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ORIGINAL ARTICLE

Implementation of a management protocol for massive bleeding reduces mortality in non-trauma patients: Results from a single centre audit

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KEYWORDS
Massive bleeding protocol;
Non-trauma bleeding;
Transfusion ratio;
Hemostatics;
Mortality

Abstract
Objective: To audit the impact upon mortality of a massive bleeding management protocol (MBP) implemented in our center since 2007.
Design: A retrospective, single-center study was carried out. Patients transfused after MBP implementation (2007–2012, Group 2) were compared with a historical cohort (2005–2006, Group 1).
Background: Massive bleeding is associated to high mortality rates. Available MBPs are designed for trauma patients, whereas specific recommendations in the medical/surgical settings are scarce.
Patients: After excluding patients who died shortly (<6 h) after MBP activation ($n = 20$), a total of 304 were included in the data analysis (68% males, 87% surgical).
Interventions: Our MBP featured goal-directed transfusion with early use of adjuvant hemostatic medications.
Variables of interest: Primary endpoints were 24-h and 30-day mortality. Fresh frozen plasma-to-red blood cells (FFP:RBC) and platelet-to-RBC (PLT:RBC) transfusion ratios, time to first FFP unit and the proactive MBP triggering rate were secondary endpoints.
Results: After MBP implementation (Group 2; $n = 222$), RBC use remained stable, whereas FFP and hemostatic agents increased, when compared with Group 1 ($n = 82$). Increased FFP:RBC ratio ($p = 0.053$) and earlier administration of FFP ($p = 0.001$) were also observed, especially with proactive MBP triggering. Group 2 patients presented lower rates of 24-h (0.5% vs. 7.3%; $p = 0.002$) and 30-day mortality (15.9% vs. 30.2%; $p = 0.018$) – the greatest reduction corresponding to non-surgical patients. Logistic regression showed an independent protective effect of MBP implementation upon 30-day mortality (OR = 0.3; 95% CI 0.15–0.61).

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Conclusions: These data suggest that the implementation of a goal-directed MBP for prompt and aggressive management of non-trauma, massive bleeding patients is associated to reduced 24-h and 30-day mortality rates.

PALABRAS CLAVE
Protocolo de hemorragia masiva;
Hemorragia no traumática;
Tasa transfusional;
Hemostasia;
Mortalidad

La aplicación de un protocolo de gestión para la hemorragia masiva reduce la mortalidad en pacientes con hemorragia no traumática: Resultados de la auditoría de un centro

Resumen
Objetivo: Auditar el impacto en la mortalidad de un protocolo de manejo de hemorragia masiva (PHM) en pacientes médico-quirúrgicos, implementado en nuestro centro desde el 2007.
Diseño: Estudio retrospectivo de cohortes. Grupo de intervención trasfundido con PHM (2007-2012, Grupo 2) comparado con cohorte histórica (2005-2006, Grupo 1).
Ámbito: Los PHM existentes están diseñados para pacientes con politraumatismo, sin evidencia clara para pacientes médicos o quirúrgicos.
Pacientes: Se incluyeron 304 pacientes en el análisis (68% hombres, 87% quirúrgicos), tras la exclusión de aquellos con mortalidad inmediata (< 6 h) tras la activación del PHM (n = 20).
Intervenciones: El PHM consta de transfusión dirigida por objetivos analíticos y uso precoz de adyuvantes hemostáticos.
Variables de interés: Mortalidad a las 24 h y a los 30 días. Las tasas transfusionales «plasma fresco congelado:concentrado de hematíes (PFC:CH)» y «plaquetas:CH (PLT:CH)», el tiempo hasta la primera unidad de PFC y la tasa de alerta proactiva del PHM fueron objetivos secundarios.
Resultados: Después de la implementación del PHM (Grupo 2; n = 222), el uso de CH se mantuvo estable, mientras que el de PFC y el uso de hemostáticos aumentó comparativamente con respecto al Grupo 1 (n = 82). La razón PFC:CH se incrementó (p = 0,053) y la administración de PFC fue más precoz (p = 0,001), especialmente en el grupo de alerta proactiva. El Grupo 2 mostró una menor mortalidad a las 24 h (0,5 vs. 7,3%, p = 0,002) y a 30 días (15,9 vs. 30,2%, p = 0,018), con el mayor descenso para los pacientes no quirúrgicos. La regresión logística mostró un efecto protector independiente del PHM para mortalidad a 30 días (OR = 0,3; IC 95% 0,15-0,61).
Conclusiones: Estos datos evidencian que la implementación de un PHM con gestión rápida y activa de la hemorragia masiva en pacientes médico-quirúrgicos se asocia a una reducción de las tasas de mortalidad a 24 h y 30 días.

Introduction

Massive transfusion refers to the infusion of a large volume of blood products over a relatively short period of time, in response to a clinical situation of massive haemorrhage.[1] Massive bleeding leads to high mortality rates, partly as a result of the ''lethal triad'' (hypothermia, acidosis and coagulopathy).[2] In trauma patients, uncontrolled bleeding may account for 50% of deaths occurred within the first 24 h.[3,4]

Several studies have shown that an early and aggressive transfusion policy has a direct impact on patient survival.[5,6] In fact, European guidelines for management of traumatic bleeding and coagulopathy recommend the development and implementation of local massive bleeding protocols (MBP), which should be activated soon after the patient admittance, or the awareness of a massive bleeding situation (GRADE 1C recommendation). Such a protocol should include a damage control strategy, restrictive fluid resuscitation, frequent coagulation monitoring, rational but optimal blood product usage, and early use of adjunctive haemostatics agents.[6–8] Local Spanish recommendations have also become available, addressing requirements for transfusion support in massive bleeding situations.[9]

Transfusion strategy within MBPs has been designed based on the military trauma experience, where whole blood is used for transfusion support.[10] Since the use of whole blood is considered unsafe and impractical in the civilian scenario,[11–13] guidelines recommend the combined use of blood products aiming at a specific fresh frozen plasma-to-red blood cells ratio (FFP:RBC), attempting to emulate whole blood. Although several randomized controlled trials and meta-analysis have been conducted on this matter, the optimal FFP:RBC ratio remains to be established.[14–17]

Complementing transfusion support, the adjunctive co-administration of fibrinogen concentrates and

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