

## Importance of the veterinarian in the diagnosis of Cryptorchidism in horses: Literature review

Bruna Helena Van Silva Tibúrcio<sup>1</sup>  
Luciene Patrici Papa<sup>2</sup>



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### ABSTRACT

Regardless of leisure or work, the population of horses has increased, due to the influence on the relationship between humans and these animals, thus increasing the relevance of these animals in people's daily lives. In the reproductive process of horses, different types of problems can occur, such as genetic failures, which can happen during the process of fertilization and embryological development, or even due to some genetic mutation suffered, with cryptorchidism being a failure that occurs during development. Cryptorchidism is defined as a disease that affects the progression of the descent of the testicles, being interrupted, so that one or two testicles are retained in the abdominal cavity or in the inguinal canal. This path taken by the testicles to the scrotum is a highly complex and multifactorial process, and may present failures. The objective of this study was to verify the importance of the veterinarian in the diagnosis of cryptorchidism in horses, using a literature review. The classification of this disease is based on the inguinal canal and is named as: complete abdominal cryptorchid, incomplete abdominal cryptorchid or abdomino-inguinal and inguinal tumors. It should be noted that genetic factors are the main cause of cryptorchidism, with high chances of mutations occurring in more than one gene and the tendency to be an autosomal recessive inheritance pattern. The diagnosis and the next conduct must be carried out by the veterinarian, due to factors such as possible heredity, where the professional in charge must be able to distinguish the necessary measures to avoid the transfer, and the unknown history of the animal, which may have previous castration, making hormonal dosage necessary. Considering the importance of genetic transmission and the potential of this animal for future generations, it is considered essential for the veterinarian to obtain early diagnosis and appropriate treatment, allowing quality control of future progenies.

**Keywords:** cryptorchidism; equines.

### 1 INTRODUCTION

Equine farming plays an important role in human life, since these animals have several functions in relation to coexistence, such as sports, work, leisure, specific activities according to the association of each breed, etc. Brazil is among the largest herds of the species in Latin America, so there is a high investment to reproduce and genetically select more qualified animals and, thus, improve specific performance for future generations (CARVALHO, 2021).

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<sup>1</sup> Undergraduate student in Veterinary Medicine at Faculdade Eduvale de Avaré (Association of Veterinary Medicine Educational of the Jurumirim Valley).

<sup>2</sup> Graduated in Biological Sciences from the Júlio de Mesquita Filho, Master and Doctor also from the Júlio de Mesquita State University  
Son;  
Professor at the Southwest University Center of São Paulo (UniFSP).

Regardless of leisure or work, the horse population has increased a lot, due to the influence on the relationship between humans and horses, thus increasing the relevance of these animals in people's daily lives. According to the latest IBGE survey regarding the equine population index in the country, Brazil has a herd with a total of 5,834,544 head (IBGE, 2022). In proportion to this growth, there is also an increase in the number of accidents and pathologies that affect them (SOUZA et al., 2018).

During equine reproduction, different types of problems can occur, such as genetic failures, which can occur during the process of fertilization and embryological development, or even due to some genetic mutation suffered, with cryptorchidism being a failure that occurs during development (CARLOS et al., 2018). It is a disease in which one or both testicles are inside the abdominal or pelvic cavity, that is, outside the scrotum after the horse reaches sexual maturity (CACERES, 2022). Cryptorchidism can be diagnosed in animals around 2 to 3 years of age (CARLOS et al., 2018), and can be observed in different breeds of horses, being more frequent in breeds such as Percheron and Quarter Horse (CACERES, 2022).

As for the causes of cryptorchidism in horses, Caceres (2022) states that some studies have tried to locate the genetic causes, but there is still insufficient proof of this ancestry. HAN et al. (2020) conducted a research guided by genetic effects using horses with unilateral cryptorchidism. Due to the small sample size, it was not possible to verify this statistical relationship, however genetic differences were observed between cryptorchid and non-cryptorchid animals, such as mutations and different levels of gene expression regarding reproductive performance. Although some authors emphasize that more studies addressing the genetic cause should be conducted, others already existing claim the importance of considering the genetic cause.

In addition, studies have been conducted to verify the environmental causes and anatomical predisposition of this problem. As it is a highly complex and multifactorial process, the path taken by the testicles through the abdominal cavity to the scrotum may present failures (CACERES, 2020). One of these failures is specifically due to the inadequate function of the gubernaculum, which results in the retention of the testicle (VALDEZ et al., 1979; TROTTER; AANES, 1981). Also, there may be failures in the production of sex hormones, which affects the process of shrinking the testicle so that the passage through the inguinal canal is completed, which is the case of progesterone. In addition to these, there are environmental influences, which allowed us to verify that prematurity at birth, maternal exposure in the first trimester of pregnancy to estrogens, and low birth weight led to a predisposition to cryptorchidism (CACERES, 2022).

Thus, the objective of this study was to verify the importance of the veterinarian in the diagnosis of cryptorchidism in horses, using a literature review.

## 2 DEVELOPMENT

Cryptorchidism is defined as a disease that affects the progression of the descent of the testicles, being interrupted, so that one or two testicles are retained in the abdominal cavity or in the inguinal canal. Some of its anatomical causes may be shortening of the cremaster muscle or vas deferens, underdevelopment of the inguinal rings, shortening of spermatic vessels, scrotal malformations, or adhesions in the peritoneum (RIBEIRO et al., 2014).

In horses, the testicles are kept inside the scrotum, located outside the body cavity, since the production of fertile sperm must take place at a temperature lower than the body (about 3 to 4° C difference). Thus, when the cells of the sperm lineage are exposed to higher temperatures, such as the body, germ cell degeneration can occur. Thus, the cryptorchid testicles, when remaining in the inguinal canal or in the abdominal cavity, are exposed to a higher temperature, where there is a compromise of spermatogenesis and the development of atrophy of both the retained testicle and epididymis. Classifying bilateral cryptorchid horses as sterile and unilateral cryptorchid horses as subfertile (VIEIRA et al., 2018). Castro (2020) emphasizes that the impairment of spermatogenesis occurs because germ cells need a lower temperature than the body for the spermatogenesis process to occur. Thus, the cryptorchid equine has an aspermic or hypospermic testicle, that is, in the formation of semen, there is no sperm emission or reduced emission, respectively. In addition, there is a high probability of developing testicular neoplasms due to this temperature change (CARVALHO, 2021; CASTRO, 2020).

Regarding testosterone production, it is observed that cryptorchid horses still produce androgens, and may present both secondary sexual characteristics and sexual behavior, since the Leydig cells, which are responsible for this hormone production, are not affected by abdominal body temperature. And, therefore, even when orchiectomy of the descended testicle is performed, the missing testicle continues with hormone production, still presenting the characteristic behavior of a stallion with aggressiveness, dominance and territorialism. It is important to emphasize that when the animal has only one testicle, whether it is retained in any of the locations or exposed, the term monorchidism is considered (THOMASSIAN, 2005; BRINSKO et al., 2011).

According to studies by Cáceres (2022), the classification of this anomaly is carried out based on the inguinal canal and is named as: complete abdominal cryptorchid, incomplete abdominal cryptorchid or abdomino-inguinal and inguinal tumors. The complete abdominal cryptorchid nomenclature is given when the testicle and the attached structures (epididymis and vas deferens) continue in the abdominal cavity, not passing through the vaginal ring. Thus, both the ring and the vaginal process will be underdeveloped and the testicle will usually be located closer to the inner inguinal ring or between the kidney and the bladder. Animals with incomplete abdominal

cryptorchidism, part of the epididymis and/or vas deferens remain in the inguinal canal or a portion of these attached structures and the testicle are located in the inguinal canal, while the other portion remains in the abdomen. On the other hand, the abdomino-inguinal and inguinal cryptorchid animals occur when the testicle passes through the inguinal ring, but does not reach the scrotum, and may be in a subcutaneous location adjacent to the external inguinal ring or retained in the inguinal canal (CACERES, 2022).

Limbado (2022) emphasizes that this interruption in testicular descent can occur due to genetic causes. This fact may occur due to the heredity of an autosomal dominant gene, an autosomal recessive gene and the involvement of at least two genetic factors, one of which is located on the sex chromosomes. Thus, it is not advisable to use animals that have shown cryptorchidism for equine reproduction. Still, Caceres (2022) emphasizes that genetic factors are the main cause of cryptorchidism, describing high chances of mutations occurring in more than one gene and the tendency to be an autosomal recessive inheritance pattern. Schade et al. (2017) point out that the etiology is also likely to be associated with changes in testicular descent in the period of fetal development.

According to the study by Nascimento (2013), the most affected breed within his research number was Quarter Horse. The author emphasized that 12 affected animals were observed, among 32 varied animals and even of no defined breed. This can be explained due to the predominance of this breed in the region described. On the other hand, Batista (2016) reports that it can occur both in the Quarter Horse and in breeds such as Percheron, crossbreeds and American Saddlebred. Also, Carvalho (2021) in his study found that, together with heredity, horses of both sexes can carry the gene, bringing confirmation that there is a prevalence in breeds, as previously mentioned, Quarter Horses and with varying ages in that location.

The diagnosis and the next conduct must be carried out by the veterinarian, taking into account factors such as possible heredity, where the responsible professional must be able to distinguish necessary measures to avoid the transfer; unknown history of the animal, where there is no knowledge of previous castration, requiring a hormonal dosage; capacity and experience of the professional, who has the function of determining the best way to perform the procedure, taking into account the well-being of the animal combined with the possibilities according to the clinical case. In cases of unilateral cryptorchidism, the first to be removed in the surgical procedure is always the one that is retained, due to the possibility of unforeseen events in which the surgery may be interrupted, thus keeping the testicle descended indicating a cryptorchid animal, facilitating the differentiation of a castrated equine (SCHADE et al., 2017).

As Freire (2018) approaches, once suspected, the diagnosis should be based on the animal's history when possible combined with a clinical evaluation, using external palpation, transrectal with the use of ultrasound and hormonal evaluation. In addition to the stallion behavior mentioned above, edema, pain to the touch and swelling can also be identified.

The transrectal examination can help in the diagnosis when there is an equine apparently castrated, but demonstrating stallion behavior without castration in its history. In cases where rectal palpation is not possible to touch the testicle in the abdomen, the diagnosis of a cryptorchid animal is considered inconclusive, since the testicles can be small, with flaccid consistency and high mobility (RABELO et al., 2017; CARVALHO, 2021). In castrated animals, the inguinal ring looks like a small depression, while in a stallion this ring is large enough for a finger to pass (CARVALHO, 2021).

In addition, external palpation is one of the methods used for the diagnosis of an inguinal cryptorchid to be carried out, since it makes it possible to identify its location. Thus, the objective will always be to evaluate the inguinal and scrotal areas in order to find the dimension of the problem, in addition to visualizing whether or not there was possible castration (CARVALHO, 2021). According to Freire (2018), the aid of ultrasound in palpation is useful in cases of cryptorchidism because it allows, in addition to locating the retained testicle, the identification of changes in the testicular structure indicating possible neoplasms. Using inguinal and rectal ultrasound together delivers a confirmatory diagnosis for cases of cryptorchidism (CARVALHO, 2021).

Since testicular neoplasms are uncommon in horses, some of them, such as Leydigocytomas, are easily treatable through orchiectomy, requiring no possible chemotherapy. Therefore, the recommended treatment is always the surgical process with bilateral or unilateral orchiectomy, if the equine presents a case of monorchidism (FREIRE, 2018).

### **3 CONCLUSION**

Cryptorchidism, in addition to being a relevant issue in horse fertility, is still not often seen accompanied by testicular neoplasms. Considering the importance of genetic transmission and the potential of this animal for future generations, it is considered essential for the veterinarian to obtain early diagnosis and appropriate treatment, thus allowing better control over the animals in the herd and the certainty of the quality that can be maintained in future progenies.

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