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Letter to the Editor

External stabilisation with vacuum assisted contrivance (ES-VAC) for chest wall injuries sustained from cardiopulmonary resuscitation

To the editor of Resuscitation, this letter describes the life-saving intervention of an external stabilisation with vacuum assisted contrivance (ES-VAC) for a flail chest, caused by cardiopulmonary resuscitation.

A flail chest is a serious and potentially life-threatening complication after trauma from cardiopulmonary resuscitation (CPR). Post CPR, even if return of spontaneous circulation (ROSC) is achieved, a post-mortem study has shown that the harm caused by compressions during CPR may qualify as cause of death.[1,2] We describe in this letter the use of ES-VAC in an eighty three year old male, with a flail chest post ten minutes of CPR for an out of hospital arrest. Despite the excellent cerebral recovery, it was determined the patient would not survive if mechanically ventilated due to atrophy of respiratory muscles and a poor baseline reserve. Bilevel

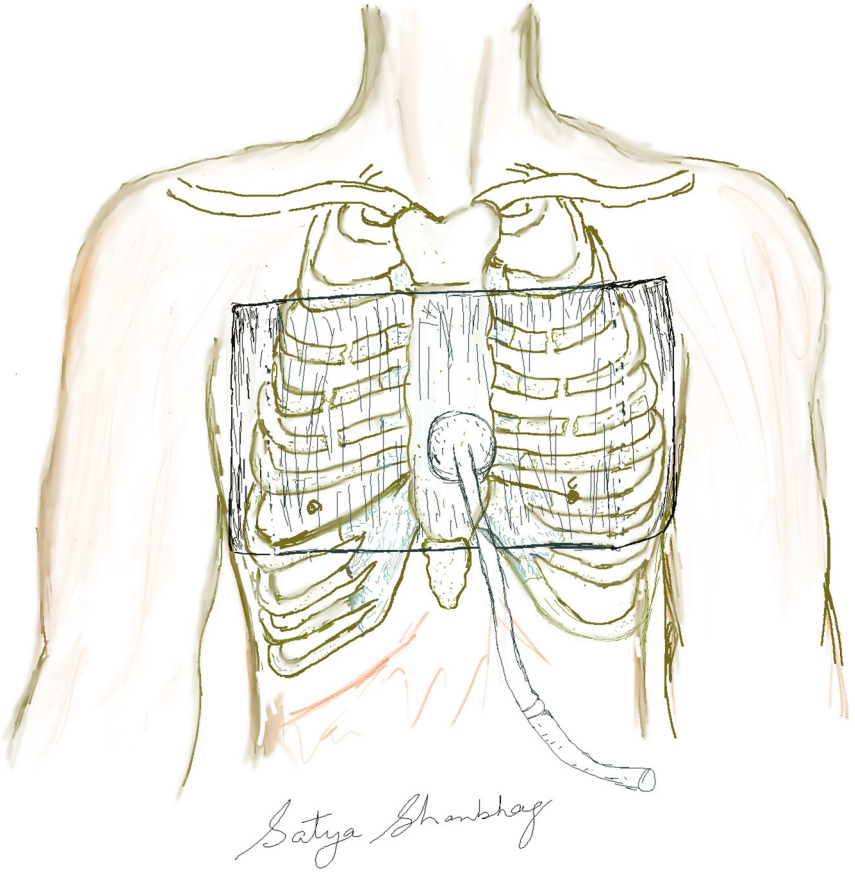

Fig. 1 – Ventral surface of chest wall with ES-VAC in situ for flail chest.

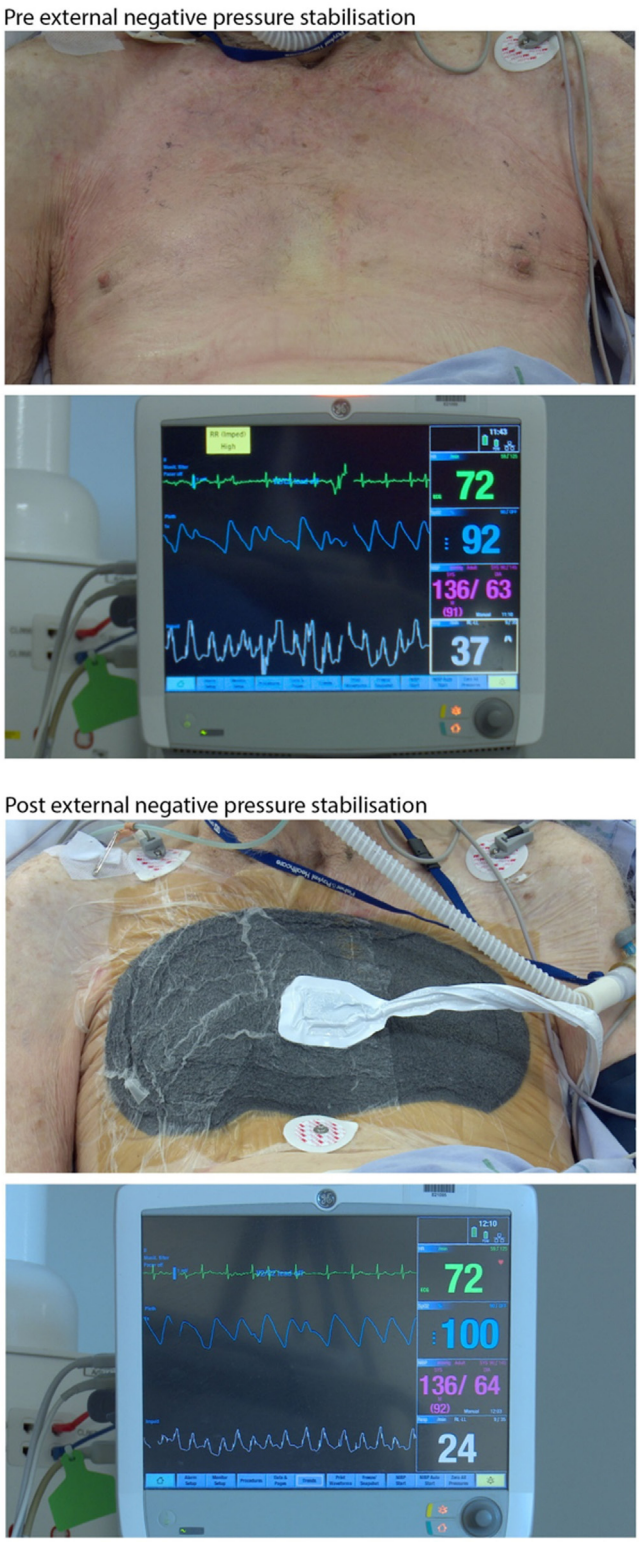

Fig. 2 – Before and after application of ES-VAC with clinical readings to demonstrate improvement in respiratory function.

Postive Airway Pressure (BiPAP) with pressures of 10/5 was commenced as a stabilising measure for respiratory support. This was tolerated for 6 h until a tension pneumothorax developed which required a chest drain insertion. High flow oxygen was commenced with an oxygen saturation of 92% on 40% FiO_2. This patient was imminently requiring positive pressure ventilation for respiratory support. This most likely would have led to subsequent surgical stabilisation in order to wean off ventilation. It was determined from a multidisciplinary meeting that this patient was too frail to survive such intervention. At this time, an ES-VAC dressing was placed in situ to provide external negative pressure to stabilise the chest without invasive therapy for respiratory support.

An interface between the skin and foam layers is undertaken to protect skin integrity. This has been achieved with the use of DuoDERM (ConvaTec, USA). A large area of chest wall was covered with foam so that the intact rigid chest wall can recruit the strength by which support and fixation is provided for the flail segments. (Video S1/Fig. 2) This utilized the concept of terra firma, a latin phrase meaning firm land. The concept here is that the defect area must be stabilized to an intact chest wall. It is hypothesized that at least a recruitment width of 3 in. is required outside of the defect of the chest wall (Fig. 1).

An initial therapy level of 200 mmHg of suction was applied with five to ten minute breaks, every four hours. This is hypothesized to further protect the skin integrity by ensuring there isn't continuous suction on the capillaries of the integumentary system. The ES-VAC dressing remained for two weeks with this regime. On day fifteen, the ES-VAC suction was decreased to 150 mmHg for five days and was removed on day twenty of admission. The patient was discharged on day twenty-two with full baseline mobility and independency with activities of daily living (ADLs).

As a result of the traumatic force involved in chest compressions, lifesaving results are often achieved at the cost of significant pain and morbidity. Rib fractures and a flail chest are a frequent complication of successful resuscitation, and these injuries are likely to become even more common as a result of the 2010 resuscitation guidelines.[3] There is currently no literature on non-operative stabilisation of chest wall defects with an ES-VAC after CPR. There are only two case reports in the literature describing the use of a vacuum dressing in stabilisation of a traumatic chest wall defect causing respiratory failure with one of these after surgical resection and the other after a motor vehicle accident.[4,5]

Much like the CPR technique itself, ES-VAC can be used in a variety of situations and environments, can be used by anyone in the medical community, and is a simple solution to a life-threatening problem. This novel concept of the utilization of an ES-VAC post CPR demonstrates a lifesaving non-invasive procedure for a flail chest. We believe this should be widely disseminated for similar cases as another treatment option for a life threatening clinical condition.

With thanks to Dr Satya Shanbhag for the illustration on Fig. 2.

The patient consented to the publication of this manuscript and media.

Conflict of interest

There are no financial disclosures to make for this piece of literature.

There are no other conflicts of interest.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.resuscitation.2019.01.028.

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