A Study of Epithelial Ovarian Neoplasms Using Electron Microscopy and Immunohistochemistry, Including a Novel Immunomarker: Hexokinase II

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Objectives: Diagnosing ovarian neoplasms is challenging, and ancillary studies help to characterize them. Immunohistochemical (IHC) stains are commonly used to help classify ovarian neoplasms, but techniques such as electron microscopy (EM) and immunogold EM (EMIG) are rarely used for this purpose.

Methods: In our study, we performed IHC staining, EM, and EMIG on 20 snap-frozen (SF) and formalin-fixed paraffin-embedded (FFPE) ovarian neoplasms from our institution’s tissue serum repository. The cases were reviewed and
confirmed to be the following: papillary serous cystadenocarcinoma (9), papillary mucinous cystadenocarcinoma (5), serous adenoma (1), Brenner tumor (1), mixed Müllerian tumor (MMMT; 1), adenocarcinoma NOS (1), and granulosa cell tumor (2). In two instances, metastatic tumor samples were also available: serous adenocarcinoma to the omentum and MMMT to the rectum. The following IHC was performed on the FFPE samples: p53, WT-1, Oct-4, and hexokinase 2 (HKII). The stains were scored as 0 (no staining), 1 (faint brown), 2 (brown-yellow), or 3 (dark brown).

**Results:** The majority of the serous/mucinous adenocarcinomas and MMMT stained strongly positive (2 to 3+) for p53 and WT-1. Oct-4 was negative in mucinous adenocarcinomas and MMMT, while 40% of serous cystadenocarcinomas were positive (2+) for Oct-4. HKII was strongly positive in 80% of serous cystadenocarcinomas, 50% of mucinous cystadenocarcinomas, and negative in MMMT. HKII also showed strong, granular positivity in the benign serous and mucinous neoplasms. EM was performed on SF tissue, and EMIG was performed using 10 nm particles. EM findings were distinct for the different neoplasms, and EMIG of serous and mucinous carcinomas (with WT-1 and p53) confirmed intranuclear gold labeling.

**Conclusions:** EM is an excellent tool for ovarian neoplasms and its use is recommended for challenging ovarian neoplasms. EMIG is helpful in confirming IHC results. We also showed that SF tissue is great for EM/EMIG.