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MANAGEMENT OF POLYTRAUMA WITH DIAPHRAGMATIC RUPTURE & TRAUMATIC BRAIN INJURY - CASE REPORT & LITERATURE REVIEW

Surgery

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ABSTRACT

Polytrauma with traumatic brain injury due to road traffic accident involving multiple rib fracture, long bone fracture , pneumothorax, surgical emphysema and rupture of the left hemidiaphragm poses a serious initial pathophysiologic challenge in the form of onset of " Lethal triad" i.e., metabolic acidosis, hypothermia & coagulopathy. Such patients need a proper triage, admission into a well equipped and committed trauma care centre with multispecialty departments, a well equipped ICU and round the clock interventional radiology, laboratory facility. Adoption of "Damage control surgery" can prevent "Second hit" injuries and improve survival.

KEYWORDS

Polytrauma, Traumatic Brain Injury, Diaphragmatic Rupture, Multiple Bone Fracture, Surgical Emphysema.

INTRODUCTION

Polytrauma involving injury to two or more organs commonly occur due to motor-vehicular accident, followed by fall, direct violence & penetrating injuries. A reduction in the overall morbidity & mortality needs adoption of effective triage & standardized protocols like ATLS, GCS, Injury Severity Score & Revised Trauma Score[1]. Principles of "Damage Control Surgery" (DCS), is helpful in cases with immediate life threatening injuries.

CASE REPORT

A 40 years male got admitted to the neurosurgery dept. with polytrauma due to RTA. He was unconscious since the accident, vomited twice in between, but without seizure & no h/o ENT bleeding. No associated co-morbidities. H/o left leg restricted movement. O/E: PR-104/min, BP- 102/68 mmHg, R/R - 38/min, Temp.- 99.2˚F, GCS-3/15, Chest exam. - Diminished breath sound on Rt side, Abd. Exam. – NAD .CXR – Rt pneumothorax, consolidation of Lt middle & lower zones, surgical emphysema Lt chest , 1st to 7th ribs fracture on Lt side (Fig-1). Xray right leg with both bone revealed both bone fracture.

Blood investigations - CBC, RBS, blood urea, serum creatinine, serum electrolytes, ABG & ECG all found within normal limits.

NCCT Head: thin acute SDH at left fronto- temporo-parietal convexity with Hemorrhagic contusions within B/L frontal & right fronto-temporo -parietal lobe.(Fig -2)

NCCT abdomen & thorax : Rt tension pneumothorax with complete collapse of right lung & left sided hemopneumo-thorax with B/L thoracic subcutaneous & deep fascial emphysema. Contiguous fracture of 2nd-7th ribs on left side, comminuted fracture of scapula & multiple foci of left lung contusion. Discontinuity & thinning of left hemidiaphragm S/O diaphragmatic rupture with pneumope ritoneum.(Fig 3,4)

MANAGEMENT

Immediately intubated in casualty & put on ventilator with ICT placement on Rt side.

Operative Procedure : Exploratory laparotomy.

INTRA OPERATIVE FINDINGS :

pneumoperitoneum, minimal hemoper itoneum, whole of stomach , part of transverse colon, large portion of greater omentum & the upper half of spleen found pushed into left hemithorax through a lacerated left diaphragm on posterolateral aspect & about 15 cm. size with a small parajejunal mesenteric laceration(Fig -5).

Procedure done : Reduction of contents from left chest cavity by gentle pulling, Normal saline lavage of peritoneum, ICT to left pleural cavity & suturing of diaphragm by inturrupted 1 prolene. Jejunal mesenteric laceration, repaired with 3-0 vicryl with tube drain to pelvis. Orthopedic surgeon applied posterior POP slab & on POD-2 , external fixators to left leg.

RESULT

Post-op ventilation support continued due to persistent low GCS because of diffuse axonal injury (DAI). CXR after 4 hours of surgery shows near normal expansion of left lung (Fig-6). Post operative right leg with both bone xray done, to see about the proper placement of external fixators (Fig-7).Patient GCS improved gradually after 4 weeks & he recovered fully by end of 7 week of admission & discharged 2 days thereafter.

DISCUSSION

The first hour following severe trauma is the "Golden hour" & majority of death occur during this period[2,5]. Major trauma related deaths occur in three time zones as :

1. Sudden death at accident site due to lethal injuries like aortic rupture or brain stem injury.
2. Early mortality within the golden hour due to blockage of airways, tension pneumothorax, severe traumatic brain injury with intracranial hematomas, cerebral edema or herniation , massive intracavitary (thoracic or peritoneal) or tissue plane or external bleeding (fracture long bone, lacerated major vessels, retroperitoneal bleed).
3. Delayed deaths (within days to weeks) as a result of sepsis, multiorgan dysfunction (MOD) & unresponsive refractile raised ICP with cerebral edema.

Severely injured polytrauma patients need early restoration of the "Lethal triad" that includes metabolic acidosis, hypothermia & coagulopathy, preferably in the ICU & prolonged surgical interventions are possibly avoided till then in order to prevent lethal "Second hit" injury .[6]

The concept of "Damage control surgery" includes 4 phages of assessment & management as[4,7] :

(1) Life saving surgery like acute decompression of tension pneumothorax, cardiac tamponade, traumatic pneumo- or hemothorax or a large epidural hematoma.
(2) Salvage operation for the control of hemorrhage as in massive hemoperitoneum, hemothorax, retroperitoneal hematoma due to pelvic ring disruption.
(3) ICU management for the stabilization of physiological & immunologic functions
(4) "Reconstructive phase" for definitive surgery .

Delayed primary surgery are carried out within first 24 hours & aimed at saving injured limbs, decompressing compartments like abdomen, chest, extremities, spinal cord or cranial cavity. Definitive surgery is to be avoided during days 2-4 after trauma (phase of hyper inflammation, that risks for "Second hit" injury) & during 2nd- 3rd week (phase of immunosuppression). The physiological phase during days 5-10 after trauma is called " time window of opportunity" & is the best time for carrying out scheduled definitive surgery[3].

CONCLUSION

A patient who recovers from the severe polytrauma may often require, multispecialty long-term recovery measures including physical, speech and occupational therapies, as well as prolonged neurology and psychiatric care[8].Adoption of " Rule of 3 R's" by Donald Trunkey i.e.,"get the Right patient to the Right hospital in Right time" can optimize survival outcome in poly trauma patients[9].

Fig 1 - Showing preoperative chest -xray of the patient

Fig 2 - Showing NCCT brain

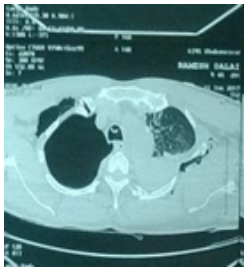

Fig 3 - Showing NCCT thorax

Fig 4 - Showing NCCT thorax including ribs (fracture left side 2nd to 7th rib)

Fig 5 - Showing intraop diaphragmatic rupture

Fig 6 - Showing Post operative chest xray

Fig 7 - Showing post operative xray of lower part of tibia fibula right leg

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