DOI : 10.5958/2277-8934.2025.00020.8 *Vol 32 No 2, p 133-138*

ENDOSCOPIC DIAGNOSIS AND MANAGEMENT OF CASES OF OESOPHAGEAL OBSTRUCTION IN DROMEDARY CAMELS

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ABSTRACT

This study examined 18 dromedary camels suffering from different oesophageal disorders. These animals were either less than 6 months old (8 cases) or aged one year and above (10 cases). Each camel underwent special examination of the oesophagus and the associated clinical signs were noted. The sites of oesophageal obstruction were cervical (10 cases), thoracic inlet (2 cases), cervical and thoracic, both (2 cases) and thoracic (4 cases) regions. The causes of oesophageal obstruction were foreign bodies, feed straw or chronic oesophagitis. The obstructions were managed by repeated siphoning (4 cases), removal using crocodile forceps during endoscopy (8 cases), oesophagotomy (1 case which later died) and advancement of the obstructive mass into the rumen (2 cases). In present study, 15 camels recovered following various treatments. Two cases were euthanatised and one was slaughtered owing to their poor prognosis.

Key words: Dromedary camels, endoscopy, oesophageal obstruction

Oesophageal diseases are frequently reported in many livestock animals and they involve oesophageal obstructions(Sadan *et al,* 2023), oesophageal dilatation(Ahmadnejad *et al,* 2021), oesophagitis (Franz and Baumgartner, 2002), oesophageal stenosis or oesophageal rupture (Franz *et al,* 2024). Diseases affecting the oesophagus in camels can impact their productivity and might also influence their welfare. Recently, the application of endoscopy in camel medicine has significantly enhanced the clinical assessment of oesophageal diseases and it is considered as a rapid and non-invasive diagnostic technique (Shawaf *et al,* 2017). However, the diagnostic studies for gastrointestinal disorders in camels are under represented. Recently, ruminoscopy was used to visualise the interior of the rumen in clinically healthy camel calves, specially to evaluate the content, mucosal ruminal appearance and the ruminal motility (Almuhanna *et al,* 2025).

A retrospective study on choke of oesophagus in dromedary camels with use of stomach tube to locate the site of obstruction has been reported (Zabady and Shawaf, 2022). Ultrasonography was used to diagnose a case of benign oesophageal fibroid polyp in camels (Elmanakhly *et al,* 2020). Endoscopy is a popular diagnostic procedure for oesophageal and gastric diseases in horses (Franz *et al,* 2024). Endoscopy helps locating oesophageal obstruction throughout the entire length of the oesophagus. Intraluminal mucosal lesions can also be detected by endoscopy. Therefore, the current study was aimed to report some oesophageal disorders through the application of endoscopy in dromedary camels including the associated clinical signs and appropriate therapeutic interventions.

Materials and Methods

A total number of 18 camels of mixed breeds (including Maghateer, Majaheem and Widdah) with age range of one month to 10 years, were included in this study. The present study had ethical approval from the university (KFU-REC 2025-FEB-ETHICS 3136). Each animal was assessed clinically immediately after admission to the Veterinary Teaching Hospital at King Faisal University. The clinical examination involved initial evaluation of the vital signs (heart rate, respiratory rate, mucous membrane appearance and the temperature) and the signalment of the examined camels were also reported. Each admitted case underwent a special examination for the oesophagus including clinical inspection for the presence of externally visible peristaltic movements over the ventral cervical area.

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Moreover, the ventral part of the entire cervical region was carefully palpated to identify regions with palpable obstructions. Subsequently, with the camel being positioned in sternal recumbency, each animal was sedated with 2% Seton* by intravenous route at a dose rate of 0.2 mg/kg (*Seton 2%; Laboratorios Calier, S.a.c./Barcelones, Barcenola, espana). In animals without externally detectable oesophageal obstruction, a stomach tube was passed to assess the patency of the oesophagus, especially in those camels where the obstruction was in the thoracic part of the oesophagus. Care was taken to avoid pushing the obstructive material further caudally. After that, oesophagus of each animal was examined using a portable video endoscopy (3.3 meter long and 12mm in external diameter). The endoscopy unit was powered with a source of LED light and had a irrigation system. It was provided with an instrument channel, 3.7mm in diameter, inside which a 4-meter foreign body forceps was inserted. The head of the examined animal was carefully secured and the endoscope was introduced into the oro-pharyngeal region. At this level, the tip of the insertion tube was allowed to touch the pharyngeal mucosa to stimulate the swallowing reflex which allows animal to swallow the endoscopy and then it was advanced caudally to allow a proper visualisation of the oesophageal lumen. In some camels, the procedure of oesophageal endoscopy was difficult due to excessive accumulation of saliva. It was overcome by lowering the position of the head and neck to a level below that of the thorax. A simultaneous manual massage at the ventral neck area helps passage of saliva towards distal part of the oesophagus.

The endoscopic visualisation of the oesophagus helped identifying the location and type of oesophageal obstruction and subsequent clinical approaches were decided accordingly. Oral removal of the obstruction was done using an 90cm long crocodile forceps in the obstructions in the upper cervical oesophageal area. Grasping and retrieval of the foreign body by a foreign body forceps was done. This forceps was passed through the instrument channel of the endoscopy. In few cases, the foreign body was pushed caudally towards the rumen via a large-bored stomach tube, particularly when the obstruction was located just cranial to the cardia. In cases of oesophageal impaction by the coarse fibrous feed repeated lavage with water followed by siphoning was employed. Cervical oesophagotomy was done in one animal where the obstruction was at thoracic inlet and it was firmly attached to the oesophageal mucosa. In two camels with extensive mucosal laceration, euthanasia was recommended and one animal was slaughtered due to poor prognosis.

Results

The details of signalment for each animal, clinical signs, site and type of obstruction, procedure adopted to treat the obstruction and final outcome of the case are summarised in Table 1. The nature of vomiting associated with oesophageal obstruction is shown in Fig 1, while the nature of the oesophageal obstruction is illustrated in Fig 2. The process of foreign body removal through the endoscopic foreign body forceps is shown in Fig 3. Endoscopic visualisation of the oesophagus allowed identification of the nature of the obstructive materials, which involved obstruction by plastic bags, fabric materials such as piece of carpets or clothes, plastic ropes used for hay baling, bezoars-like structure, impaction by food materials, presence of extensive mucosal laceration or massive nodules formation.

Briefly, in young camel calves it was noted that the majority of the reported cases were oesophageal obstruction by environmental foreign body materials. In contrast, adult camels tended to develop obstruction by feed materials or became lodged with solid bezoar-like structure causing intraluminal oesophageal obstruction. In few adult animals, intraluminal chronic inflammatory lesions such as nodules formation or massive mucosal lacerations were seen.

Discussion

In present study, the young camels aged 6 months and below (8 cases) were also affected which could be due to their open pasture grazing with environmentally polluted grounds. Camels with age of 1 year and above were also affected with oesophageal obstruction. The exact aetiology of such obstructions could not be ascertained. Endoscopic examination of the oesophagus along with documentation of the associated clinical presentation offers significant value in enhancing our understanding of commonly encountered oesophageal disorders. Our results indicated that the major clinical complaints in our cases were vomiting, excessive salivation and signs of anxiety. In some cases, visible peristaltic movement of the ventral aspect of the neck was also noted. Such clinical signs have been previously reported by handful of authors (Ahmed, 2011; Eljalii *et al,* 2014; Ramadan and Abdin-Bey, 1990; Ramadan *et al,* 1986; Sadan *et al,* 2023; Shawaf *et al,* 2017). However, our study also revealed

atypical clinical theme in which the aforementioned common clinical signs were not seen despite having chronic and severe oesophageal lesions. For example, in cases number 12 and 18, the elevation of head and neck after swallowing without obvious vomiting was the only clinical sign noted and the endoscopic findings revealed the presence of nodular formations or massive ulceration. In camel literature, elevation of head and neck, also referred to as 'star-gazing', has been reported in cases of polioencephalomalacia (Meligy and El Nahas, 2020). Therefore, such findings should be differentiated carefully.

Our results showed that the majority of the oesophageal obstructions were caused by lodgement of plastic bags or clothing, this finding has been reported frequently and thought to be caused by the lack of environmental hygiene (Zabady and Shawaf, 2022). The ecological impacts of widespread plastic pollution and subsequent ingestion of anthropogenic waste, primarily plastic bags and ropes, by dromedary camels in the United Arab Emirates (UAE) and across the Arabian Peninsula has been reported (Wernery *et al,* 2021). Camels in the UAE have shown a regional mortality rate of 1% from ingesting plastic pollution (Erikson *et al,* 2021). Feed material impaction has also been documented in Saudi Arabia and it is usually dealt with by surgery (Sadan *et al,* 2023). However, the aetiology and risk factors associated with such occurrence has not been yet been investigated. The author postulates that oesophageal impaction by hay materials might be associated with the coarseness of the chewed fibres, greediness of the animal and possibly weakness of the oesophageal muscles. Nevertheless, further experimental studies are required to confirm or debunk such speculations. Lodgement of the oesophageal lumen with hard structures like bezoar was reported in a case report, which is thought to be formed initially in the rumen and become lodged in the oesophagus during the process of regurgitation (Zabady *et al,* 2022). The nodules formation in the oesophagus might reflect a process of chronic inflammation. Although the cause of such finding was not sought in this study, the morphological appearance of the lesions resembles those seen in a previous report documenting a fibroid polyps caused by a fungal infection (Elmanakhly *et al,* 2020).

Endoscopic retrieval of oesophageal foreign body using a forceps inserted through the endoscope has been frequently reported in dogs by many authors (Deroy *et al,* 2015; Gianella *et al,* 2009; Juvet *et al,* 2010; Michels *et al,* 1995). The procedure is simple and non-invasive and has a high success rate especially if the intervention was offered during the early course (Juvet *et al,* 2010). Furthermore, the advantage of using such technique is that it offers real-time visualisation of the foreign body and simultaneous manipulation of the endoscope with subsequent correct placement of the forceps, enabling proper grasping of the obstruction and eventually facilitates its removal (Mourya *et al,* 2018). In camels, the use of digestive endoscopy has only been applied to visualise and locate the oesophageal obstruction (Zabady *et al,* 2022; Zabady and Shawaf, 2022) and to remove the obstructive materials, with the aid of crocodile forceps, only if it is lodged in upper part of the cervical oesophagus (Shawaf *et al,* 2017). However, the ability to successfully intervene in such cases depends mainly on the location of the obstruction. For instance, the obstruction is removable only when it is accessible by

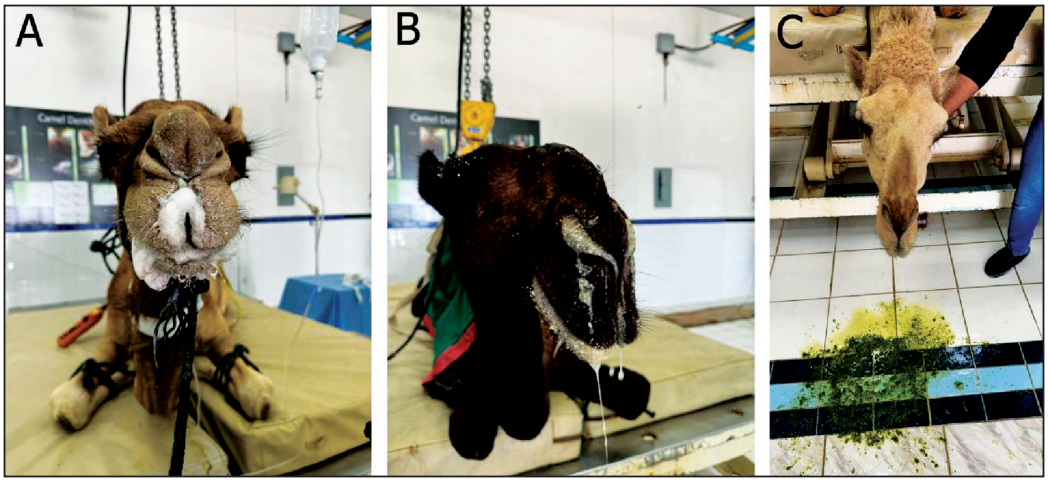

Fig 1. Types of vomited materials in camels with oesophageal obstructions. A- Frothy salivation in a camel with acute oesophageal obstruction. B- The vomiting is associated with regurgitation of milky fluid from the nostrils. C-Pasty olive/green vomitus in an animal with chronic oesophageal obstruction.

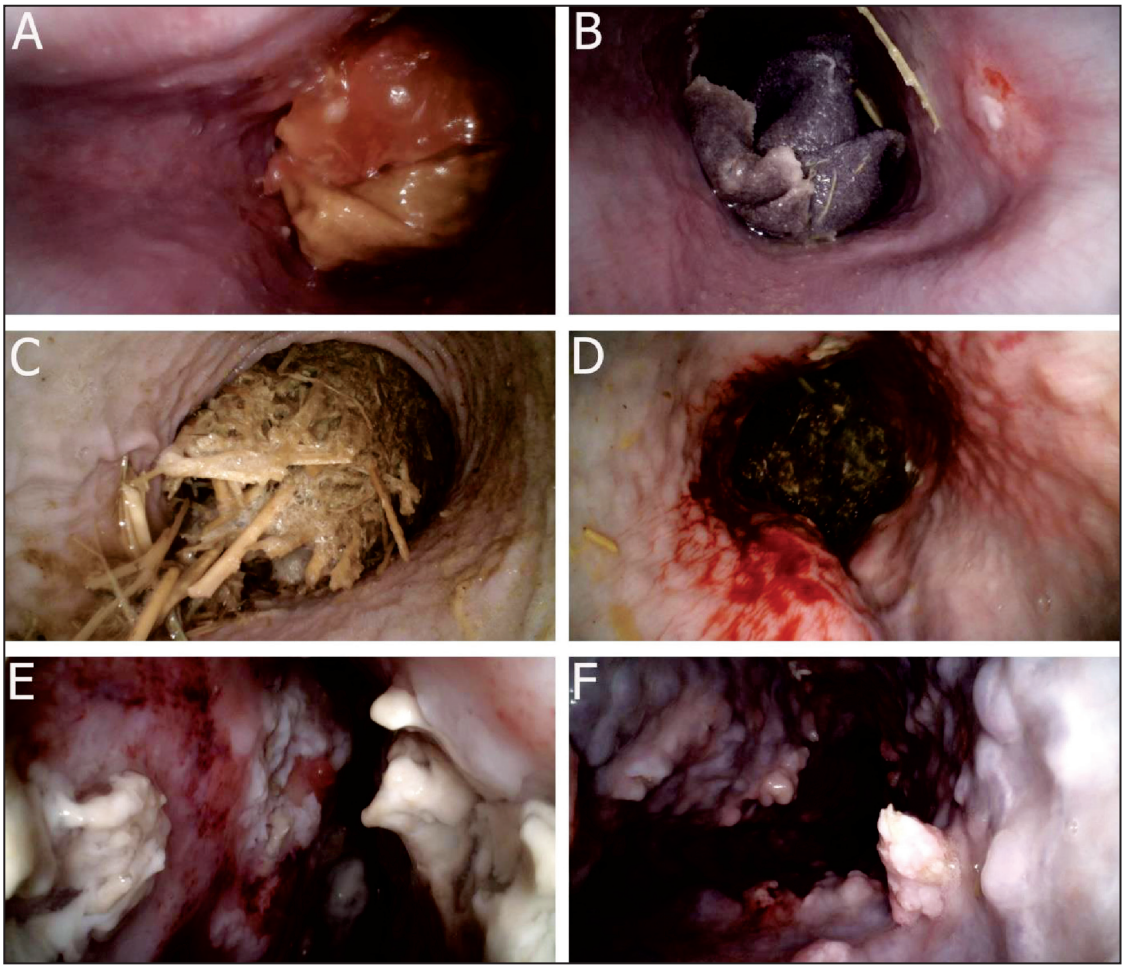

Fig 2. Examples of oesophagoscopic findings in camels with different types of oesophageal affections. A- Obstruction by a plastic bag materials. B- An obstruction by clothes. C- Cylindrical-shaped food materials causing impaction in the oesophagus. D-Obstruction by bezoar-like structure causing mucosal bleeding. E- Petechial haemorrhage is seen, some of which is covered with necrotic white material. F-Extensive nodules formation throughout the oesophageal lumen.

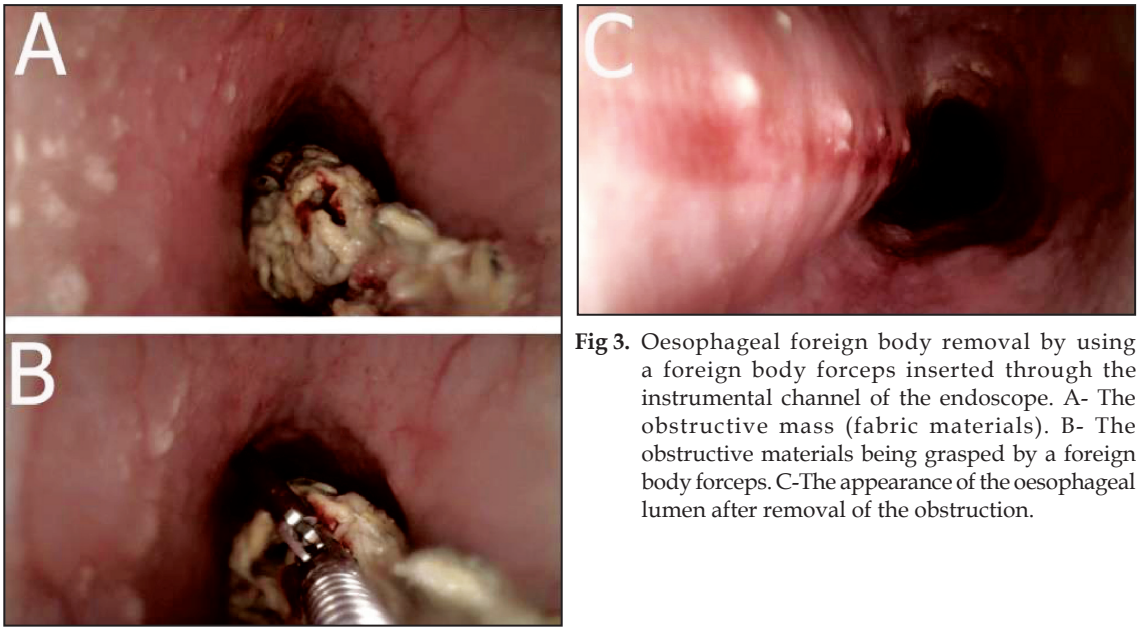

Fig 3. Oesophageal foreign body removal by using a foreign body forceps inserted through the instrumental channel of the endoscope. A- The obstructive mass (fabric materials). B- The obstructive materials being grasped by a foreign body forceps. C-The appearance of the oesophageal lumen after removal of the obstruction.

Table 1. The details of case signalment, clinical findings, endoscopic findings, site of affections, final diagnosis, therapeutic intervention and treatment outcomes.

ID	Age	Sex	Clinical signs	Endoscopic findings	Site	Final diagnosis	Method of therapeutic intervention	Outcome
1	5 years	M	Drooling of solid food after mastication, occasional vomiting after eating and hind limb tremors	Impaction by food materials	Cervical	Oesophageal obstruction	Repeated siphoning with water	Recovered
2	2 months	M	Sudden anxiety, excessive salivation repetitive head and neck movement	Lodgement by plastic bag	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
3	7 years	F	Sudden anxiety, frothy salivation and anorexia	Presence of bezoar-like structure	Thoracic inlet	Oesophageal obstruction	Oesophagotomy	Died
4	1 month	M	Regurgitation of milk immediately after milk sucking, dullness	Obstruction by fabric materials	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
5	3 years	F	Chronic vomiting of freshly masticated food, clinically visible peristaltic movement of the oesophagus in the ventral neck area	impaction by food materials	Cervical	Oesophageal obstruction	Repeated siphoning with water	Recovered
6	1 year	F	Chronic vomiting and progressive loss of body condition	Impacted food materials	Thoracic	Oesophageal obstruction	Repeated siphoning with water	Recovered
7	7 years	F	Profuse frothy salivation developed suddenly	Oesophageal obstruction by bezoar-like structure	Thoracic inlet	Oesophageal obstruction	Slaughtering was recommended	Slaughtered
8	1 year	F	Chronic vomiting and peristaltic movements	Impaction by food	Cervical	Oesophageal obstruction	Repeated siphoning with water	Recovered
9	1 year	M	Vomiting of milky materials	Oesophageal obstruction by clothes	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
10	2 months	M	Vomiting after swallow	Oesophageal obstruction with fabric materials	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
11	3 months	M	Salivation and inappetance	Plastic ropes	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
12	10 years	F	Head elevation following swallowing	Extensive nodules formation occupying the entire oesophageal mucosa	Cervical and thoracic	Chronic oesophagitis	Euthanasia was recommended	
13	2 months	M	Repeated head and neck elevation especially after swallowing for six months	Plastic bag materials obstruction in the thoracic part of the oesophagus	Thoracic	Oesophageal obstruction	Pushed to the rumen via stomach tube	Recovered
14	1 month	F	Sudden anxiety and milk regurgitation after sucking	Obstruction by fabric materials	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
15	3 months	F	Frothy salivation, anorexia and vocalization	Oesohageal obstruction by ropes	Cervical	Oesophageal obstruction	Removed using crocodile forceps	Recovered
16	6 months	M	Inappetence and vomiting	Oesophageal obstruction by a piece of carpet	Thoracic	Oesophageal obstruction	Removed with endoscopic foreign body forceps	Recovered
17	1 year	M	Vomiting after swallow	Oesophageal obstruction by a plastic bag	Thoracic	Oesophageal obstruction	Pushed to the rumen via stomach tube	Recovered
18	2 years	F	Chronic progressive loss of body conditions, inappetence, restlessness after swallowing and occasional vomiting	Diffuse petechial ulceration and presence of massive necrotic lesions	Cervical and thoracic	Chronic oesophagitis	Euthanasia was recommended	

the crocodile forceps, which measures about 90 cm in length. On the other hand, the application of foreign body forceps passed through the instrumental channel of the endoscope has the capability of removing the obstruction even in most caudal parts of the oesophagus, in particular, in the thoracic part near the cardia, which was successfully applied in this study.

In conclusion, this study has reported an important oesophageal affections through endoscopic examination of the oesophageal lumen in camels with various oesophageal affections. The novel inflammatory lesions found in the oesophageal mucosa has not been reported previously in ante-mortem studies. Such findings highlights the importance of endoscopic utility in clinical examination of camel. Therefore, we recommend that endoscopic examination in camel practice should be done routinely in any case with non-specific symptoms as it can detect unexpected lesions.

Acknowledgement

The author would like to thank Dr. Ayman Elnahas, Dr. Mohammed Zabady, Dr. Abdullah Al-Wail for their assistance in the clinical examination of the cases.

Funding

None

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