomosis for repair of acute TAAD in patients with preoperative cerebral malperfusion.
26. Outcome of surgery for acute TAAD in patients with genetic disorders.
27. Outcome of surgery for acute TAAD in patients with bicuspid aortic valve.
28. Impact of antiplatelet and anticoagulant drugs on the outcome after surgery for acute TAAD.
29. Outcome of patients aged <50 years after surgery for acute TAAD.
30. Outcome after CABG for ostial iatrogenic injury during surgery for acute TAAD.
31. Retrograde versus antegrade cerebral perfusion during surgical repair of acute TAAD.
32. Aortic anastomosis techniques for surgical repair of acute TAAD.
33. Arterial cannulation during surgery for acute TAAD (Prof. J. Kluin).
34. Carotid artery cannulation during surgery for acute TAAD.
35. Outcome after aortic valve sparing surgery for acute TAAD.
36. Deep versus moderate hypothermic circulatory arrest on the outcome after surgery for acute TAAD.
37. Risk factors for proximal aortic reoperations after surgery for acute TAAD.

38. Risk factors for distal aortic reoperations after surgery for acute TAAD.
39. Risk factors for abdominal aortic operations after surgery for acute TAAD.
40. Extent of dissection to different aortic segments and mortality after surgery for acute TAAD.
41. Comparison of the ERTAAD classification of urgency of the procedure and the Penn classification in patients undergoing surgery for acute TAAD.
42. Safe time limits of myocardial ischemia and cardiopulmonary bypass during surgery for acute TAAD.
43. Prognostic impact of gender on the outcome after surgery for acute TAAD. (Prof. J. Kluin)