



Can Less Be More in Trauma? Editor's Picks

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Gay Boyle, MA

Introduction

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Coagulopathy is often a life-threatening complication in trauma patients. Coagulopathy deriving from blood loss and dilution may be worsened by treatment with massive transfusions and blood component therapy. The current medical literature focuses on strategies that will ultimately limit blood transfusion and administration of large volumes of other resuscitative fluids while improving patient outcomes.

Let's look at two interesting studies from the literature that have evaluated some of those strategies that may help us achieve this goal. A synopsis of each study is provided below.

If you would like to learn more about coagulopathy in trauma and discover what Blood CME faculty have to say on this topic, [CLICK HERE](#).

Can We Use Low-Dose Recombinant Factor VIIa for Coagulopathy in Trauma?

Primary Author: Deborah M. Stein

Co-authors: Richard P. Dutton, John R. Hess, Thomas M. Scalea

Article: Low-dose recombinant factor VIIa for trauma patients with coagulopathy

Reference: *Injury*. 2008;39:1054-1061. [CLICK HERE](#) to access Medline.

Study Highlights

Synopsis

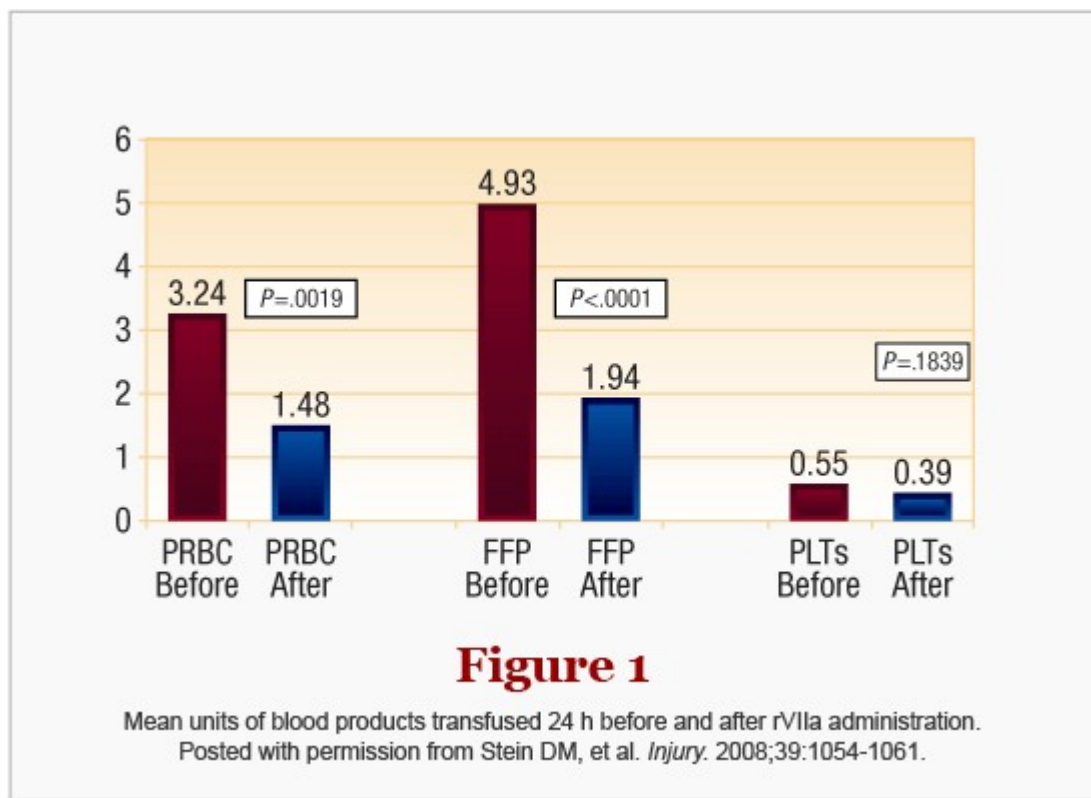
In trauma patients, coagulopathy is generally treated with fresh frozen plasma (FFP). However, FFP may take hours to administer and can cause complications by requiring large volumes of fluid. In this retrospective study, conducted over a 2-year span, the authors reviewed 84 trauma patients with mild to moderate coagulopathy who received a low dose of [recombinant factor VIIa](#) (rVIIa) in addition to FFP and blood component therapy.

Select Study Facts

- 67% of patients had traumatic brain injury (TBI) as primary injury
- Etiology of coagulopathy included TBI, 40%; warfarin use, 22%; and cirrhosis, 13%
- All patients were given 1.2 mg of rVIIa, equating to the lowest available unit dose (off-label dosing)
- No determination of efficacy could be made due to lack of a control group

Select Study Results

- All patients had a good clinical response, with no bleeding complications
- Utilization of packed red blood cells (PRBCs) and FFP was significantly less in the 24 hours after rVIIa administration than in the 24 hours before ($P = .0019$ and $P < .0001$, respectively). Blood product use is depicted in **Figure 1**
- Mean prothrombin time fell from 17.0 s (± 3.2) to 10.6 s (± 1.4) ($P < .0001$) (see **Figure 2**)
- Subsequent thromboembolic events were observed in 12 of the 81 patients; only 4 of these events were thought to be related to study treatment
- The 1.2-mg dose of rVIIa costs approximately \$1000 USD (equivalent to ≈ 8 U of plasma administered)



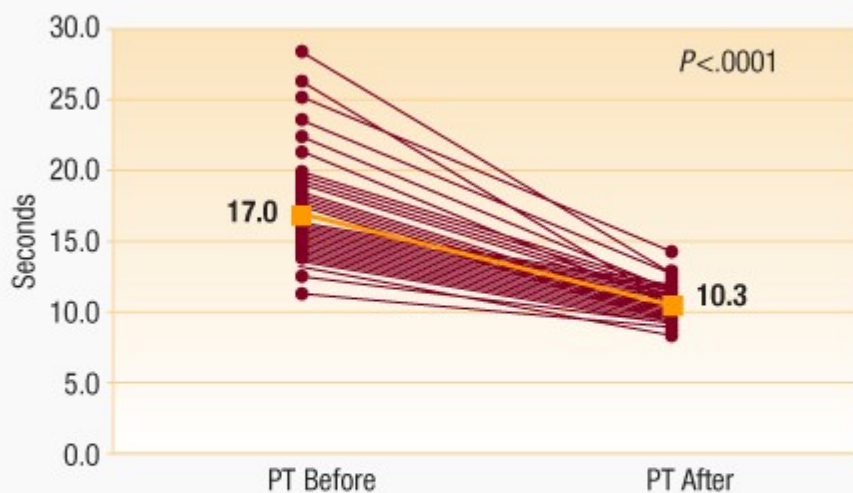


Figure 2

Prothrombin time before and after rVIIa administration.
 Posted with permission from Stein DM, et al. *Injury*. 2008;39:1054-1061.

Key Points and Summary

- Use of low-dose rVIIa rapidly and effectively treats mild to moderate coagulopathy following injury and may be effective in coagulopathic trauma patients who are not in shock but who require rapid normalization of clotting function
- Administration of a 1.2-mg dose was generally safe but was thought to contribute to thromboembolic events in 4 of 81 patients
- Use of low-dose rVIIa in these patients allowed for instantaneous reversal of coagulopathy but did not subject patients to high volumes of fluid or the risks of blood product administration

In trauma patients with mild to moderate coagulopathy following injury, low-dose rVIIa proved to be a rapid and effective treatment that did not subject patients to high volumes of fluid or the risks of blood product administration.

PCC vs FFP: Is One Treatment More Effective Than the Other for Reversing the Dilutional Coagulopathy of Trauma?

Primary Author: Gerhard Dickneite

Co-author: Ingo Pragst

Article: Prothrombin complex concentrate vs fresh frozen plasma for reversal of dilutional coagulopathy in a porcine trauma model

Reference: *Br J Anaesth*. 2009;102:345-354. [CLICK HERE](#) to access free full text.

Study Highlights

Synopsis

Resuscitation fluids that are administered following traumatic injury are a cause of hemodilution and can contribute to coagulopathy, thereby necessitating factor replacement therapy to prevent bleeding complications. Using a porcine trauma model, study investigators compared fresh frozen plasma (FFP) with prothrombin complex concentrate (PCC) to determine which therapy offers a more rapid and effective way to normalize coagulation factor levels postinjury.

Select Study Facts

- 47 castrated male pigs studied
- 65% to 70% of total blood volume (TBV) substituted with hydroxyethyl starch and red blood cells
- Treatment with 15 mL/kg isotonic saline placebo, 25 IU/kg PCC, or standard-dose (15 mL/kg) or high-dose (40 mL/kg) porcine FFP
- Infliction of standardized femur or splenic injury
- Prothrombin time (PT), platelet count, and thrombin generation used to assess coagulation function

Select Study Results

- Hemodilution markedly prolonged PT and reduced peak thrombin generation; profoundly diminished circulating factors II, VII, IX, and X
- PCC, not FFP, reversed hemodilution effects
- PCC shortened time to hemostasis after bone ($P = .001$) or spleen ($P = .028$) trauma and reduced blood volume lost ($P < .001$ for bone; $P = .015$ for spleen) compared with 15-mL/kg dose of FFP (see **Figure 3** and **Figure 4**)
- Subsequent to bone injury, PCC accelerated hemostasis ($P = .003$) and diminished blood loss ($P = .006$) versus 40-mL/kg dose of FFP

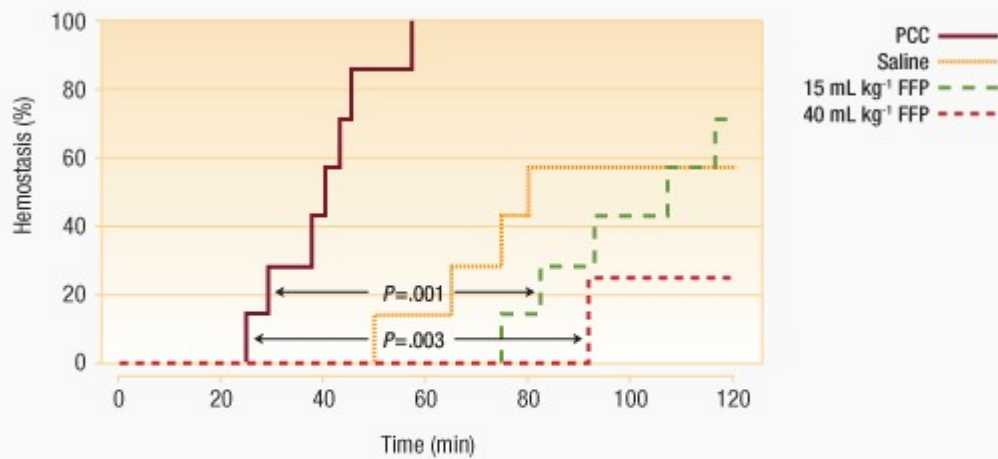


Figure 3

Time to hemostasis following experimental bone trauma in animals treated with saline, FFP, or PCC. FFP indicates fresh frozen plasma; PCC, prothrombin complex concentrate. Adapted with permission from Dickneite G, et al. *Br J Anaesth.* 2009;102:345-354.

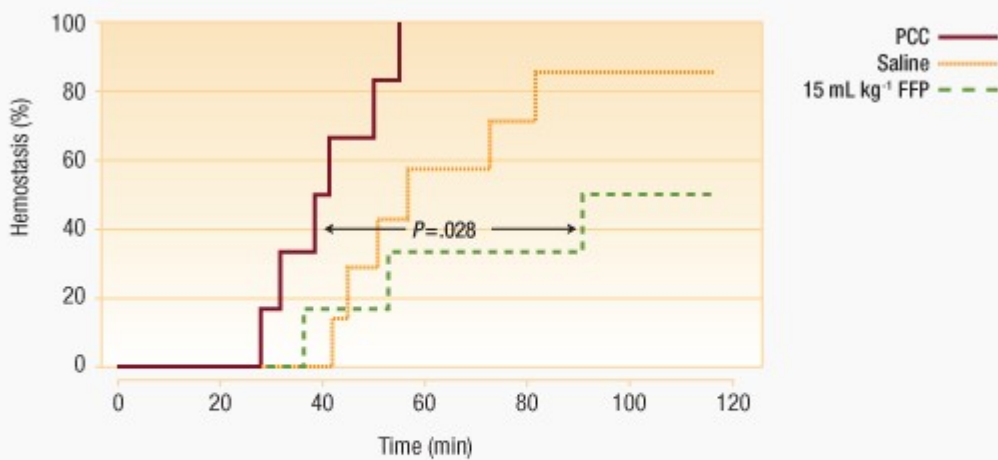


Figure 4

Time to hemostasis following experimental spleen trauma in animals treated with saline, FFP, or PCC. FFP indicates fresh frozen plasma; PCC, prothrombin complex concentrate. Adapted with permission from Dickneite G, et al. *Br J Anaesth.* 2009;102:345-354.

Key Points and Summary

- PCC was effective in correcting dilutional coagulopathy and controlling bleeding in an in vivo porcine trauma model
- PCC warrants further investigation as treatment for dilutional coagulopathy in trauma and surgery based on its suitability for more rapid administration than FFP

- The favorable effects of PCC support a potential role for its use in treating traumatic and surgical coagulopathy

In a preclinical trauma animal model, under conditions of hemodilution and hemorrhage, PCC proved superior to FFP in normalizing PT and peak thrombin generation and controlling bleeding.

Additional contributing author: Bart Zoni

The authors of this article have no real or apparent conflicts of interest to report.

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