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Surgical Lesions Encountered in Gazelles (*Gazella subgutturosa*) (28 Cases): A Retrospective Study

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Goitered gazelles (Gazella subgutturosa) numbers of which are decreasing rapidly are timid, excitable animals that are hard to immobilize. This study aimed to investigate the surgical lesions that were encountered in 28 captured goitered gazelles that were brought to the surgery clinic of the Faculty of Veterinary Medicine at Harran University in the period of 2014-2018 in terms of age, sex, date of admission, etiology and the anesthesia protocol that was applied. The lesions were determined to be bone tissue and skeletal system diseases in 14 cases (50%), general inflammatory events in 10 (36%), eye diseases in 3 (11%) and nerve tissue disease in 1 (3%). As a result, since gazelles have a timid and excited nature, more care should be taken in clinical procedures to prevent complications that can cause sudden deaths, such as CM. Since the anesthesia protocols used in the current study did not cause any complications in gazelles, it was concluded that it could shed light on the veterinary clinicians working in the field and the studies to be carried out.

Key Words: *Butorphanol, capture myopathy, gazelle, surgical lesions, tiletamine-zolazepam*

Ceylanlarda (Gazella subgutturosa) Karşılaşılan Cerrahi Lezyonlar (28 Olgu): Retrospektif Çalışma

Sayıları büyük bir hızla azalmakta olan kursaklı ceylanlar (Gazella subgutturosa) hassas, heyecanlı, immobilizasyonu zor yaban hayvanlarıdır. Bu retrospektif çalışmada 2014-2018 yılları arasında Harran Üniversitesi Veteriner Fakültesi Cerrahi Kliniğine getirilen 28 kursaklı ceylanda (Gazella subgutturosa) karşılaşılan cerrahi lezyonların yaş, cinsiyet, başvuru tarihi, etiyoloji ile uygulanan anestezi protokolü yönünden değerlendirilmesi amaçlandı. Lezyonlar kemik doku ve iskelet sistemi hastalıkları 14 olgu (%50), genel yangısal olaylar 10 olgu (%36), göz hastalıkları 3 olgu (%11) ve sinir doku hastalığı 1 olgu (%3) olarak tespit edildi. Sonuç olarak, ceylanlar çekingen ve heyecanlı bir yapıya sahip olduklarından, CM gibi ani ölümlere neden olabilecek komplikasyonları önlemek için müdahalelere daha fazla özen gösterilmelidir. Bu çalışmada kullanılan anestezi protokolleri ceylanlarda herhangi bir komplikasyona neden olmadığından, sahada çalışan veteriner hekimlere ve yapılacak çalışmalara ışık tutabileceği sonucuna varılmıştır.

Anahtar Kelimeler*: Butofanol, yakalanma myopatisi, ceylan, cerrahi lezyonlar, tiletamin-zolazepam*

Introduction

Goitered gazelles (*Gazella subgutturosa*) that belong to the Antilopinae subfamily of the Bovidae family are wild animals that can flee fast, are aggressive, timid and hard to hold and capture (1, 2). *Gazella subgutturosa* which is found only in the province of Şanlıurfa in the Southeastern Anatolia Region of Turkey today has been shown to exist in the Göbeklitepe region since the early Neolithic age (3, 4).

The initial studies on the gazelle populations in Anatolia in the 19th century (1839) showed that the herds of gazelles were encountered (5). It was reported that there has been a decrease of more than 30% in the population of gazelles since 2002 (6).

Usage of sedatives during capturing and immobilization of wild and domestic animals or the excessive excitement and acute stress situation that occurs in long transportation processes leads to a complicated metabolic syndrome known as capture myopathy (CM). In the case of shock due to capturing or immobilization, it is possible to encounter depression, superficial respiration, hyperthermia, tachycardia, hypotension, circulatory collapse and acute necrosis in the heart and skeletal muscles. This metabolic syndrome may result in injury, metabolic disorders or peracute death. In the case ofarrhythmia that occurs as a result of fast catecholamine release due to acute stress may lead to sudden death, capture, immobilization, simple intervention, anesthesia and operative interventions in gazelles become more difficult (7-15).

The aim of the study was to reveal the surgical lesions seen in goitered gazelles and to shed light on the future studies and to provide useful information to the clinicians working with this species.

Materials and Methods

The material of the study consisted of 28 goitered gazelles that were brought to the surgery clinic of the Faculty of Veterinary Medicine at Harran University for treatment between 01.01.2014 and 12.31.2018. The study was approved by the Animal Experiments Local Ethics Committee of Harran University (2019 / 004 / 02). After

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collecting anamneses information and clinical examinations, the gazelles that had lesions formed in different parts of their bodies were categorized in terms of age, sex,date of admission, etiology, surgical lesions and anesthesia methods that were applied, and the results were interpreted based on mean and percentage values. Results of this investigation are reported using descriptive crossover statistics (SPSS 18.00).

In the study, immobilization and simple interventions were carried out with the combination of tiletamine-zolazepam (4 mg/kg, IV) (Telazol, Zoetis, Spain), while all operative procedures were conducted by the combination of tiletamine-zolazepam (10 mg/kg, IV) (Telazol, Zoetis, Spain) and additional butorphanol (0.4 mg/kg, IV) (Butomidor Richter Pharma, Austria) injection (12, 16-18). In addition to these general anesthetics, local anesthetics (lidocaine) were used in operations such as osteosynthesis and extraction (12, 19).

Results

The 28 gazelles that were brought to the surgical clinic at the aforementioned dates were analyzed based on their surgical lesions. All information about these gazelles is presented in Table 1.

Table 1. Surgical lesions encountered in 28 goitered gazelles that were brough in between 2014 and 2018

Case No.	Age (Months)	Sex	Month of Admission	Etiology	Surgical Lesion	Anesthesia	Treatment
1	24	♂	June	Trauma	Segmental fracture in 2 femur and tibia bones	No anesthesia was applied	Died during examination.
2	36	♀	July	Trauma	Keratitis superficialis in right eye	Tiletamine-zolazepam (4 mg/kg, IV)	Medical treatment.
3	4	♀	August	Trauma	Right femur supracondylar fracture	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Transverse pin was applied.
4	4	♀	August	Trauma	Communitive fracture in right carpal bone	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Neutralization plate was applied.
5	4	♀	September	Trauma	Cut injury in right gluteal region	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Suture was applied.
6	6	♀	September	Trauma	Right femur segmental diaphysis fracture	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Intramedullary pin and cerclage wire were applied.
7	18	♂	September	Trauma	Cut injury on level of right metacarpophalangeal joint	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Suture was applied.
8	24	♂	September	Trauma	Eventration of bite injury in abdominal region	No anesthesia was applied as it was in agony.	Died during examination.
9	24	♀	October	Trauma	Wide tear injury in right scapular region	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Suture was applied.
10	12	♀	January	Unknown	Abscess in right femur and inside Art genu	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Drainage was achieved by puncturing. Medical treatment was applied.
11	12	♂	June	Trauma	Rupture in right ear base	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Suture was applied to ear base.
12	12	♂	June	Trauma	Fracture in right hind lateral Distal Phalanx	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Digit amputation was applied.
13	5	♂	October	Trauma	Right Radius/Ulna diaphysis transversal fracture	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Intramedullary pin was applied.
14	12	♂	October	Trauma	Left humerus diaphysis transversal fracture	Tiletamine-zolazepam (4 mg/kg, IV)	Intramedullary pin was applied.
15	24	♀	October	Unknown	Abscess in left parotid and mandibular region	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Drainage was achieved by puncturing. Medical treatment was applied.
16	24	♀	December	Unknown	Abscess in left shoulder region	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Drainage was achieved by puncturing. Medical treatment was applied.
17	36	♀	March	Trauma	Open wound in left humerus region	Tiletamine-zolazepam (4 mg/kg, IV)	Open wound treatment was applied.
18	12	♂	May	Trauma	Open wound in abdominal wall related to trauma	No anesthesia was applied as it was in agony.	Died during examination.
19	24	♀	September	Unknown	Torticollis	Tiletamine-zolazepam (4 mg/kg, IV)	Medical treatment was applied.

Tablo 1'in devamı

20	24	♂	October	Trauma	Luxation in right tibiotarsal joint	Tiletamine-zolazepam (10 mg/kg, IV -butorphanol (0.4 mg/kg, IV)	Repositioning was provided. Bandage with synthetic plaster.
21	1	♀	June	Trauma	Keratitis superficialis in right eye	Tiletamine-zolazepam (4 mg/kg, IV)	Medical treatment was applied.
22	2	♀	June	Trauma	Left Radius/Ulna diaphysis transversal fracture	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)	Synthetic plaster was applied.
23	4	♀	August	Trauma	Luxation in right coxofemoral joint	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Operated with the modified Margaret Terrace method.
24	6	♀	September	Trauma	Fracture in 3rd cervical vertebra	Tiletamine-zolazepam (4 mg/kg, IV)	Stabilizing bandage was applied.
25	18	♀	November	Trauma	Fracture in 1st cervical vertebra	Tiletamine-zolazepam (4 mg/kg, IV)	Stabilizing bandage was applied.
26	12	♀	April	Trauma	Panophthalmitis in left eye	Tiletamine-zolazepam (4 mg/kg, IV)-Retrobulbar block with lidocaine	Exenteration bulbi operation
27	5	♀	October	Trauma	Right tibia distal transversal fracture	Tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine	Acrylic external fixator was applied.
28	12	♀	January	Unknown	Purulent arthritis in left articulatio carpi	Tiletamine-zolazepam (4 mg/kg, IV)	Medical treatment was applied.

The gazelles were analyzed based on their ages, and it was found that 17 cases were in the range of 0-12 months (60.71%), 9 cases were in the range of 12-24 months (32.14%) and 2 cases were in the range of 24-36 months old (7.14%). Nineteen cases were female (68%), while 9 were male (32%). The gazelles' weights varied in the range of 6-28 kg.

Their distribution based on the months that they were admitted in may be listed as September (21%), October (21%), June (18%), August (11%), January (7%), May (4%), July (4%), November (4%), December (4%), March (3%) and April (3%) (Figure 1).

According to etiologies, 23 of the 28 cases were determined to be trauma related. The etiologies of the remaining 5 cases could not be determined based on the gazelle owners' anamnesis who stated they did not know. Among the 23 trauma-related cases, 14 were female (60.87%), and 9 were male (39.13%), while all 5 cases without a known cause were female.

The lesions were determined to be bone tissue and skeletal system diseases in 14 cases (50%) (Figures 2a, b, c, d; 3a, b, c; 4a, b, c), general inflammatory events in 10 (36%), eye diseases in 3 (11%) Figure 5a, b, c) and nerve tissue disease in 1 (3%) (Figure 6). Three cases which were brought to the clinic with agony died during the examination.

When the relationship between the surgical lesions and the months presented was examined, it was determined that bone tissue diseases were concentrated in autumn (n: 7) and summer (n: 6) months, and general inflammatory diseases were more common in autumn (n: 5). In general, the number of cases was found to be relatively low in spring (n: 3) and winter (n: 3) periods (Table 2).

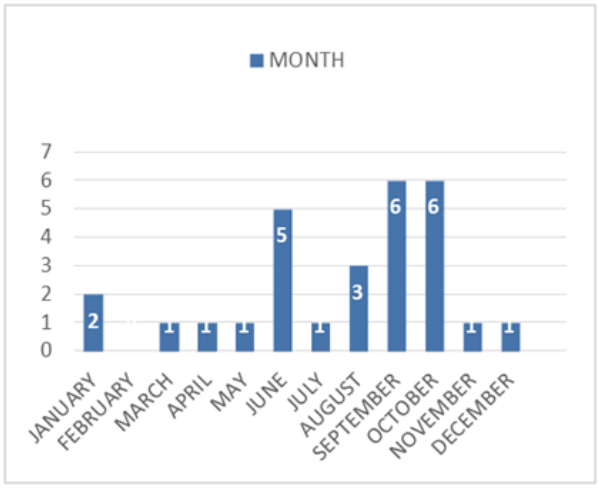

Figure 1. Assessment based on months of admission

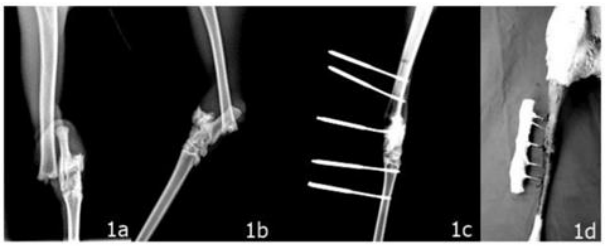

Figure 2. Case 27. **A.** Cr/Cd radiography of distal transversal fracture in the right tibia. **B.** M/L radiography of distal transversal fracture in the right tibia. **C.** Postoperative Cr/Cd radiography. **D.** Postoperative clinical appearance of acrylic external fixator

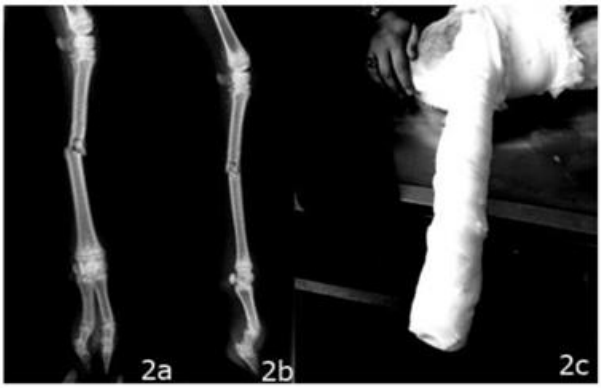

Figure 3. Case 22. **A.** Cr/Cd radiography of left radius/ulna diaphysis transversal fracture. **B.** M/L radiography of left radius/ulna diaphysis transversal fracture. **C.** Application of synthetic plaster on radius/ulna diaphysis transversal fracture

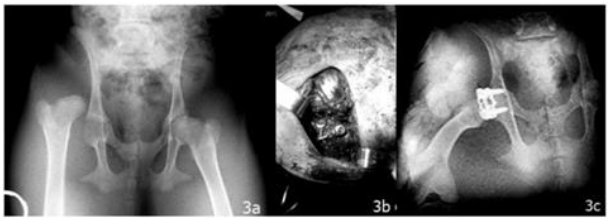

Figure 4. Case 23. **A.** V/D radiography of luxation in right coxofemoral joint. **B.** Operation of luxation by the Margaret Terrace method. **C.** Postoperative V/D radiography of luxation operation.

Figure 5. Case 26. **A.** Panophthalmitis in left eye. **B.**Exenteration bulbi operation on panophthalmitis. **C.**Postoperative appearence of exentration bulbi operation.

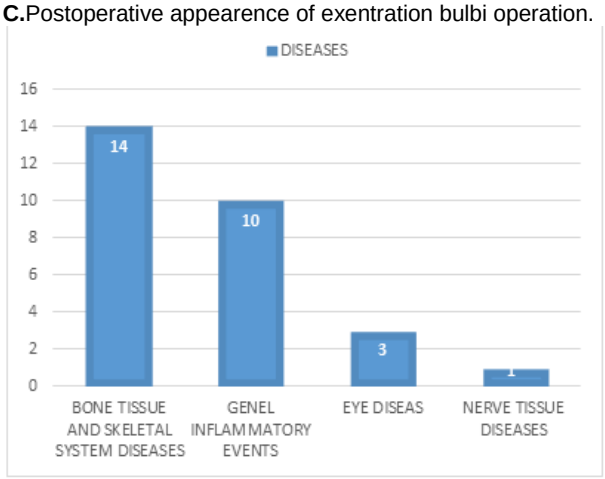

Figure 6. Assessment based on surgical lesions

Table 2. Evaluation of cases according to season-disease relationship (Crosstabulation)

		Disease				Total
		BTSSD	GIE	ED	NTD	
Season	Spring	0	2	1	0	3
	Summer	6	1	2	0	9
	Autumn	7	5	0	1	13
	Winter	1	2	0	0	3
Total		14	10	3	1	28

BTSSD: Bone Tissue and Skeletal System Diseases
GIE: General Inflammatory Events
ED: Eye Disease
NTD: Nerve Tissue Disease

The protocols that were used in the immobilization and simple interventions (tiletamine-zolazepam (4 mg/kg, IV) and the painful operative treatments (tiletamine-zolazepam (10 mg/kg, IV)-butorphanol (0.4 mg/kg, IV)-lidocaine) provided effective anesthesia in the goitered gazelles. The operations were completed without any cardiovascular or respiratory system complications related to the anesthesia protocol.

Discussion

As gazelles are animals that are sensitive, fast and hard to hold and capture, the probability of injury during the capturing process of these excitable animals is high. Severe injuries and deaths are very frequent while catching especially excessively aggressive and exhausted gazelles (1, 12, 20-22).

It was reported that mating in goitered gazelles (*Gazella subgutturosa*) takes places in the months of October to December (23), and it even continues until mid-January (2). It was emphasized that adult males in their mating period determine their territory, and in the estrous period, they are really aggressive towards other males without the need for female presence, they fight in the form of threatening, crushing and headbutting until they beat their opponent, and horn impacts in these fights may lead to fatal injuries (2, 23-25). Leclerc et al. conducted a retrospective study on greater kudu and determined that problems related to intraspecies aggression, inappropriate holding conditions, stress, crashing fences, capturing procedures or captivity may be a cause of trauma, the rates of trauma encountered in males are similar to those in females although in-herd fights among wild males of 4-7 years of age are frequent, and the age intervals of gazelles who have trauma/accident lesions are close (juvenile (27%), subadult (25%), adult (18%) and old (25%) (26). Nisbet et al. investigated the traumatic injuries of 20 roe deer (Capreolus capreolus) in a retrospective study and reported that the most frequent admissions were made in the months of June, July and November, and these were more frequent among males (n:12) than females (n:8) (27). In this study, in contrast to the findings of Leclerc et al. (26) and Nisbet et al. (27), it was seen that trauma lesions were more frequent in females [19 females (68%), 9 males (32%)], and the lesions were

seen mostly in juvenile gazelles [17 cases, 0-12-month-old (60.71%)]. Again, in difference to the study by Nisbet et al. (27), it was determined that there were more admissions in the months of September (21%) and October (21%). It was thought that the finding of the study on higher rates of trauma in female gazelles may be related to keeping these animals far from natural life in places such as houses and farms, their conditions of living and captivity-related stress as stated by Leclerc (26), and several other authors (19, 20, 23-25), the reason for the lesions in male gazelles may be their attempts to fight other males as they determined their territory and became more aggressive in the fall months where their estrous period started. The finding in our study that the admissions in the months of February (0%), March (3%) and April (3%) were the lowest was considered to be the result of the end of the mating period and the pregnancy status of females, which may have resulted in reduced aggression in males.

Nisbet et al. (27) stated that they encountered long bone fractures the most (n: 8) in roe deer, and among these bones, the most frequently broken ones were femurs (n: 4). In this study, with 14 cases (50%), the most frequently encountered condition was bone tissue and skeletal system disease. The highest number of femoral (n: 3) fractures in 8 patients with long bone fractures among bone tissue and skeletal system diseases was found to be consistent with the findings of Nisbet et al. (27).

In this retrospective study, among the juvenile and subadult gazelles, 17 were 0-12 months old (60.71%), 9 were 12-24 months old (32.14%) and 2 were 24-36 months old (7.14%), and these gazelles had more traumatic lesions, while no gazelle over the age of 3 was admitted. The reasons for observing more fractures in juvenile and young gazelles may include anatomic factors such as that their bone development has not been completed yet, their bones do not have sufficient resistance, and lack of complete fusing in their epiphysis lines, as well as issues such as that young gazelles do not yet have the experience that would protect them from dangers in their environment, and they have careless and active traits.

Several authors (7, 8, 10-15) have reported that situations of excessive excitement, fear and panic when gazelles are captured may lead to the acute stress known as CM that may result in sudden death, and the possibility of CM makes capturing gazelles, immobilizing them, and performing simple interventions, anesthesia and operative interventions more difficult. Some authors stated that opioid combinations in wild animals increase the risk of CM by causing excitement, spontaneous mobility, muscle rigidity, hypoventilation, catecholamine release and hyperthermia (11, 28), and they recommended the use of benzodiazepines such as zolazepam, diazepam and midazolam which provide a very good level of muscle relaxation by reducing muscle spasm and spasticity (11). As reported by other authors (11, 28), in this study, usage of the combination of tiletamine-zolazepam for immobilizing gazelles resulted in highly successful outcomes.

As a result, since gazelles have a timid and excited nature, more care should be taken in interventions to prevent complications that can cause sudden deaths, such as CM. Since the anesthesia protocols used in the current study did not cause any complications in gazelles, it was concluded that it could shed light on the veterinary clinicians working in the field and future studies to be carried out.

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