Pre-scrotal castration procedure in boars

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Short Report

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Abstract

**Background:** To report the feasibility of pre-scrotal castration technique in boars and document the great post-surgical evolution, thirty clinically healthy and sexually intact boars were used in a short case series.

**Results:** No wound exsudate or infection was recorded. Mild scrotal edema was reported in 12 (40%) boars, that resolved within 3 days after stall confinement finished. On the long-term follow-up (4-12 months’ post-surgery), all owners stated to be satisfied with the procedure, with minor post-surgical aftercare required.

**Conclusion:** Castration of boars using the pre-scrotal approach is a simple and safe procedure, reducing postoperative complications, and, thereby, providing better welfare, making the postoperative management of the boars, easier for handlers or owners.

**Methods:** Thirty boars were considered fit for pre-scrotal castration technique if the testis and scrotum were macroscopically normal and no perceptible adherences within the scrotum noticed. Dissociative anesthesia protocol and local anesthesia by intratesticular and pre-scrotal infiltrative lidocaine injection was performed. An 8-10 cm skin incision was made cranially to the hemiscrotum, and subcutaneous tissue was bluntly dissected reaching the *tunica dartos*, fascia, and vaginal tunica. A transfixion ligature was placed on the fibrous-muscle portion of the spermatic cord. Mesorchium was bluntly dissected to separate the spermatic cord from the surrounding fascia, and a double transfixion ligature was placed around the spermatic cord, that was sharply transected. The procedure was repeated on the contralateral testis using the same skin incision.

Introduction

More recently, surgical castration of male piglets has become a welfare concern due to pain and stress associated while performing the procedure without anesthesia.¹ Surgical castration is used as a method for preventing boar taint, caused by the accumulation of high levels of 16-androstene steroids (primarily androstenone), produced by Leydig cells in the testis, and skatole and other indoles, which are produced from the metabolism of tryptophan by the gut microflora.²

In this context, culled boars may present high levels of androstenone and skatole, reducing consumer acceptance of pork products made with its meat. Additionally, in a survey conducted with 84 commercial herds, the mean life breeding expectancy for boars was estimated to be 20 months.³ Most frequent reasons for culling boars includes old age, low sperm count and lack of libido.⁴ Therefore, the surgical castration of boars can be an option to increase the acceptance of this meat by consumers. In addition, surgical castration can benefit welfare, reducing male sexual behavior and aggressiveness,⁵ especially during transport to the slaughterhouse.⁶

Since the first reports of boar castration, the anesthesia, surgery, and especially the restraint for surgical wound management of large and strong boars may be challenging.⁷ In adult boars, the open castration
technique is commonly performed, and most frequent complications includes hemorrhage, excessive edema, infection, abscess, cirrous cord, inguinal hernia, seroma and hematoma. In order, to facilitate post-surgical management on the commercial swine breeding farms by the owners or handlers, this paper aimed to report the technique and feasibility of pre-scrotal castration in boars.

**Material And Methods**

**Animals.** Thirty clinically normal and sexual intact male boars, weighing over 250 kg (variation 255–410 kg). The boars were from commercial swine breeding farms, and culling reasons included aggressiveness, old age and poor reproductive performance. All boars included were considered clinically healthy based on background information and physical examination. The boars were considered fit for pre-scrotal castration technique if the testis and scrotum were macroscopically normal (no skin lesion or asymmetry) and the testis had mobility within the scrotum (no perceptible adherences). Surgery were performed on a clean stall (3 x 4 m) on each swine breeding farm.

**Anesthesia protocol.** The boars were fasted for 12h, and water was withheld 4h prior to surgery. For dissociative anesthesia protocol, a tiletamin and zolazepam combination (Zoletil® 100, Virbac) associated to ketamine (TZK) was administered intramuscularly. The TZK mixture was obtained by reconstituting Zoletil® 100 (powder) in 2.5 mL 10% ketamine and 2.5 mL saline, totaling 5 mL solution. Then, a 0.03 mL.kg$^{-1}$ TZK dosage was used. Local anesthesia was obtained by intratesticular and pre-scrotal infiltrative lidocaine 2% (4 mg.kg$^{-1}$) injection.

**Pre-scrotal surgical technique.** The boars were placed on left or right lateral recumbency with both forelimbs tied together and stretched with a rope. Each hind limb was tied separately causing abduction (Fig. 1A). Antimicrobials (long-acting oxytetracycline: 20 mg.kg$^{-1}$) and non-steroidal anti-inflammatory drugs (flunixin meglumine: 2.2 mg.kg$^{-1}$) were administered preoperatively in all boars. Caudal ventral abdomen was clipped, and the scrotum and perineum were aseptically prepared. Initially, the assistant surgeon pushed both testicles forward to facilitate selection of the pre-scrotal incision location (Fig. 1B-C). An 8–10 cm skin incision was made cranially to the hemiscrotum (Fig. 1D). Subcutaneous tissue was bluntly dissected reaching the tunica dartos, fascia, and vaginal tunica (Fig. 2A), which was then incised. The vaginal tunica was opened until the testicle could be exteriorized, and a transfixion ligature with #0 absorbable multifilament suture material was placed on the fibrous-muscle portion of the spermatic cord (Fig. 2B). Mesorchium was manually bluntly dissected to separate the spermatic cord from the surrounding fascia (Fig. 2C). A double transfixion ligature was placed around the spermatic cord with the same suture material (Fig. 2D), and then the spermatic cord was sharply transected with a 24-scalpel blade. The pedicle was released into the surgical incision after proper hemostasis was confirmed. The aforementioned procedure was repeated on the contralateral testis using the same initial skin incision. Afterward, both vaginal tunicas were left open, and the subcutaneous tissue was closed using the same suture material in a simple continuous pattern. Skin closure was obtained by Wolf pattern using absorbable monofilament suture material (Fig. 2D) to avoid new anesthesia or physical restraint of the
boar to suture removal. Then a repellent and antibiotic mixture (Bactrovet; König, Mairinque, São Paulo, Brazil) was sprayed on the surgical site.

**Postoperative care and follow-up.** If the boar did not recover from the anesthesia in 3-h, the recumbence side was changed. The owners were advised to maintain the boars on a clean and dry stall for seven days. Postoperatively, dipyrone pills (25 mg.kg\(^{-1}\); twice daily) were mixed to the food during the next two days. The owners were advised to offer ration as soon as the boar could stand unassisted, and to spray the pre-scrotal incision with a repellent and antibiotic spray (Bactrovet; König, Mairinque, São Paulo, Brazil) daily. Follow-up information was obtained from all owners 1-week and 4–12 months after surgery.

**Ethical aspects.** This study has been approved by the Animal Research Ethics Committee (CEUA-UnB) protocol number 14/2020.

**Results**

The two heaviest boars presented an agitated anesthetic recovery, and tried to stand unsuccessfully several times, causing slight hemorrhage on the surgical site, that stopped within 30-minutes. The others 28 boars recovered well from dissociative anesthesia with no complications. Normal appetite and fecal output was reestablished within 4-hours after the boar could stand unassisted.

During surgery, both testicles were exteriorized by the pre-scrotal approach in all boars with no complications. On the short-term follow-up (1-week post-surgery), mild scrotal edema was reported in 12 (40%) boars, that resolved within 3 days after the boar was released from stall confinement (after the 7th post-surgery day). No wound exudate or infection was recorded. On the long-term follow-up (4–12 months’ post-surgery), all owners stated to be satisfied with the castration technique, especially the minor post-surgical aftercare required.

**Discussion**

The pre-scrotal orchietomy is a routine neutering technique performed on dogs.\(^{11}\) The pre-scrotal approach has been successfully reported on llamas,\(^{12}\) pet rabbits,\(^{13}\) mini pigs\(^{14}\) and Vietnamese pot-bellied pigs.\(^{15}\) Although this is the first report of the technique feasibility on adult and heavy boars from commercial swine breeding farms.

Few works provide data on orchietomy techniques and post-surgical complications on culling boars.\(^{16}\) Although the overall use of boars has decreased dramatically, boars are still a dynamic sub-population of the swine production herd.\(^{6}\) In order to minimize consumer disapproval, culled boars must be castrated so that their meat can be used in the food industry.\(^{16}\) Additionally, based on our results, pre-scrotal approach in boars is a safe surgical procedure minimizing post-operatory complications. Potential devastating complications following castration include herniation/evisceration, hemorrhage, and infection.\(^{8,9,17}\)
Most routinely castration technique performed on adult boars is the open orchiectomy under sedation or general anesthesia. Ravagnani et al. performed two surgical techniques for orchiectomy in boars, using an emasculator, and compared suturing the skin of the scrotum. Both groups presented complications such as swelling and purulent exudate, achieving complete healing over 30–45 days. Recently, the comparison of scrotal and pre-scrotal castration approach in pet rabbits suggested that the pre-scrotal technique should be preferred due to significantly shorter anesthesia time and scrotal edema. In llamas, the pre-scrotal technique required significantly more time to complete. However, llamas castrated with the pre-scrotal technique required less aftercare and had less incisional pain when the area was palpated. Therefore, pre-scrotal approach is recommended in llamas especially where fly control is difficult.

A retrospective study with 106 pet pig’s presented that 58.5% (62/106) of the cases submitted to pre-scrotal incisions were closed in 2 layers with an intradermal suture pattern, in 0.94% (1/106) of cases the skin was closed in a simple continuous pattern and in 22.6% (24/106) of cases the incisions were stretched manually and left open. Five pigs experienced post-operative complications (complication rate: 4.7%), consisted of mild peri-incisional swelling, and the techniques were considered safe procedures with minimal rate of complications. Although, the pet pig’s mean body weight was 22.4 kg ± 44.9 kg (range: 2.8 to 350 kg), and there were no records of how many boars over 250-kg were castrated to compare with the results herein.

In conclusion, castration of boars using the pre-scrotal approach is a simple and safe procedure, reducing postoperative complications, and, thereby, providing better welfare.

Declarations

The authors declare no conflict of interest to this report.

The authors contributed equally to the manuscript.

This study has been approved by the Animal Research Ethics Committee (CEUA) of “Instituto de Ciências Biológicas” of the “Universidade de Brasília”, under protocol number 14/2020. The authors assume full responsibility for the presented data and are available for possible questions.

DECLARATION OF CONFLICT OF INTERESTS

The authors declare no conflict of interest to this report.

AUTHORS’ CONTRIBUTIONS

The authors contributed equally to the manuscript.

Antonio Carlos Lopes Câmara; main surgeon, post operative care, writing;
Rita de Cássia Campebell; auxiliar surgeon, post operative care

Kaique Nogueira; anesthesiologist, post operative care

João Vagner Silva Junqueira; anesthesiologist, post operative care

Tiago Silva Andrade; post operative care

Antonio Raphael Teixeira Neto, writing-review and editing, post operative care, images

**BIOETHICS AND BIOSSECURITY COMMITTEE APPROVAL**

This study has been approved by the Animal Research Ethics Committee (CEUA) of “Instituto de Ciências Biológicas” of the “Universidade de Brasília”, under protocol number 14/2020. The authors assume full responsibility for the presented data and are available for possible questions.

**References**


Figures
Figure 1

A. A boar placed on right lateral recumbency with each hind limb tied separately causing abduction. B, C. The assistant surgeon pushed both testicles forward to facilitate selection of the pre-scrotal incision location. D. An 8-10 cm skin incision cranial to the hemiscrotum.
Figure 2

A. Visualization of the vaginal tunica through the pre-scrotal incision. B. The vaginal tunica was opened until the testicle could be exteriorized, and a transfixion ligature was placed on the fibrous-muscle portion of the spermatic cord (arrow). C. Spermatic cord separated from the surrounding fascia. D. Spermatic cord after a double transfixion ligature was placed (closer view). E. Surgical wound appearance after skin closure using absorbable monofilament suture material in Wolf pattern. Closer view: Length of skin incision comparing to a scalpel.