Dear Sir,

Crush syndrome with muscle trauma or compression is a well-known cause of acute renal failure (ARF). Except for ARF, other organ failure is an uncommon complication if other sequelae, such as sepsis and multiple organ failure (MOF), can be prevented. We herein report a case of ARF with adult respiratory distress syndrome (ARDS) associated with crush syndrome.

A 33-year-old female without any medical history was referred from another hospital because of anuria for 24 h. Three days previously, she had slipped and fallen on the pavement and had been accidentally trapped for 1 h and 45 min under an open door of the car in which she had been about to ride. Physical examination at the time of admission to our hospital disclosed a conscious woman; temperature 37.4°C, heart rate 94 beats/min, and blood pressure 116/70 mm Hg. There were signs of extensive compression with abrasions on the trunk and limbs. A chest X-ray revealed a fracture of the right 9th rib and the left 6th rib but no damage to the bilateral lungs. Abdominal computed tomography scan showed no abnormality of the abdominal organs but indicated edema of the iliopsoas muscle. Laboratory studies showed: hemoglobin 7.5 g/dl, hematocrit 21.7%, white cell count 25,500/µl, blood urea nitrogen 81 mg/dl, serum creatinine 9.0 mg/dl, Na 138 mEq/l, K 5.0 mEq/l, bicarbonate 18.0 mEq/l, creatine phosphokinase (CPK) 39,000 IU/l, myoglobin 22,000 ng/l, aspartate aminotransferase 1,689 IU/l, alanine aminotransferase 298 IU/l, lactate dehydrogenase 4,010 IU/l.

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<th>ARDS</th>
<th>VHD</th>
<th>Cr (mg/dl)</th>
<th>ECUM</th>
<th>CPK (IU/l)</th>
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<td>↓</td>
<td>50,000</td>
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<td>BW (kg)</td>
<td>CTR (%)</td>
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<td>56</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 (days)</td>
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The patient was diagnosed as having ARF due to the crush syndrome. Hemodialysis was initiated via a femoral catheter on the 4th day after the accident. On the 5th day, the patient complained of dyspnea with marked rhonchi at bilateral lungs and chest X-ray showed diffuse infiltration without cardiomegaly. She was in respiratory distress syndrome with arterial blood gas showing pH 7.430, PCO2 35.1 mm Hg, P02 46.6 mm Hg, HC03 23.3 mEq/l. Removal of 2 liters of fluid by the extracorporeal ultrafiltration method (ECUM) improved both hypoxia and the infiltration on the chest X-ray. He-modialysis with ultrafiltration was continued every day, maintaining systolic blood pressure at 100-120 mm Hg and cardiothoracic ratio (CTR) on the chest X-ray taken anteroposteriorly at 48-50%. Her body weight was reduced from 55 to 48.5 kg accompanied by a decrease in central venous pressure from 13 to 4.5 cm H2O. However, on the 11th day she again developed the same respiratory failure as previously described with arterial blood gas showing pH 7.434, PCO2 33.0 mm Hg, P02 43.4 mm Hg, HC03 22.1 mEq/l. Although CPK and other muscle enzyme concentrations had returned to almost normal values until then, renal failure persisted. At this time, rapid removal of a large amount of fluid by ECUM improved the ARDS as effectively as the previous case. Consequently, the body weight of the patient was reduced by 10 kg and the CTR was reduced to 41 % within 9 days since the admission to our hospital (fig. 1). Intermittent hemodialysis was continued until the 40th day when the patient became independent of the dialysis. Afterwards, full normal renal function was restored and no other complication developed.

Overtransfusion in ARF possibly might be responsible for the former ARDS, though in the latter ARDS overtransfusion, sepsis syndrome and other clinical conditions such as embolism, oxygen toxicity, pneumonia and disseminated intravascular coagulation, which are common causes of ARDS, appeared to be improbable according to the clinical setting in our patient. Although the accurate cause of the latter ARDS is unclear, the gastrointestinal tract has been emphasized to function as a potential effector of MOF associated with the crush syndrome through the release of several cytokines when the ischemia and reperfusion of the micro-circulation occurred [1]. It is also recently reported that the ischemia and reperfusion of the gastrointestinal tract predisposes lungs to albumin leakage in experimental animals [2]. We believe that the increase in the pulmonary capillary permeability intrinsically associated with the crush syndrome was the cause of the latter ARDS in our patient, presumably through the ischemia and reperfusion of the tissues following the loss of water and electrolytes into damaged muscles once circulation to these area was restored after removal of the crushing object. This experience has shown us that in the case of the crush syndrome the possibility of a delayed ARDS should be taken into consideration, even when complications such as sepsis and MOF are prevented.

References

Adult Respiratory Distress Syndrome Associated with Crush Syndrome
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489