The Texas Heart Institute® Journal

Research Letter

High-Sensitivity Cardiac Troponin T Variation After Percutaneous Atrial Septal Defect Closure

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Keywords: Heart septal defects, atrial; cardiac catheterization; troponin

Troponin levels are used to rule in or rule out myocardial injury, with the T and I subunits being the biomarkers of choice. The use of high-sensitivity kits is recommended in clinical practice.[1] There are no reference values after percutaneous occlusion of an ostium secundum–type atrial septal defect (ASD).

The objective of this study was to describe the values of high-sensitivity cardiac troponin T (hs-cTnT) in a population that received percutaneous treatment for ASD without complications.

This observational, prospective, and comparative study of repeated measurements was conducted between August 2020 and November 2022. Patients with ostium secundum–type ASD, dilated right heart chambers, and percutaneous closure of the defect with devices were consecutively included.

High-sensitivity cardiac troponin T levels were measured before the intervention and at 6 hours after the end of the procedure. Measurements were performed on a Cobas autoanalyzer using an electrochemiluminescence assay (Roche). Ultrasensitive troponin T was used. The upper reference limit (URL) was 14 pg/mL. The protocol was approved by the Institutional Research Ethics Committee and Research Committee of the Hospital Privado Universitario de Córdoba. Patients and/or their guardians provided written informed consent.

Categorical variables are expressed in percentages and 95% CIs and continuous variables in medians and IQRs or means and SDs, depending on their distribution. A paired *t* test was used to compare hs-cTnT levels before and after the intervention.

Sixty-eight patients were included, 42 of whom were female (61.8%; 95% CI, 50.2%-73.3%), with a median age of 7 years (IQR, 5-14 years). Patient baseline characteristics are shown in Table I.

During the procedure, the mean (SD) pulmonary artery pressure was 21.2 (5.2) mm Hg, and the mean (SD) ASD diameter measured on transesophageal echocardiography was 14.8 (5.2) mm. One device was implanted in 66 patients (97.1%; 95% CI, 93.0%-100%) and 2 simultaneous devices in 2 patients (2.9%; 95% CI, 0%-7.0%). The mean (SD) diameter of the devices was 19.2 (6.2) mm. Most devices were the Nit Occlud ASD-R Occluder (PFM Medical); the MemoPart ASD Occluder (Lepu Medical) and Cocoon Septal Occluder (Vascular Innovations) were also occasionally used.

At baseline, the median hs-cTnT level was 3.85 pg/mL (IQR, 3.0-7.10 pg/mL), and at postimplantation (median, 362 minutes [IQR, 360-371 minutes]), it was 75.1 pg/mL (IQR, 49.4-119.3 pg/mL), which corresponds to 5.3 times (IQR, 3.5-8.5 times) the URL ($P < .001$). The 97.5 percentile for postimplant hs-cTnT was 219.3 pg/mL (15.6 times the URL).

Citation: Contreras AE, Peirone AR, Ledesma F, Juaneda E, Defagó V, Cuestas E. High-sensitivity cardiac troponin T variation after percutaneous atrial septal defect closure. *Tex Heart Inst J*. 2023;50(4):e238117. doi:10.14503/THIJ-23-8117
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All patients were discharged 24 hours after the procedure. No significant arrhythmias, conduction disturbances, or ischemic changes were recorded on 12-lead electrocardiogram. After 7 to 10 days, the electrocardiogram and transthoracic echocardiogram were repeated, which showed no alterations (0%; 95% CI, 0%-7.3%).

Other authors have explored the prevalence of myocardial injury after ASD closure. The estimated frequency varies from 16% to 100% of cases.[2-5] One meta-analysis that studied troponin T or I levels in 347 patients, using blood samples obtained between 6 and 24 hours after percutaneous ASD closure, reported a prevalence of injury of 41.8% (95% CI, 36.6%-47.2%).[6]

Different postoperative clinical scenarios have reported discrepancies between the value defined by the fourth definition as myocardial injury and its clinical relevance.

Abbreviations and Acronyms

ASD	atrial septal defect
hs-cTnT	high-sensitivity cardiac troponin T
URL	upper reference limit

The VISION study,[7] which included 13,862 patients during the postoperative period of cardiac surgery (revascularization or aortic valve replacement), found that the ultrasensitive troponin I value measured at 24 hours, related to 30-day postoperative mortality, was 218 times higher than the URL and 499 times higher than the reference limit in other cardiac surgeries. The 97.5 percentile of hs-cTnT at 6 hours after the uncomplicated procedure in the present study reached 15 times the upper reference value.

TABLE 1. Baseline Characteristics of Participants

Variable	Value (n = 68)
Age, median (IQR), y	7 (5-14)
Female sex, No. (%, 95% CI)	42 (61.8, 50.2-73.3)
Weight, median (IQR), kg	31.0 (20.3-60.5)
Body surface, median (IQR), m^2	1.07 (0.79-1.69)
Single ASD, No. (%, 95% CI)	52 (76.5, 66.4-86.5)
Deficient aortic rim, No. (%, 95% CI)	24 (35.3, 23.9-46.6)
Floppy posterior rim, No. (%, 95% CI)	31 (45.6, 33.7-57.4)
ASD diameter, mean (SD), mm	14.8 (5.2)
Pulmonary artery mean pressure, mean (SD), mm Hg	21.2 (5.4)
Baseline hs-cTnT level, median (IQR), pg/mL	3.85 (3.0-7.10)
Device diameter, mean (SD), mm	19.2 (6.2)
Sizing balloon measurement, No. (%, 95% CI)	27 (39.7, 28.0-51.3)
Device ≥50% baseline defect, No. (%, 95% CI)	13 (19.1, 9.7-28.4)
Device diameter to body surface ratio, mean (SD), mm/m^2	17.7 (6.8)
Device diameter change, No. (%, 95% CI)	8 (11.8, 4.1-19.4)
Fluoroscopic time, median (IQR), min	5.7 (4.5-9.0)
Echocardiographic time, median (IQR), min	28.4 (23.3-37.3)
Time from baseline troponin to follow-up troponin, median (IQR), min	362 (360-371)
Follow-up hs-cTnT level, median (IQR), pg/mL	75.1 (49.4-119.3)

ASD, atrial septal defect; hs-cTnT, high-sensitivity cardiac troponin T.

The main limitation of this research protocol is the small sample size of patients. The study was conducted in a single center, and there could be selection or reference biases. However, its prospective nature allowed for reliable and detailed data with internal validity following strict inclusion and exclusion criteria, which allowed for an understanding of causality owing to the prospective design of repeated samples. This study differs from those previously published in that the Nit Occlud ASD-R was the most common device and that, most importantly, ultrasensitive troponins were used.

In conclusion, in a prospective cohort of patients with percutaneous occlusion of uncomplicated ostium secundum ASD, a consistent elevation of hs-cTnT levels was observed in all cases, increasing to approximately 15 times the URL at 6 hours after the intervention.

Published: 3 August 2023

Author Contributions: All authors participated in the design of the study and approved the final version.

Conflict of Interest Disclosure: None.

Funding/Support: None.

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