



## Outcome of Early Activation of Massive Transfusion Protocol (MTP) in Trauma

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### Abstract

**Background:** Trauma and subsequent hemorrhagic shock continues to remain one of the biggest causes of mortality and significant morbidity in India. Patients presenting with significant blood loss following trauma often succumb due to either the scarcity or complete unavailability of blood products. Several studies continue to demonstrate the superiority of using blood and blood products as a resuscitative fluid in improving overall outcomes and various parameters including length of hospital stay in patients suffering from traumatic hemorrhagic shock.

**Aims:** Our study attempted to understand the role of a simple scoring system to predict an early activation of Massive Transfusion Protocols (MTP) in polytrauma patients. Additionally we descriptively analysed the nature of injuries of such patients and documented the 6 hour and 24 hour mortality of patients who received blood products via MTP.

**Methodology:** The study was a retrospective observational study conducted in MGM Medical College and Hospital, Navi Mumbai, and included all polytrauma patients who aged 18 and above who presented to the emergency department (ED) and received MTP between January 2019 and March 2019. The results were compiled and analysed.

**Results:** A total of 20 patients received blood products in the form of MTP. The protocol was activated in the ED itself for all the included patients. The average ABC score was 3.15. 80% patients had orthopaedic injuries with long bone fractures with 40% presenting with polytrauma. MTP was activated within 1 hour for most patients.

**Conclusions:** Prompt use of the ABC score for trauma patients is highly predictive of the need for transfusion in hemorrhagic shock. Polytrauma patients require significantly higher amounts of blood products to achieve stable hemodynamics. ED survival increases significantly following activation of MTP.

### Introduction

Trauma remains a leading cause of hemorrhagic shock and subsequent mortality across the world<sup>[1]</sup>. Increasingly, research has shown that the ideal resuscitative strategy is to reduce the administration of colloids, carefully balance hypotension and bleeding risk by practicing permissive hypotension, and administer blood as a

resuscitative fluid<sup>[2]</sup>. The availability of blood and blood products was a major challenge in India often hampering effective management of polytrauma patients<sup>[3]</sup>. But with the development of trauma centres and increasing awareness among the population, Massive Transfusion Protocols (MTP) can now be initiated quicker and more often in patients presenting with profound hypotension as a result of the trauma<sup>[4]</sup>. MTP is

defined as the replacement of approximately 1 blood volume in a patients within 24 hours of presentation, or the administration of  $\geq 10$  units of Packed Red Cells (PRC) in 24 hours or the requirement of  $>4$  PRC units in 1 hour with need for transfusion, or ongoing bleeding  $\geq 150$  ml/min in an hemodynamically unstable patient. MTP needs to be activated by the treating emergency physician or surgeon as soon as possible by contacting the blood bank and ordering for blood products, namely packed red cells (PRC), fresh frozen plasma (FFP) or random donor platelets RDP)<sup>[5]</sup>. Despite the availability of criteria for activation of MTP, preferences from the treating doctor regarding when to administer blood and in what quantity often tends to prevail. Hence a simple score to assess the need for MTP was developed and now increasingly seen in practice<sup>[6]</sup>. The Assessment of Blood Consumption (ABC) score was developed in 2008-09 as an alternative to existing scores like the Trauma Associated Severe Hemorrhage (TASH) and McLaughlin scores as a simple, reproducible tool for the early recognition of need for MTP<sup>[7]</sup>. It includes 4 parameters each allowed a score of either 0/+1 namely, penetrating mechanism of injury, systolic BP (SBP)  $<90$  mm of Hg, heart rate  $>120$ , and a positive FAST (Focused Assessment with Sonography in Trauma) scan. It was externally validated in 2010 and now has become established as a tool for MTP activation<sup>[8]</sup>. Our study assessed 20 patients presenting over a period of 2 months to the Emergency Department. We hereby describe their injuries, the initial ABC scores and the final outcome measured in terms of 6 hour and 24 hour mortality.

### Methodology

This was a retrospective observational study performed in the Emergency Medicine Department (ED) at Mahatma Gandhi Missions Medical College and Hospital, Navi Mumbai between January and March 2019. Adult patients who presented to the ED with history of trauma,

underwent a thorough assessment as per ATLS guidelines. The ABC score was calculated and recorded following which MTP was activated for all patients with scores  $\geq 2$ . The type of injury was assessed and the patients were observed until discharge. Any mortality occurring in the first 6 hours or 24 hours was recorded. Delayed mortality due to other causes was recorded and mentioned among the final outcome

### Results

During the duration of the study from January to March 2019, a total of 20 patients presented to the MGM Hospital ED with polytrauma and ABC score  $\geq 2$  necessitating activation of the MTP. 17/20 patients (85%) were males with only 3 females included in the study. Mean age of the patients was 40 with the youngest being a 24 year old male and oldest being a 60 year old female [Table 1]. All included patients had an ABC score  $\geq 2$ , with the median score being 3. 7/20 patients (35%) had an ABC score of 4 (all components positive) [Table 1]. The patients were evaluated by means of a primary and secondary survey, and underwent FAST scans and X-rays as indicated. Following activation of the MTP, patients received PRC, FFP and RDP in a 1:1:1 ratio. Patients requiring individual additional blood products were transfused and the same was documented. Patients on an average received 4 units of blood products in a 1:1:1 ratio. The ABC score was highly predictive of the need for blood transfusion [Table 2]. The MTP was activated within 1 hour for all patients with a mean time of 52 minutes from arrival to initiation of transfusion of first blood product. While an increase was observed in the number of required units with a higher ABC score, the difference was not found to be statistically significant. 1 patient with chest trauma who developed massive hemothorax required additional transfusion of FFP and received the same. All blood transfusions were uneventful. Patients who received MTP in the ED showed a 6 hour and 24 hour mortality benefit with complete or near complete resolution of the

hemorrhagic shock, but overall mortality in the study was at a high 75% due to secondary complications with sepsis being a major cause [Table 3].

**Table 1:** Descriptive parameters of all included patients of the MTP study (N=20)

Parameters	Description
Age	Mean 40 (Range 24-60)
Sex	17 Males / 3 Females (85 % / 15%)
ABC Score	Median 3 / Mean 3.15
Trauma	
Orthopedic / Pelvic Trauma	16 (80%)
Abdominal / Thoracic Trauma	8 (40%)
Neurotrauma	8 (40%)

**Table 2:** Average blood products transfused and categorised as per ABC score

	PRC	FFP	RDP
<b>Average</b>	4.2	4.6	4
<b>ABC Score</b>			
<b>2</b>	3.5	4.2	3.4
<b>3</b>	4.5	4.5	4.4
<b>4</b>	4.8	4.7	4.5

**Table 3:** Mortality of patients enrolled in the MTP study (N=20)

Mortality	Patients (N=20)
6 hours	0 (0%)
24 hours	0 (0%)
Overall	15 (75%)

**Discussion**

Over the last decade several strides have been made in increasing public awareness regarding the donation of blood<sup>[4]</sup>. In turn this has led to advances in blood procurement, blood bank storage methods and faster availability of blood products for patients with urgent needs. This has led to an increased survival rate following massive transfusions in trauma patients<sup>[1,9]</sup>. Hospitals with trauma centres now have robust blood bank services which allow the ED to activate MTP when the need is detected<sup>[9]</sup>. Our study performed at a tertiary hospital allowed us to form a multidisciplinary team headed by emergency medicine doctors to approach patients in a comprehensive manner with concurrent involvement of surgeons, orthopedicians and

neurosurgeons. ATLS guided resuscitation ensured the prompt diagnosis of polytrauma patients. The ABC score was used extensively in the ED during triage itself to recognise the need for MTP at the earliest. Studies demonstrate a clear increase in the time to achieve homeostasis and an associated increase in mortality with any delay in activation and initiation of MTP<sup>[6,11]</sup>. The use of the ABC score is a simple and highly reliable predictor and must be mandated in all EDs<sup>[5-7]</sup>. Hence, systems must be developed by individual hospitals based on a common framework with a focus on minimising delay after the arrival of a polytrauma patient who is identified as a MTP candidate. A clear benefit with regards to 6 hour and 24 hour mortality is observed in our study as well. The control of hemorrhagic shock has a direct impact on the mortality of polytrauma patients<sup>[9-11]</sup>. Initial resuscitation with crystalloid IV fluids until arrival of blood products is already practiced. The transfusion of blood products contributes to the prevention of any impending coagulopathy and aids patients in achieving homeostasis faster<sup>[12]</sup>. Despite the initial survival benefit, polytrauma patients are observed to have a higher degree of mortality due to various secondary complications like sepsis, renal injury, complications arising from the surgical intervention, and extensive neurological damage in cases of traumatic brain injury. The retrospective design of our study is a starting point. The need to perform prospective studies to assess other indicators of MTP activation quality like time to activation, time to delivery of first cooler, the efficacy of MTP on lactate clearance and improvement of tissue perfusion, and resolution of hemorrhagic shock are hereby recognised. There also exists a need to perform multi-disciplinary studies involving Level I Trauma centres to assess the impact by means of a larger sample size. Awareness programs regarding the importance of blood donation and the cruciality of blood availability need to be ramped up to further improve blood bank services in such trauma centres.

### Conclusion

The availability of a simple score as the ABC to predict the activation of MTP confers an added advantage to ED physicians and trauma surgeons to provide their patients with the best outcomes. Increasing availability of blood products has made it feasible to initiate MTP. Unfortunately the severity of polytrauma predisposes patients to a high mortality despite significant reductions in ED mortality. We hereby advocate for inclusion of the ABC score in initial triage and assessment of polytrauma to provide improved outcomes to such patients.

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