Administration of fibrinogen concentrate in exsanguinating trauma patients is associated with improved survival at 6 hours but not at discharge

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BACKGROUND: Despite poor evidence and high costs, fibrinogen concentrate (FC) represents one of the most frequently used hemostatic agents in exsanguinating trauma. The aim was to assess whether the administration of FC in severely injured patients was associated with improved outcomes.

METHODS: Patients documented in the Trauma Registry of the German Society for Trauma Surgery (primary admissions, Injury Severity Score [ISS] ≥ 16) who had received FC during initial care between emergency department (ED) arrival and intensive care unit admission (FC+) were matched with patients who had not received FC (FC−).

RESULTS: The matched-pairs analysis yielded two comparable cohorts (n = 294 in each group) with a mean ISS of 37.6 ± 13.7 (FC+) and 37.1 ± 13.3 (FC−) (p = 0.73); the mean age was 40 ± 17 versus 40 ± 16 (p = 0.72), respectively. Patients were predominantly male (71.1% in both groups, p = 1.0). On emergency department arrival, hypotension (systolic blood pressure, < 90 mm Hg) occurred in 51.4% (FC+) and 48.0% (FC−) (p = 0.41), and base excess was −7.4 ± 5.3 mmol/L for FC+ and −7.5 ± 6.2 mmol/L for FC− (p = 0.96). Patients were administered 12.8 ± 14.3 (FC+) versus 11.3 ± 10.0 (FC−) packed red blood cell units (p = 0.20). Thromboembolism occurred in 6.8% (FC+) versus 3.4% (FC−) (p = 0.06), and multiple organ failure occurred in 61.2% versus 49.0% (p = 0.003), respectively. Whereas 6-hour mortality was 10.5% for FC+ versus 16.7% for FC− (p = 0.03), the mean time to death was 7.5 ± 14.6 days versus 4.7 ± 8.6 days (p = 0.006). The overall hospital mortality rate was 28.6% versus 25.5% (p = 0.40), respectively.

CONCLUSION: This is the first study to investigate the effect of FC administration in bleeding trauma. In our large population of severely injured patients, the early use of FC was associated with a significantly lower 6-hour mortality and an increased time to death, but also an increased rate of multiple organ failure. A reduction of overall hospital mortality was not observed in patients receiving FC. (J Trauma Acute Care Surg. 2013;74: 387–395. Copyright © 2013 by Lippincott Williams & Wilkins)

LEVEL OF EVIDENCE: Therapeutic study, level IV.

KEYWORDS: Multiple trauma; hemorrhage; coagulopathy; transfusion; fibrinogen.

Uncontrollable bleeding is the primary cause of early mortality in severely injured patients, and recent research has demonstrated that acute trauma-associated coagulopathy substantially exacerbates hemorrhagic shock. Contemporary hemostatic resuscitation strategies suggest several key components such as transfusion of higher ratios of fresh-frozen plasma (FFP) to packed red blood cells (pRBC) units for critically injured patients with massive bleeding, which has been associated with decreased mortality rates in several retrospective studies.

Furthermore, several commercially available hemostatic agents are commonly used as adjuncts to maintain clot formation because hemostatic competence is impaired in excessive bleeding because of consumed coagulation factors. Fibrinogen (= coagulation factor I) plays a central role in hemostasis because it represents the primary substrate of coagulation but has been reported to reach critically low levels earlier than other procoagulatory factors, particularly in massive blood loss.

With respect to supplementation during acute trauma care, FFP and cryoprecipitate represent potential sources of fibrinogen. Another alternative is fibrinogen concentrate (FC), an intravenous hemostatic drug manufactured from human donor plasma in multiple purification steps, including viral inactivation and lyophilization (Haemocomplettan, CSL Behring Marburg, Germany). Currently, FC is approved for patients experiencing traumatic bleeding in Germany and several other European countries but not in the United States or the United Kingdom.


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