## H31     Evaluating Small Vessel Neutrophils as a Marker for Systemic Infection

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**Learning Overview:** After attending this presentation, attendees will be able to determine how an increase in the number of neutrophils in small-caliber vessels of organs can be used to determine whether sepsis or severe systemic infection was present at death.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing a simple autopsy scoring system for the sepsis.

Accurate autopsy identification of sepsis requires integration of clinical information, antemortem laboratory studies, and gross and histological findings. Studies have investigated sepsis-related deaths through the use of immunohistochemical biomarkers, including those that are upregulated in inflammation, such as selectins, integrins, Vascular Endothelial Growth Factor (VEGF), and Intercellular Adhesion Molecules (ICAM1). These studies used small sample sizes and the use of immunohistochemistry markers is not routine. Additional research has looked at quantifying neutrophils in acute splenitis, but that study did not find a significant correlation. The objective of this study was to determine, through the use of a scoring system, whether an increase in the number of neutrophils in small-caliber vessels of the liver, heart, and lungs can be used to predict if death was due to sepsis or severe systemic infection.

A retrospective case control study over an eight-year period was performed. An electronic information system was used to identify adults who died of either sepsis or systemic infection. Adults who died suddenly of heart disease in the same year were used as controls. Cases were excluded if there was severe decomposition, if the decedent was less than 18 years old, or if histology was unavailable. Data extracted included demographics of the decedent, cause of death, presence of conditions that could interfere with an inflammatory response, history of hospitalization, and results of microbiology cultures. Histological sections of the liver, heart, and lungs for cases and controls were assessed by two doctors who blinded to the clinical information and cause of death. Organs were scored for neutrophilic inflammation based upon a predetermined grading system. Scores of 0, 1, and 2 were assigned according to mild, moderate, and florid neutrophilic presence, respectively; a total score was also assigned based on the sum of the scores from all three organs. Comparison between the cases and controls were made using the student's *t*-test for continuous variables and chi-square for proportions and categorical variables. A test for trend looking at the percentage of sepsis cases as the scoring system increased was assessed using simple linear regression. Statistical analyses were conducted using Microsoft® Excel® and Minitab® 19.

Two hundred three cases met the inclusion criteria; they consisted of 100 sepsis cases and 103 controls. The mean age of the total group was 55.71 years, with a range from 18–92 years. Overall, 123 cases were male and 80 were female. Within the sepsis cases, the mean age was 53.1 years, 53 (66.25%) were female, and 47 (38.21%) were male. The controls were slightly older with a mean age of 58.3 years and consisted of 27 (33.75%) females and 76 males (61.79%). A similar proportion of cases (51.52%) and controls (48.48%) had a condition that could interfere with the decedent's response to an infection (p=0.656). Comparing the histological grading between cases and controls found a statistical difference with the neutrophil grading in the liver (p<0.001), lung (p<0.001), heart (p<0.001), and between the combined total score (p<0.001). Examining the percentage of sepsis cases as the histological neutrophilic score increased found a positive slope in all three organs; however, only the linear regression looking at the lung (p=0.03) and the combined score (p=0.001) were statistically significant. Despite the above results, it was also noted that in all three organ systems and with the combined score, there were sepsis cases with low scores and controls with moderate and florid neutrophilic infiltrates.

In conclusion, this study showed statistical differences in the number of intravascular neutrophils in deaths due to sepsis in comparison to the control group. Although the deaths from sepsis were not always associated with a florid neutrophilic infiltrate, the scoring system presented can be used as an additional tool in determining the presence of sepsis or severe systemic infection as a mechanism of death.

**Autopsy, Sepsis, Neutrophils**

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