

Background:

Fluid resuscitation is a key element in the treatment of severely traumatized patients. The correct fluid regimen is a hot topic and subject to ongoing debate. Since studies have shown increased mortality and higher rates of renal replacement therapy (RRT) with the use of hydroxyethyl starch (HES) solutions [1], they have been banned from intensive care units, operating rooms and emergency departments. Because of the safety concerns about HES, all synthetic colloidal fluids are generally suspected of doing more harm than good, especially with regard to renal function. As there is limited data on the use of succinylated gelatin specifically in trauma patients, we conducted a retrospective study here to analyse the effects and outcomes of succinylated gelatin (Gelofusin Iso, BBraun, Melsungen GER) for volume resuscitation in critically ill trauma patients. The aim of this study was to assess the relationship between the amount of succinylated gelatin administered and acute kidney injury (AKI) and the need for RRT.

Methods:

Retrospective data were collected from 236 critically ill trauma patients in our trauma intensive care unit at the Medical University of Innsbruck, Austria, from 2015 to 2020. The patients included in this analysis had an Injury Severity Score (ISS) of at least 16 and had to be treated in the ICU for more than 24 hours. Data on fluid resuscitation, transfusions, clotting factor substitution, laboratory results and outcomes were collected over a 7-day period in the ICU, including prehospital and perioperative timeframes. Youden index analysis was used to calculate optimal cut-offs for daily weight-based infusion volumes of succinylated gelatin and crystalloids in relation to development of AKIN grade 3 and need for RRT.

Results:

73.8% of patients were male, with a median age of 49 years (IQR 31-65) and median AAAM/DGU ISS scores of 26 (17-38). **No significant association was found between treatment with gelofusin >10ml/kg/d and the initiation of renal replacement therapy (OR=1.27, p=0.695) or development of AKIN 3 (OR=1.36, p=0.661).** A significant decrease in creatinine clearance rates among patients receiving high doses of gelofusin was shown only on Day 2 of the ICU stay with a median of 129.96 ml/min (75.59-170.97) vs. 97.46 ml/min (55.33-133.32), associated with significantly higher amounts of positive fluid balance, with 1927 ml/d (917-2896) for patients vs. 1280 ml/d (369-2126) for low amounts of gelofusin. All other days of ICU stay showed no significant differences of creatinine clearance and blood urea levels between patients receiving high amounts of gelofusin and those who did not.

Conclusion:

There was no significant association between even high doses of succinylated gelatin and high grade kidney injury (AKIN 3) or the need for RRT. Our results suggest that succinylated gelatin may be used as a safe and effective alternative to crystalloids in regards to renal function in critically ill severely traumatized patients for the treatment of hypovolemic shock.

References:

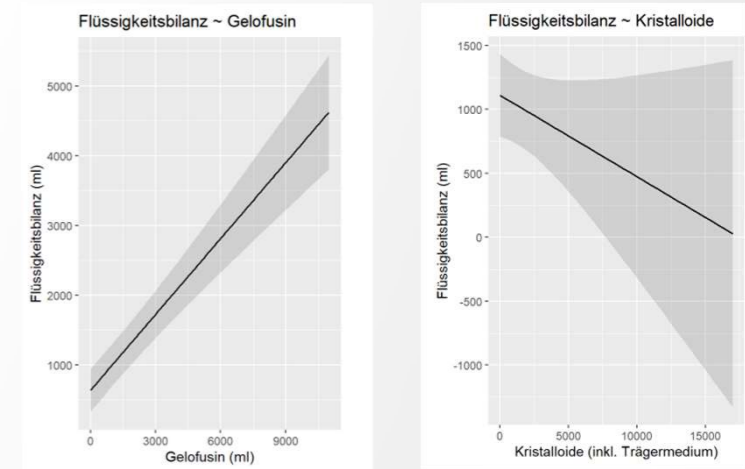
[1] Perner A, et al; Scandinavian Critical Care Trials Group. Hydroxyethyl starch 130/0.42 versus Ringer's acetate in severe sepsis. N Engl J Med. 2012 Jul 12;367(2):124-34.

Gelofusin as volume resuscitation shows no association with acute kidney injury or renal replacement therapy in critically ill traumatic ICU patients

P Lichtenberger¹, D Fries¹, M Bachler¹, D Niederbrunner¹, P Tscholl², B Treichl¹

¹Department of Anaesthesiology and Intensive Care Medicine, Medical University of Innsbruck, Innsbruck, Austria

²Department of Mathematics, Faculty of Mathematics, Computer Science and Physics, University of Innsbruck, Innsbruck, Austria



Gelofusin was shown to have a significant effect on fluid balance, with 1 ml of Gelofusin resulting in an increase of daily fluid balance by 0.36 ml (95% CI 0.29 to 0.44; p < 0,001)

No significant correlation could be established for the effect of crystalloid fluids on fluid balance, with an estimated effect of -0.06 ml (95% CI -0.15 to 0.02; p=0.139)

Gelofusin

	Total (n=216) ^a	<= 10 ml/kg/d (n=101)	> 10 ml/kg/d (n=117)	Estimate with 95% CI ^b	p value ^c	Not known
Kreatinin Clearance ml/min auf 1.73 m ² gerechnet	107.92 (64.39-149.54)	129.96 (75.59-170.97)	97.46 (55.33-133.32)	31.75 (15.52 to 50.19)	0.0003	13/10
Harnstoff	42.85 (30.18-63.15)	35.7 (20-58.05)	45.45 (31.35-67.42)	-5.8 (-11.5 to -0.3)	0.0378	6/1
Flüssigkeitsbilanz gesamt pro Tag	1510 (740-2549)	1280 (369-2126)	1927 (917-2896)	-674 (-1060 to -323)	0.0004	0/0

^a Data presented as medians (25th to 75th percentile)

^b Estimated median difference

^c Assessed by Wilcoxon Rank Sum Test

Kristalloide

	Total (n=216) ^a	<= 10 ml/kg/d (n=101)	> 10 ml/kg/d (n=117)	Estimate with 95% CI ^b	p value ^c	Not known
Kreatinin Clearance ml/min auf 1.73 m ² gerechnet	107.92 (64.39-149.54)	105.35 (61.27-145.49)	129.96 (77.09-156.7)	-19.35 (-39.97 to 1.17)	0.006	19/4
Harnstoff	42.85 (30.18-63.15)	46 (31.4-64.5)	33.3 (25.4-48.38)	9.6 (4 to 16.2)	0.001	6/1
Flüssigkeitsbilanz gesamt pro Tag	1510 (740-2549)	1659 (905-2598)	1286 (587-2200)	221 (-211.48 to 655.95)	0.2948	0/0

^a Data presented as medians (25th to 75th percentile)

^b Estimated median difference

^c Assessed by Wilcoxon Rank Sum Test

Only day 2 of the ICU period showed significant differences in Creatinine Clearance rates and blood urea levels between the Gelofusin an Cristalloids groups, with lowered creatinine clearance rates and higher blood urea concentrations in patients receiving high amounts of gelofusin

RRT ~ group(Gelofusin) (ml/kg/d)

	Estimate with 95% CI	p-value	Significance	OR
Intercept	-2.66 (-3.67 to -1.64)	<0.001	*	0.07 (0.03 - 0.19)
Gelofusin >= 10 (ml/kg/d)	0.24 (-0.96 to 1.44)	0.695		1.27 (0.38 - 4.24)

AKIN ~ group(Gelofusin) (ml/kg/d)

	Estimate with 95% CI	p-value	Significance	OR
Intercept	-2.96 (-4.12 to -1.8)	<0.001	*	0.05 (0.02 - 0.17)
Gelofusin >= 10 (ml/kg/d)	0.31 (-1.06 to 1.67)	0.661		1.36 (0.35 - 5.31)

No significant correlations between daily Gelofusin supply of >10 ml/kg/d and initiation of RRT or AKIN could be established

Sponsors and collaborators:

