Acute Myocardial Infarction in the Evening Has a Worse Prognosis. Circadian Rhythm, Does It Matter?

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Recently Bae et al.[1] reported that hospital presentation of patients with acute myocardial infarction (AMI) in the evening was linked to a higher rate of mortality for twelve months. In addition, congestive heart failure (CHF) was more prevalent in the evening onset of AMI. Therefore, it was concluded that the evening onset of AMI was indirectly related to a worse prognosis due to poor baseline left ventricular (LV) function. A finding consistent with previous reports was that the proportion of diabetes patients was higher in the evening onset of ST segment elevation myocardial infarction (STEMI).[2] Since the mode of onset as the dependent variable in the baseline data was not considered, statistical analyses on factors related to evening onsets similar to the previous study were not available.[2-4]

LV function is the strongest prognostic factor in AMI. It is critical to ascertain the factors which are associated with depressed LV function at the time of hospital presentation.[5] Consequently, symptom to door (STD) time or door to balloon time (DBT) should be the first theoretical reference for AMI. However, it is very difficult to define the real onset of AMI using chest pain as an indicator because the elderly, patients with diabetes and females have blunted or atypical symptoms. In this study, an important finding on the quality of care was addressed. DBT was longer in the evening or during off-duty hours. A worse outcome of pre-hospital delay or longer DBT was

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not observed, even with a higher proportion of STEMI in this study. This is because the effect can be diluted by patients with a very long STD time. STD time, which is pre-hospital time delay in STEMI was 419±573 minutes, which is better compared to the previous result of 699±144 minutes.[4] However the large standard deviation is still challenging and the factors related to the pre-hospital time delay in Korea need to be further investigated.

The natural course of AMI is inevitably followed by LV failure within a couple of days. As with the progression of infarction, increased wall tension and ischemia may allow the provocation of angina by a vulnerable myocardium resulting in a delayed presentation in the evening. Asymptomatic or neglected onset of AMI in the morning can present as CHF in the evening. Recurrent and gradual or slowly progressive ischemia in the morning may also result in AMI with CHF in the evening. As a pathophysiological perspective, Tanaka et al.[6] suggested patients with non-plaque rupture are more likely to present in the evening.

Nonetheless, an evening onset of AMI is not necessarily a delayed manifestation by a new onset of LV dysfunction from the morning since pre-existing LV dysfunction or ischemia could provoke ischemic symptoms in the evening. With overtime work, mental stress may aggravate pre-existing CHF in patients who have critical stenosis in the coronary vessel. Consequently, they would suffer from chest pain with a recumbent position in the evening. Other factors associated with an evening onset of AMI such as the reluctance to visit the hospital, poor social or familial support and behavioral factors such as smoking and drinking may be associated with CHF.[7] History of CHF and Non-Q wave MI are well known factors linked to the evening onset of AMI.[2] In the early 1990s, Kim et al.[8] also reported that history of CHF is more frequently noted in the evening onset of AMI in Korean patients. In patients with pre-existing heart failure, limited duration of heart failure medications could also unveil ischemic symptoms in

the evening. On the other hand, aspirin or beta-blockers may blunt the symptoms in the morning, potentially leading to pre-hospital delay.[2] Hence, from the clinical viewpoint, AMI in the evening warrants a more sophisticated strategy to cope with all of these associated clinical problems.

CHF was present in 20-40% of AMI patients on admission and pre-existing heart failure was present in approximately 10% of patients.[5] Considering the mechanism of CHF at the onset of AMI and the prognosis, multi-vessel disease with single culprit lesion causing AMI is of particular interest. The net results of revascularization treatment are decided by the summation of the infarcted myocardium and the saved ischemic myocardium. Therefore, not only the quality of care for the culprit lesion but also the results of revascularization on non-culprit vessels may be important for long-term prognosis. As the optimal revascularization strategy for the non-culprit lesions in AMI patients with depressed LV function, outcome of percutaneous coronary intervention versus coronary artery bypass graft needs further study.

Unlike previous studies in Western countries, a majority of Asian studies showed a clear double peak circadian rhythm in AMI.[3)7)9)10] It is important to investigate whether this difference is due to racial/biologic factors or to socioeconomic factors in order to provide appropriate interventions.

REFERENCES

1) Bae MH, Ryu HM, Lee JH, et al. *The impact of circadian variation on 12-month mortality in patients with acute myocardial infarction. Korean Circ J 2010;40:616-24.*

2) Hjalmarson A, Gilpin EA, Nicod P, et al. *Differing circadian patterns of symptom onset in subgroups of patients with acute myocardial infarction. Circulation 1989;80:267-75.*

3) Kim SD, Song JK, Park CB, et al. *Chronobiological patterns of acute aortic syndrome: comparison with those of acute myocardial infarction. Korean Circ J 2004;34:970-7.*

4) Jeong JO, Kim YC, Sung BY, et al. *Analysis of time delay to affect thrombolytic therapy in patients with acute myocardial infarction. Korean Circ J 1997;27:842-50.*

5) Weir RA, McMurray JJ, Velazquez EJ. *Epidemiology of heart failure and left ventricular systolic dysfunction after acute myocardial infarction: prevalence, clinical characteristics, and prognostic importance. Am J Cardiol 2006;97:13F-25F.*

6) Tanaka A, Kawarabayashi T, Fukuda D, et al. *Circadian variation of plaque rupture in acute myocardial infarction. Am J Cardiol 2004;93: 1-5.*

7) Li Y, Du T, Lewin MR, et al. *Circadian, day-of-week, and age patterns of the occurrence of acute coronary syndrome in Beijing's emergency medical services system. Am J Emerg Med 2010;28:663-7.*

8) Kim KS, Song YS, Hur SH, et al. *Circadian variation in acute myocardial infarction. Korean Circ J 1993;23:173-83.*

9) Kinjo K, Sato H, Sato H, et al. *Circadian variation of the onset of acute myocardial infarction in the Osaka area, 1998-1999: characterization of morning and nighttime peaks. Jpn Circ J 2001;65:617-20.*

10) Bhalla A, Sachdev A, Lehl SS, Singh R, D'Cruz S. *Ageing and circadian variation in cardiovascular events. Singapore Med J 2006;47: 305-8.*