**Letter to Editor**

**Well-differentiated cerebellum within a mature cystic teratoma of the ovary**

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Mature cystic teratoma is the most common benign neoplasm of the ovary, accounting for 27-44% of all ovarian tumors and up to 58% of benign ovarian tumors [1], and is composed of mature-appearing derivatives of two or three embryonal layers [2]. Ectodermal derivatives are observed in almost all mature teratomas [2]. Organized mature neural tissue is a common component. Glial tissue is the most common neural component of mature teratoma, and well-organized cerebrum and choroid plexus are also present [3]. However, presence of cerebellum is extremely rare in ovarian mature teratomas, and only 13 cases of mature cerebellar tissue within ovarian teratoma have been reported in the literature [4-8]. Herein, we describe the 14th documented case of well-differentiated cerebellar tissue in an ovarian mature cystic teratoma and review the literature.

A 28-year-old Japanese female without gravidaity was detected with an abnormal cervical smear (high-grade squamous intraepithelial lesion) during a medical check-up. Thus, she visited a gynecological clinic, and bilateral ovarian cystic tumors were found by magnetic resonance imaging. She was referred to our hospital, and laparoscopic cystectomy of the bilateral ovarian tumors and conization were performed.

Histopathological study of the conization specimen revealed cervical intraepithelial neoplasia II, and presence of high-risk human papilloma virus was detected. The right ovarian tumor was a mature cystic teratoma, which was composed of mature skin, skin appendage, peripheral nerve, and cartilage tissues, and no immature component was present. The left ovarian tumor was also a mature cystic teratoma, which was comprised of mature skin, skin appendage, respiratory epithelium, dental, bone, and cartilage tissues (Figure 1A). A peculiar finding of the left ovarian tumor was the presence of well-differentiated cerebellar tissue within the tumor (Figure 1B). The cerebellar tissue was well-organized and was composed of molecular, Purkinje cell, and internal granular layers (Figure 1C). Moreover, an Obersteiner external granular layer was also present outside the molecular layer (Figure 1C, arrow).

Accordingly, an ultimate diagnosis of mature cystic teratoma with well-differentiated cerebellum of the left ovary was made.

The present left ovarian tumor is the 14th documented case of well-differentiated cerebellar tissue within a mature cystic teratoma of the ovary. Dominguez-Rosado et al. reported the 13th case of this type of tumor and summarized the characteristics of the previously reported cases [4]. This type of tumor mainly affects young females (7 to 32 years). Only 5 cases, including the present one, had an Obersteiner external granular layer in the cerebellum tissue within a mature cystic teratoma [5-8], while most cases lack this layer and are composed of molecular, Purkinje cell, and internal granular layers, which are the components of normal adult cerebellar tissue [4].

The normal cerebellum at birth has a sheath of immature neuroblasts, which are referred to as Obersteiner external granular layer [9]. This is
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located in the superficial region of the molecular layer, and these cells give rise to inwardly migrating cells that form the internal granular cell layer through the molecular layer. Although the Obersteiner external granular cell layer begins to diminish at 2 to 3 months after birth, it does not totally disappear until 12 months [9]. According to these results, the cellular composition and arrangement of the cerebellar tissue of the current case correspond to those found in a normal developing cerebellum at an infant period.

The presence of an Obersteiner external granular layer is speculated to be of importance in the pathogenesis of primitive neuroectodermal tumor (medulloblastoma) of the cerebellum [10, 11]. Moreover, Boor PJ and Schoene WC reported a very interesting case of ovarian teratoma with cerebellar tissue associated with primitive neuroepithelial tumor [7]. Therefore, the presence of an Obersteiner external granular layer may have an important role in the pathogenesis of malignant neuroectodermal tumor in the ovary, and additional studies are needed to clarify this issue.

Disclosure of conflict of interest

None.

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