the IS/OS line at an earlier stage by the pathological changes in a typical case of AZOOR. We should note that care should be taken in evaluation of the COST line because its visibility is dependent on the intensity and direction of the laser light that reaches the photoreceptor layer. However, in patients with AZOOR, the COST line and the foveal bulge observed by OCT could help as indicators of early cone photoreceptor dysfunction in cases with minimal ophthalmoscopic and angiographic abnormalities.

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Financial Disclosure: None reported.

Funding/Support: This work was supported by research grants from the Ministry of Health, Labor, and Welfare, Japan, and by SENTAN, Japan Science and Technology Agency, Japan.


Adult Ovarian Retinoblastoma Genomic Profile Distinct From Prior Childhood Eye Tumor

We report the first case of a woman, previously cured of childhood intraocular retinoblastoma, who developed tumor in the ovary with histological and genomic characteristics suggesting an independent retinoblastoma, not a metastasis.
Report of a Case. **Bilateral Retinoblastoma.** In a 10-month-old girl with esotropia for 6 months, the right eye was classified as group IVb (Reese-Ellsworth classification)/group D (International Intraocular Retinoblastoma Classification) and the left eye was classified as group Vb/group D. There was no extraocular disease on computed tomography or bone marrow and cerebrospinal fluid examinations. She was cured by irradiation of the right eye and enucleation of the left eye. There was no tumor extension into the choroid or optic nerve.

**Ovarian Tumor.** At age 19 years, she had constipation and abdominal distention, with a large abdominal mass on computed tomography (**Figure 1A and B**). After an open biopsy, she underwent laparotomy for resection of a left ovarian tumor and fallopian tube, mesentery, and lymph nodes, which were involved by tumor, and drainage of 5 L of ascites containing no tumor cells. She was cured by irradiation of the right eye and enucleation of the left eye. There was no tumor extension into the choroid or optic nerve.

**Figure 1.** Radiological and pathological imaging. A, Coronal computed tomographic image of the abdomen showing a large pelvic tumor (arrowhead) extending into the abdomen with marked ascites. B, Axial computed tomographic image showing cystic (double arrowheads) and solid (single arrowhead) areas in the pelvic tumor. C, Section of the ovarian mass showing the small blue cell tumor, with a normal ovarian follicle in the lower right corner (hematoxylin-eosin). D, Ovarian follicle (hematoxylin-eosin). E, Immunohistochemistry of the normal ovary showing vimentin positivity (inhibin, desmin, calretinin, actin, and pancytokeratin positivity not shown). F, Magnification of the small blue cell tumor (hematoxylin-eosin). Homer Wright rosettes (G) and Flexner-Wintersteiner rosettes (H) in the ovarian tumor (hematoxylin-eosin). Immunohistochemistry of the ovarian tumor showing CD56 positivity (I), a high MIB-1 index (J), and synaptophysin positivity (K) (also positive for neuron-specific enolase but negative for chromogranin, desmin, CD99, pancytokeratin, S-100 protein, HMBA45, epithelial membrane antigen, and CEA-P, not shown).

**Molecular Analyses.** The patient was heterozygous in blood and homozygous in the eye and ovarian tumors for a C to G point mutation causing an immediate nonsense codon in exon 23 of the \textit{RB1} gene (TAC→TAG, Tyr790X). The DNA from the ovarian and eye tumors was tested by quantitative multiplex polymerase chain reaction for copy number changes in the \textit{KIF14, DEK, E2F3, and MYCN} oncogenes and the \textit{CDH11} tumor suppressor gene, which constitute post-RB1 mutations in retinoblastoma.
tumorigenesis.\textsuperscript{2,3} \textit{ACVRL1} and \textit{RLBP1} were used as 2-copy controls (Figure 2), normal blood was used as a negative control, and a retinoblastoma with known \textit{KIF14}, \textit{DEK}, \textit{E2F3}, and \textit{MYCN} gains and \textit{CDH11} loss was used as a positive control. Distinct profiles were observed: the eye tumor showed gain of \textit{KIF14} (mean copy number, 2.77) and \textit{MYCN} (mean copy number, 4.80) with single-copy \textit{CDH11} (mean copy number, 1.04), whereas the ovarian tumor showed no \textit{KIF14} gain, amplification of \textit{MYCN} (mean copy number, 19.50), and 2-copy \textit{CDH11} (mean copy number, 2.21) (Figure 2). \textit{DEK} and \textit{E2F3} were not gained in either tumor.

\textbf{Comment.} We consider 2 possible explanations for our observation of retinoblastoma manifesting in the ovary: late metastasis or independent malignant transformation. Late metastasis is unlikely 18 years after cured retinoblastoma. Metastasis usually occurs in the first few years after diagnosis. Ovaries are extremely rare sites, reported in only 1 other case after 2 years.\textsuperscript{4} Malignant transformation of retinal cells within an ovarian teratoma 15 years after cured retinoblastoma has been reported, but without the molecular characterization we show.\textsuperscript{5}

Our patient had no teratoma. She developed an ovarian tumor with histological (Figure 1) and molecular (Figure 2) features of retinoblastoma. Ovarian markers were observed only in uninvolved ovarian tissue, while the proliferative tumor stained for retinoblastoma markers and displayed Homer Wright and Flexner-Wintersteiner rosettes, pathognomonic for retinoblastoma. The eye and ovarian tumors both shared the same first (M1) and second (M2) \textit{RB1} mutations, likely from loss of the normal \textit{RB1} allele and reduplication of the mutated allele (loss of heterozygosity), which is observed in 52\% of retinoblastoma cases.\textsuperscript{6}

The different pattern of post-\textit{RB1} mutational events in the ovarian tumor suggests a separate clonal origin from the eye tumor. Common for retinoblastoma, the eye tumor displayed gains of \textit{KIF14} and \textit{MYCN} with loss of 1 copy of \textit{CDH11}.\textsuperscript{3} The ovarian tumor showed only \textit{MYCN}}
amplification with a normal CDH11 copy number (Figure 2). MYCN amplification may account for the aggressiveness of the ovarian tumor, as it does for highly fatal neuroblastomas.7

The evidence indicates that the ovarian tumor was an independent retinoblastoma rather than a metastasis. While our analysis did not attempt to reveal the cell of origin that underwent malignant transformation, marker analysis revealed that it was not of ovarian origin. Instead, we speculate that it may have been a retinal cell displaced into the ovary by an unknown mechanism. Alternatively, a primitive pluripotent cell persisting in the ovary may have acquired the second RB1 and subsequent other mutations allowing the malignant transformation.

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**Financial Disclosure:** None reported.

**Funding/Support:** This work was supported in part by a grant from the Ontario Institute for Cancer Research and the Terry Fox Research Institute (Drs Gallie and Chan), by the Canadian Retinoblastoma Society, by the Royal Arch Masons of Canada (Dr Gallie), and in part by the Ontario Ministry of Health and Long-Term Care.

**Disclaimer:** The views expressed do not necessarily reflect those of the Ontario Ministry of Health and Long-Term Care.

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**Acute Exudative Polymorphous Paraneoplastic Vitelliform Maculopathy in a Patient With Carcinoma, Not Melanoma**

Paraneoplastic retinopathy occurs when autoantibodies against cancer cross-react with normal retinal antigens and lead to retinal degeneration and subsequent vision loss.1 Two main categories of paraneoplastic retinopathies have been described, including cancer-associated retinopathy and melanoma-associated retinopathy.2 Cancer-associated retinopathy is found most often in patients with small cell lung carcinoma and affects both rod and cone function, while melanoma-associated retinopathy occurs with metastatic cutaneous or uveal melanoma and affects primarily rod function.1 Autoantibodies against recoverin and bipolar cells are typically found in cancer-associated retinopathy and melanoma-associated retinopathy, respectively, although other retinal antigens have also been described.1,3 Herein, we illustrate a case of a more recently recognized paraneoplastic retinopathy, termed acute exudative polymorphous paraneoplastic vitelliform maculopathy (AEPPVM).

**Report of a Case.** A 69-year-old woman noted gradually progressive blurred vision in both eyes over 2 years. Three months previously, she experienced subjective loss of peripheral vision bilaterally. Other symptoms included mild decreased night vision and photopsia. Stage I breast cancer was diagnosed 5 years prior and treated with excisional biopsy and radiotherapy. She had a second cancer, stage IV lung cancer with liver metastasis, that was diagnosed 2 years prior and was treated with chemotherapy.

On examination, best-corrected visual acuity was 20/80 OD and 20/70 OS. The anterior segment, optic disc, and retinal vessels were unremarkable bilaterally. Fundus examination revealed multiple small, round, amelanotic (vitelliform) lesions approximately 500 µm in diameter in the postequatorial region bilaterally that superficially appeared like choroidal metastasis or retinal pigment epithelial detachments (Figure 1). There was no vitritis. Ultrasonography showed multifocal regions of chorioretinal thickening. Optical coherence tomography revealed multiple areas of localized subretinal fluid with debris overlying flat retinal pigment epithelium (Figure 2). Autofluorescence disclosed hyperautofluorescence corresponding to the serous retinal detachments (Figure 1), whereas fluorescein angi-