Comparison of 6% hydroxyethyl starch (6%HES130/0.4/9) and 5% albumin on volume therapy, complications, and glycocalyx degradation during major abdominal surgery

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Backgrounds and purpose

Hydroxyethyl starch has been focused on renal impairment especially in intensive care patients.

The purpose of this study was to investigate the difference effect on hemodynamic parameter, renal function, mortality and glycocalyx degradation between 5% albumin and 6% HES130/0.4/9 during major abdominal surgery.

Materials and Methods

IRB approval, Randomized open labeled study. Fifty adult patients of elective hepatic or pancreatic surgery, ASA 1,2 Sept. 2014 through Nov. 2015 were randomly allocated to HES(25) or Alb group (25).

<Exclusion criteria>

ASA 3 or higher, renal dysfunction (Cr > 1.5 mg/dl), liver dysfunction, anemia (Hb <10 g/dl), clotting abnormality, history of steroids/diuretics use, allergies, refusal to participation of study

Anesthetic management

Rt. internal jugular vein:
PreSep® catheter ScvO₂

General anesthesia: O₂/Air/
Desflurane/remifentanyl
Thoracic epidural anesth:
0.2% ropivacaine +fentanyl
2µg/ml, 10ml/h

Rt. peripheral IV line:
colloid solution 2ml/kg/h

Lt. peripheral IV line:
crystalloid solution
3ml/kg/hr
Arterial line (Vigileo/
FroTrac™)

Fluid management

Results

<Patient demographics>

	HES (n=25)	ALB (n=25)	P value
Age (years)	66 ± 12	64 ± 10	0.2
Height (cm)	161 ± 8	162 ± 7	0.8
Weight (Kg)	58 ± 8	60 ± 9	0.72
Sex (male/female)	18/7	19/6	0.19
ASA (1/2)	7/18	11/14	0.19
Anesthesia time (min)	517 ± 122	507 ± 109	0.39
Operation time (min)	427 ± 119	420 ± 111	0.84

All data were not significant between the groups.

(M ± SD)

<Intraoperative fluids>

	HES (n=25)	ALB (n=25)	P value
Total fluid (ml)	3600 (3100-4050)	3600 (3050-4050)	0.65
Crystalloid (ml)	1800 (1500-2200)	1800 (1550-2200)	0.74
Colloids (ml)	1750 (1500-2100)	1500 (1500-2000)	0.13
Blood loss (ml)	615 (440-1635)	750 (500-1320)	0.86
Urine output (ml)	720 (470-1065)	440 (310-560)	<0.01
RBC (ml)	0 (0-280)	0 (0-0)	0.29
FFP (ml)	0 (0-240)	0 (0-0)	0.16

FFP: Fresh frozen plasma, RBC: Red blood cell

median : 25-75 %

Red indicates statistically significant.

<Intraoperative hemodynamics >

	Control	EOS	ICU	POD 1
APCI (ml/min/m ²)	HES 2.6 (2.5-2.8)	3.1 (3.0-3.6)	3.2 (2.6-3.6)	3.0 (2.5-3.6)
SVI (ml/beat/m ²)	ALB 2.5 (2.1-2.8)	3.2 (3.0-3.8)	3.1 (2.8-3.5)	3.4 (2.5-3.7)
SVV (%)	HES 43 (37-49)	43 (39-47)	41 (37-47)	41 (37-48)
Lac (mmol/l)	ALB 42 (35-47)	42 (39-51)	39 (37-50)	39 (34-47)
ScVO ₂ (%)	HES 7 (5-8)	6 (5-8)	6 (5-8) : SB	6 (5-7) : SB
	ALB 7 (6-8)	6 (5-7)	7 (6-9) : SB	8 (7-9) : SB
	HES 0.8 (0.7-1.0)	2.3 (0.9-3.1)	2.2 (1.7-3.1)	1.5 (1.1-1.8)
	ALB 0.9 (0.8-1.2)	1.8 (0.9-2.5)	1.9 (1.4-2.3)	1.2 (1.0-1.7)
	HES 84 (81-87)	85 (79-88)	79 (75-84)	78 (71-82)
	ALB 81 (78-85)	85 (79-88)	77 (75-82)	73 (71-80)

Control: after induction of anesthesia

median:25–75%

ICU : intensive care unit admission, EOS : end of surgery

POD: postoperative day, Lac: lactate SB : Spontaneous breathing

All data were not significant between the groups.

<Δ Cr >

ΔCr

median:25–75%

Cr: creatinine, Median Δ value (difference of ICU, POD 1 or 1 month median value after surgery from the preoperative baseline median value)

<Biomarkers of glycocalyx >

Median Heparan sulfate

Median Syndecan-1

median:25–75%

Discussion/Conclusions

- There was no significant difference in hemodynamic parameters, Δserum creatinine, and biomarkers of glycocalyx between the groups, but urine output was higher in HES group.
- Mortality was zero after 1 month in both groups.
- 6%HES 130/0.4/9 is as safe and useful as albumin when used for colloid volume therapy in major abdominal surgery.

First author : T. Suzuki. I have no COI with regard to our presentation.

Co-Presenter : H. Miyao. Matters requiring disclosure of COI with

Regard to our presentation are as follows. Honoraria(lecture fee) from :

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