

Local versus Systemic Inflammation in a Standardized Porcine Trauma Model: Is There a Discernible Effect of the Magnitude of Injuries?

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Purpose: Severe injury leads to inflammatory changes known to be associated with systemic complications (organ failure/ARDS [acute respiratory distress syndrome]). The aim of this study was to analyze the acute response after local extremity versus multiple injuries associated with severe hemorrhage in a large animal model.

Methods: We used a standardized pig model: hemorrhagic shock (pressure controlled, 1 hour, 25 mm Hg), liver laceration, femoral shaft fracture, blunt thoracic trauma (group Polytrauma [PT]). Control animals were submitted to isolated trauma (femur fracture only, group MT). Fracture stabilization was by nailing. Observation period was 6 hours. Time points were baseline (BL), trauma (TR), completion of resuscitation, and 2, 4, and 6 hours after nailing. The systemic inflammation was measured with enzyme-linked immunosorbent assay (ELISA) (interleukin [IL]-6, IL-10). Soft-tissue analyses were performed with polymerase chain reaction (PCR) (IL-6, IL-10) of muscle and fatty tissue harvested from the fracture site at baseline and at termination.

Results: Group PT (n = 27) showed a significant increase in systemic IL-10 1 hour after resuscitation until the end of observational period (P < 0.02). Further, our data show significant differences in systemic IL-6 values when comparing group PT to group MT (n = 25) (P < 0.008). The local circulation was decreased at the fracture site in group PT compared to group MT (P < 0.03). The local increase in IL-6 and IL-10 of fatty tissue is comparable in group MT and group PT. The local microcirculation in the extremities differ in groups MT and PT (P < 0.05)

Conclusion: In the acute phase of inflammation after severe injury, the significant changes observed in systemic inflammation do not translate into the local tissue reaction. Our data reveal that the local vascularity is lower in polytraumatized animals, which might explain the lack of this response. Further studies are needed to reveal whether this is associated with a delayed reperfusion damage.

		Systemic inflammation											
		Baseline		Trauma		Resuscitation		Tra 2h		Tra 4h		Termination	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
group PT	IL 10	24.5	23.2	320.2	386.4	475.2	416.9	210.8	152.1	281.8	199.7	274.6	338.8
group MT		27.0	41.2	299.7	342.4	206.6	292.9	112.6	48.6	104.1	87.0	139.2	345.0
		ns		ns		ns		*		**		**	
group PT	IL 6			71.7		216.9	281.9	472.4	446.4	745.0	488.8	660.8	462.6
group MT				16.5		22.1	47.4	79.3	174.9	197.6	230.5	282.0	315.3
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		Local Inflammation Fold change compared to Baseline at fractured site	
		Fatty tissue	
		Mean	SD
group PT	IL 6	119.5	174.3
group MT		407.6	678.8
group PT	IL 8	173.6	340.1
group MT		612.9	1219.2
group PT	IL 10	4.5	4.0
group MT		10.5	16.2
group PT	HMG1B 1	1.3	2.0
group MT		5.1	14.4
group PT	HSP	4.9	11.3
group MT		12.6	29.2
		Muscle	
group PT	IL 6	2308.1	4534.1
group MT		11048.3	26989.8
group PT	IL 10	13.4	13.2
group MT		26.1	43.3

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