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Case Report And Review of Literature on Anaesthetic Management of Cell Phone Blast Injury Causing Liver Laceration And Haemothorax

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Abstract: *An 8 year old boy met with a mobile phone blast injury and presented with pain in abdomen and multiple injuries over abdomen, chest and right thigh. Patient had developed right sided haemothorax. Patient was taken up for emergency laparoto my under general anaesthesia. On laparotomy patient was found to have grade 5 liver lacerations. Patient responded to timely surgical intervention and recovered well.*
Keywords: *blast injury, liver laceration, haemothorax, rapid sequence induction (RSI)*
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I. Introduction

Blast injuries result from the complex pressure wave generated by an explosion. Several factors affect the likelihood of blast injury:

- The first is the medium in which the explosion takes place; water is non-compressible so the pressure wave propagates rapidly with a slow rate of dissipation. It therefore has a greater potential for injury than an explosion in air.
- Second is the distance a person is from the explosion; the closer one is to an explosion, the greater the blast pressure experienced.
- Third is the site of blast. The blast pressure is amplified as pressure waves reflect back from solid surfaces and increase its force. So people in close proximity to a wall (eg. in a confined space) will be subject to enhanced blast pressure and be at an increased risk of injury.

Blast injuries are divided into four categories:

- A primary blast injury is caused by the direct effect of blast overpressure on tissue. Air-filled organs (e.g. ear, lung, and gastrointestinal tract) and organs surrounded by fluid-filled cavities (e.g. brain and spinal cord) are particularly susceptible to primary blast injury.
- A secondary blast injury is caused by people being hit by debris that is physically displaced by the blast pressure wave. These can cause a combination of penetrating and blunt trauma injuries.
- A tertiary blast injury is caused by high-energy explosions and occurs when people fly through the air and strike other objects.
- Miscellaneous blast-related injuries include all other injuries caused by explosions, e.g. due to fire or collapse of buildings, burns, toxic substance exposures (such as radiation, carbon monoxide poisoning, cyanide poisoning), asphyxia and psychological trauma.

Figure 1 : External injuries of victim

II. Case

An eight year old boy (Fig. 1), weighing 18 kgs, presented to Emergency department with alleged history of mobile blast while charging the cell phone with pain in abdomen and multiple injuries over abdomen, chest, right arm, left hand and right thigh. He was hemodynamically unstable and drowsy at the time of presentation. Abdominal pain was sudden in onset which was continuous and progressive, present all over the abdomen. There was history of blurring of vision and pain in the left eye. Past history, family history and personal history was not significant. General examination was normal. On local examination many small abrasions and lacerations with specks of visible black foreign body are seen.

On preanaesthetic evaluation, patient was in obvious distress. He was NBM for 4 hours. He was 142 inches tall and weighed 18 kgs with pulse rate of 150/min, regular in rhythm, of low volume and Blood pressure of 64/30 mm Hg taken on right upper arm in supine position with severe pallor. On physical examination there were decreased breath sounds on right side of the chest, with dull note on the base. Per abdomen findings were suggestive of guarding, rigidity and rebound tenderness was present with absent bowel sounds. On airway assessment the patient had adequate mouth opening, no loose teeth and with Mallampati criteria II. Preoperative laboratory workup revealed Hemoglobin of 7.5 gm/dl. Platelet count and total blood counts were normal. Chest radiogram (Fig. 2) revealed right sided moderate haemoperitoneum and ultrasonography of abdomen revealed free fluid in Morrison's pouch and pre-hepatic region. CT abdomen showed liver laceration (Fig. 3 & 4). Blood products including 2 units of packed cells and 3 units of fresh frozen plasma were ordered. Patient was resuscitated in the preoperative room with colloid and right inter-costal drainage tube no. 20 was inserted on right side of the chest.

General anaesthesia was planned for the exploratory laparotomy as the patient was in a state of shock and was hypotensive. Informed consent was obtained after the risk of extensive bleeding, possible blood transfusion, and general anaesthesia related complications were explained to the patient. Two 20 G intravenous lines were inserted and 1 litre of crystalloid administered preoperatively. In the operation room, standard ASA monitors were applied. The patient was pre medicated with Injection Ranitidine 20 mg. Injection Metoclopromide 4mg, Injection Glycopyrolate 0.08 mg and Injection Fentanyl 40 µg. Rapid sequence intubation was carried out with Injection. Ketamine 40 mg and Injection Succinyl choline 40 mg , adequate cricoid pressure was applied and patient intubated with cuffed endotracheal tube of 5.5 F and fixed at mark 16 cms after confirmation of bilateral air entry. Anaesthesia was maintained with titrated doses of SEVOFLURANE and intermittent boluses of Injection Fentanyl 5-10 mcg. Injection Atracurium 10 mg was used for neuromuscular blockade. Post induction a 5 F triple lumen central line was inserted in right IJV for CVP guided fluid management.

On opening the abdomen with a midline vertical incision, grade 5 liver laceration involving lobes 5, 7, 8 was seen. No other bleeding site was noted. Surgical packing of the liver was done. Extensive hemorrhage was noted. Estimated blood loss during the surgery was 1100 ml. Intra-operatively; patient´s blood pressure was managed with crystalloids and 6% hydroxyl-ethyl starch along with 5mcg of Injection phenylephrine intermittently. Patient was also started on inotropic support with inj. NA (3/50) at 4 ml/hr i.e. 4 mcg/min. Patient received 2 units of fresh frozen plasma followed by 3 units of packed cell volume intra-operatively and 1 unit of packed cell volume postoperatively. Hypothermia was prevented using intra-venous fluid warmer and active convective warming of the patient. Blood gas analysis revealed metabolic acidosis with pH value of 7.O, 60 ml of sodium bicarbonate was infused and hypocalcaemia was corrected with intravenous calcium gluconate according to weight and age of the patient. Total duration of surgery was 120 minutes which was uneventful post the fluid and blood resuscitation. The patient was electively ventilated for 24 hours for maintaining haemodynamics. Post operatively patient was hemodynamically stable with heart rate of 108/min, blood pressure of 116/54 mm Hg. For post operative analgesia, infusion of injection. Fentanyl at the rate of 10 mcg/hr was started.

His postoperative period was uneventful and patient was extubated on post operative day 2 and he was discharged 10 days after surgery.

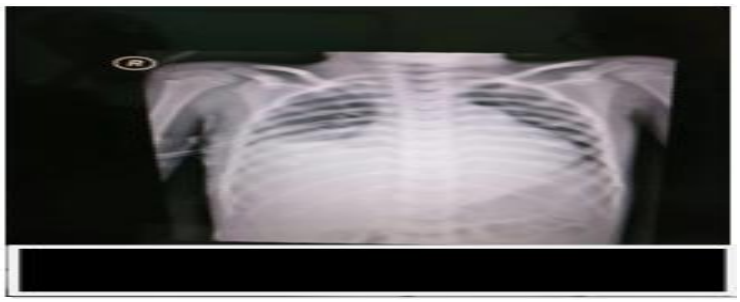

Figure 2: Chest Radiogram of victim

Figure 3: CT Scan abdomen

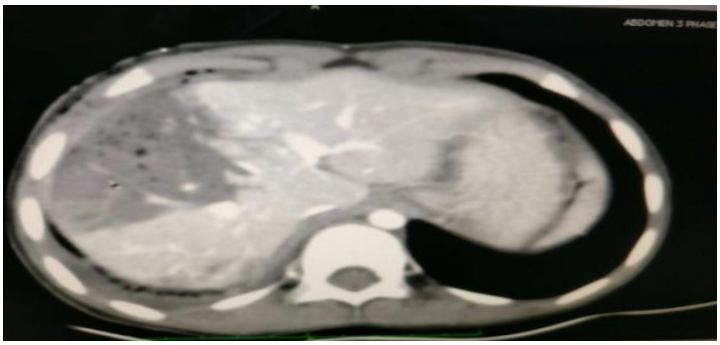

Figure 4: CT Scan abdomen

III. Discussion

Blast trauma is multidimensional injury; the type of the blast injury may lead to different systems involvement as it often combines blast, penetrating blunt, and burn mechanisms in the same casualty. In primary blast injuries, ear drum perforation is the most common clinical finding. Pneumothorax and haemothorax should be actively ruled out and immediately decompressed in patients.

The challenge for anesthesiologist is the fact that in a laparotomy it is imperative to maintain adequate fluid volume to compensate for the third space losses. But in a blast injury there are maximum chances for the injury to chest and abdomen. The chest radiogram had revealed right sided moderate haemothorax. Our challenge in this case was more pronounced as we were unaware of the extent of haemothorax. After placing right sided internal jugular vein Multi-lumen 5 F Central Catheter, as the CVP would provide a vital insight to the volume status. Our total fluid input was 1000 ml. Blood loss was 1100 ml. Intra operatively blood was started, 2 PCV and 3 FFP were given.

In our case he was a child, which necessitated judicious fluid management. The fluid challenge was covered injectable furosemide 5 mg intravenously.

Due to excessive stress of the trauma and its subsequent management and in order to rule out the extent of damage to lungs, we preferred to defer the process of extubation, in order to maintain his hemodynamic stability. The patient was shifted to PICU. The patient was extubated on post operative day 3 and discharged after 7 days.

IV. Conclusion

War crimes, household issues, mechanical sites all involve risks both humanitarian as well as physical. Blast injuries are very common. We cannot stop them to occur, but we can save lives, by interventions at right time. The most common injuries include that to ear, lungs and abdomen. The initial remedy is the best prevention in them. The modernization of all hospitals with better critical care is the need of the hour.

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