

## REMAINING OF THE YOLK SAC

Gabriela Amorim Campos<sup>1\*</sup>  
Victor Filgueiras Cruz Garcia<sup>1</sup>  
Milena da Silva Machado<sup>2</sup>  
Viciany Erique Fabris<sup>3</sup>  
Maria Jaqueline Mamprim<sup>1</sup>  
Nereu Carlos Prestes<sup>1</sup>

### ABSTRACT

It was described the occurrence of yolk sac remnant with macroscopic, radiographic, ultrasonographic, tomographic and histologic evaluation of the material obtained from the placenta of a Thoroughbred mare after delivery of a viable foal.

**Keywords:** Parturition, mare, obstetrics.

## SACO VITELÍNICO REMANESCENTE

### RESUMO

Ocorrência de remanescente de saco vitelínico descrito por avaliação macroscópica, radiográfica, ultrassonográfica, tomográfica e histológica do material obtido da placenta de uma égua Puro Sangue Inglês após o parto de um potro viável.

**Palavras-chave:** Parto, égua, obstetrícia.

## REMANENTE DE SACO VITELINO

### RESUMEN

Ocurrencia de un remanente de saco vitelino descrito por evaluación macroscópica, radiográfica, ecográfica, tomografía computarizada y histológica del material obtenido de la placenta de una yegua Puro Sangre después del nacimiento del potro viable.

**Palavras clave:** Parto, yegua, obstetrícia.

## INTRODUCTION

The yolk sac originates from endodermic tissue emanating from the inner cell mass covering the internal trophoectoderm layer. It develops from the blastocoele and almost disappears after a few weeks, except in horses, that present persistent yolk sac, being observed up to 60 days of gestation (1,2).

In horses, the yolk sac is the dominant structure in the first three to four weeks of gestation, comprising the majority of the total embryo weight (1). Thereafter, the cavity of the yolk sac and the allantoic sac occupy the same space, and about after 60 days, the yolk sac undergoes atresia, becoming a linear bag contained within the distal umbilical cord (3,4).

<sup>1</sup> Department of Animal Reproduction and Veterinary Radiology. FMVZ – UNESP – Botucatu, São Paulo, Brazil.

\*Corresponding autor: Distrito de Rubião Junior, s/n, Botucatu, SP, Brasil, 18.618-970. gabrielaamorim@msn.com

<sup>2</sup> Beverly Hills Farm, Avaré, São Paulo, Brazil

<sup>3</sup> Department of Pathology. FMVZ – UNESP – Botucatu, São Paulo, Brazil.

Occasionally, large ossified hollow structures remnants of the yolk sac are found in the horse placenta. These structures are connected by a stalk segment to the allantoic cord (3). This structure generally has cystic shape and variable size and consistency (5). It is usually filled with fluid and for unknown reasons develops small areas of bone metaplasia in its central segment, or several bony plates on the wall (6,7). On rare occasions, these structures can compromise blood flow of the umbilical vessels and result in miscarriage (3,7).

## CASE REPORT

During the breeding season in a Thoroughbred race Haras, in the region of Avare (Latitude 23 05' 55" S, Longitude 48 55' 33" W), São Paulo, in the routinely pregnancy diagnosis evaluation, it was identified that one of the mares, 5 years old and weighing 620 kg, had an initial twin pregnancy, with three vesicles. It was decided to perform the destruction of two vesicles and follow through with the pregnancy of one, in order not to delay pregnancy and to prevent future complications.

The procedure was successfully performed using ultrasound to guide the identification of the vesicles to be eliminated. Gynecological exams were performed routinely throughout the gestation.

At parturition, the mare needed aid for delivery, requiring traction of the foal. After the obstetric procedure, it was noted next to the fetal membranes a circular mass of firm consistency and cystic areas (Figure 1A and 1B). The mass was collected, wrapped, stored at -20°C, and then sent to the Animal Reproduction Division, Universidade Estadual Paulista "Julio de Mesquita Filho", Botucatu-SP.

At the Veterinary Hospital, ultrasound, radiography and computerized tomography examinations were performed. Then, the material was immersed in 70% alcohol and after 2 days, it was transferred to formaldehyde for histological evaluations.

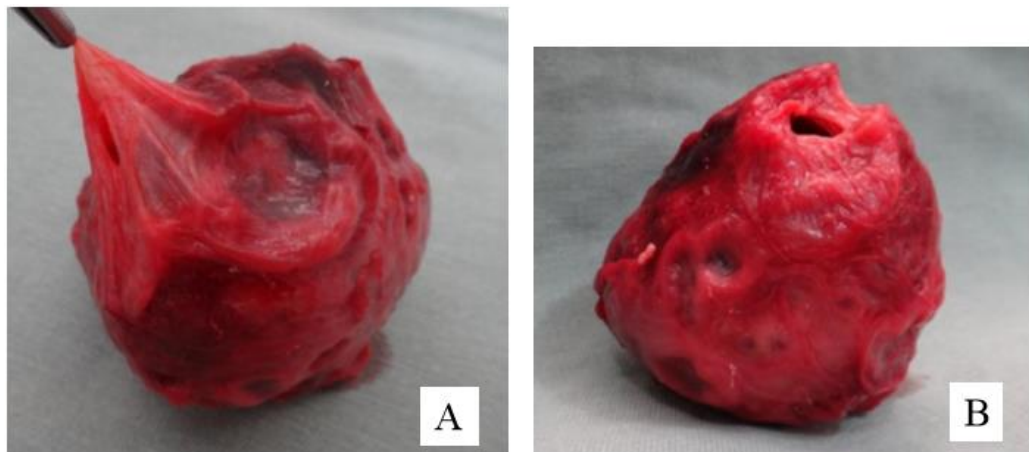


Figure 1. (A) and (B) Yolk sac remnant.

## MACROSCOPIC EXAMINATION

The tissue weighed 91 g, measuring 7.5 x 6.0 x 6.0 cm, with a serous and mucous content in their cystic cavities, which ranged from 1.0 to 4.0 cm in diameter. On palpation, it was noted a firm consistency, that when pattering, it made a hollow sound. At cut, there were numerous cystic formations of various sizes, some with serous or mucoid tissue and others with a brown content. All structures were permeated by hard tissue, calcified, which produces the hollow sound reported above (Figure 2).



Figure 2. Yolk sac remnant cut in half. It can be seen cystic formations surrounded by ossified tissue.

## RADIOGRAPHY

At the X-ray, it was observed a circumscribed structure with radiopaque borders, measuring 6.83cm x 6.03cm in their major axes, showing internal septa and trabeculae of bone radiopacity, with areas of cavities filled with gas content (Figure 3A).

## ULTRASOUND EXAMINATION

At the ultrasound examination an irregular surface structure was revealed, with wraps and hyperechoic septa forming some areas of posterior acoustic shadowing artifact. There were also cavity areas filled with hypoechoic fluid content and discrete hyperechoic dots in suspension and other cavity areas filled with reverberation forming content (Figure 3B).

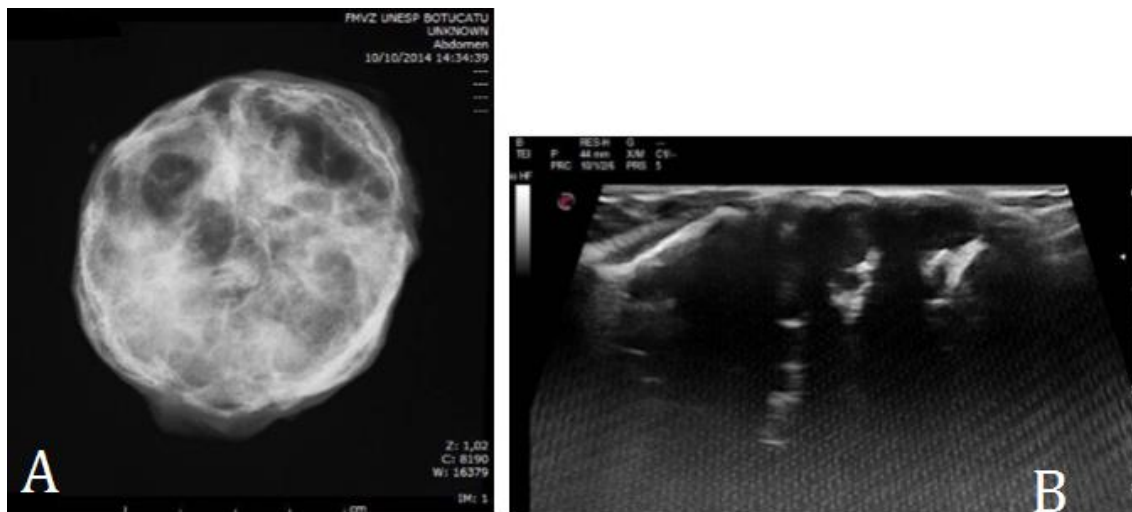


Figure 3. (A) X-ray of an ossified remaining of the yolk. (B) Ultrasound exam where it is observed uneven surface, cavities filled by hypoechoic fluid content.

## CT SCAN

The computerized tomography performed in axial projection with 1mm increment cuts without contrast injection also has identified cavity areas filled by material with density ~ -1.000HU and ~ -2 to 50HU and presence of irregular septa with high density ~ 200HU forming the various cavity areas. After fixation in 38% formaldehyde, the CT images showed that the size was 6.89 x 6.39 x 6.09 cm in their largest axis (Figure 4).

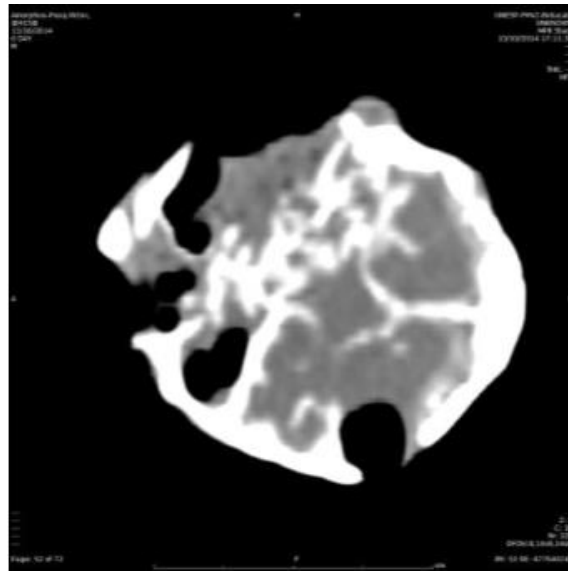


Figure 4. CT scan of the yolk sac remnant.

## HISTOPATHOLOGY

Cysts filled with sero-mucous material were observed with red blood cells, uncoated walls and with a basophilic matrix, where in most of them there was mineralization (Figure 5A). It can be observed a mineralized uncoated cystic wall (Figure 5B and 5C). The mineralization is done in mucinous substrate, where there are areas of calcification and ossification.

It is concluded that the material described above is a "cyst" of the umbilical cord: Remnant of the yolk sac, mineralized (calcified / ossified).

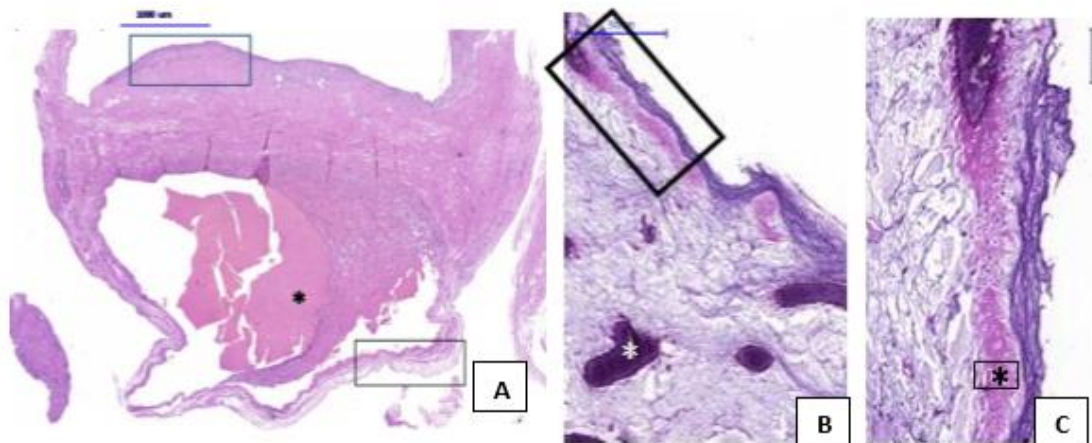


Figure 5. (A) "Cysts" filled with sero-mucous material with red blood cells (\*), walls without superficial coating and with a basophilic mucinous matrix (details) (HE). (B) Mineralized cystic wall without epithelial lining. Mineralization in mucinous substrate, where there were calcification (\*) and ossification (HE without decalcification). (C) Detail of the previous figure, in which there is calcification in basophilic and bone formation in continuity, overlying a mucoid mucinous matrix (HE).

## DISCUSSION AND CONCLUSION

The macroscopic aspects found in this case are similar to those reported cited by (3,5,6,7). In the histology slide a mineralized cystic wall was observed. Similar data were

presented by (3,5). Different from King (6), these cysts were filled with sero-mucous material with the presence of red blood cells. The radiographic features found in this report corroborate the findings of Cassar et al. (3).

The ossification of the involuted yolk sac tissue is quite common and provides evidence that larger ossified remnants of yolk sac probably begin as small areas of metaplastic formation of trabecular bone that gradually expand on a highly organized manner to form the lamellar wall commonly found in larger "ossified" yolk sac tissues (3).

This seems to be the first study to report data on ultrasound and computerized tomography of which was confirmed to be a yolk sac remaining calcified.

## REFERENCES

1. Sharp DC. The early fetal life of the equine conceptus. *Anim Reprod Sci.* 2000;60-61:679-89.
2. Landim-Alvarenga FC. Reconhecimento materno do concepto e início da placentação. In: Prestes NC, Landim-Alvarenga FC. *Obstetrícia veterinária.* 1a ed. Rio de Janeiro: Guanabara Koogan; 2006. p.22-40.
3. Cassar TIY, Fallon LH, Martinez EH, Schlafer DH. Segmental ossification of involuted yolk sacs in equine umbilical cords. *Anim Reprod Sci.* 2006;94:439 -42.
4. Morreseay PR. The placenta. In: Mckinnon AO, Squires EL, Vaala WE, Varner DD. *Equine reproduction.* 2nd ed. Oxford: Blackwell Publishing Ltd; 2011. p.84-95.
5. Sartori Filho R, Prestes NC, Coelho KIF. Yolk sac remnant in a mini-pony foal. *Equine Pract.* 1997;19:24-6.
6. King JM. Yolk sac remnant. *Vet Med.* 1994;89:27-8.
7. Schlafer DH. Examination of the placenta. In: Mckinnon AO, Squires EL, Vaala WE, Varner DD. *Equine Reproduction.* 2nd ed. Oxford: Blackwell Publishing Ltd; 2011. p.99-110.

**Recebido em: 15/05/2015**

**Aceito em: 27/06/2016**