

Scrotal ablation and orchiectomy in the domestic laboratory goat (*Capra hircus*)[☆]

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ABSTRACT

Domestic goats (*Capra hircus*) have been used as animal models in biomedical research, and for numerous years for agricultural research and models for human diseases. This column describes an improved surgical technique, for castration of male goats, similar to companion animal techniques for use in the laboratory setting. The technique discussed supports a more in-depth perioperative protocol for performing scrotal ablation and orchiectomy in the male goat.

1. Introduction

Domestic goats (*Capra hircus*) have been used as animal models in biomedical research, and for numerous years for agricultural research and models for human diseases (Underwood et al., 2015). This column describes an improved surgical technique, for castration of male goats, similar to companion animal techniques for use in the laboratory setting. The ideology behind this method is to reduce the risk of anesthetic and post-operative complications (i.e. anesthetic death, scrotal swelling, hematomas, infection) usually associated with “in the field” castration procedures. A 2-month old male Spanish-Cross kid belonging to the institutional teaching colony protocol was presented for routine castration. Goats in research are routinely castrated for population and herd management, prevention of reproductive diseases, and unwanted aggressive behaviors (Edmondson, Roberts, Baird, Bychawski & Pugh, 2012; Smith & Sherman, 2009). There are several testicular and scrotal diseases reported in the goat including: varicoceles, epididymitis (*Bruceella* spp.), orchitis (trauma or infection), sperm granulomas, testicular hypoplasia and degeneration (zinc deficiency, hypothyroidism) and cryptorchidism (genetic predisposition) (Edmondson et al., 2012; Smith & Sherman, 2009).

2. Materials and methods

2.1. Restraint and anesthesia

It is recommended to fast small ruminants from feed and water for

no more than 12 h and 8 h respectively prior to surgery (Lin, Caldwell, & Pugh, 2012; Smith & Sherman, 2009b). Fasting neonates is not recommended due to the potential for hypoglycemia. Several anesthetic protocols can successfully be used in young goats, the following described is an example of a protocol used at our respective institution. A combination of dexmedetomidine hydrochloride at a dose of 0.15 mg/kg (Dexdomitor®, Zoetis Inc., Kalamazoo, MI, USA; 0.5 mg/mL) and butorphanol tartrate at a dose of 0.2 mg/kg (Torbugesic®, Zoetis Inc., Kalamazoo, MI, USA; 10 mg/mL) was given intravenously (IV) for pre-anesthesia. Propofol was given at a dose of 4–5 mg/kg (PropoFlo®, Abbot Laboratories, North Chicago, IL, USA; 10 mg/mL) IV as the induction agent via a size 22 G x 1 in. cephalic catheter. Following intubation, the animal was maintained on gas anesthesia 1.5–2% isoflurane (Fluriso™, MWI Veterinary Supply, Boise, ID, USA; each mL contains 99.9% isoflurane) combined with 100% O₂ at a flow rate of 2 l per minute (LPM). The animal was maintained on IV fluid therapy at a rate of 10 mL/kg/h (Lactated Ringers Solution, Hospira Inc., Lake Forest, IL, USA, 1000 mL bag) throughout the procedure. Upon completion of the surgical castration, the animal was reversed using atipamezole hydrochloride at a dose of 0.1–0.2 mg/kg (Antisedan®, Zoetis Inc., Kalamazoo, MI, USA; 5 mg/mL) (Blackburn, 1985; Fossum et al., 2007).

2.2. Endotracheal intubation procedure

Endotracheal intubation in goats and sheep can be difficult due to several factors: inability of the mouth to open widely, narrow

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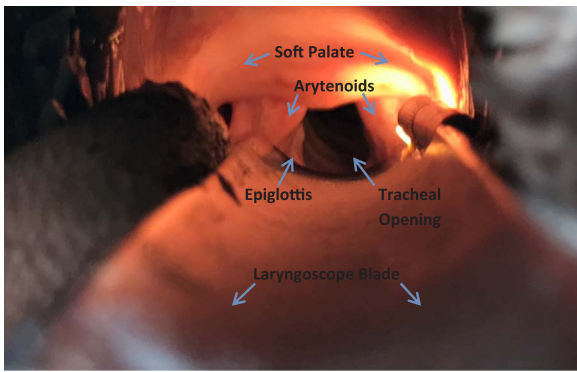


Fig. 1. Anatomy of the goat oral cavity.

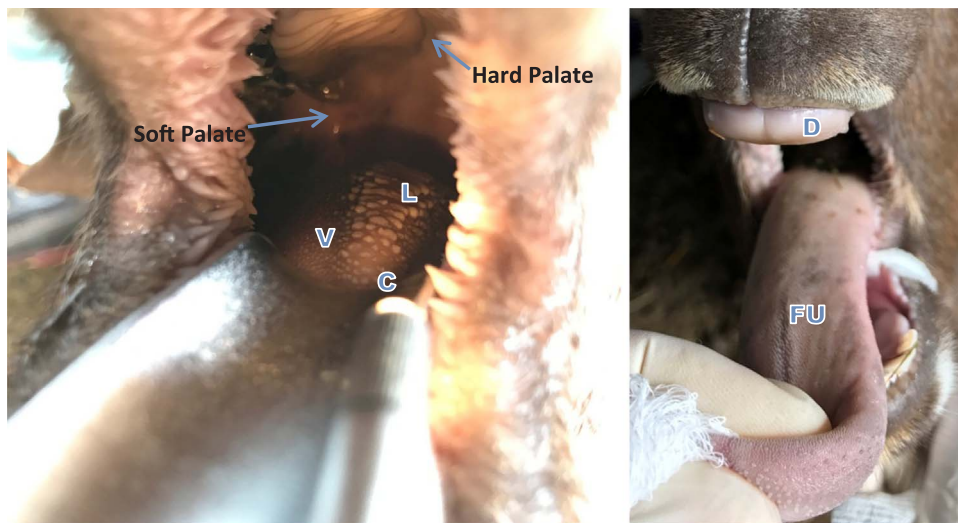


Fig. 2. Anatomy of the goat tongue and associated papillae. (L) Lenticular papillae. (C) Conical papillae. (V) Circumvallate papillae. (FU) Fungiform papillae. (D) Dental Pad.

intermandibular spacing, and deep caudal anatomical location of the laryngeal opening resulting in poor visualization (Figs. 1 and 2) (Lin et al., 2012; Smith & Sherman, 2009b). Young goats are also known to be susceptible to laryngospasm, so it is advised to apply injectable lidocaine topically (a total of 0.25 mL was used in this patient) by trickling down the endotracheal tube to allow contact prior to performing intubation (Lin et al., 2012; Smith & Sherman, 2009b). When a state of adequate anesthesia was reached, the animal was placed in sternal recumbency with the neck extended, allowing the oral cavity to

be comfortably held open using roll gauze (Fig. 3). The laryngoscope was placed over the back of the animal's tongue and positioned towards the larynx. Using a long narrow plastic stylet, the endotracheal tube was directed into the tracheal opening over the stylet. Confirmation for correct placement was performed via direct visualization and by application of the Beck Airway Airflow Monitor whistle (BAAM®, Great Plains Ballistics Inc., Lubbock, TX, USA) (Fig. 4). A loud whistling sound was heard upon correct placement into the trachea. Animal was maintained on a closed circle rebreathing anesthesia circuit with a standard anesthetic gas scavenging system to protect operating personnel.

2.3. Scrotal ablation and orchietomy

The animal was placed in dorsal recumbency and all surgical

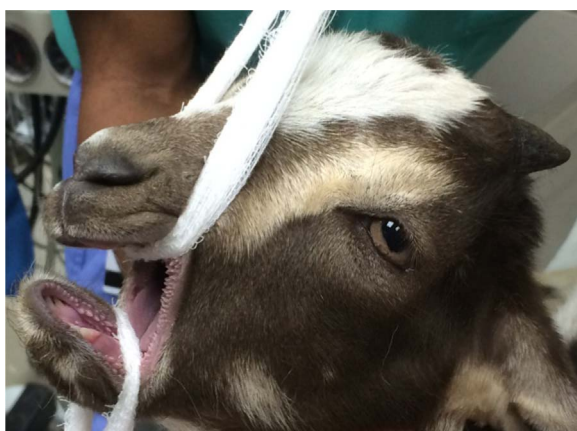


Fig. 3. Roll gauze is placed on the animal's mandible and maxilla to comfortably open the oral cavity for intubation while the head and neck are extended.



Fig. 4. (A) The laryngoscope (L) is placed over the back of the animal's tongue (T) and positioned towards the larynx allowing smooth placement of the endotracheal tube (ET). (B) Application of the BAAM® (blue arrow) whistle is used to confirm tube placement by the resulting whistling sound. A size 6.0 (26 cm long) ET tube was used for the pictured animal (2-month old Spanish-Cross kid).

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