



## Hyperkalemia after Administration of Hypertonic Mannitol: Two Case Reports: Reply to Editor

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Many thanks to the comments and questions raised by Meng [1] and accompanied by a case report from Huang [2]. In this reply, we would like to present all the related details which might be un-emphasized in our original writing [3].

### Pertinent Details

The patient did not have abnormal cardiac history and other pertinent medical history. The brain lesion was located in the right cerebellum and during the surgery, intraoperative neurophysiological function was monitored (potential pathological diagnosis was metastatic carcinoma which was small cell carcinoma). Mannitol was administered at the time when the surgeon was separating the tissue (surgeons asked to). It did not arrive at the lesion and the position was relatively shallow, so this can eliminate the bradycardia and low blood pressure that was caused by stimulating parasympathetic nerve or by direct stimulation at the center. Twenty-five minutes after the completion of mannitol administration, hypotension and bradycardia occurred. Since it was the start of the surgery, the blood loss was mild (about 50 ml), and when the crisis occurred, urine output was about 200 ml. Unfortunately, the subsequent Urine output was not documented. After the crisis occurred, Transesophageal echocardiography (TEE) was performed during the resuscitation. TEE suggested that the left ventricle and the left atrium were enlarged and sluggish. The size of the right atrium and ventricles were normal, and the embolus did not appear.

### Intervention and Response

When the crisis occurred, anesthesia was immediately turned off, and at the beginning, hyperkalemia was not recognized. We paid full attention to resuscitation, including external chest compression, electric defibrillation.  $\text{HCO}_3^-$  solution was infused and 1~3 mg adrenaline was injected intravenously (responded well to adrenaline).

### Differential Diagnosis of Pulmonary Embolism (PE)

The end-tidal carbon dioxide ( $\text{ETCO}_2$ ) was normal

and it can also be one of the factors to exclude the potential diagnosis of massive PE. About 90% of emboli are from proximal leg deep vein thromboses (DVTs) or pelvic vein thromboses. DVTs are at risk for dislodging and migrating to the lung circulation. The conditions are generally regarded as a continuum termed venous thromboembolism (VTE).

The preoperative examination showed that this patient's D-dimer level was normal and the ultrasonography of lower extremity vein showed no deep vein thromboses (DVTs). The patient did not have the risk factor of PE like obesity or after surgery which causes hypercoagulability. Meanwhile when the hypotension and bradycardia occurred, the surgeon was separating the brain tissue, and the TEE did not find any direct and indirect evidences of potential pulmonary thromboses.

### Literature Review

As mentioned, although mannitol is a relatively safe pharmacological agent when it is used as per the recommendation based on the 50+ years of clinical experience [1], hyperkalemia and hyponatremia are the two common electrolyte abnormalities following the mannitol administration.

Previous research suggested that after the administration of mannitol, hyperkalemia occurred in some patients and caused asystole ( $\text{K}^+$  6.5 mEq/L) [4], ventricular tachycardia ( $\text{K}^+$  6.8 mEq/L,  $\text{K}^+$  7.5 mEq/L) [5,6]. After excluding all the potential differential diagnoses, the authors suggested that the crisis was because of the administration of mannitol and caused hyperkalemia. Huang, et al. [1] suggested that the patients with hyperkalemia ( $\text{K}^+$  6.2 mEq/L) experiences transient episodes of bradycardia. The mechanism of mannitol induced hyperkalemia needs exploration.

### References

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