Beyond the Documented Diagnosis: Integrated Gross and Histologic Identification of Multiple Malignancies in a Cadaveric Donor

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Introduction

Gross cadaveric dissection in the anatomy laboratory remains a foundational component of modern medical education and is widely regarded as the gold standard for learning human anatomy. However, the educational value of cadaveric study extends beyond the completion of routine dissections. In addition to providing hands-on understanding of gross anatomical structures, cadaveric donors offer opportunities to observe anatomical variation and identify underlying pathological processes. When combined with histological analysis, findings from cadaveric donors can bridge gross anatomy and pathology, expanding the educational and scientific value of the anatomy laboratory. This report describes extensive metastatic disease identified in a cadaveric donor and highlights the value of integrating gross anatomical observations with histological analysis in medical education.

Methods

Tissue samples from malignant appearing lesions identified during gross dissection were collected for histological analysis to allow for characterization of the cellular architecture of each lesion in comparison with the primary tumor. Nine tissue cassettes were prepared from representative sites across the thoracic and abdominal cavities. Cross-sectional histological sections were generated from the following tissues: (1) left diaphragm; (2) left lung; (3) right pleura; (4) right thoracic vagus nerve; (5) right thoracic phrenic nerve; (6) right lobe of the liver; (7) left para-aortic lymph nodes; (8) thoracic duct; and (9) right lung - suspected primary tumor. Tissue preparation and staining was performed by the UMC Department of Pathology.

Gross Presentation

During routine gross dissection of a cadaveric donor in an anatomy laboratory at Louisiana State University School of Medicine at New Orleans, widespread malignant lesions were identified across multiple body cavities and organ systems. The donor was a 73-year-old male whose recorded cause of death was primary lung adenocarcinoma. The first evidence of malignancy was identified within the thoracic cavity. Initial dissection revealed extensive gelatinization of material in the right thorax, potentially related to the donor's pathology.

The right lung tissue and pleura were found to be firmly adhered to the posterior thoracic wall by a 2.5 cm well-defined mass with a tan-white cut surface and scalloped borders, consistent with the typical gross appearance of lung adenocarcinoma. Following removal of the lungs, extensive metastatic disease was observed throughout the right thoracic cavity, including lesions on the parietal pleura of the posterior, lateral, and anterior thoracic walls, the mediastinal pleura, and the diaphragm, with involvement of the vagus nerve, phrenic nerve, and thoracic duct. Additional lesions were also noted on the left lung. Further dissection revealed metastatic involvement of the liver and para-aortic lymph nodes, particularly near the aortic bifurcation. Dissection of the pelvic region and external genitalia revealed absence of the prostate and both testes, consistent with prior surgical removal.

The extensive distribution of malignant lesions, combined with additional pathological findings observed in the donor raised questions regarding the extent of spread of the primary lung adenocarcinoma and whether additional malignancies originating from other tissues may also have been present.

Histological Imaging

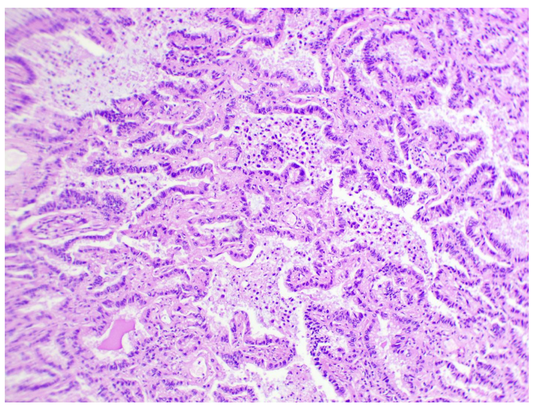

Figure 1. Suspected primary lesion identified in the right lung displaying lepidic component consistent with pre-invasive malignancy.

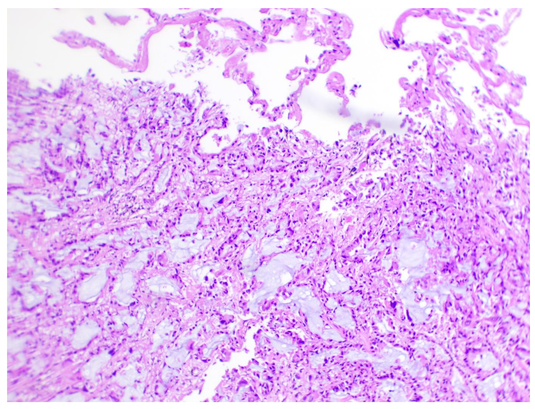

Figure 2. Invasive lung adenocarcinoma demonstrating desmoplastic growth with malignant glandular formation, abundant extracellular mucin, and nuclear pleomorphism.

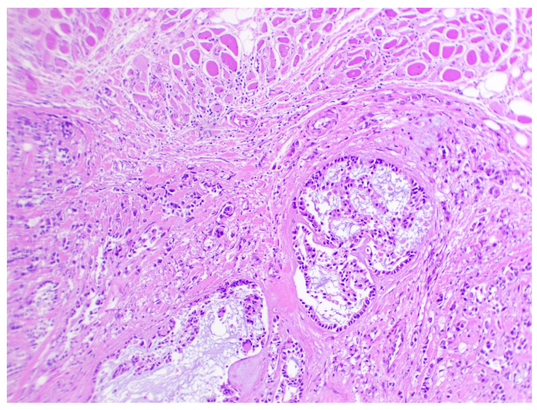

Figure 3. Neoplasm with similar aggressive morphology to figure 2 seen infiltrating between fascicles of skeletal muscle within a section from the diaphragm.

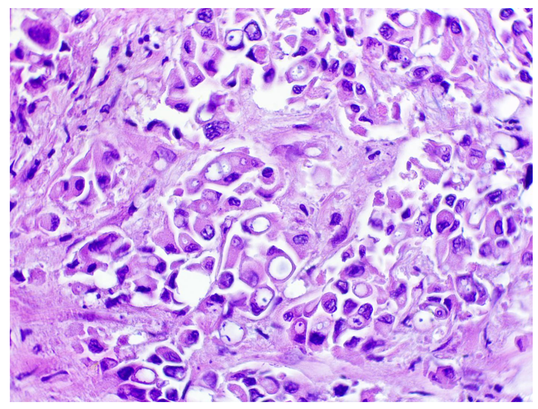

Figure 4. Neoplasm involving the phrenic nerve demonstrating cells notable for signet-ring morphology, mitotic activity, and abundant mucin, consistent with invasive adenocarcinoma.

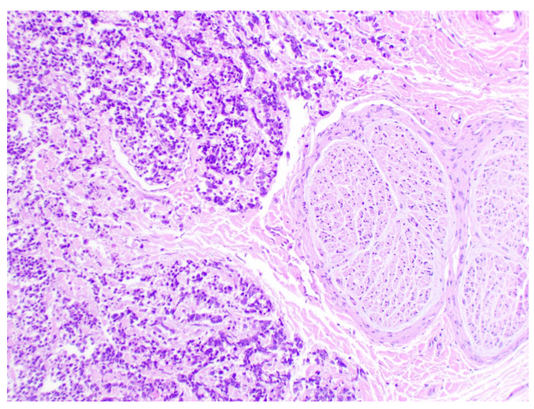

Figure 5. Neoplasm identified in the right vagus nerve presenting with unique neuroendocrine morphology.

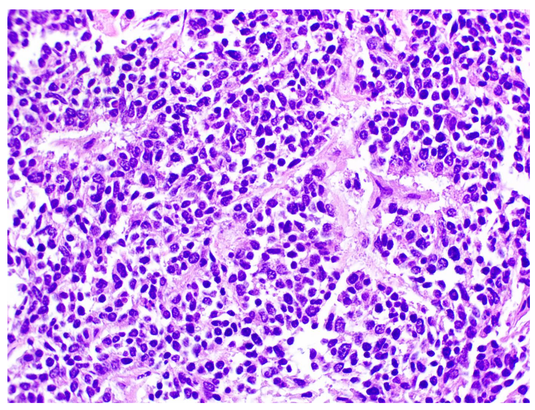

Figure 6. Neuroendocrine morphology notable for nuclei with distinct "salt-and-pepper" chromatin, minimal cytoplasm, and a nesting (zellballen) growth pattern.

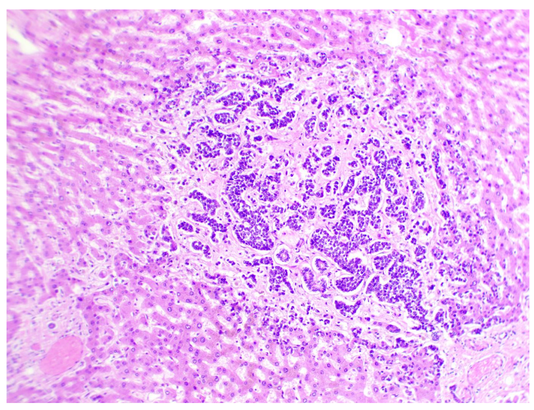

Figure 7. Potential collision tumor identified in section from the liver, with evidence of both adenocarcinoma and neuroendocrine tumor morphology visible in the same field.

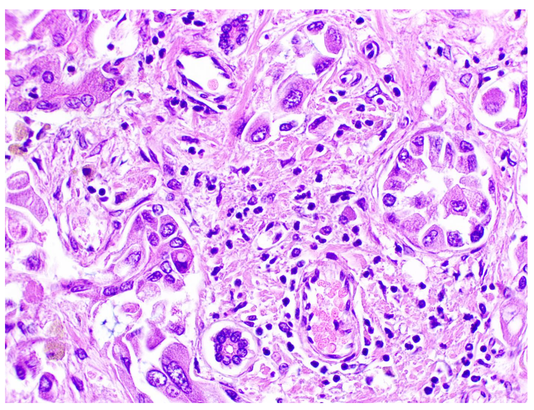

Figure 8. Adenocarcinoma component of hepatic lesion displaying glandular formation and signet-ring morphology.

Discussion

Future analysis could include immunohistochemical staining for appropriate biomarkers to further determine the tissue origin of each metastatic lesion. In particular, staining for thyroid transcription factor 1 (TTF-1), along with Napsin-A, will support primary lung adenocarcinoma origin, while staining for chromogranin and synaptophysin will confirm neuroendocrine differentiation. Given the absence of a prostate on gross examination, prostatic lineage can be evaluated using NKX3.1. Although gross examination of the gastrointestinal tract did not reveal any suspicious lesions, staining for CDX2 may be performed to evaluate for a gastrointestinal primary if TTF-1 and NKX3.1 are negative. Overall, Integration of histological and immunohistochemical findings with review of the donor's medical history will provide greater insight into patterns of metastatic progression and potential interactions between malignancies of differing origin.

Beyond the pathological findings, this case highlights the educational potential of integrating histological analysis into the anatomy laboratory. Providing medical students with opportunities to engage in cadaveric research not only enhances depth of learning but also fosters the development of research and presentation skills applicable to future clinical practice. This particular case study promoted early exposure to cancer pathology—an area typically encountered later in medical training—thereby enriching students' foundational understanding.

The structure of the Louisiana State University Health Sciences Center medical curriculum has always facilitated sequential learning of anatomical and histological study, with gross anatomy taught in the fall semester followed by histology in the spring. With additional resources and institutional support, implementing a structured program that allows students to perform histological analysis of tissue samples collected during anatomical dissection could further enhance integration of anatomy and pathology in medical education.

Acknowledgments

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