

Bilateral cryptorchidectomy by retroumbilical median longitudinal celiotomy in pig – case report

[*Criptorquidectomia bilateral por celiotomia longitudinal mediana retroumbilical em suíno – relato de caso*]

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ABSTRACT

Cryptorchidism is a developmental disorder characterized by failure of one or both testicles to migrate from the abdominal cavity to the scrotum. In pigs, this condition is responsible for several post-pubertal clinical changes, in addition to causing a negative economic impact, with cryptorchidectomy surgery being recommended. Despite the importance of the surgical procedure in pigs with this condition, there is a lack of studies and reports describing surgical approaches for cryptorchidectomy in this species. The objective of the present work is to discuss the clinical and surgical aspects and propose the possibility of an approach using retroumbilical median longitudinal celiotomy for cryptorchidectomy in a 9-month-old mixed breed pig with bilateral intra-abdominal cryptorchidism treated at the Veterinary Hospital of Federal Rural University of Rio de Janeiro, presenting history of infertility and absence of both testicles in the scrotum. After the diagnosis of cryptorchidism, made through anamnesis, reproductive history and thorough physical examination, the patient was referred for bilateral cryptorchidectomy using a retroumbilical median longitudinal approach. The procedure was considered simple, easy and low-cost, which allowed bilateral symmetrical access to the ectopic testicles and allowed their removal without trans- or postoperative complications, providing comfort and well-being to the patient.

Keywords: cryptorchidism, developmental disorder, ectopic testicle, median celiotomy, swine

RESUMO

Criptorquidismo é um transtorno de desenvolvimento caracterizado pela falha na migração de um ou ambos os testículos da cavidade abdominal até a bolsa escrotal. Em suínos, essa afecção é responsável por diversas alterações clínicas pós-puberais, além de causar impacto econômico negativo, sendo recomendada cirurgia de criptorquidectomia. Apesar da importância do procedimento cirúrgico em porcos com essa condição, faltam estudos e relatos que descrevam abordagens cirúrgicas para criptorquidectomia na espécie. O objetivo do presente trabalho é discutir os aspectos clínico-cirúrgicos e propor a possibilidade de abordagem por celiotomia longitudinal mediana retroumbilical para criptorquidectomia em suíno, sem raça definida, de nove meses de idade, com criptorquidismo intra-abdominal bilateral, atendido no Hospital Veterinário da Universidade Federal Rural do Rio de Janeiro para revisão, apresentando histórico de infertilidade e ausência de ambos os testículos na bolsa escrotal. Após diagnóstico de criptorquidismo, feito por meio da anamnese, de histórico reprodutivo e de exame físico minucioso, o paciente foi encaminhado para realização de criptorquidectomia bilateral por abordagem longitudinal mediana retroumbilical. O procedimento foi considerado simples, fácil e de baixo custo e possibilitou acesso simétrico bilateral dos testículos ectópicos, bem como permitiu sua remoção sem complicações trans ou pós-operatórias, proporcionando conforto e bem-estar ao paciente.

Palavras-chave: criptorquidismo, celiotomia mediana, transtorno de desenvolvimento, suíno, testículo ectópico

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INTRODUCTION

Cryptorchidism is a development disorder characterized by a migration flaw of one or both testicles from the caudal pole of the kidneys (inside the abdominal cavity) to the scrotal sac (vaginal cavity). In swine species, the testicles migration occurs physiologically between 10 to 14 days after birth (Amann and Veeramachaneni, 2007). In animals with this condition, the cryptorchid testicle can be located inside the abdominal cavity or even in the subcutaneous (external to the abdominal cavity) (Amann; Veeramachaneni, 2006). Cryptorchidism etiology in pigs is still not well defined, however causes like estrogenic environmental agents, epigenetic changes and genetic mutations can be involved in this pathology (Wilson *et al.*, 2004; Amann and Veeramachaneni, 2007).

Cryptorchidism incidence in pigs is low and variate from 4% to 12% (Skelton *et al.*, 2021), having this pathology also been described in miniature pig pets (Woods and Tynes, 2012), being the abdominal location most frequent in the species (Scollo *et al.*, 2016). In addition to post-pubertal clinical changes correlated to this pathology, such as spermatogenesis alterations in the ectopic testicles, atypical reproductive hormones concentration and testicular neoplasia (Amann and Veeramachaneni, 2006), cryptorchidism in pigs also generates negative economic impacts for causing organoleptic alterations in the meat, making it unfit for human consumption (Andresen, 2006; Scollo *et al.*, 2016).

For these reasons, surgical removal of ectopic testicles in cryptorchid swine is recommended. When the testicles are located inside the abdominal cavity, surgery can be performed from paramedian or parainguinal approach, or inguinal non-invasive approach, depending on the type of cryptorchidism (uni or bilateral) and the testicles location (Scollo *et al.*, 2016; Anderson and Mulon, 2019; Skelton *et al.*, 2021). Although the importance of surgical procedure in pigs presenting this condition, there is a lack of studies and reports that describe surgical approaches for cryptorchidectomy in the species and the trans and post-operative aspects, therefore, the goal of this paper is report the well succeeded clinical surgical conduction of bilateral cryptorchidism in a pig through

retroumbilical median longitudinal celiotomy approach.

ETHICAL ASPECTS

This study was not submitted to the Ethics Committee on Animal Use, but the person responsible signed a free and informed consent form authorizing the publication of the data.

CASE REPORT

A male pig, mixed breed, 9-months-old, from subsistence farming, weighing 100kg was attended to hidden for review Veterinary Hospital. According to the tutor, the animal was acquired within 2-months-old in the intention of breeding and on the occasion both testicles were in the scrotal sac. When the animal started mounting there was no success in fertilizing the females, and it was when the tutor reported not being able to visualize the testicles anymore in the scrotal sac, seeking veterinary medical orientation.

In the clinical inspection it was not possible to visualize the testicles in the scrotal sac (Fig. 1), as well as not possible to find them in palpation or in the subcutaneous cellular tissue in the inguinal region (externally to abdominal cavity). Animal physical exam revealed clinical parameters inside normality. Taking in consideration the history and the clinical exam of the patient, as well as the absence of both testicles from their usual topography, it was opted for cryptorchidectomy of the intra-abdominal ectopic testicles through retroumbilical median longitudinal celiotomy.

The animal was submitted to 12-hours food fasting and 8-hours water fasting. For sedation and dissociative anesthesia, the follow protocol was administered: 0.25mg/kg of midazolam maleate 0.5%, 2.5mg/kg of xylazine hydrochloride 2%, and 10mg/kg de ketamine 10%, in the same syringe intramuscularly.

The animal was then positioned in dorsal decubitus (supine) to aseptic preparation of the surgical site and perform anaesthetic blockage in the incision line using lidocaine 2% without vasoconstrictor (3mg/kg). Cutaneous incision of approximately 8 cm was made in retroumbilical paramedian region (preputial right side) with later blunt dissection of the subcutaneous cellular

tissue to reach the linea alba (Fig.2A). With scalpel blade nº 24 a stab incision was made in the linea alba (median celiotomy) using Allis forceps as repair. In the abdominal cavity inspection was possible to find the testicles near to the inguinal canal bilaterally, being possible their exposition through median celiotomy (Fig. 2B). Subsequently ligature and transfixation of the spermatic cords of both ectopic testicles were performed using polyglactin thread 910 1 (Fig. 2C). Without bleeding, abdominal rectus muscle celiorrhaphy was initiated with polyamide 1 thread in an interrupted simple pattern. For the subcutaneous cellular tissue synthesis polyglactin thread 910 was used in mattress pattern, and dermorrhaphy was performed with polyamide 1 thread in "X" pattern (Fig. 2D).



Font: Author's collection (2024)

Figure 1. Perianal region (animal in station) evidencing absence of the testicles in the scrotal sac (black arrows) in male pig, mixed breed, 9-months old, from subsistence farming, weighing 100kg, attended to hidden for review Veterinary Hospital.

There were no trans-operative complications. Tetanus Antitoxin was applied immediately in the post-operative. As postoperative protocol was prescribed antibiotic (penicillin, 15.000 UI/kg, SID, intramuscularly, for 5 days), non-steroidal anti-inflammatory (diclofenac, 1 mg/kg, SID, intramuscularly, for 3 days), and repellent around the wound. The patient remained well clinically, not presenting post-operative complications. Received surgical discharge after stitches removal with 15-days post-operative.

DISCUSSION

Cryptorchidism reported incidence in pigs are low and variate from 4% to 12% (Skelton *et al.*, 2021), being just a few that described cryptorchidectomy surgery approach for the species. Studies show that ectopic testicles in abdominal location, as described in the animal of this report, is the most frequent (90,8% e 93,6%, respectively) (Scollo *et al.*, 2016; Skelton *et al.*, 2021). However, Skelton and collaborators (2021) reported only 4% incidence (2/47) of bilateral cryptorchidism, as observed in this paper. Apparently, the prevalence of unilateral retained testicles is higher, in comparison to the bilateral presentation, being the retention of the left side testicle more often when compared to the right side (Skelton *et al.*, 2021), probably because left side kidney in pigs are more cranial than the right side one, which makes descent trajectory of left testicle longer (Dalmose *et al.*, 2000).

As described in the present case report, reproductive history, anamnesis, and thorough physical exam, especially through inspection and palpation of the external genital are essential to cryptorchidism diagnosis (Radostits *et al.*, 2002; Scollo *et al.*, 2016). In swine, the physiologic testicles migration should occur between 10 before to 14 days after birth. In the case of no gubernaculum regression, testicles may be "movable" and retractable, above all in the pre-pubescent phase, when they still had little volume, ending by being retained inside the abdomen in the beginning of reproductive phase due to his exacerbated growth or even for a strained in the inguinal canal (Amann e Veeramachaneni, 2007). The fact that the tutor observed the animal testicles in the scrotal sac when the pig was 2 months old (pre-pubescent phase) and not later in the reproductive phase,

can be associated with this fact. Therefore, it is necessary and important keeping a palpation and inspection routine of external genital breeders

until they reach the reproductive phase (5-6-months old).



Font: Author's collection (2024).

Figure 2. Bilateral cryptorchidectomy through retroumbilical median longitudinal celiotomy in male pig, mixed breed, 9-months old, from subsistence farming, weighing 100kg, attended at hidden for review Veterinary Hospital. **A.** Location of cutaneous retroumbilical paramedian incision with approximately 8 cm in the right preputial side (black dashed line) and absence of testicles in the scrotal sac (black arrows). **B.** Manual exposition of the right testicle through retroumbilical median longitudinal celiotomy. **C.** Right spermatic cords after ligation and transfixation using polyglactin thread 910 1. **D.** Dermorrhaphy with polyamide 1 thread in "X" pattern.

In bilateral cryptorchidism cases, as the reported pig, the animal is usually infertile, once the elevated temperature of abdominal cavity affects directly the spermatogenesis, being for that reproductive history important to the diagnosis (Radostits *et al.*, 2002; Hafez and Hafez, 2004). Carbonari and collaborators (2022) suggest the abdominal ultrasonography as a useful alternative in cryptorchid testicle diagnosis, allowing to observe their exact location and ensuring best surgical access, with less viscera manipulation, however, in the present report was not possible to perform the exam due to tutor's

financial issues, opting for exploratory celiotomy, since the impossibility in palpating the testicles in the scrotal sac or inguinal subcutaneous region.

Swine cryptorchidism is responsible for important post-pubere clinical changes as altered spermatogenesis in the ectopic testicles, atypical reproductive hormones concentration and development of testicular neoplasias (in the ectopic testicles). Besides that, it has a genetic character, and the cryptorchid should be removed from breeding, even if he is fertile (Amann and

Veeramachaneni, 2006). And more, it is an affection that have negative economic impact, since the presence of cryptorchid testicles results in alterations in the meat's flavor, with strong smell due to androsterone and skatole, becoming unfit for human consumption (Andresen, 2006; Scollo *et al.*, 2016). For these reasons, the surgical removal of ectopic testicles is recommended in cryptorchid pigs, and this also contributed to the cryptorchidectomy indication in the animal of the present study.

Despite having just a few retrospective studies and reports that describe the surgical approaches for cryptorchidectomy in pigs, the surgical techniques to access the cryptorchid testicles variates depending on the type of cryptorchidism (uni or bilateral) and the location of the cryptorchid testicle (s). When the testicles are inside the abdominal cavity, surgery can be performed with paramedian or parainguinal celiotomy or inguinal non-invasive approach (Scollo *et al.*, 2016; Anderson and Mulon, 2019; Skelton *et al.*, 2021).

Skelton *et al.* (2021) defend using the paramedian celiotomy approach to cryptorchidectomy of testicles retained in the abdomen in pigs, since the technique was considered simple, fast and low coast, being associated with small numbers of complications as wound infection, inappetence and pain, all of them resolved in the conservative way. Scollo and collaborators (2016) suggest the utilization of non-invasive inguinal approach, technique which was previously described in horses, cats and dogs. However, this technique presented important trans-operative complications as the incapacity to find the ectopic testicle and rupture of the gubernaculum in the traction moment through the inguinal ring, and should be performed with caution (Scollo *et al.*, 2016; Skelton *et al.*, 2021). Even more, the paramedian technique also eliminate the risk of inguinal hernia in contrast to the parainguinal celiotomy, in which is necessary the cranial open of the inguinal ring for tracking the ectopic intra-abdominal testicle (Anderson and Mulon, 2019; Skelton *et al.*, 2021).

In the present report the authors suggest the retroumbilical median longitudinal celiotomy as a possible access. It is important to highlight that the previously mentioned studies (Scollo *et al.*,

2016; Skelton *et al.*, 2021) involve exclusively unilateral cryptorchidism in pigs, characterized by the presence of one abdominal testicle. However, in the reported case of the present study, the animal presented bilateral intra-abdominal cryptorchidism. In the face of that, it was opted for retroumbilical median longitudinal celiotomy approach, allowing bilateral symmetric view of the abdomen. This technique facilitates the access to both ectopic testicles near to the inguinal region, without trans or postoperative complications. The retroumbilical median longitudinal celiotomy approach was considered by the authors simple, easy and low cost. Still, access through linea alba, with retroumbilical median longitudinal celiotomy it is considered faster, less bloody and less painful that the access through reto-abdominal muscle, as occurs in paramedian celiotomy (Fossum, 2021).

The performed surgery in the present study was considered clean and antimicrobial use was not mandatory, however, due to potential for environmental contamination of the surgery wound, since the animal returned to the straw bed, it was opted for the use of penicillin in the post-operative. Furthermore, for humanitarian reasons and in the intention to promote post-surgical analgesia to the patient, non-steroidal anti-inflammatory was used (diclofenac). The topical repellent ointment used on the surgery wound was intended to protect it against possible ectoparasites. It should be noted that the animal in question would not be destined to enter the food chain after hospital discharge.

Cryptorchidectomy prognostic in pigs are good, independently of the chosen technique, being associate to few complications, the most of them possible to be treated in the conservative way (Scollo *et al.*, 2016; Anderson and Mulon, 2019; Skelton *et al.*, 2021). Animal thorough evaluation, understanding of the cryptorchidism type and team experience seems to be import factors in the selection of the best surgical approach and technique success, and the authors of the present study suggest the retroumbilical median longitudinal celiotomy as a surgical possibility in bilateral intra-abdominal cryptorchidism in pigs.

CONCLUSION

It is concluded that cryptorchidectomy through retroumbilical median longitudinal celiotomy in pigs with bilateral intra-abdominal cryptorchidism was a simple, easy execution technique with low cost, that made it possible bilateral symmetric view of the ectopic testicles located in inguinal region, allowing their removal without trans or postoperative complications, ensuring comfort and well-being to the patient.

CONTRIBUTORS

MESL Fernandes: Formal analysis; Investigation; Validation; Visualization; Writing - original draft; Writing - review & editing. KRF Freire: Formal analysis; Writing - review & editing. ER Mello: Formal analysis; Investigation; Validation; Writing - original draft; Writing - review & editing. JMP Bastos: Validation; Visualization; Writing - review & editing. JM Paulino: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Supervision; Validation; Writing - review & editing. VAN Carvalho: Supervision; Writing - review & editing. SA Caldas: Conceptualization; Formal analysis; Investigation; Supervision; Writing - review & editing. MJSA Helayel: Supervision; Validation; Writing - review & editing.

DATA AVAILABILITY STATEMENT

The research data are available within the article itself.

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