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Perioperative anaesthetic management of a case of penetrating neck injury with Rh negative blood group:-a case study

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ABSTRACT:-Penetrating neck injury is a relatively uncommon and life threatening event leading to airway compromise and requiring emergency surgical treatment. Anaesthetic management of such cases pose a challenge during surgical procedure particularly if the patient has a rare blood group. A single wrong decision can become a matter of life and death in such cases. Here we will discuss the case of a 25 year old male with penetrating neck injury(PNI) with Rh negative blood group requiring immediate surgical intervention. The injury was a right sided Zone II PNI, at the level of thyroid extending from midline posteriorly till the anterior border of trapezius which was 20cm length, 6cm breadth and 6cm depth, damaging various structures. He was hemodynamically unstable on arrival and underwent surgical exploration and repair done in two stages under general anaesthesia.

Keywords:-zones of the neck, anaesthetic management, penetrating neck injury, Rh negative, blood groups

BACKGROUND:-

Penetrating neck injury (PNI) is a potentially life threatening injury resulting from assault or self harm in the younger population. It is dangerous due to the involvement of underlying vascular and airway components in a tightly bound space. PNI contribute to almost 5% of trauma cases in the country[1].Patients with the penetrating neck injury present in a decompensated state, requiring immediate resuscitation or may simply present with the cut, bleeding (severe/mild), hoarseness, dysphagia or dyspnea. Resuscitation is given the first priority in its management, following which history along with a thorough clinical examination is done to identify the structures involved and decide on the further line of management[2].Also contributing to the difficulty of treatment is the presence of a rare blood group especially Rh-negative blood. After ABO, Rh becomes the most significant factor indetermining the state of a patient in case of acute and severe blood loss. Management of such patients become far more challenging when the resources at hand become limited and one has to ensure patient safety within such limitations.

We shall discuss one such unusual case in our hospital in the North East India, where the patient arrived in a unstable condition post assault by a known person.

Case Presentation: - A25-year-oldmale (height 145cm, weight 55kg) presented in our emergency department with a slit neck post assault by a known person.Upon initial examination, patient was conscious, disoriented, agitated and hemodynamically unstable. He also reported of multiple episodes of blood-tinged vomiting. Upon local examination, pallor was present, with no apparent swelling of the neck or related structures. There was active bleeding from the injury site. The injury was a Zone II PNI, right sided, at the level of thyroid extending from midline posteriorly till the anterior border of trapezius which was 20cm length, 6cm breadth and 6cm depth, damaging the right external jugular vein, anterior jugular vein, internal jugular vein, unnamed emissary veins, sternocleidomastoid muscle, platysma, omohyoid muscle and scraping the right carotid. Peripheral pulses were palpable over the carotid arteries and in the upper limbs. He was found to have B negative blood group. Other laboratory findings, including a complete blood count, electrolytes and glucose, were done. All (except Hb which was 3.9gram%) were within the normal limits. ABG done on arrival showed metabolic acidosis with pH 6.99, potassium 3.1mmol/L, PCo2 45mmHg, Po2 93mmHg, sodium 143mmol/L, hematocrit less than 15%, BE -20.2mmol/L, HCO3 10.8 mmol/L.

After initial examination, measures were taken to stop the active bleeding. However due to the blood pressure dropping rapidly and becoming not recordable, the patient was quickly shifted to the operation theatre for further management and exploration of the injury under general anaesthesia.

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Inside the operating room, the patient was given standard monitoring and vitals were recorded such as Heart rate was 120bpm, spo2 was 90% on face mask with 5L oxygen, Blood pressure was not recordable, ECG showedsinus tachycardia. Patient became drowsy and after a couple of minutes, ECG changes (arrythmia) occurred, so immediate left sided femoral vein was cannulated with triple lumen catheter under aseptic and antiseptic condition. Inotropes (Noradrenaline double strength @ 15ml/hr) was started and BP was found to be 80/48mm Hg.Initially the surgeons wanted to do the exploration under local anaesthesia fearing difficulty during intubation and further injury to airway, but later due to failing condition of the patient the decision was taken to do the procedure under general anaesthesia. Patient was induced using 50mg of Ketamine, 3ml(1mg/ml) Midazolam andSuccinylcholine 75mg. Under directlaryngoscopic vision, ETT size 8mm ID, with cuff was inserted and fixed at 21cm after confirmation with bilateral air entry and capnography. Anaesthesia was maintained using oxygen, Isoflurane, Inj. Vecuronium(intermittent), and controlled mechanical ventilation. There was no oedema or abnormality in the movement of vocal chords on laryngoscopy.

After induction,right femoral artery was cannulated for continuous invasive blood pressure monitoring and serial ABG. Acidosis was corrected by using soda bicarbonate 50ml at regular interval upto 200ml. Potassium levels and calcium levels were also corrected with KCL and Ca gluconate respectively. Colloids and crystalloids were infused but still no improvement was seen in the blood pressure, so Vasopressin was started @ 5mcgs/hr, which resulted in a BP of 110/70mmHg. The case was then handed over to the surgeon.

Still the main challenge in this case was the extensive loss of blood leading to a Hb of 3.9gm% and the blood group (B negative) being rare, only 1 unit (220ml) was available in the blood bank. The same was infused and after consultation with the blood bank, O negative blood 1unit (310ml)was also given. Along with this, 2 units of Fresh Frozen Plasma (130ml and 170ml respectively)and 2 units of Platelet was infused. This improved the hemodynamic status of the patient. Infusion rates of inotropic and vasoconstrictor drugs were then set according to the patient's circulatory state, while targeted arterial BP was 60mmHg. As the patient needed more blood and blood products, compatible blood group B positive was opted for further transfusion after proper consultation. This was done after shifting the patient to ICU post procedure. The procedure took approximately 90 minutes, after which the patient was not extubated and shifted to ICU for further management.

Discussion:-Penetrating neck injury , though uncommon and infrequent, often results in high morbidity and mortality when it occurs. It has become one of the common cause of death in younger population, especially males[3]. The most common aetiologies of PNI are stab wounds, gunshot wounds or shotgun wounds[4]. As the anatomy of the neck is complex, with various vascular and significant structures lying millimetres away from each other, PNI results in high blood loss. Among the anatomical zones of the neck, zone II injuries are the most common and surgically manageable[5].

The initial management of PNI follows standard trauma resuscitation principles, including immediate airway control to avoid further compromise [6]. Management also depends majorly on the degree of vascular injury, blood loss and hemodynamic status of the patient on arrival. In this case, the patient was severely deteriorated and required immediate resuscitation for hemodynamic stability and further management.Also the patient presented with severe metabolic acidosis. Worsening acidosis effects the cardiovascular system in various ways, like myocardial and smooth muscle depression resulting in a decreased stroke volume and peripheral resistance, inducing hypotension and bradycardia[7]. Increased [H+] is associated with change in plasma [K+], which may lead to arrhythmias. Thus management of acidosis becomes imperative for making the patient hemodynamically stable.

Another factor in this case was the presence of a rare blood group combined with significant blood loss, which led to haemorrhagic shock. It is a severe clinical syndrome, produced by rapid and massive blood loss, which may lead to instability, decrease in in oxygen delivery and tissue perfusion, cellular hypoxia, organ damage, and even death. One of lifesaving treatments of haemorrhagic shock is massive transfusion[8]. But due to the presence of a rare Rh negative blood group, blood products were limited and hence other compatible blood groups also had to be transfused. This decision to use compatible blood group for acute blood loss becomes a calculated one in the hands of the anaesthesiologist as over transfusion may lead to adverse effects.Hence massive transfusion could not be achieved.

Early and proper management of a patient of PNI becomes crucial in a hemodynamically unstable condition to avoid further deterioration.

Rapid correction of acidosis and hemodynamic stability achieved by inotropes and transfusion of blood products in this case posed to be major challenges for the perioperative anaesthetic management. This case responded well to the resuscitation and surgery could be completed and the patient had to be transferred to ICU for further management.

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