

Meta-Analysis of Circadian Variation in the Onset of Acute Aortic Dissection



Hisato Takagi, MD, PhD^{a,*}, Tomo Ando, MD^b, and Takuya Umemoto, MD, PhD^a (All-Literature Investigation of Cardiovascular Evidence [ALICE] Group)

Circadian variation in the onset of acute aortic dissection (AAD) has been less investigated than other cardiovascular diseases. We performed a meta-analysis to assess the presence of an circadian rhythmic variability of AAD onset. Eligible studies were observational studies enrolling patients with AAD and reporting a circadian variation in AAD. Study-specific estimates, that is, 2-hour incidence of AAD, were combined using the random-effects model. Chronobiological analysis (analysis of circadian rhythmicity) was performed by applying a partial Fourier series to the pooled 2-hour incidence using the weighted least-squares method. We identified 7 eligible studies enrolling a total of 1,827 patients with AAD. Pooled 2-hour period incidence of AAD was 3.4% in 0:00 to 2:00, 4.8% in 2:00 to 4:00, 5.4% in 4:00 to 6:00, 9.6% in 6:00 to 8:00, 13.8% in 8:00 to 10:00, 11.1% in 10:00 to 12:00, 8.1% in 12:00 to 14:00, 8.9% in 14:00 to 16:00, 8.8% in 16:00 to 18:00, 7.0% in 18:00 to 20:00, 8.1% in 20:00 to 22:00, and 5.5% in 22:00 to 24:00. Chronobiological analysis (nonlinear Fourier rhythm analysis) identified a significant ($p = 0.0082$) circadian pattern in the occurrence of AAD with a peak in 8:00 to 10:00 and a nadir in 0:00 to 2:00. Pooled analysis demonstrated significantly more incidence in 8:00 to 10:00 than in 0:00 to 2:00 (risk ratio 3.59, 95% confidence interval 2.19 to 5.90, $p < 0.00001$). The incidence of AAD was 8.8%, 15.5%, 25.0%, 17.7%, 16.1%, and 13.8% in 0:00 to 4:00, 4:00 to 8:00, 8:00 to 12:00, 12:00 to 16:00, 16:00 to 20:00, and 20:00 to 24:00, respectively. A significant circadian pattern was found in the occurrence of AAD with a peak in 8:00 to 10:00 and a nadir in 0:00 to 2:00. © 2017 Elsevier Inc. All rights reserved. (Am J Cardiol 2017;120:1662–1666)

Circadian rhythms are driven by circadian clocks, which can be defined as a transcriptionally based molecular mechanism based on both positive and negative feedback loops with a free-running period of approximately 24 hours.^{1,2} Circadian clocks are identified within almost all mammalian cell types including cardiomyocytes³ and vascular smooth muscle and endothelial cells,⁴ and the onset of various pathologic events such as myocardial infarction and stroke is all time-of-day dependent in humans peaking near the sleep-to-wake transition (i.e., early morning).^{1,5} Rhythmic patterns, characterized by a higher risk from 6:00 A.M. to 12:00 P.M., are suggested in the incidence of acute aortic dissection (AAD) or abdominal aortic aneurysm (AAA) rupture.⁶ Mechanisms of AAD onset, however, may be distinct from those of AAA rupture.^{7,8} In the present article, we performed a meta-analysis to assess the presence of a circadian rhythmic variability of AAD onset.

Methods

All studies investigating the circadian variation in AAD were identified using a 2-level search strategy. First, databases including MEDLINE and EMBASE were searched through February 2017 using Web-based search engines (PubMed and OVID). Second, relevant studies were identified through a manual search of secondary sources including references of initially identified articles and a search of reviews and commentaries. All references were downloaded for consolidation, for elimination of duplicates, and for further analysis. Search terms included “aortic dissection” and “season(s),” “seasonal,” “seasonality,” “monthly,” “weekly,” “daily,” “circadian,” “hourly,” “chronology,” “chronologic,” “chronological,” “chronobiology,” “chronobiologic” or “chronobiological.”

Studies considered for inclusion met the following criteria: the design was an observational study; the study population was patients with AAD; and main outcomes included the circadian variation in AAD. Data regarding the 2-hour incidence of AAD (number of AAD in a 2-hour period divided by that in a day) were abstracted from each individual study. Data were extracted in duplicate by 2 investigators (HT and TA) and independently verified by a third investigator (TU). Disagreements were resolved by consensus.

Study-specific estimates, that is, the 2-hour incidence of AAD, were combined using the random-effects model (1-group meta-analysis). Chronobiological analysis (analysis of circadian rhythmicity) was performed by applying a partial Fourier series to the pooled 2-hour incidence using the weighted

^aDepartment of Cardiovascular Surgery, Shizuoka Medical Center, Shizuoka, Japan; and ^bDepartment of Cardiology, Detroit Medical Center, Detroit, Michigan. Manuscript received May 4, 2017; revised manuscript received and accepted July 10, 2017.

See page 1666 for disclosure information.

H. Takagi and T. Ando contributed equally to this study and share the first authorship.

*Corresponding author: Tel: (+81) 55 975 2000; fax: (+81) 55 975 2725. E-mail address: kfgth973@ybb.ne.jp (H. Takagi).

Table 1
Study design and patient characteristics

Study	City, country	Period	Mean age (years)	Women
Kojima 2002 ⁹	Tokyo etc., Japan	Jan 1979 to Mar 2000	62.6 ± 12.7	29.6%
Lasica 2006 ¹⁰	Belgrade, Serbia and Montenegro	Jan 1, 1998 to Jan 1, 2004	59.14 ± 11.76	33.5%
Liao 1995 ¹¹	Taipei, Taiwan	1989 to 1994	55*	33.0%*
Mehta 2002 ¹²	International	1996 to 2000	62 ± 14 [†]	31.8% [†]
Ryu 2010 ¹³	Daegu, Korea	Jul 2001 to Jun 2009	58.8 ± 13.5	48.8%
Siddiqi 2017 ¹⁴	International (IRAD)/US (Gen-TAC)	1996 to 2012 (IRAD)/2007 to 2013 (Gen-TAC)	37.7 ± 12 [‡]	60.7% [‡]
Sumiyoshi 2002 ¹⁵	Tokyo etc., Japan	1970 to 1999	62.9 ± 12.9 [§]	34.6% [§]

AAD = acute aortic dissection; Gen-TAC = Genetically Triggered Thoracic Aortic Aneurysms and Cardiovascular Conditions; IRAD = International Registry of Acute Aortic Dissection; TAD = thoracic aortic dissection; US = United States.

* In original 109 patients.

[†] In original 957 patients.

[‡] In original 257 patients.

[§] In original 387 patients.

least-squares method. As a result of preliminary testing, the following Fourier model with 2 harmonics of 24 and 12 (periods of 24 and 12 hours) was selected as the best fit:

$$y = a_0 + a_1 \cdot \cos(\pi/12 \cdot x) + a_2 \cdot \sin(\pi/12 \cdot x) + a_3 \cdot \cos(\pi/6 \cdot x) + a_4 \cdot \sin(\pi/6 \cdot x)$$

where x = time of day (1, 3, 5, ... 19, 21, 23); y = incidence of RAAA (%); and a_0, a_1, a_2, a_3, a_4 = constants.

When the pooled 2-hour incidence significantly ($p < 0.05$) fitted a curve, we generated risk ratios (RRs) and 95% confidence intervals (CIs) using data regarding the incidence in the 2-hour period corresponding to both the peak and the nadir of the fitted curve for each study, and then combined them using the random-effects model.

For each study using data regarding the incidence of AAD in each 4-hour period, we generated RRs and 95% CIs for the incidence of AAD in (1) 4:00 to 8:00 versus 0:00 to 4:00, (2) 8:00 to 12:00 versus 0:00 to 4:00, (3) 12:00 to 16:00 versus 0:00 to 4:00, (4) 16:00 to 20:00 versus 0:00 to 4:00, (5) 20:00 to 24:00 versus 0:00 to 4:00, (6) 8:00 to 12:00 versus 4:00 to 8:00, (7) 12:00 to 16:00 versus 4:00 to 8:00, (8) 16:00 to 20:00 versus 4:00 to 8:00, (9) 20:00 to 24:00 versus 4:00 to 8:00, (10) 12:00 to 16:00 versus 8:00 to 12:00, (11) 16:00 to 20:00 versus 8:00 to 12:00, (12) 20:00 to 24:00 versus 8:00 to 12:00, (13) 16:00 to 20:00 versus 12:00 to 16:00, (14) 20:00 to 24:00 versus 12:00 to 16:00, and (15) 20:00 to 24:00 versus 16:00 to 20:00 (Supplementary Table S1). Study-specific estimates, that is, the incidence of AAD in each 4-hour period, were combined using the random-effects model. To counteract the problem of multiple comparisons, p values were adjusted by the Bonferroni correction.

All analyses were conducted using Review Manager version 5.3 (available at <http://community.cochrane.org/tools/review-production-tools/revman-5>), OpenMetaAnalyst (available at <http://www.cebm.brown.edu/openmeta/index.html>), and Non-linear Least Squares Regression (Curve Fitter) (available at <http://statpages.info/nonlin.html>).

Results

Of 83 potentially relevant articles screened initially, we identified and included 7 eligible studies^{9–15} enrolling a total

of 1,827 patients with AAD (Table 1). In all but 1 study,¹⁴ data were retrospectively collected. In a study by Siddiqi et al,¹⁴ patients were prospectively enrolled into the International Registry of Acute Aortic Dissection (IRAD) and the Genetically Triggered Thoracic Aortic Aneurysms and Cardiovascular Conditions (Gen-TAC).

The pooled 2-hour period incidence of AAD (Supplementary Figures S1 to S12) is summarized in Supplementary Table S2 and in Figure 1. Chronobiological analysis (nonlinear Fourier rhythm analysis) identified a significant ($p = 0.0082$) circadian pattern in the occurrence of AAD with a peak in 8:00 to 10:00 and a nadir in 0:00 to 2:00, fitting to the following curve (Figure 2):

$$y = 7.77 - 2.99 \cdot \cos(\pi/12 \cdot x) - 0.26 \cdot \sin(\pi/12 \cdot x) - 0.23 \cdot \cos(\pi/6 \cdot x) - 1.60 \cdot \sin(\pi/6 \cdot x)$$

We compared the incidence in 8:00 to 10:00 with that in 0:00 to 2:00. Pooled analysis demonstrated significantly more incidence in 8:00 to 10:00 than in 0:00 to 2:00 (RR 3.59, 95% CI 2.19 to 5.90, $p < 0.00001$; Supplementary Figure S13).

The pooled 4-hour period incidence of AAD (Supplementary Figures S14 to S19) is summarized in Supplementary Table S3 and in Figure 3. The pooled analysis demonstrated significantly more incidence of AAD in 4:00 to 8:00 than in 0:00 to 4:00, in 8:00 to 12:00 than in 0:00 to 4:00, in 12:00 to 16:00 than in 0:00 to 4:00, in 16:00 to 20:00 than in 0:00 to 4:00, and in 20:00 to 24:00 than in 0:00 to 4:00 (Supplementary Figures S20 to S24; 0:00 to 4:00 < 4:00 to 8:00, 8:00 to 12:00, 12:00 to 16:00, 16:00 to 20:00, and 20:00 to 24:00); significantly more incidence in 8:00 to 12:00 than in 4:00 to 8:00 (Supplementary Figure S25; 4:00 to 8:00 < 8:00 to 12:00); no significant difference in incidence between 12:00 to 16:00 and 4:00 to 8:00, between 16:00 to 20:00 and 4:00 to 8:00, and between 20:00 to 24:00 and 4:00 to 8:00 (Supplementary Figures S26 to S28; 4:00 to 8:00 ≈ 8:00 to 12:00 to 16:00 ≈ 16:00 to 20:00 ≈ 20:00 to 24:00); no significant difference in incidence between 12:00 to 16:00 and 8:00 to 12:00 and between 16:00 to 20:00 and 8:00 to 12:00 (Supplementary Figures S29 and S30; 8:00 to 12:00 ≈ 12:00 to 16:00 ≈ 16:00 to 20:00); significantly less incidence in 20:00 to 24:00 than in 8:00 to 12:00 (Supplementary Figure S31; 8:00 to 12:00 > 20:00 to 24:00); no significant difference in

Download English Version:

<https://daneshyari.com/en/article/8651706>

Download Persian Version:

<https://daneshyari.com/article/8651706>

[Daneshyari.com](https://daneshyari.com)