



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**SESSIE 3: Cardiac surgery & valvular heart disease**

	Zaal: Limousin 3	Voorzitters: dr. Pier Woudstra, cardioloog Frisius MC dr. Berto Bouma, cardioloog Amsterdam UMC
1	09.00 - 09.10	<b>Surgical Care for Rheumatic Heart Disease Patients: Insights from the Netherlands Heart Registration</b> <i>Lotte de Wilde, Amsterdam UMC, Amsterdam</i>
2	09.11 - 09.21	<b>Revival of the Ross Procedure in Adults</b> <i>Nabil Saouti, Radboudumc, Nijmegen</i>
3	09.22 - 09.32	<b>When Waiting Is Not an Option: Urgent Versus Elective M-TEER in Real-World Practice</b> <i>Abby Geerlings, Amsterdam UMC, Amsterdam</i>
4	09.33 - 09.43	<b>Outcomes After Transcatheter Edge-to-Edge Repair for Secondary Mitral Regurgitation Beyond Left Ventricular Ejection Fraction</b> <i>Myrthe Welman, Maastricht University Medical Center+, Maastricht</i>
5	09.44 - 09.54	<b>Serum Proteomic Assessment and Deep Immunophenotyping in Aortic Stenosis</b> <i>Eveline van Doorn, Radboudumc, Nijmegen</i>
6	09.55 - 10.05	<b>Patient-reported Quality Of Recovery after Minimally Invasive Valve Surgery: a Prospective Observational Study</b> <i>Sandor van Straten, Isala, Zwolle</i>
7	10.06 - 10.16	<b>Minimally Invasive Versus Sternotomy Mitral Valve Surgery in Patients Aged 70 Years and Older: a Nationwide Study</b> <i>Jules Olsthoorn, Isala, Zwolle</i>
8	10.17 - 10.27	<b>Upper-hemi Sternotomy Aortic Arch Surgery without Circulatory Arrest: a Feasibility Study of Zone 1-2 Repair</b> <i>Emile Farag, Isala, Zwolle</i>



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**NVVC Voorjaarscongres 2026**  
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**Session 3: Cardiac surgery & valvular heart disease**  
Abstract 1

**Surgical Care for Rheumatic Heart Disease Patients: Insights from the Netherlands Heart Registration**

Presenting author: L.L.G. de Wilde  
Department: Cardiology

*L.L.G. de Wilde (Amsterdam UMC, Amsterdam); S. el Mathari (Erasmus MC, Rotterdam); D.W.M. Blokhuis (Amsterdam UMC, Amsterdam); M.M. Roefs (Nederlandse Hart Registratie, Utrecht); R.A.F. de Lind van Wijngaarden (Amsterdam UMC, Amsterdam); S.A.J. Chamuleau (Amsterdam UMC, Amsterdam); On behalf of Cardiothoracic Surgery Registry Committee of the Netherlands Heart Registration*

**Purpose:**

Although rheumatic heart disease (RHD) has declined in high-income countries, migration sustains its presence. Definite therapy for RHD is surgical mitral valve replacement (MVR), but data are lacking in the Netherlands. This study evaluated the overall surgical care for RHD patients with data from the Netherlands Heart Registration (NHR).

**Methods:**

This prospective cohort study included RHD MVR patients from all cardiothoracic centers (n=16) in the Netherlands. RHD MVR patients aged  $\leq 75$  years were identified in the NHR database between 2017 and 2023. Baseline, admission, procedural, and outcome data were analyzed, with up to five years of follow-up. RHD patients were compared across center volumes, divided into tertiles, and with non-RHD MVR patients in the NHR database.

**Results:**

In total, 435 RHD patients were included with a mean (SD) age of 58 (12) years and 73.3% was female. Upon admission, 77.0% of patients had a LVEF  $\geq 50.0\%$ , 40.2% had atrial fibrillation, 88.7% of patients were symptomatic, of which 45.3% were highly symptomatic (NYHA III-IV). Within a median (IQR) postoperative follow-up of 2.9 (1.1-4.6) years, total uncensored mortality was 12.2%. One-year mortality was similar among RHD MVR patients in high-volume ( $>200$  MVRs) and low-volume ( $<132$  MVRs) centers ( $p=0.791$ ). One-year mortality did not differ between RHD and non-RHD MVR patients (HR: 0.80; 95% CI 0.53-1.21;  $p=0.288$ ).

**Conclusion:**

These data show effective surgical care for RHD MVR patients, with similar one-year mortality rates across center volumes and compared with non-RHD MVR patients, suggesting that RHD MVR patients can be managed similarly as non-RHD MVR patients.

**Keywords:**

Rheumatic Heart Disease, Mitral Valve Replacement,



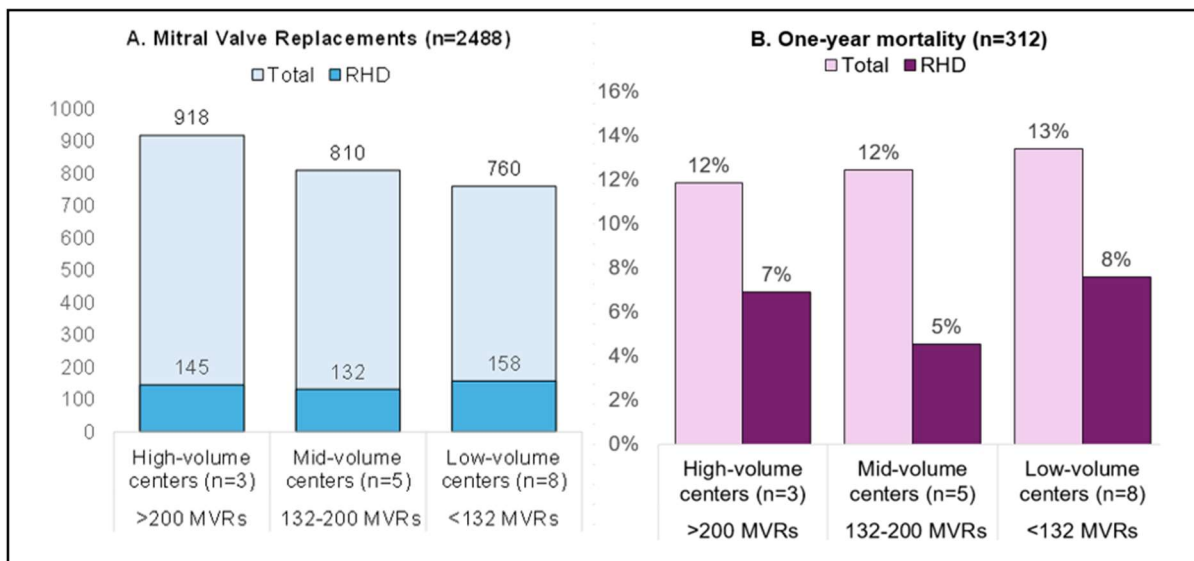
**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Figure:**

Figure 1: Mitral Valve Replacements and One-year Mortality by Centre Volume (2017-2023). Mitral valve replacements (n=2488) and one-year mortality (n=312), stratified by centre volume according to the total number of patients treated between 2017 and 2023.

A. Mitral valve replacements in high-volume centres (n=3; >200 MVRs), mid-volume centres (n=5; 132-300 MVRs), and low-volume centres (n=8; <132 MVRs).

B. One-year mortality for MVR patients. There is no significant difference in RHD-related MVR mortality between high and mid-volume centres (p=0.402), mid and low-volume centres (p=0.272) and high- and low-volume centres (p=0.791).





**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 2

**Revival of the Ross Procedure in Adults**

Presenting author: N. Saouti

Department: cardio-thoracic surgery

*N. Saouti (Radboudumc, Nijmegen); N. Saouti (Radboudumc, Nijmegen); A.L. Duijnhouwer (Radboudumc, Nijmegen); T.J. Ten Cate (Radboudumc, Nijmegen); A.P.J. van Dijk (Radboudumc, Nijmegen); R.H. Heijmen (Radboudumc, Nijmegen)*

**Purpose:**

The aim of this study is to evaluate the short-term outcomes of our newly initiated Ross program in adults.

**Methods:**

All patients who underwent the Ross procedure at the Radboud University Medical Center between April 2024 and December 2025 were systemically followed up and data structurally collected. Baseline characteristics, operative details, and postoperative outcomes were extracted from the electronic medical record.

**Results:**

A total of 32 patients were included, median age of 42 years of which 63% were male and 93% had a bicuspid aortic valve. The predominant pathology was pure stenosis in 67%. All procedures were elective except one. There was no operative or 30-day mortality. Complications included one conversion to a Bentall procedure for leaflet retraction and one urgent percutaneous coronary intervention probably due to right coronary button kinking. No patient had more than mild aortic regurgitation at discharge.

**Conclusion:**

The Ross procedure in young and middle-aged adults was associated with favorable short-term outcomes in this initial cohort. These results support the feasibility and safety of the Ross procedure when performed in a dedicated expert center. Ongoing follow-up will be essential to assess medium- and long-term durability.

**Keywords:**

Ross procedure, adults, short-term outcomes



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 3

**When Waiting Is Not an Option: Urgent Versus Elective M-TEER in Real-World Practice**

Presenting author: A.E. Geerlings

Department: Cardiology

*A.E. Geerlings (Amsterdam UMC, Amsterdam); K.V.V. Lieve (Amsterdam UMC, Amsterdam); F.P. Geerlings (Amsterdam UMC, Amsterdam); D. Robbers-Visser (Amsterdam UMC, Amsterdam); S.M. Boekholdt (Amsterdam UMC, Amsterdam); M.M. Vis (Amsterdam UMC, Amsterdam); M.A.M. Beijk (Amsterdam UMC, Amsterdam); J.S. Lemkes (Amsterdam UMC, Amsterdam); R.J. de Winter (Amsterdam UMC, Amsterdam); J. Baan (Amsterdam UMC, Amsterdam); B.J. Bouma (Amsterdam UMC, Amsterdam)*

**Purpose:**

Transcatheter edge-to-edge repair (TEER) is an established treatment for severe mitral regurgitation (MR). However, most studies focus on elective cases, data on patients with urgent M-TEER are limited.

**Methods:**

We performed a retrospective cohort study including all M-TEER patients from January 2021 to December 2024. Urgent cases included patients diagnosed with severe MR, who were excluded from surgery due to co-morbidities, and required M-TEER intervention during their hospital stay. These patients could not be discharged without the procedure. Survival was analyzed using Kaplan–Meier and Cox regression.

**Results:**

Of 171 patients (median age 80 years, 59.1% male), of whom 157 underwent elective and 14 urgent M-TEER. Urgent M-teer patients were younger (64.5 vs 80 years,  $p < 0.001$ ), more often in NYHA class III–IV (92.9% vs 58.6%,  $p = 0.010$ ), had higher NT-proBNP levels (3437 vs 1793 ng/L,  $p = 0.003$ ) and had a higher EuroSCORE II (10.1 vs 3.9  $p < 0.001$ ). There were no patients with mechanical circulatory support. Mortality was 7% ( $n = 1$ ) among urgent cases vs 1,9% ( $n = 3$ ) after 30 days, and 28.6% vs 10.2% ( $p = 0.063$ ) after 1 year follow-up. During a median follow up of 24 months, urgent M-TEER was associated with higher all-cause mortality compared with elective M-TEER when adjusted for age and sex (HR 3.5, 95%CI 1.4–9.3,  $p = 0.01$ ).

**Conclusion:**

M-TEER performed in an urgent setting in patients with advanced heart failure is associated with worse survival compared to those who underwent an elective procedure. Nevertheless, urgent M-TEER represents a feasible therapeutic option for selected patients with severe MR who cannot be discharged without intervention.

**Keywords:**

Urgent, M-TEER, Mitral regurgitation

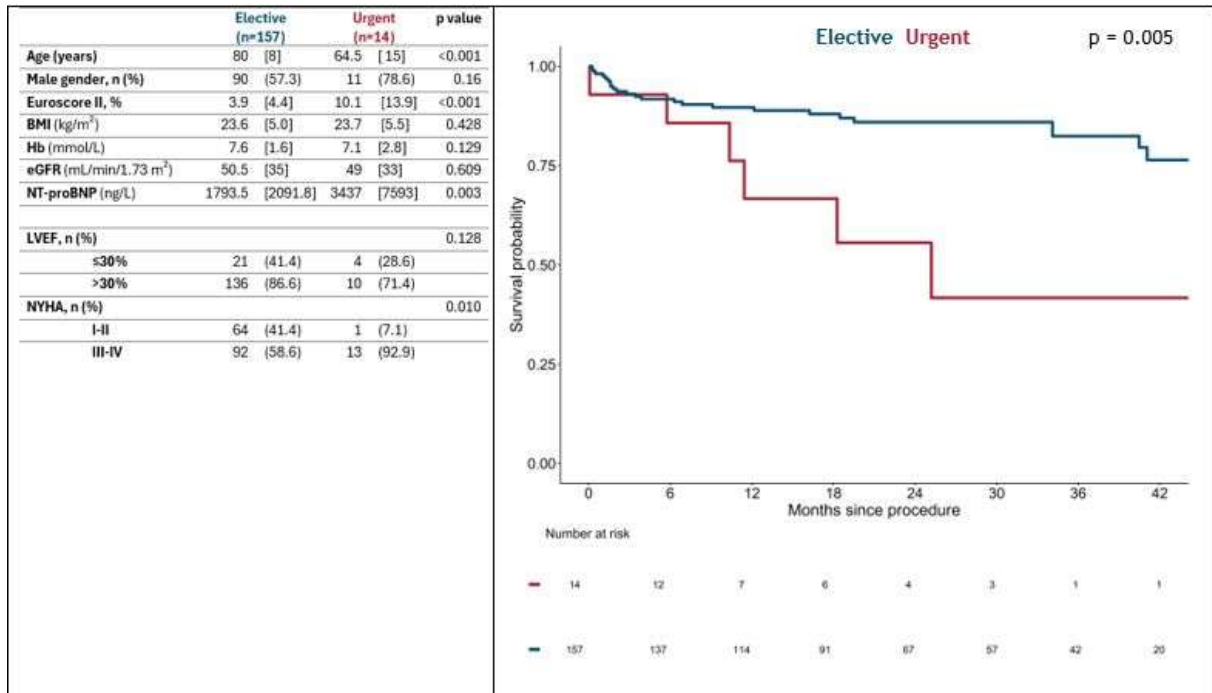


**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Figure:**

Table 1 Continuous variables are presented as median [interquartile range] due to non-normal distribution. Categorical variables are presented as number (%).

Figure 1 Kaplan–Meier survival curves for elective versus urgent M-TEER. Patients were censored at the date of last follow-up (17-05-2025).





**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 4

**Outcomes After Transcatheter Edge-to-Edge Repair for Secondary Mitral Regurgitation Beyond Left Ventricular Ejection Fraction**

Presenting author: M.J.M. Welman

Department: Cardiologie

*M.J.M. Welman (Maastricht University Medical Center+, Maastricht); B.B.E. van de Wouw (Netherlands Heart Registration, Utrecht); L. Timmers (St. Antonius Hospital Nieuwegein); A. van 't Hof (Maastricht University Medical Center+, Maastricht); P.A. Vriesendorp (Maastricht University Medical Center+, Maastricht) On behalf of the Transcatheter Heart Valve Interventions Registration Committee of the Netherlands Heart Registration*

**Purpose:**

Secondary mitral regurgitation (SMR) is associated with adverse outcomes in patients with systolic heart failure. Although current guidelines have clarified the role of transcatheter edge-to-edge repair (TEER), real-world outcome data across different levels of left ventricular ejection fraction (LVEF) remain limited.

**Methods:**

This nationwide observational cohort included patients undergoing TEER for SMR between 2021 and 2024, using data from the Netherlands Heart Registration and the Dutch Hospital Data. Patients were stratified according to baseline LVEF (<30% vs. ≥30%). The primary endpoint was one-year survival; secondary endpoint included heart failure hospitalization. Multivariable analyses were performed to identify factors associated with outcomes.

**Results:**

Among 378 patients, 91 (24%) had a baseline LVEF <30% and were characterized by higher EuroSCORE II, younger age, and male predominance. Adjusted one-year survival did not differ between LVEF <30% and ≥30% (79% vs 85%,  $p = 0.31$ ). EuroSCORE II (HR 1.04, 95% CI 1.00–1.07;  $p = 0.02$ ), and impaired mobility (HR 4.50, 95% CI 2.03–9.97;  $p < 0.001$ ) were independent predictors of survival, while the baseline LVEF group was not. Heart failure hospitalization rates were comparable between LVEF groups (log-rank  $p = 0.29$ ). Baseline LVEF group was not independently associated with heart failure hospitalization (OR 0.79, 95% CI 0.48–1.28;  $p = 0.33$ ), whereas urgent TEER was associated with an increased risk (OR 2.10, 95% CI 1.12–3.92;  $p = 0.02$ ).

**Conclusion:**

In real-world practice, one-year survival after TEER for SMR was not independently associated with baseline LVEF, with outcomes primarily driven by preoperative risk and clinical vulnerability.

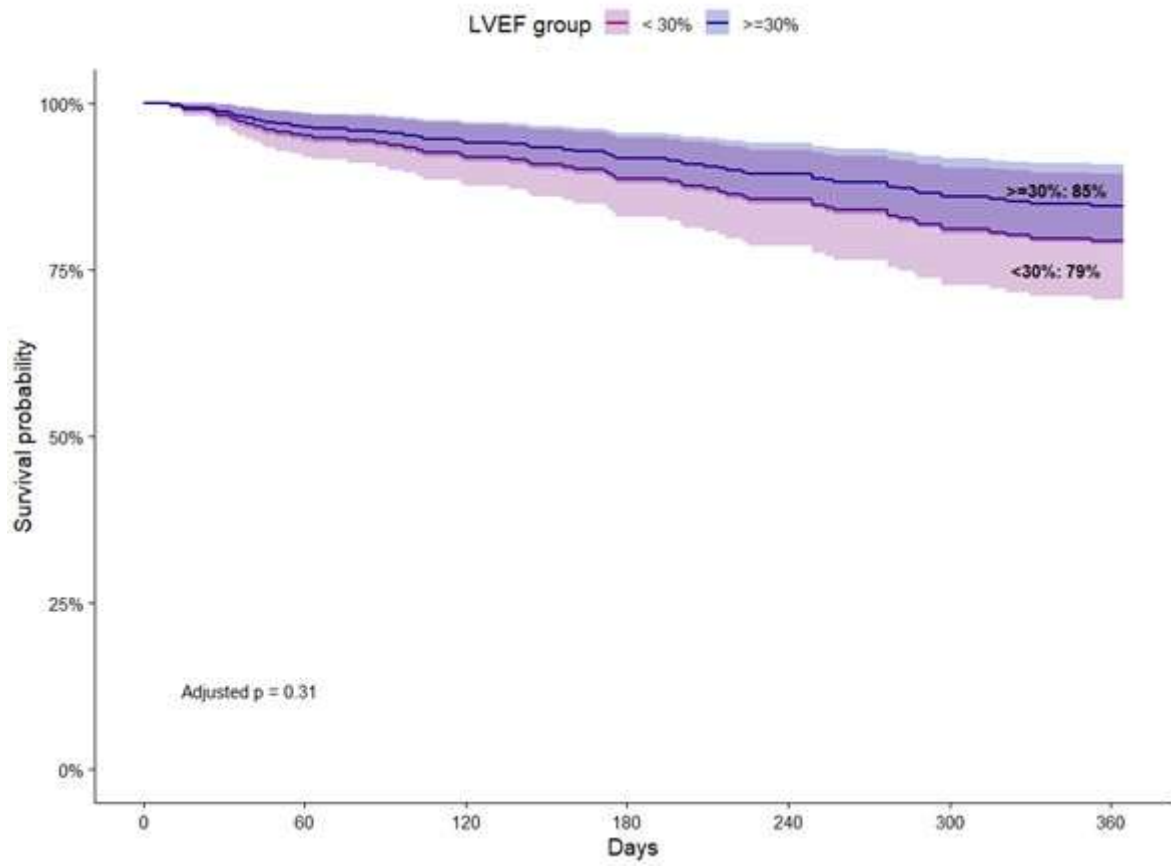
**Keywords:**

Secondary Mitral Regurgitation, Transcatheter Edge-to-Edge Repair, Clinical Outcomes



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Figure:**





**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 5

**Serum Proteomic Assessment and Deep Immunophenotyping in Aortic Stenosis**

Presenting author: E.P.M. van Doorn

Department: Cardiology

*E.P.M. van Doorn (Radboudumc, Nijmegen); W. Broeders (Radboud University Medical center, Nijmegen); A. van Broekhoven (Radboud University Medical Center, Nijmegen); A. Cetinyurek-Yavuz (Radboud University Medical Center, Nijmegen); M.G. Netea (Radboud University Medical Center, Nijmegen); N. van Royen (Radboud University Medical Center, Nijmegen); N.P. Riksen (Radboud University Medical Center, Nijmegen); S. El Messaoudi (Radboud University Medical Center, Nijmegen)*

**Purpose:**

Aortic stenosis (AS) involves progressive fibrocalcific remodeling of the aortic valve, eventually causing left ventricular outflow obstruction. No pharmacological therapies currently slow AS progression, highlighting the need for early biomarkers. Increasing evidence points to innate immune activation in the development and progression of AS, yet the specific inflammatory mediators involved are not fully defined. This study aimed to identify inflammation-related circulating proteins that differentiate patients with AS from healthy controls and to assess their associations with markers of systemic inflammation.

**Methods:**

Serum samples from 118 patients with tricuspid AS and 65 healthy controls were analyzed using the Olink Target 96 Inflammation panel, quantifying 92 inflammation-related proteins via proximity extension assay. Leukocyte composition, circulating inflammatory markers, monocyte phenotype, and peripheral blood mononuclear cell (PBMC) cytokine production capacity were also evaluated. Multiple testing was corrected using the Benjamini–Hochberg FDR method.

**Results:**

Seventeen of 92 proteins differed significantly between AS patients and controls, including nine downregulated and eight upregulated proteins. Among the upregulated proteins, FGF-21, FGF-23, IL-6, CD8A, and 4E-BP1 showed the most consistent differences, remaining significant after adjusting for age and sex (Figure 1A). These proteins positively correlated with leukocyte composition, monocyte CCR2 expression, and PBMC capacity to produce TNF- $\alpha$  and IL-1 $\beta$ . HLA-DR expression showed inverse correlations with proteins elevated in AS (Figure 1B).

**Conclusion:**

Patients with tricuspid AS displayed higher circulating levels of FGF-21, FGF-23, IL-6, CD8A, and 4E-BP1. These were linked to leukocyte composition, markers of monocyte activation, and higher PBMC cytokine production capacity, indicating a more pro-inflammatory monocyte profile in AS.

**Keywords:**

Aortic stenosis, Inflammation, Proteomics

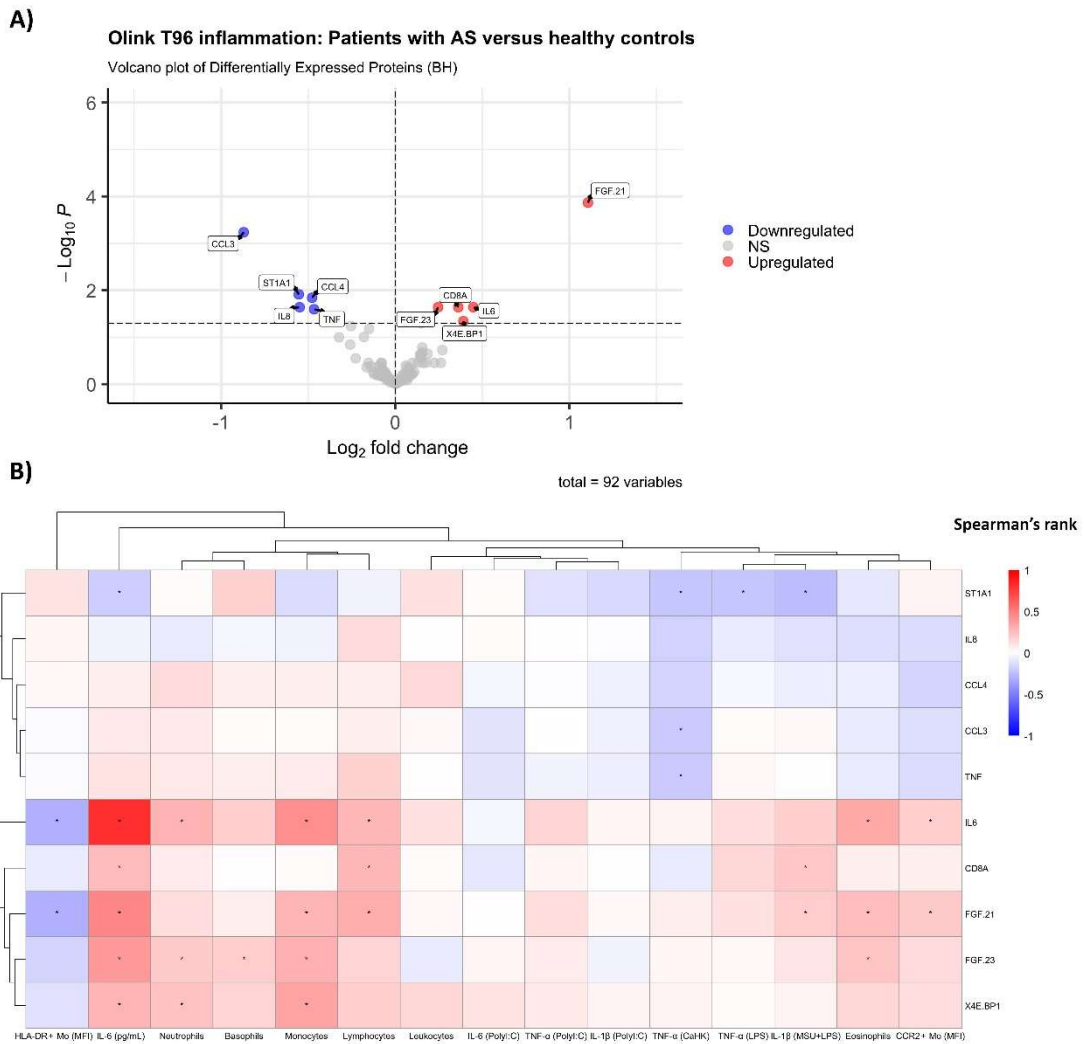


**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Figure:**

Figure 1. Proteomic signatures in patients with AS versus healthy controls.

A) Volcano plot showing the differentially expressed proteins in patients with AS versus healthy controls after adjustment for age and sex. B) Heatmap showing spearman correlations between significantly expressed proteins and the circulating inflammatory profile and function in patients with AS and healthy controls. CaHK = Heat-killed *Candida albicans*; CCL = C-C motif chemokine ligand; CCR2 = C-C chemokine receptor type 2; CD8A = Cluster of Differentiation 8 alpha chain; FGF = Fibroblast Growth Factor; HLA-DR = Human Leukocyte Antigen-DR isotype; IL = Interleukin; LPS = Lipopolysaccharide; MFI = Median Fluorescence Intensity; Mo = Monocyte; MSU = Monosodium urate crystals; PolyI:C = Polyinosinic:polycytidylic acid; ST1A1 = Sulfotransferase family 1A member 1; TNF = Tumor Necrosis Factor; X4E-BP1 = Eukaryotic translation initiation factor 4E-binding protein 1.





**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 6

**Patient-reported Quality Of Recovery after Minimally Invasive Valve Surgery: a Prospective Observational Study**

Presenting author: S. van Straten

Department: Cardiothoracic Surgery

S. van Straten (Isala, Zwolle); S. van Straten (Isala, Zwolle); J.R. Olsthoorn (Isala, Zwolle)

**Purpose:**

Minimally invasive valve surgery aims to reduce surgical trauma and accelerate postoperative recovery. The transaxillary approach may positively influence functional recovery. However, patient-reported recovery after transaxillary valve surgery remains insufficiently described. This study evaluated patient-reported quality of recovery (QoR) after transaxillary valve surgery.

**Methods:**

All patients undergoing transaxillary valve surgery with complete longitudinal QoR-15 data were included. Assessments were performed preoperatively, on postoperative day 2 (POD2), at discharge and six weeks after surgery. QoR-15 scores were reported as median and interquartile range (IQR) and compared over time using the Friedman test. Postoperative pain was assessed using the Numeric Rating Scale during hospitalization.

**Results:**

In total, 60 patients were included. Median age was 70.5 years [60.3-74.0] and 66.7% was male. Transaxillary procedures included AVR n=42, MVP n=14, combined MVP and TVP n=2 and myxoma resection n=2. Median length of hospital stay was 5 days [4-6]. Postoperative complications observed during hospitalization included the following: Postoperative AF occurred in 18 patients (30.0%), permanent pacemaker implantation in 3 patients (5.0%), ICU readmission in 1 patient (1.7%), and pleural drainage was required in 2 patients (3.3%). Median QoR-15 score was 136.5 [123.5-143.8] preoperatively. Scores declined on POD2 to 127 [107-134], followed by rapid recovery, returning to baseline at discharge 135 [123.3-140.8]. At six weeks, QoR-15 scores increased further to 145.0 [141.0-148.0], exceeding preoperative values (overall  $p < 0.001$ ), indicating not only recovery but functional improvement beyond baseline. Median postoperative pain scores, assessed using the Numeric Rating Scale (NRS), were low and decreased over time: after detubation the median score was 2 [1-3], on postoperative day 1 it remained 2 [1-3], on postoperative day 2 it decreased to 1 [1-2] and at hospital discharge the median score was 1 [1-1.75].

**Conclusion:**

Transaxillary heart valve surgery is associated with a rapid and favorable patient-reported recovery. Low postoperative pain scores support the transaxillary approach as a patient-centered and recovery-focused surgical strategy. Longitudinal assessment using the QoR-15 provides clinically meaningful insight into recovery after minimally invasive heart valve surgery.

**Keywords:**

Minimally Invasive Valve Surgery, Transaxillary valve surgery, Patient reported outcomes



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**

Abstract 7

**Minimally Invasive Versus Sternotomy Mitral Valve Surgery in Patients Aged 70 Years and Older: a Nationwide Study**

Presenting author: E. Farag

Department: Cardiothoracic Surgery

*J.R. Olsthoorn (Isala, Zwolle); J.R. Olsthoorn; A. Tjon Joek Tjien; K. Ko; S. Heuts; S. Houterman; M. Roefs; S. Singh; N. Verberkmoes*

**Purpose:**

Older patients are more prone to postoperative morbidity and mortality after mitral valve (MV) surgery. Minimally invasive MV surgery (MIMVS) is increasingly adopted worldwide, with a potential benefit in the elderly. This study compares short- and mid-term outcomes in patients over 70 years old, undergoing MIMVS versus median sternotomy (MST), in a nationwide registry.

**Methods:**

All patients over 70 years old undergoing primary elective MV surgery ( $\pm$  tricuspid valve (TV) surgery, atrial septal defect closure, rhythm surgery) between 2013-2021 were included. All data were extracted from the Netherlands Heart Registration. Primary outcomes were short-term morbidity, mortality and 5-year survival.

**Results:**

In total, 1418 patients were included (MST n=797, MIMVS n=621). No statistically significant differences in baseline characteristics were found. Median Logistic EuroSCORE I was 6.3 [4.7-8.5] vs. 6.0 [4.6-8.5], p=0.27) for MST and MIMVS, respectively. MV repair rate (77.7% vs 64.7% p<0.001) and concomitant TV surgery (43.9% vs 18.2%, p<0.001) was more frequently performed in MST. Lower 30-day mortality was observed in MIMVS (0.6% (n=4) vs 2.5% (n=21), p=0.01). Furthermore, the incidence of pneumonia, prolonged intubation, re-admission to ICU, kidney failure and new-onset arrhythmia were lower for MIMVS. No difference in 5-year survival was found (MST: 89.1 $\pm$ 4.6% vs MIMVS: 91.6 $\pm$ 4.7% Log-Rank p=0.51).

**Conclusion:**

MIMVS in patients over 70 years old may be associated with lower 30-day mortality and incidence of postoperative complications compared to sternotomy.

**Keywords:**

Mitral Valve Surgery, Minimally Invasive Surgery, Netherlands Heart Registration



**ABSTRACTS**  
**NVVC Voorjaarscongres 2026**  
**Donderdag 16 april**  
**09.00 – 10.30 uur**

**Session 3: Cardiac surgery & valvular heart disease**  
Abstract 8

**Upper-hemi Sternotomy Aortic Arch Surgery without Circulatory Arrest: a Feasibility Study of Zone 1-2 Repair**

Presenting author: J.R. Olsthoorn  
Department: Cardiothoracic Surgery

*J.R. Olsthoorn (Isala, Zwolle); J.R. Olsthoorn; M. Pieraets; E. Farag; K. Lam*

**Purpose:**

Aortic arch surgery (zone 1-2) is traditionally performed through sternotomy and frequently requires hypothermic circulatory arrest to facilitate distal anastomosis and cerebral protection. While effective, circulatory arrest is associated with neurological and systemic risks. Minimally invasive approaches for arch pathology remain scarcely reported, largely due to concerns regarding exposure, cannulation strategies and cerebral protection. This study evaluates the technical feasibility and early clinical outcomes of performing aortic arch surgery through an upper-hemi sternotomy without circulatory arrest.

**Methods:**

All consecutive patients undergoing aortic arch surgery (zone 1-2) through upper-hemi sternotomy were retrospectively analyzed. Femoral arterial cannulation was used in all patients. Cerebral protection was achieved by direct brachiocephalic trunk cannulation for 1/3 arch (zone 1) procedures and by additional direct left carotid artery cannulation for zone 2 procedures, using a 13-Fr cannula. Clamping was achieved in either zone 1 or 2.

**Results:**

ix patients were included. Median age was 64 years [IQR 55.5-67.3], median BMI was 27.1 kg/m<sup>2</sup> [IQR 24.8-29.8] and five patients were male. Median EuroSCORE II was 5.1% [IQR 2.9-5.8]. Procedures performed included supracoronary ascending aortic replacement (SCAR) with 1/3 arch extension (n=4), Bentall with 1/3 arch replacement (n=1) and AVR with SCAR and 2/3 arch extension (n=1). Surgical access was obtained at the third intercostal space (n=5) or fourth intercostal space (n=1). No conversion to full sternotomy and need for circulatory arrest was required. Median CPB and cross-clamp time were 243 [IQR 164-266] and 121 [IQR 74-135] respectively. There was no operative or 30-day mortality and no postoperative stroke or neurological deficit. Median chest drain output was 203 ml [IQR 120-240]. Postoperative AF occurred in two patients and one patient required pericardial drainage. Median intensive care and hospital stay were 1 day [IQR 1-1] and 6 days [IQR 4-8] respectively.

**Conclusion:**

This study demonstrates that aortic arch procedures can be safely and reproducibly performed through an upper-hemi sternotomy without circulatory arrest. Although limited by small patient numbers, these findings suggest that a minimally invasive, no-circulatory arrest strategy may represent a viable alternative in carefully selected patients.

**Keywords:**

Aortic Surgery, Minimally Invasive Surgery, Novel technique