revistachilenadeanestesia.cl

DOI: 10.25237/revchilanestv50-04-03

Battlefront medicine - scoop and scoot or stay and play?

¿Medicina en el frente de batalla - arrancar o jugar?

Shibu Sasidharan[1*], Harpreet Dhillon[1]
[1] MONUSCO

Madam,

In a war zone, artillery and firearm injuries are common. The forward surgical units, like ours, situated at Goma in the DR Congo, that cater to such injuries are equipped with emergency medical and surgical capabilities, as per a Level III trauma hospital. Trauma centres as per their capability are classified from Level[1]-[5]. Taking two reference case, we like to highlight a few points to remember when managing and most importantly deciding when, how and where to evacuate the patient.

Case 1

We recently had a case of bullet injury to the head, that was evacuated to our hospital by air from a forward location. A 26 yr old soldier was shot on the head in a close range with a rifle. As the perpetrators fled, he was left in a "pool of blood". Patient was unconscious, but was breathing normally. Help arrived in the form of paramedics, who informed the doctor, who was an hour away at a different location. Taking his advice on phone, tight compressive dressing was given and oxygen was administered to the patient. The doctor meanwhile raised a casuality evacuation SOS call, to shift to our centre which is a level 3 hospital. In the frenzy of the moment, his initial intimation to this hospital was "patient has suffered a bullet injury to the head by a gun shot and is critical". Patient had got injured at 0400 hours in the morning. He arrived at our centre at 1200 hours, 8 hrs after getting injured. The patient arrived in the emergency bay, with a GCS of 03/15, with no definite airway, no oxygen and only connected to a SpO_2 probe which read 68%-72%. On arrival, his BP was recorded as 132/60 mm Hg, HR - 99 bpm and ECG - sinus tachycardia. There were entry and exit wounds on both sides of his forehead on the temporal side (Rt - 1 cm, Lt - 1.5 cm). He was rushed to the ICU, urgent blood panels sent including blood grouping, GCS reassessed, and definitive airway was taken and was mechanically ventilated. Before intubation, it was noted that his mouth was frothing with fresh blood and he had aspirated the same, which also came out through the endotracheal tube after intubation. Aspirate was suctioned using sterile techniques. A central line was inserted in the Rt subclavian and Xray images were taken of skull and chest. Since this centre did not have advanced imagine facilities like CT Scan or MRI, and super-specialities like neuro-surgery, a decision was taken to immediately evacuate the patient to a Level 4 centre which had all these facilities. The clearance for travel by air to a neighbouring country (Uganda) in these times of COVID-19, needed a mandatory RT PCR negative status. This report took 02 hours to come. By then, his blood panels had come. It was suggestive of decreased Hb and normal coagulation profile. Radiograph Skull AP and lateral view showed a bony defect in bilateral temporal region (entry and exit wounds) with fracture line extending anteriorly and posteriorly from them. The anterior fracture line extended to the frontal bone and the posterior fracture line extends posteriorly within temporal bone before dividing to superior arm extending to parietal bone and inferior-extending to base of skull in region in petrous part of temporal bone. Pneumocephalus was noted in frontal region on lateral view. There were few bone fragments noted within the calvarium-likely scattered skull fragments. There was a fracture of the lateral aspect of greater wing of right sphenoid (likely site of entry wound) and fracture of mid third of greater wing of sphenoid (left-exit wound).

Chest AP view showed central line in situ inserted from right subclavian region and tip in region of SVC/Brachiocephalic junction. Scattered air space opacities are noted in both lung fields (right > left).

Just as the patient was being prepared to be shifted, patient had sudden hypotension with bradycardia, which progressed to ventricular tachycardia (VT). Despite starting inotropes at the very onset of hypotension, patient quickly deteriorated and in the next 03 minutes arrested with a VT. Despite all treatment given as per the ACLS protocols, patient could not be revived and was declared dead at 1,530 h.

Case 2

Two soldiers suffered injuries after a generator blast close to their duty station. This sent flying pieces of metal into the air which in great velocity injured the soldiers, including fracturing the skull of a patient. Both patients had extensive trauma to their limbs and abdomen. Since medical help was immediately available, both the patients were rushed to the medical bay, where compression dressing was applied to stop the bleeding, and they were given oxygen, started on iv fluids, given

shibusasi@gmail.com
*ORCID: https://orcid.org/0000-0003-2991-7595

pain medications and antibiotics. The patient with a penetrating trauma to the head had GCS 15/15 and was conversing, though with pain.

They were shifted to our hospital for staging while procedures to shift the patient to a level 4 centre was already in motion. As the patients arrived, RT PCR samples were taken and as soon the reports came, they were shifted to the higher centre. Both patients survived the incident and are presently in rehabilitation.

Discussion

Trauma centre levels across the many countries of the world are identified in a designation process. The different levels (ie. Level I, II, III, IV or V) refer to the classes of resources accessible in a trauma centre and the number of patients admitted annually. These groupings describe national standards for trauma care in hospitals. Classification is exclusive to both adult and paediatric services[2].

Emergency evacuation in a health care environment has focused on methods for evacuating a facility, resources for transferring patients, and sufficient capacity at sheltering facilities[2]. Unfortunately, the interaction between health care facility evacuation that would result in cases of significant logistic congestion, has always been overlooked. Every medical unit should have a clear optimization approach for recognizing the staff and vehicle transportation requirements, as well as the scheduling of these requirements, within a laid down evacuation time frame while curtailing cost[3].

Patient transfers can be divided into three comprehensive categories:

1. Horizontal transfer of a patient from one flat surface to another.
2. Upright transfers where a patient is moved from a horizontal position to an upright position or a sitting position in a wheelchair, chair or commode and the return of the patient to the horizontal position from an upright or sitting position.
3. Third category of transfer pertains to the movement of patients to change their position in a bed or chair, such as pulling the patient up in the bed or rolling the patient from side to side[4].

Establishing patient movement requirement

It is pertinent to establish and document what treatment a patient needs and where the patient can get that from. It is important to recognize patients that are fit to be evacuated, establish evacuation choices and necessities for special requirements of patients (neonatal, nursing home, critical care, psychiatric, dialysis) and anticipate requirements of medical personnel and equipment to transport a wide range of patient groups[5].

Potential evacuation risks and appropriate patient preparation

Patients moved from war zones are often critical care patients. Although there are no absolute contraindications to aeromedical evacuation, patient selection and preparation are key elements in safe patient movement. The chief medical hazards linked with air transport are hypoxia and gas expansion. Other factors comprise of noise, low lighting, vibration, temperature variations, and the stresses of multiple patient transfers. During a disaster, the sending physician has to believe the level of care will be enhanced by transporting the patient from one medical facility to another and be prepared to accept the risk related with the transfer[5]. A disaster may order hospital evacuation also because of lack of infrastructure. However the transferring physician should keep in mind that it may take substantial amount of time before the patient is back to a hospital equivalent with the one the patient left[6].

Few Considerations before transfer by air:

1. Airway protected?
2. Breathing adequately supported?
3. Circulation acceptable?
4. Disability?
   a. Brain injuries can swell and seizure thresholds lower at higher altitudes. Precautions should be taken to premedicate if needed to prevent seizures. Confirm that the aeromedical evacuation crews have all the apparatuses (medicines and devices) they need to address seizures should they develop any (i.e., IV anti-epileptic drugs and IV access).
5. Expansion of trapped air.
6. Ensure all lines and tubes are carefully fixed and stabilized.
7. Equipment and supplies.
8. Psychiatric patients will need attendants to accompany them who must not be disruptive through the transfer, and they must be able to follow directions[7].

Points for evacuating doctors

Apart from the above details, the evacuating team should be well trained to/aware of:

a) Immediately demand a helicopter for evac through proper channel.
b) How to prepare the Helipad for evac.
   a. Air socks for wind direction.
   b. Smoke candles for landing.
   c. Helipad protection.
c) Air certified cylinders.
d) Should the oxygen cylinder exhaust on board, how to demand and use the inflight oxygene.
g) Casualties travel better before surgery than immediately after surgery.
h) Proper triage is essential while evacuating mass casualties.

Conclusion

Optimal prehospital care for the injured patient is controversial. The lack of strong evidence and the methodological limitations inherent in most analyses make any definitive recommendations open to criticism. In addition, the interpretation of published evidence is complicated by the significant heterogeneity in study design, patient populations, outcomes of interest and variability in the type of interventions performed in the prehospital setting. Efforts to simply dichotomize prehospital systems into either ALS type or BLS type do not sufficiently take into account this heterogeneity.

Given the lack of benefit, and the potential for harm, newly developed systems of trauma care should focus on efficient and rapid means of transport, rather than on field interventions. It should, however, be appreciated that these recommendations might differ significantly depending on the prehospital environment. While there is no strong evidence to support prehospital ALS, the wide range of settings and providers included in the studies examining this topic preclude any definitive conclusions from being drawn. Certainly, certain prehospital systems that function in the ALS model function extremely efficiently. The specific processes of care associated with the success of these programs have not yet been identified, however, and may therefore preclude translating such programs to other environments. Finally, in the context of very long transport times (for example, rural environments) - where the relative amount of time spent on interventions is proportionally less - interventions prior to transportation to hospital might provide some advantage[8].

Further study is needed to confirm whether the adverse effects of prehospital interventions are due to a delay in the provision of definitive care or are due to inherent harmful effects of a specific procedure that may or may not be modifiable. Specifically, with the growing body of literature linking prehospital intubation to inappropriate ventilation, it is plausible that education or better monitoring might play an important role at negating the harmful effects of prehospital intubation, and might even demonstrate an overall benefit to this intervention.

In Case 1, it is likely that despite our best efforts, we would not been able to save the patient due to the nature of the injury. In Case 1, the patient should have gone directly to Level 4/5, and in Case 2, the patient took the benefit of Level 3 hospital while already being in line for transfer to Level 4/5. This saves precious time. But since the patient deteriorated hemodynamically only after 11 hours of insult, there is a remote possibility that some neuro-intervention could have possibility made a difference in outcome. Patient's airway was unprotected during the transfer during which oxygen was also not administered. This could have caused hypoxic brain damage, in a journey spanning 45 min. Our patient could have succumbed to his head trauma, aspiration pneumonitis or hypovolemia. Timely and vigorous intervention on two cases mentioned in Case 2, saw favorable outcomes.

In summary, in an urban environment with relatively short transport times (the typical clinical setting of most published studies), there is no strong evidence supporting field ALS - and only a suggestion of harm. It is acknowledged that in very selected circumstances ALS maneuvers might be life-saving, but the rarity of such patients and the difficulty in maintaining competence if practiced only in these circumstances preclude any advantage at the population level to implementing prehospital ALS. During the design phase of a new trauma system in an urban setting, emphasis should be placed on efficient transport, on limited BLS interventions at the scene and on triage to a designated trauma center[8].

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