Lopes/ Journal of Camelid Science 2013, 6:122-131
http://www.isocard.org

Case study

Flank caesarean section in a Bactrian camel (*Camelus bactrianus*) restrained in sternal recumbency and post-operative treatment with enteral fluid therapy

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Abstract

A female Bactrian camel was admitted to the veterinary hospital with a history of restlessness and anorexia for about 12 h. On admission there was tachycardia and the vulva was swollen and partially open. Vaginoscopy revealed that the cervix was closed. A large live foetus was found in the uterus during transrectal palpation. The exact gestational age was not known and no obvious sign of dystocia was observed, therefore no attempt to accelerate delivery was made. Restlessness and anorexia persisted and, 18 h after admission, rectal palpation revealed that foetal activity was reduced. The camel was sedated and restrained in sternal recumbency, and a left flank caesarean section was performed. A dead fully formed foetus weighing 47 kg was extracted. Because anorexia persisted an indwelling small bore nasogastic tube was placed 48 h after surgery, and 120 litters of electrolyte solution and 80 litters of bovine ruminal fluid were administered through the nasogastric tube over 5 days. Gradual improvement of appetite was observed. Healing of the surgical wound was uneventful and skin sutures were removed 2 weeks after surgery. A left flank caesarean section with the camel sedated and restrained in sternal recumbency is a practical and inexpensive method for caesarean section in camels. An indwelling small bore nasogastric tube is well tolerated and is an effective route for the administration of electrolyte solutions and ruminal fluid in camels.

Keywords: Bacterian camel, caesarean section, anorexia, enteral fluid therapy, ruminal fluid

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Introduction

Detailed information about camelid medicine and surgery is relatively limited when compared with other domestic animals. Five cases of caesarean section in dromedaries (*Camelus dromedaries*) are all that can be currently found in refereed journals. In those five cases, caesarean sections were performed with the dromedary placed under general anaesthesia (Elias, 1991; Purohit et al., 1989). There is virtually no report of dystocia and caesarean delivery in Bactrian camels (*Camelus bactrianus*). The aim of this article is to report on a caesarean surgery on a Bactrian camel restrained in sternal recumbency and the management of post-operative anorexia using a small bore nasogastric tube as a route for fluid therapy, transfaunation and partial nutrition.

Case Report

A 3 year-old female Bactrian camel belonging to a circus with a history of abnormal behaviour (restlessness, frequent stretching and recumbency, anorexia and aggression) for about 12 h was admitted to the veterinary hospital at Universidade Federal de Viçosa, Brazil. The camel was in fair body condition and her keepers had not noticed any change in the size or shape of the abdomen and did not think that the camel could be pregnant. No sign of vulvar discharge had been observed by the owners, but the vulva was enlarged and partially opened, and a portion of the mucus membrane was exposed (Figure 1). The udder was small and did not appear to be developed for lactation. The camel had been living with an intact adult male Bactrian camel, but mating had not been observed. The female camel had no previous clinical problem other than chronic swelling of the left tarsus and intermittent lameness.

Figure 1. Enlarged and partially opened vulva in a female Bactrian camel with restlessness, frequent stretching and recumbency, anorexia and aggressive behaviour for about 12h. The owners did not believe that the camel could be pregnant. It was later found that the camel was in labor.

Upon admission the camel was bright, alert and responsive. Body weight was grossly estimated to be about 450 kg. The left tarsus was moderately enlarged and was firm on palpation. Mucous membranes were pink and moist, heart rate was slightly elevated (60 beats/minute), respiratory rate was normal (18 respirations/minute), rectal temperature was normal (37.8° C) and borborygmi could be heard on auscultation of the dorsal and ventral parts of the abdomen on both sides. Vaginal inspection and palpation revealed moderate amount of clear mucus and a closed cervix. Transrectal palpation revealed a large live foetus in the abdominal cavity. Transcutaneous ultrasonography of the abdomen was attempted, but this exam was not well tolerated by the camel and had to be curtailed. A haemogram did not reveal any abnormality.

Two approaches were considered and discussed with the owner: continuous supportive care and observation or immediate caesarean delivery. Considering the lack of information about the age of the pregnancy, the lack of obvious signs of mammary development, the absence of any definitive sign that parturition had initiated, the most conservative approach was chosen. The camel was initially kept in a stall with access to food and water and was continuously observed. A 14 G Teflon catheter was placed in the right jugular vein, and lactated Ringer's was administered at 3 ml/kg/h. The camel was anorexic and spent most of the time in sternal recumbency but did not have any visible abdominal contraction. Polakyuria and clear urine were observed 6 h after the beginning of fluid therapy, and the rate of fluid administration was reduced to 2 ml/kg/h. Pain medication was not administered because of concerns about harming the foetus or masking important clinical signs.

Every 6 h, clinical examination including rectal palpation was performed. Eighteen hours after admission, rectal palpation revealed that foetal activity was still present but markedly reduced, and the decision to perform a caesarean delivery was made. Potassium penicillin (22000 iu/kg IV) and gentamicin (6.6 mg/kg IV) were administered intravenously as prophylactic antibiotic therapy. The left flank was clipped and prepared for surgery. The camel was sedated with xylazine (0.1 mg/kg IV) and, 5 minutes later, was walked to the surgery room and positioned at the centre of a large mat. Guaifenesin (100 mg/kg IV) as a 10% solution in 5% dextrose was administered. The camel was supported by the halter and from

the back and flanks to slowly crouch into sternal recumbency. Intranasal oxygen administration (10 L/min) was initiated. The skin of the left flank was scrubbed with betadine and ethyl alcohol. The subcutaneous tissue and the deeper layers of the abdominal wall of the left flank were injected with 2% lidocaine (100 ml) following a 30 cm line at the dorsal edge of the internal abdominal oblique muscle. After the skin was prepared for surgery, the camel and the mat were covered with surgical drapes. The skin, subcutaneous tissue and the external abdominal oblique muscle were incised with a scalpel. Blunt digital dissection was used to create an opening through the transverse abdominal muscle parallel to its fibres. The peritoneum was tented with an Allis forceps and a small incision was created with scissors. Blunt digital dissection was used to enlarge the opened peritoneum. One horn of the uterus containing the extremities of the hind limbs of the foetus was partially exposed through the incision. An assistant supported the exposed portion of the uterine horn to avoid excessive stretching of the uterus and its ligaments. A 30 cm long longitudinal incision was made on the exposed uterine horn. The foetal membranes were incised with scissors to expose the distal extremities of the hind limbs of the foetus (Figure 2). Traction on the hind limbs of the foetus resulted in the extraction of a well formed but dead foetus weighing 47 kg (Figure 3). Internal palpation of the uterus revealed that there was no laceration or a second foetus. The placenta was firmly attached to the endometrium and was not extracted.

Figure 2. Incised horn of the uterus of a Bactrian camel restrained in sternal recumbency and subjected to caesarean section through the left flank. The extremities of the hind limbs of the foetus were exposed.

Xylazine (0.2 mg/kg IV) and buthorphanol (0.01 mg/kg IV) were administered immediately after foetal extraction. At the edges of the uterine incision (5 cm margin), the placenta was separated from the endometrium

Figure 3. Fully formed but dead Bactrian camel foetus weighing 47 kg extracted through a flank caesarean section.

Figure 4. Surgical wound in a female Bactrian camel 48 h after a left flank caesarean section.

to avoid incorporating the placenta in the suture of the uterine wall. The uterine incision was sutured in two layers with no. 2 chromic gut: A simple continuous suture oversaw with a Cushing suture. The serosa of the exposed uterus was lavaged with 10 L of warm lactated Ringer's solution. The uterus was returned to the abdominal cavity. The abdominal cavity was explored and no abnormality was found. The transverse abdominal muscle was sutured with no. 2 chromic gut using a cruciate pattern. The external abdominal oblique muscle was sutured with no. 2 chromic gut using a cruciate pattern. The subcutaneous tissue was sutured with no. 0 chromic gut in a simple continuous pattern. Each extremity of the skin incision was closed with two cruciate sutures with no. 0 monofilament nylon, while the remaining portion of the skin defect was sutured using a simple continuous pattern (Figure 4). The wound was covered with a stent bandage made with sterile lap sponges.

Anaesthesia recovery was uneventful and the camel was able to walk to her stall 50 minutes after surgery. Flunixin meglumine (1 mg/kg IV) was administered at the end of the surgery and every 12 h for 3 days. Since the camel had not received tetanus vaccine during the last 12 months, a dose of tetanus vaccine and 5000 units of tetanus antitoxin were administered subcutaneously at two

separate sites. To stimulate uterine contraction and placenta expulsion, oxytocin (30 iu IM) was administered immediately after surgery. Because placenta expulsion had not occurred, 12 h after the first dose of oxytocin, estradiol cypionate (10 mg IM) was administered. Oxytocin was administered again 3 h (10 iu IM) and 9 h (20 iu IM) after estradiol administration. After the last dose of oxytocin, the camel had brief episodes of mild abdominal pain, which were considered to be associated with uterine contraction. Placenta expulsion occurred about 32 h after the end of surgery (Figure 5). Inspection of the placenta did not reveal any abnormality. Intravenous fluid therapy (2 ml/kg/h) was continued for 48 h after surgery. A complete blood count performed 12 h and 36 h after surgery did not reveal any change other than a mild left shift (16% or about 1600 band neutrophils). Since no fever or other signs of infection were observed during the post-operative period, antibiotic therapy (gentamicin 6.6 mg/kg IV 24h and penicillin 22,000 iu/kg IV 6 h) was discontinued 72 h after surgery. For the first 48 h after surgery, the camel was quiet and anorexic despite being offered a great variety of feed (i.e., several types of green grasses, hay, pelleted horse feed, carrots). Two days after surgery an indwelling small bore nasoesophagic tube (Nasogastric Feeding Tube NG18100, Mila International, Inc., Erlanger, Kentucky 41018, USA) was passed while the camel was standing. As expected, the camel resisted

Figure 5. Placenta expulsion 32 hours after caesarean section in a Bactrian camel. Oxytocin (30 iu IM) had been administered immediately after surgery and estradiol cypionate (10 mg IM) was administered 12 hours after surgery. Oxytocin was administered again 3 h (10 iu IM) and 9 h (20 iu IM) after estradiol administration.

nasogastric intubation, but the tube was successfully inserted with the help of 2 assistants restraining the camel by the halter. After this initial reaction, the camel did not seem to be bothered by the indwelling nasogastric tube. This tube was used for the administration of a homemade electrolyte solution developed for horses containing 135 mEq of Na, 95 mEq of Cl and 5 mEq of K with a calculated osmolality of 280 mOsm per litter (Lopes et al. 2002), and ruminal fluid extracted from a healthy cow with a ruminal fistula. The electrolyte solution and ruminal fluid were transferred to a carboy and administered through a coiled fluid line (Figure 6). Enteral administration of fluids and ruminal content were well tolerated and the camel's appetite was markedly improved 24 h after the beginning of this therapy. A total volume of 80 L of ruminal fluid was administered over 2 days, while 120 L of electrolyte solution were administered over 5 days. Appetite gradually improved and the camel was bright, alert and responsive 6 days after surgery. The wound had minimal swelling that resolved 7 days after surgery and the skin sutures were removed 2 weeks after surgery, when the camel was discharged. At the time of discharge, the camel was already being fed 5 kg of pelleted horse feed (Corcelina, Purina do Brasil, Paulínia, São Paulo 13140-000, Brazil) per day and free choice grass hay. Recommendations were made against any intense physical activity (running or riding) for 2 months. The owners were also instructed to make any dietary change gradually and to give a dose of tetanus vaccine in two weeks, and every 12 month thereafter. Twelve months after surgery, the owner informed that the camel was doing well.

Figure 6. Female Bactrian camel that had been subjected to a caesarean section treated with enteral fluid therapy through an indwelling small bore nasogastric tube. Fluid therapy was administered continuously using a coiled fluid line to allow free movement of the camel in the stall.

Discussion

If, at admission, it had been clear that the camel had an at-term pregnancy, caesarean delivery would have been performed sooner because labour was going for at least 12 h, and there were no signs of progression. The scarcity of the literature about pregnancy and dystocia in Bactrian camels has to be acknowledged as contributing factors for the delay in performing caesarean delivery. In humans and domestic animals, assessment of foetal well-being with transcutaneous abdominal ultrasonography and other tests has been used to determine the occurrence of foetal distress (Bucca, 2006) and the need for immediate caesarean delivery (Lagrew et al., 2006). An attempt to evaluate the foetus and placenta with transcutaneous ultrasonography was not well tolerated by the camel.

The anaesthesia protocol and surgical approach were simple, effective and relatively inexpensive. The left flank approach with the camel restrained in sternal recumbency for a caesarean section had been used before (Ramadan et al., 1986; Tibary and Anouassi, 2000). Sternal recumbency is a natural and comfortable position for camels and is adopted for resting, copulation and parturition (Khanvilkar et al., 2009). It is likely that, in camels, sternal recumbency has fewer undesirable effects on respiration and cardiovascular function than lateral or dorsal recumbency. However, no study testing this hypothesis has been published. The site and orientation of the abdominal incision were chosen with a slight modification of a technique previously described (Tibary and Anouassi, 2000).

The post-operative anorexia and depression were interpreted as the result of exhaustion and stress associated with dystocia, anaesthesia, abdominal surgery, the hospital environment and frequent interventions for clinical assessment and medical treatment. The use of the indwelling small bore nasogastric tube was well tolerated, and was certainly less stressful than repeated oral intubations with a large bore tube would have been. Oral intubation using a large diameter tube is commonly performed in camelids (Marqués, 2008) and cows (Roussel, 2004) for the administration of electrolyte solutions, ruminal fluid and other therapies. The small bore nasogastric tube has been successfully used in horses (Lopes et al. 2002; Lopes et al. 2003), cows (Avanza et al. 2004) and goats (Atoji and Ribeiro Filho, 2007) but its use had not been reported in camelids. The administration of large volumes of ruminal fluid was performed to

maintain a healthy ruminal flora and to provide partial nutrition.

The need for periodic assessment of the health status of all animals in captivity including their reproductive status cannot be overemphasized. In the case reported in this article, the calf could have been saved if the veterinary had been aware since the beginning that the camel had an at-term pregnancy. A left flank caesarean section with the camel sedated and restrained in sternal recumbency is a simple, effective and relatively inexpensive option for camels with dystocia. A small bore nasogastric tube can be used for the administration of fluids and ruminal content in camels. This report of this rare case of dystocia in a Bactrian camel will help other veterinarians treat similar cases.

Acknowledgments

The author acknowledges the valuable help from other clinicians, staff and students at the Departamento de Veterinária, Universidade Federal de Viçosa, especially Dr. José Domingos Guimarães. The author also acknowledges Dr. Ahmed Tibary from the College of Veterinary Medicine at Wahsington State University for providing valuable advice via e-mail.

References

Atoji K., Ribeiro Filho J. D., 2007. Nasogastric fluid therapy in goats. In: Proceedings. 7º Congresso Brasileiro de Buiatria. P. 49.

Avanza M. F. B., Lopes M. A. F., Souza M. V., 2004. Enteral fluid therapy in normal and experimentally dehydrated cows. In: Proceedings. 31º Congresso Brasileiro de Medicina Veterinária. P. 15.

Bucca, S. 2006. Diagnosis of the compromised equine pregnancy. Vet. Clin. North Am. Equine Pract. 22, 749-761.

Elias E., 1991. Left ventrolateral caesarean section in three dromedary camels (Camelus dromedarius). Vet. Surg. 20, 323-325.

Khanvilkar A.V., Samant S. R., Ambore B. N., 2009. Reproduction in camels. Vet. World 2, 72-73. Available at: http://www.veterinaryworld.org/Vol.2/February/Reproduction%20in%20Camel.pdf. Accessed May 12, 2013.

Lagrew D. C., Bush M. C., McKeown A. M., Lagrew N. G., 2006. Emergent (crash) caesarean delivery: indications and outcomes. Am. J. Obstet. Gynecol. 194, 1638-1643.

Lopes M. A. F., Hepburn R. J., McKenzie H. C., Sikes B. W., 2003.

Enteral fluid therapy for horses. Compend. Cont. Educ. 25:390-397.

Lopes M. A., Walker B. L., White N. A., Ward D. L., 2002. Treatments to promote colonic hydration: enteral fluid therapy versus intravenous fluid therapy and magnesium sulphate. Equine Vet. J. 34:505-509.

Marqués F. J., 2008. Fluid therapy: general practical recommendations for camelids. Large Animal Veterinary Rounds. 8. Available at: http://www.larounds.ca/crus/laveng_01_08.pdf. Accessed May 12, 2013.

Purohit N.R., Chouhan D.S., Choudhary R.J., 1989. Post-caesarean ventral hernia in two camels. Br. Vet. J. 145, 294.

Ramadan R. O., Kock R. A., Higgins A. J., 1986. 8. Observations on the diagnosis and treatment of surgical conditions in the camel. Br. Vet. J. 142, 75-89.

Roussel A. J., 2004. Chapter 5 - Fluid therapy. In: Fubini SL, Ducharme NG, eds. Farm animal surgery. Saunders, St Louis, Missouri, pp. 91-95.

Tibary A., Anouassi A., 2000. Surgery of the reproductive tract in camels. In: Skidmore, L., and G. P. Adams (eds.). Recent Advances in Camelid Reproduction, Ithaca: IVIS, 2000. Available at: http://www.ivis.org/advances/camel_skidmore/tibary/ivis.pdf. Accessed May 12, 2013.