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The impact of prehospital assessment and EMS transport of acute aortic syndrome patients

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ABSTRACT

Background: The quality of acute aortic syndrome (AAS) assessment by emergency medical service (EMS) and the incidence and prehospital factors associated with 1-month survival remain unclear.
Methods: We retrospectively analyzed the data collected for 94,468 patients with non-traumatic medical emergency excluding out-of-hospital cardiac arrest during the period of 2011–2014.
Results: Of these transported by EMS, 22,075 had any of the AAS-related symptoms, and 330 had an EMS-assessed risk for AAS; of these, 195 received an in-hospital AAS diagnosis. Of the remaining 21,745 patients without EMS-assessed risk, 166 were diagnosed with AAS. Therefore, the sensitivity and specificity of our EMS-risk assessment for AAS was 54.0% (195/361) and 99.4% (21,579/21,714), respectively. EMS assessed the risk less frequently when patients were elderly and presented with dyspnea and syncope/faintness. Sign of upper extremity ischemia was rarely detected (6.9%) and absence of this sign was associated with lack of EMS-assessed risk. The calculation of modified aortic dissection detection risk score revealed that rigorous assessment based on this score may increase the EMS sensitivity for AAS. The 1-month survival rate was significantly higher in patients admitted to core hospitals with surgical teams for AAS than in those admitted to all other hospitals [87.5% (210/240) vs 69.4% (84/121); $P < 0.01$]. Multiple logistic regression analysis demonstrated that Stanford type A, Glasgow coma scale ≤14, and admission to core hospitals providing emergency cardiovascular surgery were associated with 1-month survival.
Conclusions: Improvement of AAS survival is likely to be affected by rapid admission to appropriate hospitals providing cardiovascular surgery.

1. Introduction

Acute aortic syndrome (AAS), including aortic dissection (AD), intramural hematoma and penetrating atherosclerotic ulcer, is the major acute and lethal disease affecting the thoracic aorta [1-3]. Critically ill patients with AAS are transported to hospitals by local emergency medical service (EMS). Multiple factors complicate early and accurate identification of acute AD, not only in a hospital or medical office setting but also in a prehospital setting. At the bedside, current guidelines emphasize the role of physicians in the early detection and improved outcome of AAS [3,4]. Most patients with AAS have out-of-hospital onset and were transported to hospitals by EMS [5]. The quality of AAS assessment by EMS and prehospital factors may affect survival from AAS in light of the guideline-based approach to detect AAS [3,4,6].

We aimed to examine the clinical background, signs and symptoms, incidence and outcomes of AAS patients who were transported to hospitals by EMS as non-traumatic medical emergencies excluding out-

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of-hospital cardiac arrest (OHCA). In addition, we evaluated the quality of EMS assessment and clarified the prehospital factors associated with survival in AAS.

2. Methods

Data were collected in accordance with the national ethical guidelines for epidemiological surveys [7]. This study was approved by the review board of the Ishikawa Medical Control Council (MCC).

2.1. Population and EMS setting

Ishikawa Prefecture with an area of 4185 km^2 and a population of 1.16 million is divided into four administrative regions: one central/urban and three semi-rural/rural. Sixty-two percent of residents are located in the central region. Approximately 22% of residents are over the age of 65 years. Ishikawa MCC provided a standard protocol and education on EMS for the management of medical emergencies including severe trauma, acute coronary syndrome (ACS), stroke and other illnesses causing shock. The protocol stated that history-taking and physical examination for AAS are recommended in non-traumatic patients presenting with any of the following symptoms and signs: chest, back or abdominal pain, syncope, or perfusion deficit.

During the study period, there were 11 fire departments and 55 ambulance teams that participated. More than 3 crews including at least one paramedic were dispatched to a scene. Emergency medical technicians including paramedics were not allowed to provide any medication or fluids to patients without out-of-hospital cardiac arrest.

There were 12 core hospitals that had high diagnostic capacity and initially managed critically ill patients, of which 4 core hospitals functioned as emergency medical centers that provide advanced medical care for acutely and critically ill patients. In general, critically ill patients were transported to core hospitals. When these hospitals cannot accept a patient, or the patient's family refused the transportation to these hospitals, patients were transported to one of 32 regional hospitals, rather than a core hospital. Five core hospitals (3 emergency medical centers and 2 core hospitals) had the surgical team performing emergency cardiovascular surgery, and these hospitals were able to accept patients requiring surgery for acute aortic diseases for 24 h every day and have abundant treatment experience. All of these hospitals were located in the central region.

According to the Japanese guidelines [8], the recommended treatment for acute-phase AAS was emergency surgery for type-A AD and surgical treatment for type-B AD with severe complications.

2.2. Data collection and selection

From January 1, 2011 to December 31, 2014, fire departments prospectively created data record sheets for 98,306 patients with non-traumatic medical emergencies. Of these, we excluded 3838 OHCA patients. The data record sheets contained the following items: background and past history of patients, time factors, onset and nature of symptoms, vital signs, electrocardiogram findings, EMS-assessed risks for critical illnesses causing symptoms and vital sign abnormalities, patient location at the time of request for EMS, and the reasons for selection of medical institution to which the patient was transferred, that were recorded by paramedics before arrival at hospitals. Of the remaining 94,468 non-

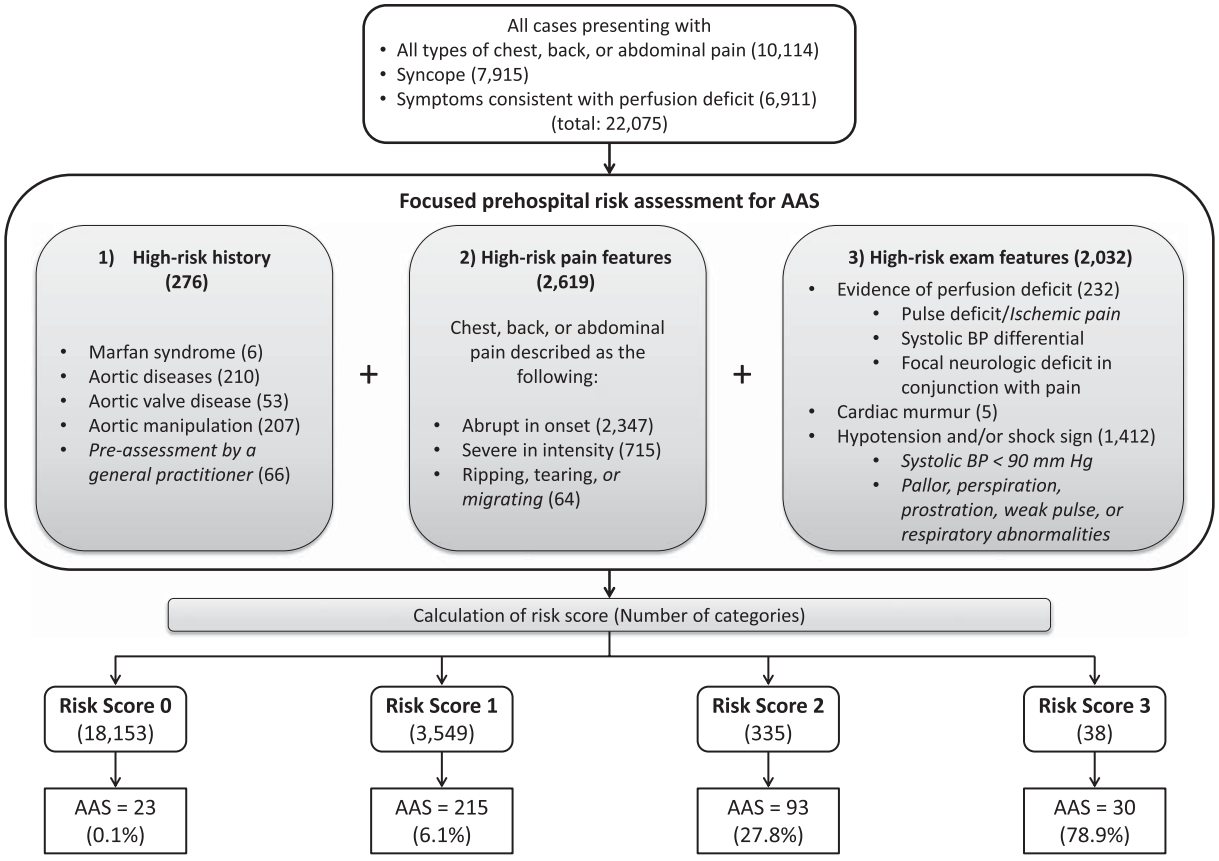

Fig. 1. Prehospital evaluation of acute aortic syndrome patients. Italics indicate modifications or addition of definitions for evaluation by EMS. AAS, acute aortic syndrome; BP, blood pressure.

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