



THE USE OF TRANSCAPILLARY ALBUMIN LEAK RATE AS AN EARLY MARKER IN A LPS INDUCED SEPSIS MODEL

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INTRODUCTION

Normal endothelial function provides an excellent barrier against the loss of plasma proteins such as albumin. During normal physiologic conditions only small amount of fluid shifts occur between the intravascular and extravascular compartment.

In inflammatory states vascular permeability increases due to the loss of endothelial integrity and leads to an increased losses of intravascular fluid as well as plasma albumin. In systemic inflammatory response syndrome (SIRS) and sepsis, the increased vascular permeability is believed to occur in all organ beds.

A new method to measure the vascular albumin leak rate is available through the **Blood Volume Analyzer (BVA-100, Daxor, NY)**.

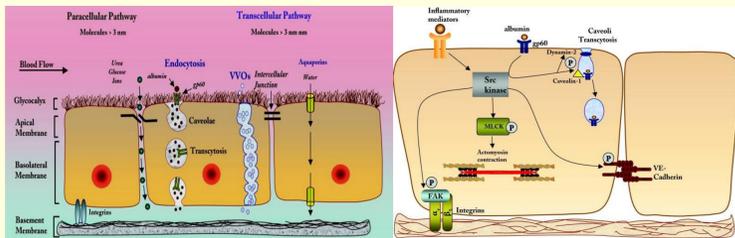


Fig 1. Albumin Transcytosis

Fig 2. Albumin Transcytosis in SIRS

Albumin Leak Rate

The Albumin leak rate can be measured using I-131 tagged albumin injected into the bloodstream and measuring serial disappearance of the isotope. The albumin leak rate - a surrogate of capillary permeability - may represent the degree of endothelial dysfunction and severity of illness.

As part of the blood volume report, the albumin leak rate is presented as a % per minute, with normal values being 0-0.4% per minute.

Procedure for Bloodvolume measurements –

a) I-131 labeled albumin is injected intravenously with 4 sequential blood draws at timed intervals to measure tracer levels.

b)The blood volume was calculated via the dye-dilution method.

c) The albumin intravascular transudation rate is determined via the loss of tracer albumin from the intravascular space.

d)An elevated albumin leak rate (ALR) was defined as a value greater than 0.45% (0.45 of 1% per minute exiting the circulation).

Hypothesis

Vascular albumin leakage rate increases early in the process of a LPS-induced porcine endotoxemia model.

RESULTS

The Albumin slope:

- at baseline was 0.45%±1.3,
- 0.38%±1.9 in control stage
- 1.38%±2.5 at sepsis stage.

Albumin slope was statistically significant when baseline was compared to sepsis (p=0.001) but not to control (p=0.81). Control stage was statistically significant different than Sepsis stage (p=0.003).

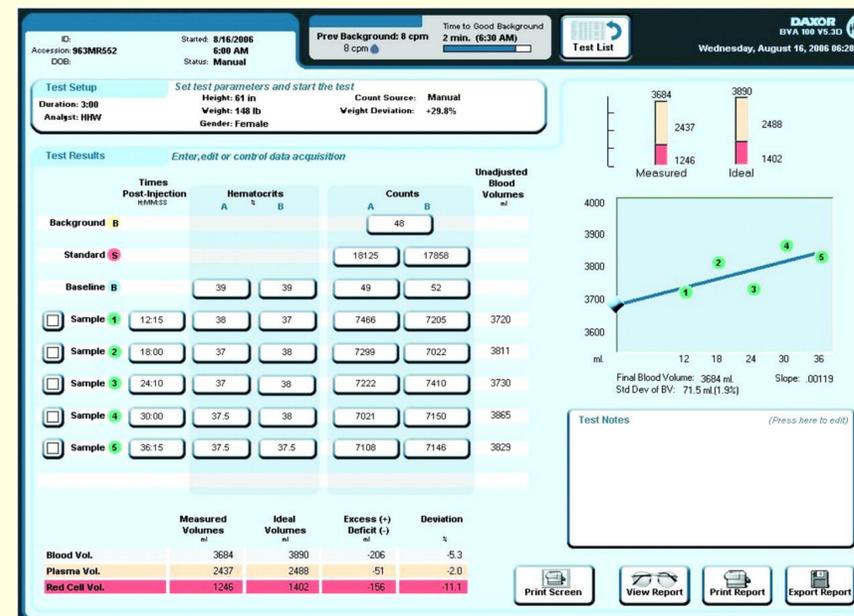


Fig 3. Bloodvolume Analysis (BVA-100, Daxor, NY).

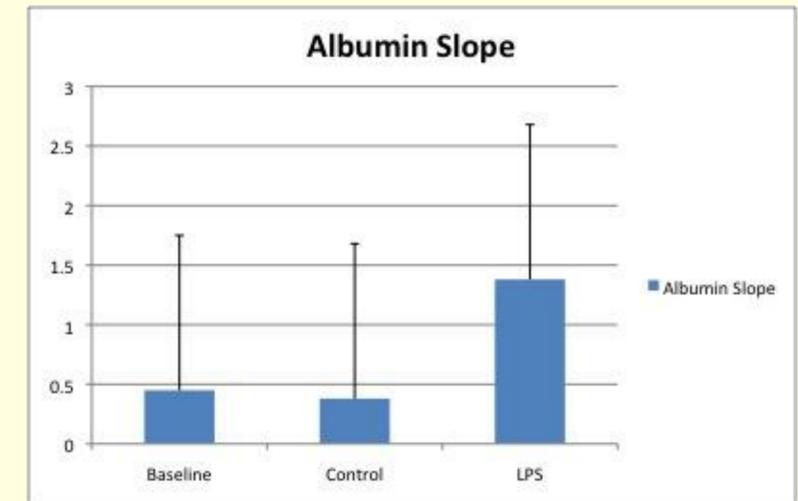


Fig 4. Albumin Escape rate at baseline, control and LPS induced endotoxemia

METHODS

Twelve 10 kg 1 month old piglet were anesthetized and instrumented with central venous catheter, femoral arterial catheter and pulmonary artery blood flow probe (CO) placed through a thoracotomy approach. Data was collected after anesthesia (baseline), after thoracotomy (control) and 15 min after 0.02 mg/kg of IV LPS administration (Sepsis). Data was analyzed by one way Anova and pair wise comparison with Fisher test. P less 0.05 was considered significant

CONCLUSIONS

- ❖ First Endothelial albumin leak rate increases significantly in the early process of sepsis.
- ❖ Further studies are necessary to evaluate if albumin leak can be used as an early marker, a prognostic indicator and/or as objective marker for responds to treatment.

REFERENCES

- [1] Fisel RS et al, Vessel injury and capillary leak. *Crit Care Med* 2003;31:S502-S511
- [2] Verheij J et al: Simple vs complex radionuclide methods of assessing capillary protein permeability for diagnosing acute respiratory distress syndrome. *J Crit Care* 2005; 20:162-171