

## Outcome of Endovascular-Treated Subarachnoid Bleeding Triggering Pulmonary and Cardiac Takotsubo

Sir,

With interest we read the article by Nonaka *et al.* about 10 female patients undergoing endovascular treatment for aneurysmal subarachnoid bleeding being complicated by neurogenic pulmonary edema (NPE) and simultaneously Takotsubo syndrome (TTS).<sup>[1]</sup> In six patients, the Hunt-Hess classification (HHC) was IV-V and in the remaining patients II-III.<sup>[1]</sup> In all patients, embolization was successful without procedure-associated complications.<sup>[1]</sup> The outcome on the modified Rankin scale was 0 ( $n = 4$ ), 1 ( $n = 2$ ), 3 ( $n = 1$ ), and 5 ( $n = 3$ ).<sup>[1]</sup> We have the following comments and concerns.

There are different types of TTS including the apical, mid-ventricular, basal, lateral, and the global type.<sup>[2]</sup> Since the outcome is highly variable between these various types, we should know which types of TTS were diagnosed in the ten patients and if the TTS type influenced the outcome. Obviously, the four patients with HHS I-III had the better outcome than the six patients with HHS IV-V.<sup>[1]</sup> This finding suggests that HHS rather than severity of TTS or NPE determines the outcome in these patients.

Since TTS and NPE may require treatment<sup>[3]</sup> we should know how many of the ten patients received specific treatment for TTS or NPE and in how many of them improvement was attributed to cardiac or pulmonary therapy.

Since patients with aneurysmal subarachnoid hemorrhage (aSAH) frequently require treatment on an intensive care unit, we should know how many of the ten patients required artificial ventilation, if duration of artificial ventilation was correlated with the HHS, and if period of time on the intensive care unit influenced the outcome.

Since NPE can be regarded as the Takotsubo of the lungs,<sup>[4]</sup> we should know if TTS and NPE occurred simultaneously or if they occurred one by one. In how many patients did they occur simultaneously, in how many preceded TSS the NPE, and in how many the NPE the TTS?

Recovery of echocardiography in TTS can be observed within maximally 6 weeks and normalization of the electrocardiogram (ECG) within 10 weeks after onset.<sup>[5]</sup> We should know after which latency TTS resolved completely and if recovery time was correlated with the HHC at onset. In addition, we should know how many had an ECG

mimicking myocardial infarction, how many had elevated troponine, and how many had elevated proBNP.

Interestingly, three patients received local anesthesia and the remaining patients general anesthesia for the endovascular procedure.<sup>[1]</sup> Did the type of anesthesia influence the outcome?

Age of patients ranged from 35 to 73 years.<sup>[1]</sup> We should be informed if age had an effect on the outcome. Furthermore, the authors should discuss why only females experienced TTS and NPE during a SAH within the observational period.

Overall, this interesting study could be more meaningful if the points raised above were thoroughly addressed. The outcome of patients experiencing a SAH may not only depend on the severity of SAH but also on the severity and duration of complications such as TTS and NPE, on age and concomitant medication.

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### Conflicts of interest

There are no conflicts of interest.

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