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Short Communication

Clinical analysis of thoracoscopic surgery combined with intraoperative autologous blood transfusion in the treatment of traumatic hemothorax

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ABSTRACT

From January 2013 to January 2015, 19 patients of traumatic hemothorax with hemorrhagic shock were treated in our department by thoracoscopic surgery combined with autologous blood transfusion. This study retrospectively analyzed the therapeutic effect and shared our experience. The average amount of blood transfused back was 662.41 ml ± 269.15 ml. None of the patients developed transfusion reaction and were all discharged uneventfully. Thoracoscopic surgery combined with autologous blood transfusion is effective in the rescue of patients with progressive hemothorax and hemorrhagic shock. When corresponding indications are well managed, treatment for these patients is quicker, safer, and more effective.

Patient data

Traumatic hemothorax is the most common thoracic emergencies and patients are usually in critical conditions because of other combined serious complications such as hemorrhagic shock, which leads to a high mortality. Retrospective analysis of 19 cases of traumatic hemothorax with hemorrhagic shock who received thoracoscopic surgery together with blood washing and continuous autologous transfusion was conducted. There were 16 males and 3 females, aged 21–47 years, mean (28.76 ± 5.24) years. The injury type included rib fracture combined with intercostal artery rupture bleeding in 8 cases, lung laceration following thoracic sharp injury in 6 cases, and intercostal vascular rupture & pulmonary laceration caused by thoracic sharp injury in 5 cases. The systolic blood pressure was (68 ± 5) mmHg and diastolic blood pressure (53 ± 6) mmHg. The mean blood loss was (1100.27 ± 230.51) ml: 1000–1200 ml in 12 patients, 1200–1500 ml in 5 cases, and >1500 ml in 2 cases. The diagnosis of hemorrhagic shock strictly followed the principle of patients with an estimated blood loss >800 ml (or more than 20% of the total). Patients with combined injury were excluded from this study.

Under combined anesthesia through double-lumen tracheal intubation, the patients underwent thoracoscopic surgery to achieve full detection and hemostasis. Intraoperatively aseptic operation was strictly controlled. At the same time, Type 3000P blood recycling machine (Beijing Jingjing Medical Equipment Co., China) was used to perform blood washing and transfusion. The blood in the chest bottle and thoracic cavity was collected. After filtration, centrifugation and washing, the anticoagulant, part of platelets, red blood cell (RBC) debris, tiny particles, free plasma protein and plasma components were removed; the clean concentrated RBCs were pumped and transfused back to the patient.

Results

The recycled amount of RBCs among the 19 patients reached maximumly 1680 ml, minimally 490 ml, mean (662.41 ± 269.15) ml. The two patients with a blood loss over 1500 ml had a poor recycle rate with many blood clots. On postoperative day 1, their hemoglobin level was less than 70 g/L. Totally they were infused with 14 U stored RBC suspension. For the whole group, the mean transfusion volume of RBC was 2.8 U. None of the 19 cases had postoperative transfusion reactions, secondary hemorrhagic disease or sepsis. All of them were discharged uneventfully.

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Discussion

Traumatic hemothorax is one of the most common thoracic emergencies in clinical practice. Patients combined with hemorrhagic shock and other serious complications often need thoracotomy. In recent years, the development of video-assisted thoracoscopic surgery is popular because it is a minimally invasive technique with less intraoperative blood loss and rapid postoperative recovery. It proves to be safe, effective and appearance-beneficial, and thus has been widely used.

All our 19 patients of traumatic hemothorax & hemorrhagic shock received thoracoscopic surgery rather than traditional thoracotomy, even those with the injury types of rib fractures accompanying intercostal artery hemorrhage and sharp instrument-induced injury to the intercostal vessels or/and the lungs. The reasons are: for all the abovementioned combined injuries, thoracoscopic exploration can well define the patient's injury conditions in a very short time; as for the intercostal bleeding and pulmonary laceration bleeding, hemostasis can be easily done under thoracoscopy, which can greatly shorten the operation time and reduce surgical trauma as well as the chance of chest contamination. Therefore thoracoscopic surgery has the advantages of minimally invasive, rapid recovery, and few complications.[1]

However, thoracoscopic treatment for progressive hemothorax also has limitations. This technique is difficult and the indications must be well known.[2] Moreover the surgeons need to do a comprehensive, prompt and accurate judgment on the patient's condition. Once a case was selected wrongly for thoracoscopic surgery, serious consequences will happen.[3] The main indications of video-assisted thoracoscopic surgery in treating traumatic hemothorax are: (1) open or closed thoracic trauma associated with persistent hemothorax; and (2) thoracic penetrating injury with primary drainage amount greater than 800 ml.[4] Whereas the contraindications include: (1) severe shock shortly after injury or drainage of a large amount of coagulated bloody fluid, which is often suspected or determined to have major vessels and heart damage; (2) severe pulmonary laceration or tracheal/bronchial injury; (3) combined esophageal rupture; (4) severe combined injury and unstable hemodynamics; (5) patient cannot tolerate one-lung ventilation; and (6) serious pleural adhesions on the operation side due to previous surguries.[5] As long as the abovementioned surgical indications are strictly followed, the surgery can obtain satisfactory results. However, if intraoperative exploration shows the need for traditional thoracotomy, surgical strategies should be immediately changed.

For patients with chest trauma-induced hemorrhagic shock, surgery and blood transfusion are both indispensable. Some critical patients need emergent blood transfusion. But due to the blood preparation time or shortage of matched blood, surgery combined with autologous blood transfusion is very important.[6] All the 19 cases were sent to our hospital with varying degrees of shock. They were diagnosed to have progressive hemothorax preoperatively. Autologous transfusion of the blood free of contamination in the chest cavity was conducted,[7] which won the valuable time for anti-shock treatment and played a very important role in patient's rehabilitation.

Intraoperative autologous blood transfusion is a way of autologous transfusion. For serious bleeding patients, blood transfusion is a key factor determining the rescue success. In the emergent condition of acute massive bleeding, intraoperative autologous blood transfusion can increase the success rate and win valuable time for the patient, and moreover avoid as high as 60%–70% of allogeneic blood transfusion.[8] For all our 19 patients, no one had blood transfusion reactions. In the emergent surgery of traumatic thoracic injury-induced bleeding, autologous blood transfusion is more time-saving, more convenient, safer and more effective than the stored blood transfusion,[9] and the patient's intraoperative blood loss will not be wasted. Moreover the former is fresh autologous RBCs with a better cell viability and higher oxygen carrying capacity, which can rapidly supply blood volume and maintain an effective cycle without adverse transfusion reactions.[10] But the indications and contraindications for autologous blood transfusion should be well known. Blood that flows out of the vessels for more than 6 h or was suspected with contamination or contains cancer cells must not be re-transfused.

The preservation technology of salvaged blood for intraoperative autologous transfusion has obtained more and more attention. Combined with thoracoscopic surgery, the treatment in some patients with trauma-induced progressive hemothorax can make a great progress from conservative observation into more active surgical treatment, which greatly improves the rescue success rate and treatment safety.

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