

POSTER PRESENTATION

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The effect of endotoxin adsorber haemoperfusion on microcirculation in septic pigs

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Introduction

Microcirculatory dysfunction plays an important role in sepsis-related multiple organ dysfunction.(1) Several studies has shown polymyxin B hemoperfusion has favorable effects on mean arterial pressure, vasopressor use, and mortality.(2) One rat sepsis study had found that microcirculation was better maintained in the polymyxin B hemoperfusion group.(3) However, the effects of polymyxin B hemoperfusion on the microcirculation of the intestinal mucosa, intestinal muscular-serosal layer, kidney, and liver were unknown. We used a fecal peritonitis-induced septic pig model to investigate the effect of polymyxin B perfusion on the microcirculation.

Objectives

This animal study aimed to investigate the effect of polymyxin B-immobilized fiber column hemoperfusion on the microcirculation of multiple organs in septic pigs.

Methods

Eighteen male Lanyu pigs (Taitung Animal Propagation Station, Taiwan, body weight 25 ± 4 kg) will be investigated. This study was approved by the Institutional Animal Care and Use Committee. The animals were randomly assigned to the following 3 groups: 1 - Sham; 2 - Sepsis (fecal peritonitis model); and 3 - Sepsis + PMX-HP (fecal peritonitis model + polymyxin B-immobilized fiber column hemoperfusion). Time course of the animal model is shown in the Figure 1.

In the Sepsis and Sepsis + PNX-HP groups, 0.5 g/kg autologous feces and 200 mL 5% glucose were injected into the abdominal cavity. The hemodynamic parameter

was monitored by the Pulse index Contour Continuous Cardiac Output system. A sidestream dark-field video microscope and a tissue oxygen monitor were used to investigate microcirculation.

Results

12 pigs completed the study (4 for each group). The hemodynamic parameters were shown in the Table 1.

The perfused small vessel density (PSVD) of the terminal ileal mucosa in the septic pigs was less than the non-septic pigs at 0h (24.3 mm/mm^2 vs. 30.0 mm/mm^2 , $p = 0.005$). The images of the microcirculation of the terminal ileal mucosa at 6h were shown in Figure 2.

Table 2 represents that the PSVD of the terminal ileal mucosa at 6h in the Sepsis + PMX-HP group had a trend to be greater than the Sepsis group (25.7 mm/mm^2 vs. 16.3 mm/mm^2 , $p = 0.066$).

The images of the microcirculation of the kidney surface at 6h were shown in Figure 3.

Table 3 represents the fact that the urine output in the Sepsis + PMX-HP group was greater than in the Sepsis group.

Conclusions

In summary, we found that polymyxin B hemoperfusion for septic pigs improves urine output and has a potential to attenuate the microcirculatory dysfunction of the terminal ileal mucosa.

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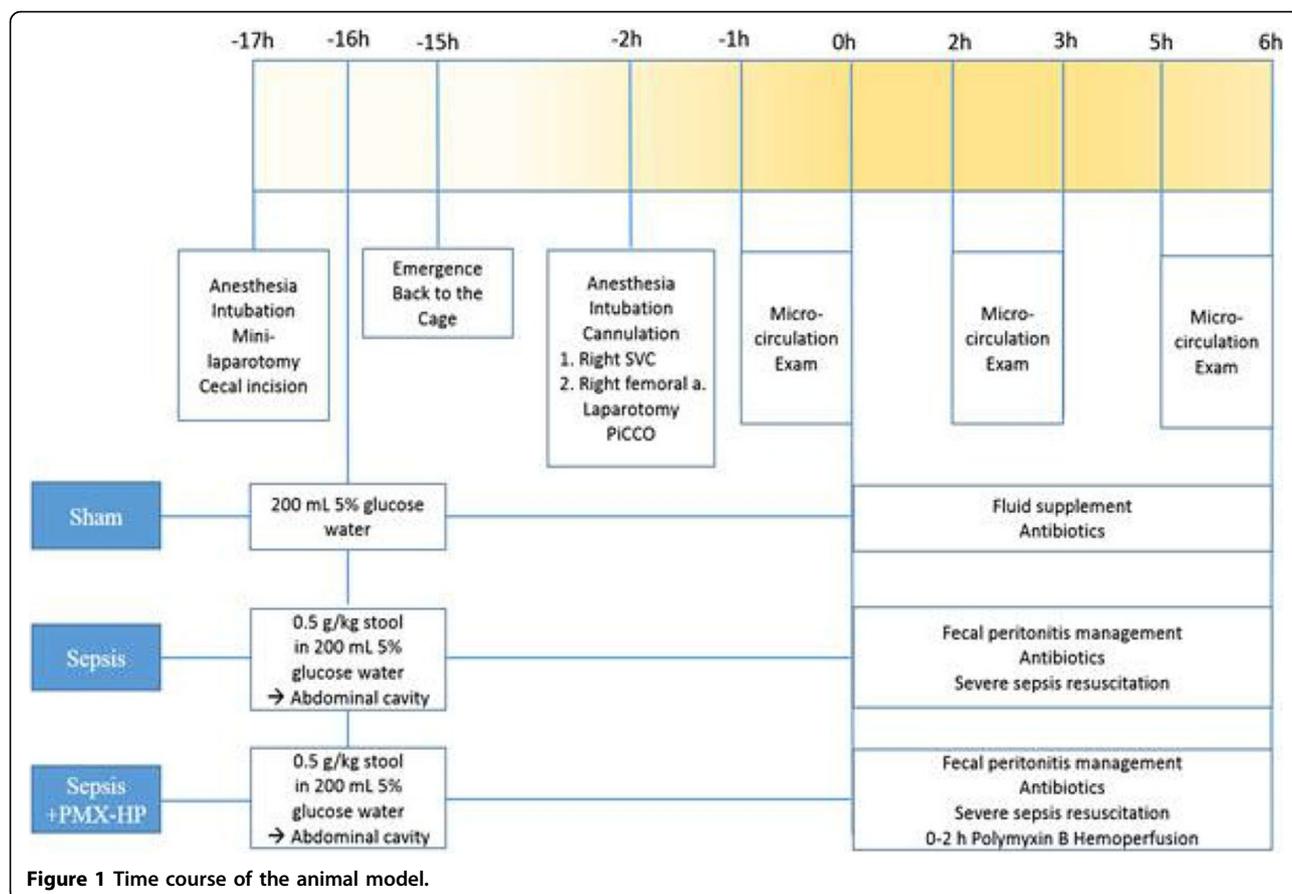


Table 1 Hemodynamic parameters.

	Sham	Sepsis	Sepsis + PMX-HP
N	4	4	4
HR _{0h} (bpm)	132 (14)	160 (22)	174 (28)
HR _{6h} (bpm)	127 (49)	188 (3)	169 (13)
MAP _{0h} (mm Hg)	90 (12)	94 (20)	80 (26)
MAP _{6h} (mm Hg)	74 (8)	77 (18)	75 (5)
CI _{0h} (L/min/m ²)	3.5 (0.7)	3.4 (1.3)	3.4 (0.4)
CI _{6h} (L/min/m ²)	3.3 (0.6)	3.4 (0.3)	3.1 (0.7)
EVLWI _{0h} (mL/kg)	11.8 (2.6)	14.4 (2.7)	12.3 (1.9)
EVLWI _{6h} (mL/kg)	13.5 (2.4)	17.4 (4.7)	14.5 (4.6)

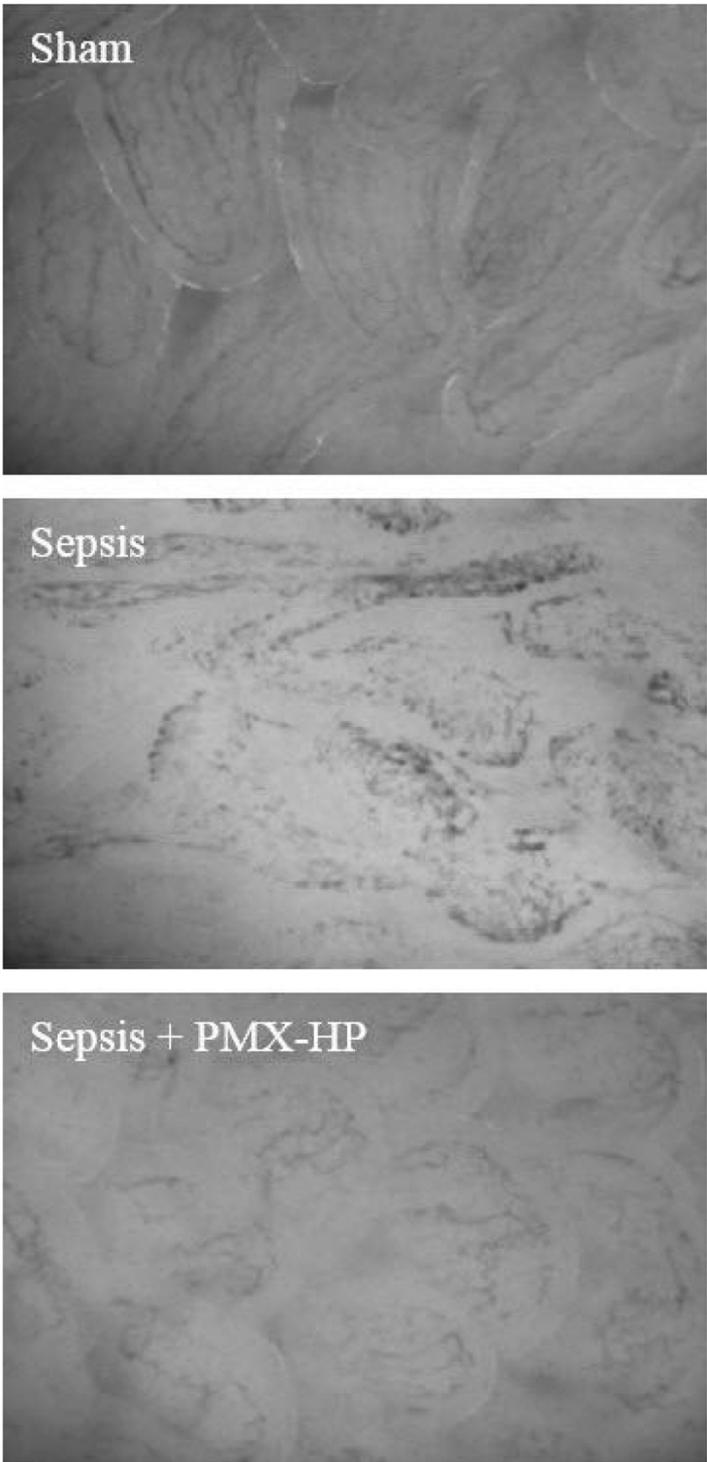


Figure 2 Microcirculation of terminal ileal mucosa (6h).

Table 2 Microcirculation comparison.

		Sham	Sepsis	Sepsis + PMX-HP
Intestinal mucosa	PSVD_0h (mm/mm ²)	30.0 (2.4)	25.2 (3.9)	23.5 (5.0)
	PSVD_6h (mm/mm ²)	31.2 (2.2)	16.3 (11.7)	25.7 (5.1)
	StO ₂ _0h (%)	54 (7)	41 (18)	41 (22)
	StO ₂ _6h (%)	66 (2)	42 (16)	48 (6)
Kidney	PSVD_0h (mm/mm ²)	35.1 (3.0)	26.9 (12.1)	24.0 (7.5)
	PSVD_6h (mm/mm ²)	37.3 (2.0)	22.8 (17.6)	24.2 (4.3)
	StO ₂ _0h (%)	69 (12)	58(8)	63 (11)
	StO ₂ _6h (%)	74 (8)	63 (5)	66 (10)

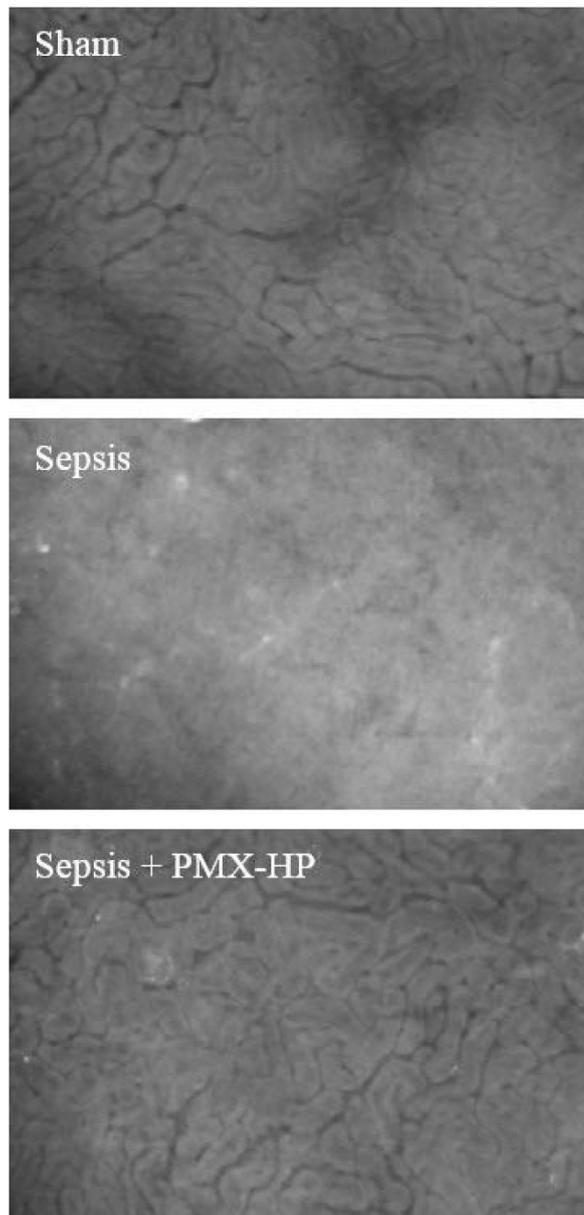


Figure 3 Microcirculation of kidney surface (6h).

Table 3 Vasopressor, urine output, and laboratory results.

	Sham	Sepsis	Sepsis + PMX-HP
Norepinephrine_6h (mcg/kg/min)	0.09 (0.16)	0.62 (0.56)	0.33 (0.39)
Fluid therapy 0-6h (mL)	2212 (754)	2912 (999)	3262 (430)
Urine output 0-6h (mL)	191 (30)	131 (69)	256 (71)
Creatinine_0h (mg/dL)	1.3 (0.2)	1.6 (0.9)	1.5 (0.3)
Creatinine_6h (mg/dL)	1.3 (0.2)	2.0 (1.3)	1.5 (0.6)
ALT_0h (U/L)	24 (5)	33 (3)	27 (6)
ALT_6h (U/L)	20 (5)	32 (11)	22 (3)
Lactate_0h (mmol/L)	1.2 (0.5)	3.9 (2.5)	3.9 (1.9)
Lactate_6h (mmol/L)	1.6 (0.6)	4.2 (1.9)	3.8 (3.1)

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