Control of severe pelvic fracture hemorrhage with pelvic packing

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The mortality of pelvic fracture caused by high energy trauma is very high. If the fracture is combined with massive blood loss, the mortality will reach 50%-60%.1,2 The bleeding site usually origins from retroperitoneum. Unstable pelvic fracture can easily cause continuous retroperitoneal bleeding which is bound to a hemorrhagic shock state. So it is critical to prevent retroperitoneal bleeding as the first step to save the patient’s life, which seems to be more efficient than transfusion.3 Interventional angiographic procedure and pelvic packing have been taken to control life-threatening hemorrhage.4,5 Controversy exists on how to control exsanguinating hemorrhage more efficiently after trauma. Herein, we reported the excellent efficacy of direct retroperitoneal packing in two patients who remained hemodynamically labile after taking resuscitative measures and discussed the role of pelvic packing to control massive hemorrhage in unstable pelvic fractures.

CASE REPORT

Case 1

A 24 year-old man suffered from crash accident and was carried directly to our hospital. His initial blood pressure (BP) was 80/40 mm Hg and hematocrit was 34.8%. In the course of his transportation, 500 ml of balanced solution was transfused. Until the patient was transferred to the emergency room, the systolic pressure did not increase to more than 90 mm Hg. On his arrival to our hospital, the patient had BP of 100/88 mm Hg, a pulse of 154 beats per minute (bpm) and Glasgow Coma Scale (GCS) score of 15. Anteroposterior radiograph and CT scanning of the pelvis showed Tile C fracture (Fig.1). Head, chest and abdomen showed no significant injuries. The initial diagnosis was pelvic fracture, bladder rupture, lumbar vertebra fracture and hemorrhagic shock. Despite receiving 4000 ml of packed red blood cells (PRBCs), the patient continued to have tachycardia about 130 bpm and blood pressure decreased to 70/40 mm Hg, accompanying with patient’s temperature at 33.5°C and hematocrit of 32%. He was taken immediately to the operating room for external fixation (Orthofix) and pelvic packing by orthopaedic surgeon. Hematoma was found obviously in the region of genitalia. After the packing, patient’s BP was 123/82 mm Hg and his pulse was 90 bpm. The duration of packing and external fixation was 30 minutes. He was sent to intensive care unit (ICU) for further resuscitation. One day postoperatively, the life signs of patient were stable with the pulse of 95 bpm and systolic pressure over 90 mm Hg. No sign of infection was found. Four days after the packing, the pads in the abdomen were taken out. The final internal fixation was performed one week later.

Case 2

A 26 year-old man suffered from motorcycle accident and transferred to our hospital 2 hours later. His initial BP was 110/75 mm Hg and the number of hemoglobin was 67 g/L. In the primary hospital, 1000 ml of balanced solution had been transfused. The systolic pressure was 80 mm Hg on the arrival to our hospital and GCS score was 10. Urethral laceration was found by ultrasound and cystostomy was performed. Soft tissue laceration was found on the right lateral thigh where about 10 cm skin cast off. Anteroposterior radiograph and CT scan of the pelvis and head showed Tile C pelvic fracture and arachnoid sinus hemorrhage (Fig.2). Chest-ray showed pleural effusion on both sides. The initial diagnosis was pelvic fracture, urethral laceration,
hemorrhagic shock and hand skin degloving injury. The patient received tracheal intubation urgently after we documented PO2/FiO2 (50%) was 250. Despite receiving 5,000 ml of PRBCs, patients continued to have tachycardia about 130 bpm and BP decreased to 70/40 mm Hg. Thirty-six hours later, he was taken immediately to the operating room for laparotomy by general surgeons and external fixation (Orthofix) and pelvic packing by orthopaedic surgeons. After the packing, the patient’s BP was 110/90 mm Hg and his pulse was 90 bpm. The duration of packing and external fixation was 20 minutes. He was sent to ICU for further resuscitation. Three days after operation, the life signs of patient were stable with the pulse of 90 bpm and systolic pressure over 90 mm Hg. The average out/in difference value was over 600 ml. Five days after packing, the pads were removed. One week later, the siblings of the patient refused no further treatment. Therefore, the second operation was not carried out.

**DISCUSSION**

Exsanguinating hemorrhage is the major cause of death in multiply injured patients with unstable pelvic fracture within the first 24 hours after injury. Post-traumatic blood loss over 1,200 ml will have a mortality of about 40%. Since the conception of “damage control” was proposed, first aid in the emergency room becomes the efficient way to reduce the mortality. To control the “first hit” and prevent the “second hit” can significantly improve the prognosis.

The treatment of exsanguinating hemorrhage in multiply injured patients with unstable pelvic fractures is controversial. Immediate reduction and external stabilization of pelvic fractures have been well accepted. However, the best method to control hemorrhage still gives rise to debate. European medical centers generally prefer the more radical approach of laparotomy and direct packing whereas North American centers rely more on angiographic embolization.

Early stabilization of an unstable pelvic fracture has been reported to have a beneficial effect in bleeding control. External stabilization results in spontaneous hemostasis of retroperitoneal bleeding by reducing the volume of pelvic basin, adjusting the fracture ends, increasing the pelvic pressure and acquiring consequent the self tamponade-like effect. As a matter of fact, human pelvic structure is not as watertight as idealistic module. Blood can be effused into legs and inguinal region through intramuscular space in posterior pelvis, causing swelling or hematoma in lower limbs and thigh. Moreover, unstable pelvic fractures can lead to severe damage of the constrain ligaments of pelvic ring as well as floor and iliopectineal fascia, which ham-
pers the body’s self tamponade effect. Thus, retroperitoneal hematoma can drain into the lacunae, the abdomen, even the chest. Unpredictable blood loss can be life-threatening.

The rationale behind pelvic packing derives from the fact that 80% of the bleeding originates from venous plexus. Bleeding from the venous plexus can be effectively controlled only by local packing. Pelvic packing can convert pressure directly to the inside of pelvic to stop bleeding. Small arterial bleeding can also be successfully controlled by pelvic packing. Although numerous investigators have reported the benefits of angiography in selected cases, angiography is time-consuming and requires transportation of a severely injured unstable patient to the angiography unit, which may hamper resuscitative efforts. It also requires the availability of a skilled radiologist. Moreover, only 1.9% patients with pelvic injury required embolization.

The purpose of pelvic packing is to control bleeding in a short time and successfully inhibit “first attack”. Emergent retroperitoneal packing plays an important role in damage control of critically injured patients. It can be done immediately and easily in conjunction with abdominal surgical procedures to stabilize the patient. The stable life sign makes the other surgical procedure available. Ertel et al. reported the success in controlling both arterial and venous bleeding with C-clamp fixation and tight pelvic packing. Removal of the packing pads were done in 1.7 ± 1.3 days. Definitive stabilization of pelvic ring injuries was accomplished after 3.0 ± 2.8 days.

In our experience after having successfully treated 2 patients, we found that unstable pelvic fracture combined with massive blood loss could be effectively managed with pelvic packing technique. Two patients receiving pelvic packing showed stable life sign and endowed with chance for second operation (internal fixation). As the mortality of severe pelvic fracture hemorrhage is high, we believe that immediate life support and damage control (packing and external fixation of pelvis) should be recommended in critical cases.

REFERENCES


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