



Surgery of the Injured Dulla in Dromedary Camels (*Camelus dromedarius*)

Fahd A. Al-Sobayil, PhD
Ahmed F. Ahmed*, PhD

College of Agriculture and Veterinary Medicine, Qassim University,
Qassim, Saudi Arabia

Abstract

Objectives: to investigate classification and possible causes of dulaa disorders and effect of surgical removal on male sexual desire.

Animals: Twenty six male camels (age=6-13years) with dulaa injuries were admitted to the Veterinary Teaching Hospital, Qassim University, Saudi Arabia. Sixteen camels showed signs of protruding, fluctuating and edematous dulaas. Other ten camels showed signs of completely entrapped dulaas.

Procedures: Under deep sedation and local infiltration anesthesia, injured dulaa was surgically amputated. Entrapped dulaa was gently pulled out before performing surgery.

Results: Amputated protruded dulaa had ulcers, edema and hematoma. Entrapped dulaa had ulcers, impaction with food, fibrosis and penetrating wounds. None of the operated males showed reducing sexual desire 4 weeks after the operation.

Conclusions and Clinical Relevance: It was concluded that injured dulaa was either protruded or entrapped. Sharpness of canine teeth may play a role of having dulaa injury in camels, so it is recommended to perform teeth rasping annually just before the reproductive season. Amputation of dulaa had no effect on male sexual desire in dromedary camels.

Keywords: Camel, Dulaa, Protruded, Entrapped, Amputation.

Introduction

The palatine diverticulum (dulaa or gulaa) is a distensible diverticulum on the lower part of the soft palate usually seen in male dromedary camels.^{1,2} It is more developed in adult males than in females and is protruded frequently during rutting season as a form of sexual behavior of the male. The dulaa is not seen in other animals even in close relatives including the Bactrian camels or South American llamas.³ The exact mechanism of distension of the dulaa

* Corresponding author:

Ahmed F. Ahmed, PhD

College of Agriculture and Veterinary Medicine, Qassim University, Buraydah, 51452 Qassim, Saudi Arabia
email: afahmed70@hotmail.com

is not well understood. However, it has been thought that the dulaa distends during expiration when the camel closes its nares and air is forced from the lungs into the oral pharynx to inflate the soft palate.¹ With unknown reason, the exteriorized dulaa has been mainly seen in the right commissure.⁴

The dulaa is commonly injured in adult male camels during breeding season. It has been reported that injuries of dulaa occur when male camels chase females for mating or fights with other males, or as a result of sharp teeth. The dulaa can be affected with lacerated wounds, hematoma and food impaction.⁵ This might lead to extravasations of the blood inside the cavity or at the submucosa of the dulaa. The inflammatory conditions with edematous swelling of the dulaa affect its withdrawal to the mouth and by the time, the condition becomes more complicated. Gangrene has been also recorded in the dulaa.⁶ Surgical removal of the injured dulaa has been described in few cases.^{5,6} In one study,⁷ surgical removal of the intact dulaa from male racing camels has been used as a technique to increase the maximum oxygen uptake at speed, which overall improves track performance. There are few reports on the detailed classification, etiology and treatment of the injured dulaa in camels. Therefore, the objectives of this study were to investigate the classification and possible causes of dulaa disorders and the effect of its surgical removal on sexual desire of male dromedary camels.

Material and Methods

Animals

Twenty six male camels (*Camelus dromedarius*) were used in this study with mean age of 10 years (range from 6 to 12 years). These camels were referred to the Veterinary Teaching Hospital, College of Agriculture and Veterinary Medicine at Qassim University in Saudi Arabia. History of the case, causes, and clinical symptoms were recorded. Treatment was established by surgical amputation in all cases. Follow up of the cases was done by contacting camel owners for a period of 6 months with special reference to the effect of amputation on male sexual desire. The male sexual desire (attention, attraction, willingness and eagerness of male toward female) and mating techniques (grasping, setting, and pelvic movements) were compared before and after operation.

Surgical Procedure

Surgery was performed under deep sedation and local infiltration analgesia. The camel was controlled in kneeling position. Xylazine hydrochloride^a (0.2 mg/kg, IV) was first injected for sedation. The mouth was opened and the oral cavity was washed by a potassium permanganate solution (0.001%). The entrapped dulaa was gently pulled out with the help of sponge forceps and gentle pressure on the enlarged throat region. The dulaa was prepared for aseptic surgery and a local infiltration analgesia using lidocaine HCL 2%^b was infiltrated at the root of the dulaa. Two long artery forceps were used to hold and crush the major blood vessels close to the origin of the dulaa. A purse string suture pattern using Polydioxanone No. 2^c was applied approximately 1 cm outside the location of the artery forceps. About 2 cm away from the purse string suture, the dissection was performed. The dulaa was removed and the stump was closed by Cushing suture pattern using Polydioxanone No. 2^c. In some cases, interrupted, overlapping horizontal mattress stitches were used before amputation and the wound was further closed by simple continuous sutures.

The postoperative management consists of administering a systemic antibiotic (penicillin-streptomycin at a dose of 30,000 IU/kg penicillin and 10 mg/kg streptomycin)^d, for five days, rasping the sharp teeth by using dental rasp and withholding food for 24 hours.

Results

Dulaa injuries were classified into two categories, protrusion (n=16) and entrapment (n=10). The mean (\pm SD) ages of camels with protruded and entrapped dulaa were 9.1 (\pm 3.1) and 8.6 (\pm 2.4) years, respectively. The mean time elapsed between the occurrence of dulaa injury and presentation to the hospital (history of the case) for protruded and entrapped dulaa was 2.8 (\pm 1.8) and 9.8 (\pm 4.7) days, respectively. All cases, except one, presented to the hospital during the breeding season. All camels had long and sharp teeth especially canines (Fig. 1E). The protruded dulaa was ulcerated, edematous and in 13 (out of 16) cases with hematomas (Fig. 1A). Camels showed signs of protruded, fluctuating and edematous dulaas. Camels were unable to withdraw the dulaa inside the mouth. The owners stated that the conditions appeared gradually during the reproduction (rutting) season (November-February). On the other hand, the dulaa was completely entrapped at its normal position in ten camels. These camels showed signs of dysphagia and mild dyspnea. The entrapped dulaa had signs of ulceration, impaction with food, fibrosis and penetrating wounds (Fig. 1C and 1F).

Successful surgical amputation of the dulaa was performed in 25 (out of 26) camels. One camel died during exteriorization of the entrapped dulaa. No postoperative complication was recorded in all cases. Twenty four animals returned to normal life within two weeks postoperatively. The operation had no effect on the male sexual desire in 21 cases. The information about postoperative male sexual desire could not be obtained in 4 cases.

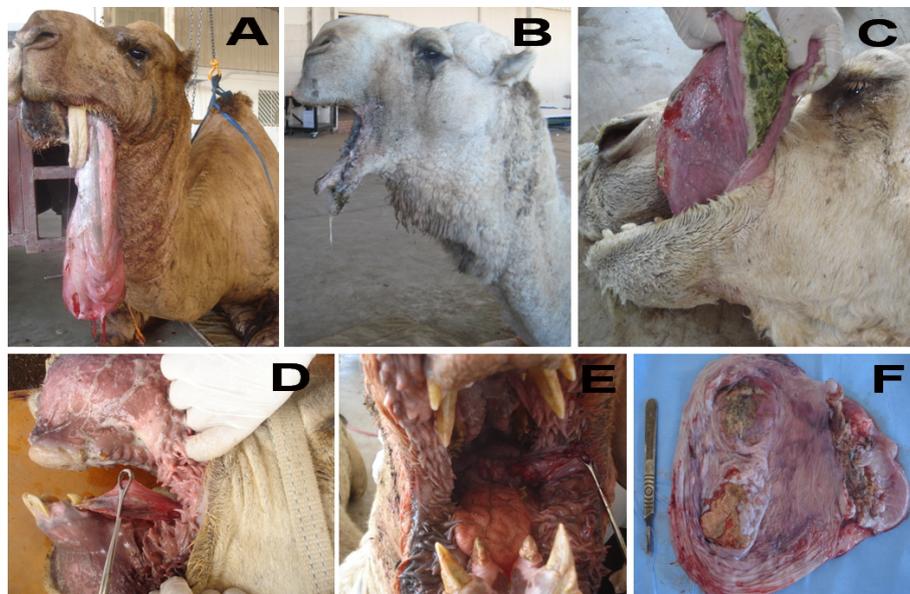


Figure 1. A) A protruded dulaa in a male camel with ulceration, edema and hematoma. B) A palpable and observable swelling at the throat region as a result of dulaa entrapment with signs of severe dyspnea. C) Impacted dulaa with food. D) An entrapped portion of the dulaa in the canine tooth. E) The sharpness of the canine teeth in a male camel. F) Ulcers and penetrating wound in an entrapped dulaa after amputation.

Discussion

The major owner complains of injured dulaa were dysphagia and dyspnea (Fig. 1B). Dysphagia has been reported as a characteristic sign seen in cases of soft palate injuries.⁸ The dulaa was unable to balloon out (entrapped type) or stays hanging outside the mouth (protruded type). It has been reported that a camel with protruded dulaa doesn't eat or drink, whereas a camel with entrapped dulaa can drink but cannot eat.⁹ The other sign that can be seen in case of protruded or entrapped dulaa is stretched neck.⁸ In addition, the entrapped dulaa may adhere with its nearest structures that negatively affect its inflating.⁸

It has been reported that injuries of dulaa occur when male camels chase females for mating or fights with other males, or as a result of sharp teeth. The dulaa can be affected with lacerated wounds, hematoma and food impaction.⁵ In the present study, the canine and premolar teeth of all camels were very sharp (Fig. 1E). In some cases, the camel showed a portion of its dulaa entrapped in a tooth (Fig. 1D). The present study showed that the injured dulaa had ulceration, and/or penetrating wound with subsequent entrapment (Fig. 1D). It seems that these wounds and ulceration occurred as a result of sharp teeth. Therefore, rasping or trimming of sharp teeth in male camels might decrease the chance of having the dulaa injuries. This can be performed as a routine task once a year just before the beginning of the reproductive season.

In the present study, cases of protruded dulaa were ulcerated, edematous, and in most cases with hematomas (Fig. 1A). It has been reported that the injuries of dulaa cause tear to the mucosa and rupture of its blood vessels.⁸ As a result of that, a daily increase in the size of the protruded dulaa might be seen. The delay of performing surgical amputation of the injured dulaa may lead to its gangrene.⁶

In case of entrapped dulaa, a palpable and observable swelling is seen externally at the throat region (Fig. 1B). A long hook has been used to pull out and then a towel was used to catch the pulled portion of the entrapped dulaa.⁸ In this study, the dulaa was entrapped as a result of food impaction or wound penetration (Fig. 1C). Regurgitated food during rumination may enter the injured palatine diverticulum retrogradly resulted in its impaction and subsequent entrapment. For expulsion of the entrapped dulaa, the sedated camel was positioned in a lateral recumbency. The mouth was opened and the tongue was gently pulled out. The area of pharynx was gently pressed upward by an assistant and the displayed portion of the dulaa was used to pull it out completely. Lowering the rostrum facilitated exteriorization. Withdrawing the food-impacted and entrapped dulaa showed signs of asphyxia. Therefore, the food inside the dulaa was first removed by using water hose to facilitate its withdrawal.

Surgical amputation of dulaa has been reported elsewhere.^{5,6} Temporary tracheotomy has been reported as a procedure preceded the surgical removal of the impacted dulaa.⁵ In this study, tracheotomy was not performed and the entrapped dulaa of all the camels were successfully removed except in one camel. This camel had difficulty to breath and died during surgery while trying to withdraw the dulaa out of the throat. Asphyxia was thought to be the cause of death. Temporary tracheotomy was not performed to this camel prior to the surgery. It can be concluded that temporary tracheotomy should be performed prior to surgical amputation of an entrapped dulaa in camels that show signs of severe dyspnea. Another study has reported the death of one camel due to severe bleeding leading to occlusion of the airway by blood clots.¹⁰

The effects of dulaa amputation on the reproductive behavior and performance of the male camels have not been studied yet. Although the exact function of dulaa is not known, it becomes more active and well developed during the reproductive season in adult male camels.

In the present study, the vast majority of male camels resumed their normal sexual desire during the follow up period. Follow up was lost in 4 cases because of selling and transport. It has been shown that the histological structure of the dulaa consists of several mucous glands. However, the exact secretions of these glands have not been determined yet.²

In conclusion, injuries of the dulaa occur commonly during the breeding season of dromedary camels. These injuries are classified as protrusion and entrapment. Sharp teeth are the primary cause of injured dulaa. It is recommended to rasp or trim these sharp teeth annually just before the rutting season. Amputation of the dulaa had no effect on male sexual desire in dromedary camel.

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Footnotes

^a Bomazine 10%, BOMAC Laboratories Ltd, New Zealand

^b Norbrook Laboratories, UK

^c PDS, NO. 2, Ethicon, UK

^d Pen&strep, Norbrook Laboratories, UK

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جراحی دولا آسیب دیده در شترهای یک کوهانه

فهد السبیلی، احمد ف احمد

دانشکده کشاورزی و دامپزشکی، دانشگاه قصیم، قصیم، عربستان سعودی

هدف - بررسی تقسیم‌بندی علل احتمالی اختلالات دولا و تاثیر برداشت آن با کمک جراحی روی میل جنسی **حیوانات**-۲۶ نفر شتر نر (محدوده سنی ۶-۱۳ سال) با آسیب های دولا در بیمارستان آموزشی دانشکده دامپزشکی دانشگاه قصیم عربستان سعودی پذیرش شدند. ۱۶ نفر از شترها علائم بیرون زدگی و ادم دولا را نشان دادند. در ده نفر دیگر دولا بطور کامل گیر افتاده بود.

روش کار - تحت آرام‌بخشی عمیق و بی‌حسی موضعی، دولای آسیب دیده از طریق جراحی قطع شد و دولای گیر افتاده پیش از جراحی بطور ملایم بیرون کشیده شد.

نتایج - دولای بیرون زده قطع شده، زخم، ادم و هماتوم داشت. دولای گیر افتاده زخم، انباشتگی با غذا، فیبروز و زخم نافذ را نشان داد. هیچکدام از حیوانات نر عمل شده تا ۴ هفته بعد از جراحی کاهش کیل جنسی نشان ندادند.

نتیجه گیری و کاربرد بالینی - دولای آسیب دیده، بیرون زده یا گیر افتاده است. تیزی دندان‌های نیش ممکن است در آسیب دولا در شتر واجد نقش باشد و توصیه می‌شود که دندانها سالیانه قبل از فصل تولیدمثلی سوهان زده شود. قطع دولا اثری روی میل جنسی در شترهای یک کوهانه نداشت.

کلمات کلیدی - شتر، دولا، بیرون زده، گیر افتاده، قطع.