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Clinicopathological Features of an Equine Ovarian Teratoma

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Contents

The present study describes the clinicopathological features of a mature cystic ovarian teratoma occurred in a 4 year old, cyclic, nulliparous Andalusian mare. The mass was discovered in the left ovary during a breeding soundness examination, and was hard in consistency and variously echogenic. Laparoscopy was performed to confirm the neoplastic change, followed by a unilateral laparotomic ovariectomy in the standing animal. On the cut surface the teratomatous ovary showed a large cyst filled with hair and sebaceous material and three small cysts containing mucous fluid, surrounded by solid areas where bone and cartilage could be recognized. Exceptionally, functional remnants of the ovary, including small follicles and a diestral corpus luteum were found near the tubal extremity. Histology revealed mature tissues foreign to the ovary including stratified squamous and respiratory epithelia, mucous, sebaceous and sweat glands, muscle fibres, fat and nervous tissue. The appearance of tracheal and lung architecture was occasionally observed.

Introduction

Ovarian teratomas are rare neoplasms of germ cell origin occurring in domestic animals, composed of a mixture of tissues foreign to the gonad (McEntee 1990; Kennedy et al. 1999). In the mare, they are occasionally seen, although they have been reported as the second most frequent ovarian neoplasm after granulosa-theca cell tumours (Clark 1975; Hughes et al. 1980; Pugh et al. 1985). They are usually reported in mares aged between 3 and 18 years, but with a prevalence in younger mares (< 5 years) (Clark 1975; Frazer et al. 1988), as an incidental finding, discovered at slaughter or during routine physical examination (Pugh et al. 1985; Panciera et al. 1991). Transrectal palpation can reveal an enlarged ovary with change in consistency; ultrasonography could aid in differentiating an ovarian teratoma when it contains structures of high echogenicity, such as bone or teeth (Ginther and Pierson 1984; Frazer et al. 1988). Laparoscopy has also been reported to be useful in the diagnosis of such tumours (Fischer et al. 1986). Equine ovarian teratomas have been discovered during gestation or following parturition, suggesting that they generally do not affect fertility (Hovell and Hignett 1968; Pugh et al. 1985). They are hormonally inactive and cyclicity is assured by the functional controlateral ovary (Pugh et al. 1985; Panciera et al. 1991; McCue 1998). Unlike in human beings, the prognosis is generally good because of the benign behaviour of the tumour, although a teratoma probably giving rise to an adenocarcinoma (Van Camp et al. 1989) and a teratocarcinoma (Frazer et al. 1988) have been reported in the mare. Surgical removal of the affected ovary is the recommended treatment (Bosu et al. 1982; Pugh et al. 1985). Grossly, equine ovarian teratomas are generally unilateral and include solid and cystic areas replacing the affected ovary (Panciera et al. 1991; Hughes 1993). Teratomas have occasionally been reported in association with other tumours, such as cystoadenoma (Fujimoto and Sakay 1955) and granulosa cell tumour (Panciera et al. 1991). A great variety of tissues foreign to the ovary have been reported in teratomas, originating from two or three germ cell layers, as well as haired skin with sebaceous and sweat glands, respiratory epithelium, salivary glands, ganglion cells and nerve fibres, smooth muscle, cartilage, bone and teeth (Abraham 1968; Panciera et al. 1991; Hughes 1993).

Case History

A 4 year old, cyclic, nulliparous, Andalusian mare was admitted for a breeding soundness examination. In the previous breeding season, she was barren, although a natural service was used for several oestrous cycles. External genitalia were normal. Genital tract palpation *per rectum* revealed a tubular uterus, an enlarged left ovary (approximately 10 cm in diameter), irregularly ovoid and very hard in some areas, and a right ovary normal in size and consistency, with one palpable follicle (approximately 3 cm in diameter). On ultrasonography, performed with a 5-MHz linear-array transducer and a 5-MHz endovaginal curvilinear transducer, the enlarged ovary revealed a striking appearance. On short-axis cross-section, two cavities surrounded by hyperechoic lines and filled with variously echogenic material floating in hypoechogenic fluid were seen, while sagittally the architecture was not clear for the presence of large acoustic shadowings (Fig 1a and b). Sequential transrectal palpations and ultrasonic examinations revealed no evident changes in the ovarian mass. With a presumptive diagnosis of ovarian tumour, a left flank laparoscopy in the standing animal was performed. The large ovary was easily visible, with an irregular surface, yellowish and with prominent ovarian pedicle vessels. No visible metastases were detected in the abdominal cavity. Because of the size of the affected ovary and its pedicle, a unilateral ovariectomy was carried out by laparotomy. Tetanus prophylaxis, antibiotic and antiphlogistic therapy were administered before surgery.

Gross pathology

The enlarged ovary ($10 \times 8 \times 6$ cm; weight, 300 g) was irregularly ovoid and yellowish with dark grey foci

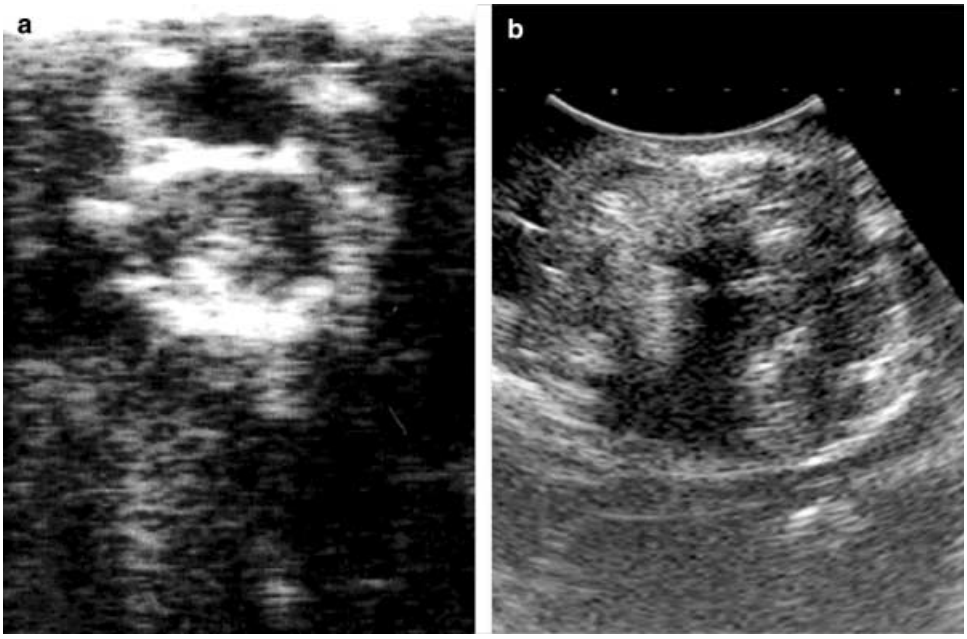

Fig. 1. (a, b) Transrectal and endovaginal sonograms of the left ovary

Fig. 2. The removed left ovary with irregular and yellowish surface with greyish foci

(Fig. 2). The ovulation fossa was undetectable. The consistence varied from soft to hard in different areas. Radiographs of the ovarian mass revealed an inner area having the radiodensity of bone. On the cut surface, the teratomatous nature of the mass was evident and characterized by a mixture of cysts and solid areas (Fig. 3). A large cyst (45 cm) was totally filled with hair and sebaceous material, while three other smaller cysts (2 cm in diameter) contained a mucous yellow–green fluid. In the solid areas, cartilage, bone and other yellow softer tissues could be recognized. Functional ovarian tissue was found in the tubaric extremity, including a reddish flattened corpus luteum and a few small follicles (< 1 cm in diameter) (Fig. 4).

Histopathology

Representative ovarian specimens were fixed in 4% paraformaldehyde in phosphate-buffered saline (PBS). They were embedded in paraffin wax, sectioned to 5 μm and stained with haematoxylin–eosin, periodic acid-Schiff (PAS) and Masson's trichrome. The mass was composed of a wide variety of mature tissues, foreign to the ovary and diffusely scattered. The large cyst appeared lined with stratified keratinized squamous epithelium and other skin-like structures, including hair follicles, sebaceous and sweat glands (Fig. 5). The smaller cysts were generally lined with columnar ciliated epithelium, branched mixed tubuloacinar glands with cartilage underneath, resembling a tracheal organization (Figs 6 and 7). In other areas, lung tissue was found, in which alveolar ducts and sacs and bronchioles could be recognized (Fig. 8). Focal areas of ossification and mature bone could be seen in the central area, often with an active bone marrow inside (Fig. 9). Moreover, fibrous and fatty tissues, neural tissue and ganglia, muscle and lymphatic tissue were observed scattered over the solid areas (Fig. 10). Degenerative lesions, including foci of necrosis, lipid-filled macrophages and foreign body giant cells were seen together with cholesterol-like crystal deposits. A corpus luteum with functional luteal cells surrounded by normal ovarian stroma was found up against the mass. A definitive diagnosis of mature ovarian teratoma was made.

Discussion

Ovarian mature teratomas have to be considered in differential diagnosis in mares with unilateral ovarian enlargement. Clinical signs and ultrasonographic appearance may aid in differentiating these tumours from other ovarian disorders (Ginther and Pierson 1984; Frazer et al. 1988). In this study, ultrasonography and especially laparoscopy were essential to confirm the neoplastic change. In particular, endovaginal ultrasonography was the more reliable technique for evaluating different sections of the ovary with higher resolution, while laparoscopy was useful for detection of the real dimensions of the ovarian mass, the vascularization and

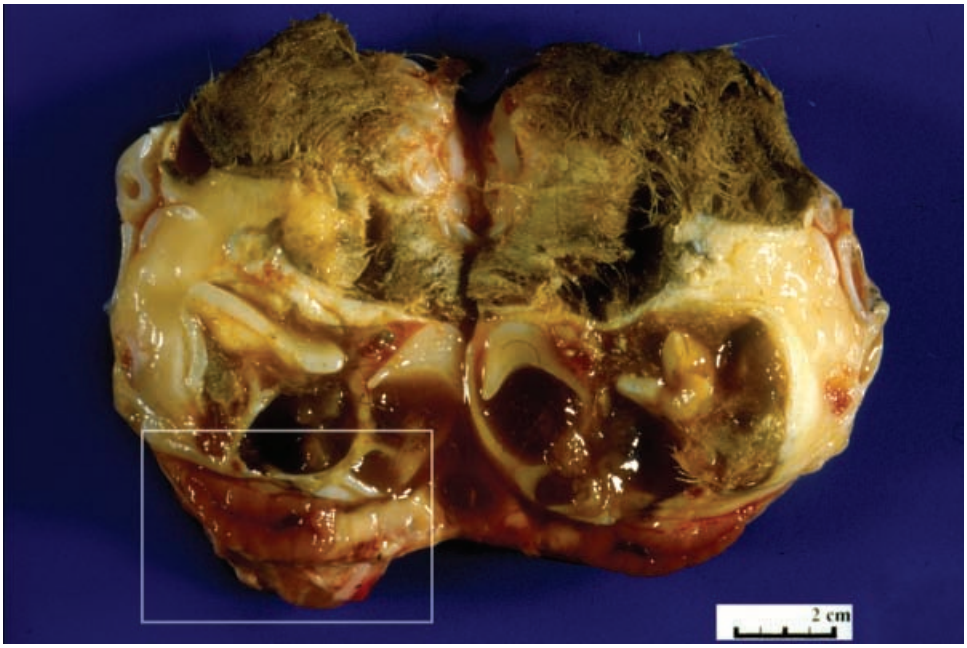

Fig. 3. Cut surface of the ovarian mass. The teratomatous nature is evident

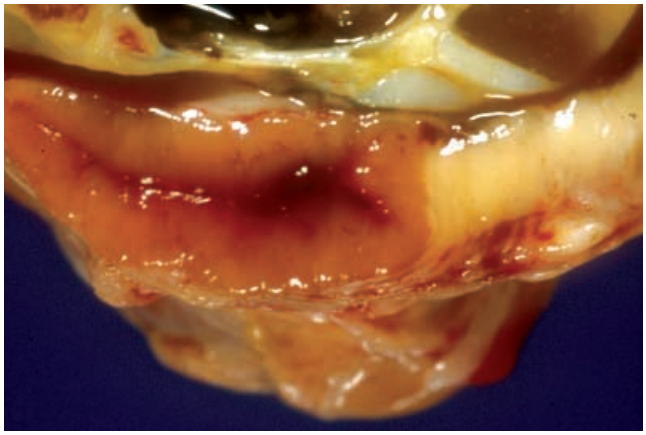

Fig. 4. A detail of the corpus luteum confined near the tubal extremity

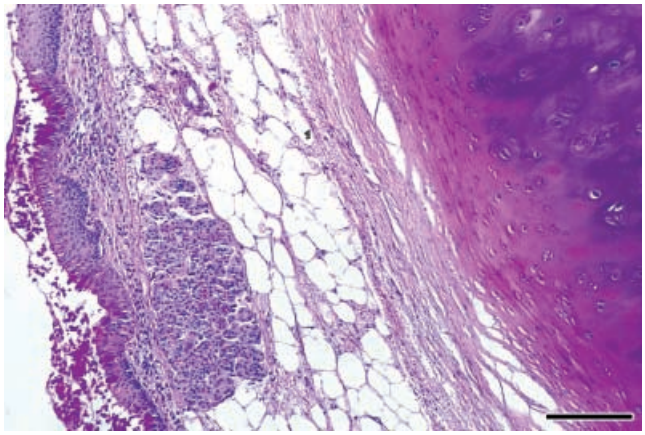

Fig. 6. Tracheal organization with respiratory epithelium, clusters of glands, fat tissue, perichondrium and cartilage. Periodic acid-Schiff (PAS): bar = 230 μm

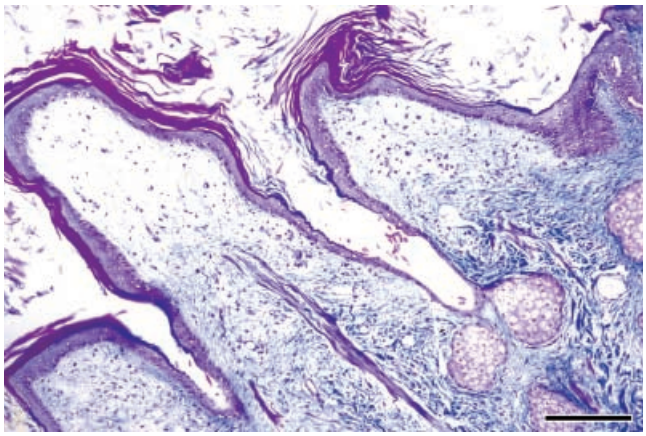

Fig. 5. The large cyst containing keratin debris and lined with stratified keratinized squamous epithelium. Masson's trichrome. Bar = 160 μm

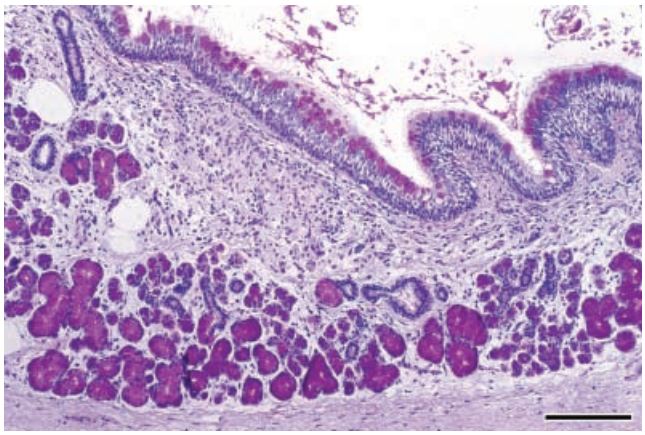

Fig. 7. The branched mixed tubuloacinar glands under the columnar ciliated epithelium at higher magnification. Periodic acid-Schiff (PAS): bar = 150 μm

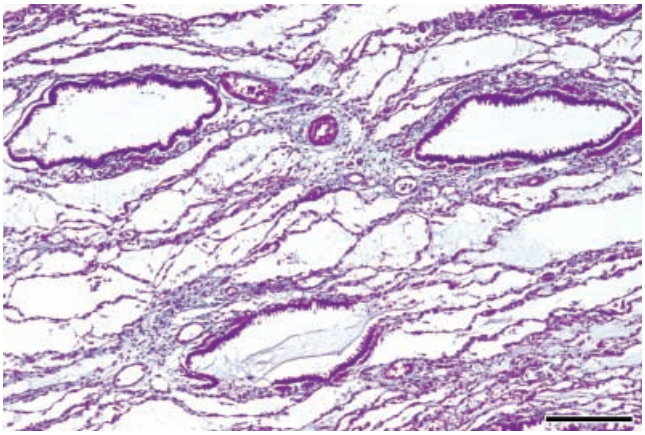

Fig. 8. Lung structure, with alveolar ducts and sacs and bronchioles in cross-section. Masson's trichrome: bar = 160 μm

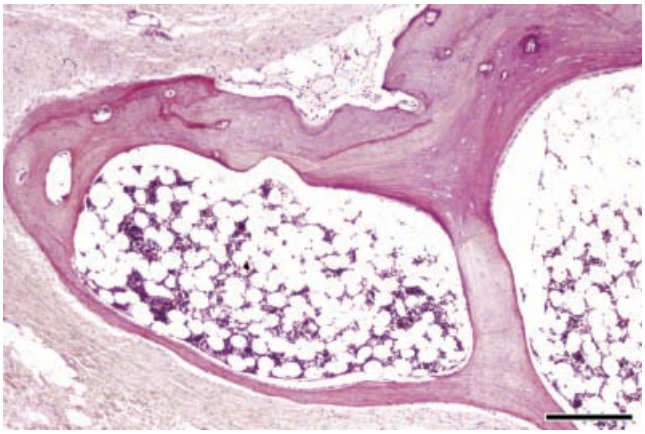

Fig. 9. Bone containing bone marrow. Haematoxylin–eosin: bar = 300 μm

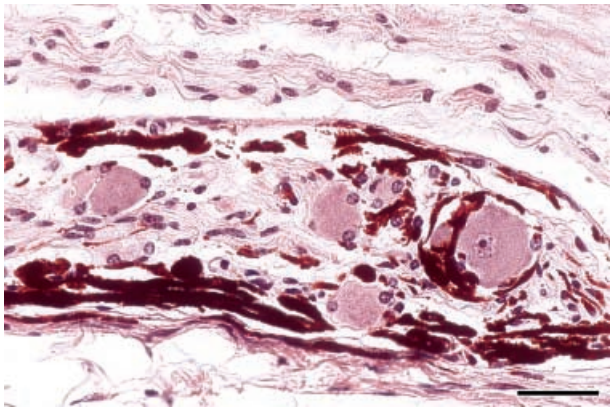

Fig. 10. Gangliar cells and melanocytes discovered among nervous tissue areas. Haematoxylin–eosin: bar = 40 μm

for the choice of surgical approach. Moreover, possible abdominal metastases would be revealed (Fischer et al. 1986). Teratomas are hormonally inactive and generally do not affect the oestrous cycle, but their growth may cause abdominal pain, pressure symptoms and adhesions to the surrounding structures and fertility could be indirectly affected (Abraham 1968; Hovell and Hignett 1968; Pugh et al. 1985). In the present study, the mare had a normal cycle and despite the teratomatous ovary was able to ovulate, as demonstrated by the exceptional presence of a diestral corpus luteum and some small follicles. On the contrary, it is unlikely that the size of the neoplasm was so large as to cause physical disturbances to internal organs and in particular to the reproductive tract. For all these reasons, the clinical history of infertility was likely due to mismanagement rather than the ovarian teratoma. In any case, in the following breeding season, when correct reproductive management was applied, the mare was bred, she conceived and foaled. While cutaneous elements are common findings in ovarian teratomas, this case report was interesting also for the great variety of well-differentiated tissues from all three germ layers; in particular, the findings of an active bone marrow and a lung structure have never been listed in equine ovarian teratomas.

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