Scientific Works. Series C. Veterinary Medicine. Vol. LXIX (1), 2023
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

THORACIC TRAUMA UPDATES IN FELINE HIGH-RISE SYNDROME. WHAT CHANGED IN 30 YEARS? 50 CASES IN ONE YEAR

Seralp UZUN[1], Iuliana IONASCU[1], Florin DUMITRESCU[1], Dragos-Marian DUMITRASCU[1], Tiberiu Sebastian IANCU[1], Radu JERCAU[2], Catalina GEORGESCU[2], Dumitru MAGALEAS[2], Georgeta FILIP[2], Ada IONESCU[2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Splaiul Independenței, District 5, Bucharest, Romania
[2]University of Agronomic Sciences and Veterinary Medicine of Bucharest, University Veterinary Emergency Hospital "Prof. univ. dr. Alin Bîrţoiu", 105 Splaiul Independenței, District 5, Bucharest, Romania

Corresponding author email: seralp.uzun@gmail.com

Abstract

High-rise syndrome is a general definition of multiple traumatic injuries that cats experience after falling from a height of 2 or more floors of high-rise buildings in urban areas. This falling generally results with multiple injuries including thoracic, abdominal, orthopedic and craniomandibular or craniomaxillofacial trauma. The combination of multiple traumatic injuries can be life threatening. 50 cats diagnosed with high-rise syndrome between period December 2021 - December 2022 in Veterinary Emergency Hospital, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine. Thoracic trauma was diagnosed in 82% of cats. Pneumothorax was diagnosed in 54% of cats and Pulmonary contusions diagnosed in 50% of cats. Some cats diagnosed both pneumothorax and pulmonary contusion. Past 30 years, some authors pointed and rated the injuries they diagnosed in their articles and case reports. The aim of this study is to point increased thoracic trauma after high-rise syndrome related with hitting more hard grounds than past years in urban areas.

Key words: *high-rise syndrome, pneumothorax, pulmonary contusion, thoracic trauma.*

INTRODUCTION

Feline high-rise syndrome (FHRS) refers to combination of some traumatic injuries that cats experience after falling from a certain height (8 meters or 24 feet or 2 floors) generally in urban areas. High-rise syndrome, mostly reported and described in cats by several authors in the past. (Robinson 1976, Dupre et al., 1995; Flagstad et al., 1998; Papazoglou et al., 2001). This syndrome is also been reported in dogs (Gordon et al., 1993), but it is rare than in cats. In humans the terms “high-flyer syndrome” or “jumpers syndrome” were also used by some authors (Reynolds et al., 1971; Smith et al., 1975).

Some authors reported the relationship between the height of the fall and the severity of the injuries feline high-rise syndrome the severity of the injuries (Flagstad et al., 1998; Papazoglou et al., 2001) while some others focused severity of the traumatic injuries linearly with the height of the fall (Dupre et al., 1995).

According to popular belief, falls from a height usually happen while chasing a bird or an insect on the balcony or losing the balance and slipping on the edge of the balcony railing as well as window.

The aim of this study is statistically evaluating 50 cats which were diagnosed with FHRS between December 2021 and December 2022 in the Veterinary Emergency Hospital of USAMVB and focus on increased thoracic trauma percentages than previous reports and articles.

All kind of injuries were documented, likewise the timing of the fall (night or day time), the ground they hit (soft soil garden or concrete) to understand the severity of the injuries with thoracic trauma and also to understand if there is a relationship with height.

MATERIALS AND METHODS

In the period between December 1, 2021 and December 1, 2022 50 cats were treated after high-rise syndrome in the Veterinary Emergency Hospital of University of Agronomic Sciences and Veterinary Medicine, Bucharest (USAMVB). Only the cats which felt from second and higher floors included in this study. Trauma triage was performed to all the cases. Depending on the triage further diagnostic tools were performed such as biochemical and hematological analysis. Fast thoracic (T-FAST) and fast abdominal (A-FAST) ultrasounds were performed to all patients as a general trauma approach protocol. X-rays or computed tomography (CT) performed only after patients were stabilized.

To evaluate the traumatic injuries, we used following criteria:

- Thoracic trauma, pulmonary contusions, pneumothorax, hemothorax and traumatic diaphragmatic hernia (TDH) - score 3;
- Epistaxis, craniomaxillofacial fractures, colon vertebrae fractures and dislocations, hard palate fractures and abdominal trauma with bladder rupture or urethral rupture - score 2;
- Orthopedic fractures and luxations - score 1

Based on this scoring system, each kind of injuries summed up. As an example, if a cat diagnosed with pneumothorax and pulmonary contusions with a fractured femur scored as; 3+3+1 = 7 whereas if a cat had two metatarsal fractures with fractured radius and ulna scored as; 1+1+1+1 = 4. Each fracture scored with 1 point. Thus, if a cat had more than one metacarpal or metatarsal fractures each counted as 1.

All cats were evaluated with impact force they exposed after hitting the ground to understand the relationship between the weight of the cats and the height they felt from. At the same time, to find out the minimum impact force that can cause thoracic trauma, pneumothorax and/or pulmonary contusion. To calculate the impact force "Newton's second law of motion" is needed. This law basically describes of the changes that a force can produce on the motion of a body.

Second law of motion states that the time rate of change of the momentum of a body is equal in both magnitude and direction to the force imposed on it. The momentum of a body is equal to the product of its mass and its velocity and the equation is $F = ma$, where F (force), m (mass) and a (acceleration) are both vector quantities. Secondly the "conservation of energy" must be considered. Conservation of energy manifests that energy isn't created or destroyed, just transformed from one form into another.

The conservation of energy is needed to calculate how much kinetic energy an object has just before the point of impact. This is the energy which the object has all come from the gravitational potential it has before falling and the equation is $E=mgh$, where E is the energy, m is the mass of the object, g is the acceleration due to gravity constant (*9.81 m* s^{-2} *or 9.81 meters per second squared*), and h is the height the object falls from.

The other information that we know from the impact force calculation is the penetration. As an example, if an object penetrates into the ground after the impact, the impact force that it will be exposed is smaller. In another words, greater penetration implies smaller impact force while higher impact force will be exposed by the object if it hits to harder ground because hard ground means less penetration. The other information is that if the object bounces back, the impact force will be even greater because of greater chance in momentum and many cats bounce back little or more after falling and hitting the ground.

With all those information the formula will be;

$$\text{average impact force} = \frac{\text{kg} \times 9.81\ \text{m}/s^2 \times \text{m}}{\text{d}}$$

d is the average distance that the object bounces after the impact. For our study we assumed d as 0.1 m = 10 cm for all the cats hit the ground.

In modern building constructions the average height of the second floors are between 4.7 and 5.8 meters depending on the construction materials used.

In this study the average of the second floor considered as 5.25 meters and each floor after second floor considered as 3 meters.

According to the average impact force formula and all the data, if a cat with 3.5 kg body weight falls from 5th floor (14.25 meters height), the average impact force that the cat exposed will be 4887.7 Newton(s) N.

RESULTS

During the defined period age ranges of the cats with HRS were between 3 months and 11 years old. It was determined that the majority of cats felt from a height were one year old or below, 44% (22/50). The oldest cat was 11 years old (Figure 1).

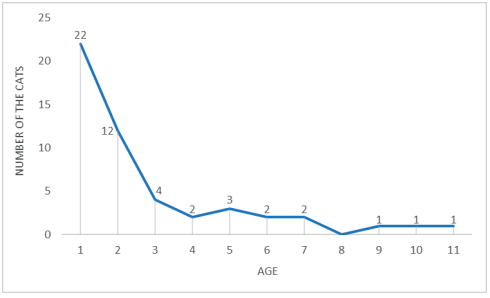

Figure 1. Age dispersion of the cats with HRS

Maximum number of the falls happened in July (13 cats), while the minimum was in January (1 cat). In March and April, we didn't receive any cats felt from balcony or window.

Remarkably 13 cats were brought to the hospital between October and January which mostly owners said that cats jumped from the window or felt from the edge of the balconies right after they arrived home and opened the windows to have fresh air in the house (Figure 2).

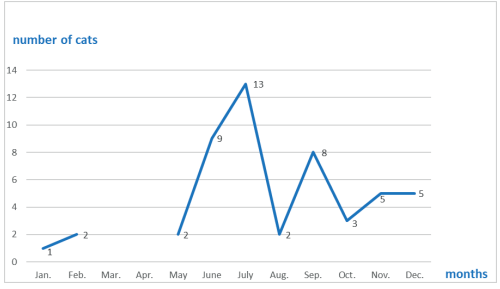

Figure 2. Number of cats and months they felt from balconies or window

46% of the cats were female (23/50), 24% were male (12/50), 10% of the cats were spayed females (5/50) and 20% of the cats were neutered males (10/50) (Figure 3).

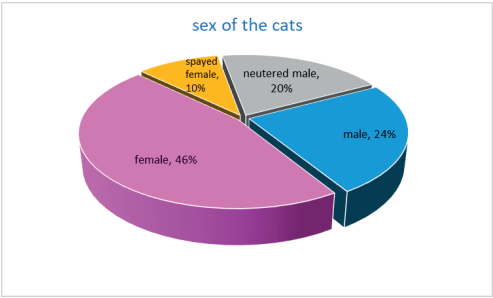

Figure 3. Sex dispersion of the cats with HRS

31 cats fell at night time while 19 cats felt during the day time. 5 neutered males felt at the night time and 5 neutered males felt in the day time. 2 male cats felt in the day time, while 10 non-neutered males felt at the night time. Similar results are also found in female cats. 3 spayed females felt in day time, while 2 spayed felt at night. 9 females felt in the day time and remarkably 14 non-spayed females felt at night (Figure 4). This valuable information helped us to understand cats' behavior. We all know that cats are night hunters by nature. Therefore, high-rise syndrome were observed mostly at night period. The other finding was that spayed and neutered cats probably were less active at night time than the non-spayed and non-neutered cats.

This also might be evidence of behavioral changes after spaying or neutralizing. Besides we learned 2 female and 1 male cats knowledge high-rise syndrome 1 year before approximately the same period.

Thoracic trauma was diagnosed in 82% (41/50) of cats. All those cats received supplemental O_2 via flow-by, mask or O_2 cabin technique due to respiratory distress, dyspnea, or cyanosis. Pneumothorax was present in 65.8% (27/41) of these cats with thoracic trauma. Thoracentesis carried out bilaterally to all those 27 cats without rushing the radiography to avoid extra stress and as well as not to worsen the respiratory situation.

Thoracentesis is our hospital's protocol for dyspneic, thoracic trauma patients due to its diagnostic and therapeutic purposes.

12h to 24h hours later, when the cats stabilized, radiographic images confirmed also the existence of pulmonary contusions in 55.5% (15/27) of the cats which were also had pneumothorax. 24.3% (10/41) of the cats with thoracic trauma presented only pulmonary contusions. All the cats with pneumothorax treated with thoracentesis or chest tube placement.

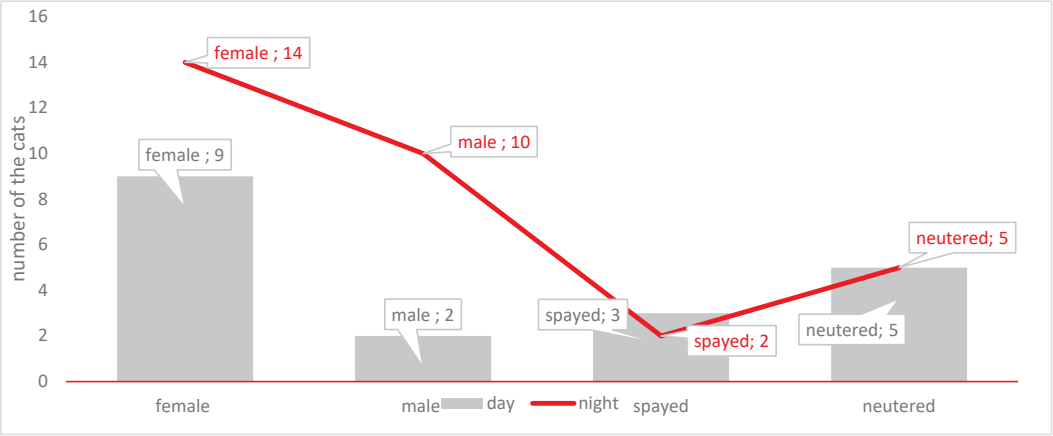

Figure 4. Cats sex dispersion and falling period relations

Only one 9 years old 4.2 kg one female cat which felt from 8th floor was diagnosed with spontaneous pneumothorax. For this cat thoracentesis performed in each 8 h for the first 36 h and in each 12 h for the following 24 h. Atelectasis, collapsed lung lubes on the right side diagnosed via computed tomography (CT) and the lung lobectomy surgery performed via sternotomy. Unfortunately, this patient passed away one hour later the surgery in ICU. The other 1 year old, 3 kg body weight, cat which felt from 6th floor died in 30 minutes after entering to emergency room due to hemothorax. Nevertheless, the survival rate was 96% (48/50).

4% (2/50) cats were diagnosed with traumatic diaphragmatic hernia and both cats were taken to surgery 24 h to 36 h later after they came to hospital.

4% (2/50) cats had rib fractures and 1 cat clinically diagnosed with flail chest.

Thoracic trauma was diagnosed regardless of floor difference. While pneumothorax and pulmonary contusion were diagnosed together in 33.3% of the cats which felt from the 5th floor. Pulmonary contusion and pneumothorax were diagnosed together in 44.4% of the same number of the cats which felt from the 6th floor. One cat which felt from the highest floor (10th floor), diagnosed with only pneumothorax and the oldest cat (11 years old) which felt from 5th floor also diagnosed with only pneumothorax (Table 1).

Incidence of thoracic trauma in female cats were 86.2% (25/29) while the incidence of thoracic trauma in male cats were 76.1% (16/21).

Incidence of pneumothorax diagnosed together with pulmonary contusions in the majority of cats at 1 year old and below was 31.8% (7/22). This value was even greater than the pneumothorax and pulmonary contusion component diagnosed together in all cats in other age groups 25% (7/28).

Impact force calculated for each cat to understand the relationship between impact force and thoracic trauma.

Cats diagnosed with thoracic trauma had an average body weight of 5.7 kg and the average impact force they experienced was 2919.75 N, felt from the 2nd floor.

Table 1. Thoracic trauma relation with the height

	Pneumothorax	Pulmonary contusions	Pneumothorax & Pulmonary contusions	Hemothorax	Flail chest	Traumatic diaphragmatic hernia	Without thoracic trauma
2nd floor	3		2				2
3rd floor		2	1				1
4th floor	2	1	2				
5th floor	2	1	3	1			2
6th floor	3		4		1		1
7th floor	1	3					3
8th floor		3	3			2	
10th floor	1						

The average body weight of the cats which felt from 3rd floor was 4.5 kg and the average impact force they experienced was 3638.25 N. The average body weight of the cats which felt from 4th floor was 3.2 kg and the average impact force they experienced was 3555.55 N. The average body weight of the cats which felt from 5th floor was 4 kg and the average impact force they experienced was 5638.3 N. The average body weight of the cats which felt from 6th floor was 3.3 kg and the average impact force they experienced was 5530.32 N. The average body weight of the cats which felt from 7th floor was 3.8 kg and the average impact force they experienced was 7441.85 N. The average body weight of the cats which felt from 8th floor was 3.9 kg and the average impact force they experienced was 8848.15 N.

All cats evaluated with a special traumatic injuries score system. Each injury added to main thoracic trauma scores. Only 4 cats diagnosed with thoracic trauma did not present any other injuries. Rest of the cats with thoracic trauma also presented with multiple other injuries. 12% (6/50) of the cats diagnosed with hematuria. Other than hematuria, abdominal injuries not observed in 50 cats.

11 cats were hypothermic, body temperatures were between 35.1°C-36.3°C. Those cats were kept in oxygen incubators with heating pads until their body temperature turn back to normal range.

Tibia was the most frequently fractured bone (11 cats). Tibia followed by radius bone fractures (9 cats). 8 of the cats also presented with ulna fractures.

One cat had radius and ulna fractures in both legs. 8 cats diagnosed with metacarpal fractures. Those cats had more than one metacarpal bone fracture. In total 21 metacarpal fractures were diagnosed. Fractured femur diagnosed in 6 cats. 42% (21/50) of the cats diagnosed with single one bone fracture. 58% (29/50) of the cats diagnosed with multiple fractures (Table 2).

3 cats clinically diagnosed with hard palate fracture. 2 cats were diagnosed with craniomaxillofacial fractures and 1 cat with mandibular fracture. Esophagostomy feeding tubes placed 3 of those 6 cats.

Coxofemoral luxations diagnosed in 5 cats. femoral head ostectomy (FHO) performed to those cats.

Titanium implants used in all radius, tibia, femur and pelvic fractures. Only in one cat intramedullary pin used due to economic reasons of the owner.

Cats with the rib fractures treated with cage rest.

Spinal fusion surgery performed to a cat with colon vertebrae fracture. This cat hospitalized 21 days and discharged home after.

Table 2. Fractures and luxations dispersions in cats after HRS

Fractured bones and injuries	Number of cats
Metacarpal fractures	8
Radius	10
Ulna	9
Scapula	1
Craniomaxillofacial	2
Mandibula	1
Hard palate fractures	3
Rib fractures	2
Vertebral fractures	2
Pelvic fractures	4
Sacroiliac fractures /luxations	3
Coxofemoral luxations	5
Femur	6
Tibia	11
Metatarsal fractures	1

According to special traumatic injuries score system (TIS), Female cats were diagnosed with more severe injuries than male cats. Average traumatic injuries score of female cats were higher than male cats. Even though, interestingly the average TIS were greater in 1 year old and younger males than the same age range female cats (Average TIS = 6.3 male cats, age 1 and below/Average TIS = 5.13 female cats age 1 and below). No remarkable difference found between young and old cats with TIS (Average TIS = 5.7 in cats, 1 year old and below/Average TIS = 5.4 in 2 years and older cats).

DISCUSSIONS

High-rise syndrome is seen mostly younger cats. Younger cats fall from balconies and windows whilst playing, chasing a bird or butterfly (Vnuk et al., 2004). The mean age of the cats in our study was 2.76 years. 44% (22/50) of the cats were 1 year old and below. Whitney and Mehlhaff (1987) reported that 65% of the cats were under age 3. The mean age of the cats in our study were higher then that reported by Dupre et al. (1995) - 2.5 years, Flagstad et al. (1998) - 2.3 years, Vnuk et al. (2004) - 1.8 years and even older than the mean age of the cats reported by Papazoglou et al. (2001) - 1.2 years.

Papazoglou et al. (2001) reported 51% males, 46% females, 1% neutered males, 1% spayed females and 1% unrecorded gender status. Whitney and Mehlhaff (1987) reported 48% females and 48 % males and 4% unrecorded. In that study also mentioned that 23% males were neutered and 27% females were spayed. Vnuk et al. (2004) reported 53.8% were females, 42% males, neutered males 3.4% and undetermined 0.8% in their study. In our study 46% of the cats were females, 24% males, 10% spayed females and 20% neutered males. The study of Papazoglou et al, were covering the years between 1988-1998 in Greece with the greatest percentage of males experienced high-rise were in their study (51%). The study of Vnuk et al, were covering the years between 1998-2001 in Croatia which male percentage were 24%. Our study covers one year between December 2021 and December 2022 in Bucharest, Romania with a percentage of the males 24%. In our study neutered males were 20% which were higher than the studies of Papazoglou et al. and Vnuk et al.

The decreasing percentage of males experienced high-rise syndrome may be due to increasing numbers of neutralized males in years.

Yet, we do not know the percentage of cats fell from balconies or windows in day time and/or at night from many other authors' studies. Papazoglou et al. (2001) reported the majority of the cats fell during day time in their study, while Whitney and Mehlhaff (1987) reported %40 fell at night. In our study 38% of the cats fell from high buildings in the day time and 62%, were fell at night. The nighttime fall rate of non-spayed female cats 28% (14/50) was significantly higher than the daytime fall rate of non-spayed female cats in our study 18% (9/50). The result we found was even more interesting when we made the same comparison between non-neutered male cats. (4% (2/50) day time fall - 20% (10/50) night time). This differences and the higher value of night time falls, inevitably brings to mind the question of whether cats are jumping from a balcony or a window with the instinct of hunting rather than a game or sexual urge.

Thoracic trauma was diagnosed in 82% of the cats. Only pneumothorax was diagnosed in 12 cats. Only pulmonary contusion was diagnosed in 10 cats. However, 15 other cats diagnosed with pulmonary contusion and pneumothorax together. This was clear finding that the incidence of pneumothorax were 54% and 50%

pulmonary contusion. Whitney and Mehlhaff (1987) diagnosed 90% of cats with thoracic trauma, pneumothorax in 63% of cats and pulmonary contusions in 68% of cats in their study. Papazoglou et al. (2001) reported thoracic trauma in only 13% of the cats, pneumothorax 4% and pulmonary contusions as 6.8% in 207 cats between 1988 and 1998 in Greece. Flagstad et al. (1998) diagnosed pneumothorax only in 7.1% of the cats in Denmark. Vnuk et al. (2004) reported 33.6% pneumothorax and 20% pulmonary contusions in 119 cases between 1998 and 2001 in Croatia. Merbl et al. (2013) reported 21.5% pneumothorax and 18.7% pulmonary contusions in 107 between 1999 and 2009 in Israel.

The percentage of pulmonary contusions were extremely higher than other authors' reports except study of Whitney and Mehlhaff (1987). Whitney and Mehlhaff recommended thoracic radiographies in all cats and thoracic radiography carried out in 69% of the cats in their study. Papazoglou et al. (2001) reported thoracic radiographies were carried out in all cats. Vnuk et al. (2004) reported thoracic radiographies carried out only in cats which were showing the abnormal respiration. In our study thoracic radiographies carried out on all cats but only after they were clinically stabilized. Besides all the pneumothorax cases diagnosed with thoracentesis in the emergency room before radiographs. Thoracentesis is our protocol before thoracic radiographs or CT scans not to worsen the situation in dyspneic patients. Besides timing of radiographs are seriously important for diagnosis in pulmonary contusions. Because pulmonary contusions may not appear up to 6-12 h post trauma. The low appearance of pulmonary contusions in other reports may due to timing of the radiographs or due to some animals with thoracic trauma may have minimal clinical signs or even none (Aron and Roberts, 1993). In those animals, possible thoracic trauma was not diagnosed.

If we look closely to the cat numbers and the years of the reports, we can think more cats will be observed with thoracic trauma in the future, due to the change in living style, moving to higher buildings. We think that concretization in cities and the risk of cats falling on concrete grounds more frequently increased.

In addition, 27 cats diagnosed with pneumothorax in our study and 15 of those cats were also diagnosed with pulmonary contusion which the percentage were 55.5%. This strong finding reinforcing the fact that it would not be strange to suspect the presence of pulmonary contusion in cats which are clinically diagnosed with pneumothorax in HRS.

Pneumothorax and pulmonary contusions and other thoracic traumas were diagnosed in all floors that cats fell from. This clinical finding disproves the thesis that cats would have less thoracic trauma if they fall from lower floors.

Vnuk et al. (2004) reported 38.5% cats with forelimb fractures. Papazoglou et al. reported 68% of the limb fractures were forelimb fractures. Merbl et al. (2013) reported 16.8% forelimb fractures. Zaghloul and Samy (2018) reported 20% out of 45 cases between 2015 and 2018 in Egypt but not reported any thoracic trauma. Catalkaya et al. (2022) reported 22.2% forelimb fractures in 72 cases in 2019 in Turkey but also not reported any thoracic trauma, pneumothorax or pulmonary contusions. This difference may be due to their reports mostly focused on orthopedic injuries. In our study forelimb fractures percentage was 68% in total bone fractures. Unlikely the cats with hindlimb fractures, all the cats diagnosed with forelimb fractures also diagnosed with thoracic trauma, pneumothorax and/or pulmonary contusions. This interesting clinical finding makes us believe that there can be high incidence of thoracic trauma existence in the cats with forelimb fractures after high-rise syndrome.

Unlike the studies of other authors, in our study the impact force calculations were made to understand if there is a relation between thoracic trauma and the impact force that cats are experiencing while hitting the ground.

All average impact force and the average body weight, which play a role in the formation of pneumothorax and pulmonary contusion, are listed floor by floor in our study.

One of the interesting findings regarding the effect of impact force on thoracic trauma was that 2 cats with the same body weight (3.3 kg) also both felt from 8th floor in different times. Both cats clinically diagnosed with

pneumothorax and pulmonary contusions. The impact force they faced was 7519 N. Another interesting finding was with the cat 4.4 kg body weight. This cat felt from 10th floor and experienced 12612.6 N impact force while hitting the ground. However, the cat diagnosed with only pneumothorax and without any orthopedic injuries. Next surprising clinical finding was the cat with 6,5kg body weight fell from 6th floor. This cat also experienced extremely high impact force, 10988.2 N and diagnosed with only fractured tibia.

Instead of these two exception cases, we do believe there might be strong effect of the impact force on thoracic trauma. But yet to prove this we need to study on many more cases.

REFERENCES

Aron, D.N., Roberts, R.E., (1993). Pneumothorax. In: Bojrab, A. (Ed.), *Disease Mechanism in Small Animal Surgery*. Lea & Febiger, Philadelphia, pp. 396e403.

Catalkaya, E., Altan, S., Ersoz-Kanay, B., Yayla, S., Saylak, N. (2022). Clinical and etiologically evaluation of cats with high-rise syndrome: assessment of 72 cases (A retrospective study). *MAE Vet Fak Derg, 7*(1): 20-25, 2022DOI: 0.24880/maeuvfd.957535

Dupre, G., Allenou, A., Bouvy, B., (1995). High- rise syndrome: retrospective study on 413 cats. *Veterinary Surgery 24,* 294.

Flagstad, A., Arnbjerg, J., Jensen, S.E., (1998). Feline high-rise syndrome in the greater metropolitan area of Copenhagen. A four-year retrospective study. *The European Journal of Companion Animal Practice 9,* 165-171.

Gordon, L.E., Thacher, C., Kapatkin, A., (1993). Highrise syndrome in dogs: 81 cases (1985-1991). *Journal of the American Veterinary Medical Association 202,* 118-125.

Merbl, Y., Milgram, J., Moed, Y., Bibring, U., Peery, D. and Aroch, I. (2013). Epidemiological, Clinical and Hematological Findings in Feline High-Rise Syndrome in Israel: A Retrospective Case-Controlled Study of 107 Cats. *Israel Journal of Veterinary Medicine. Vol. 68*(1).

Papazoglou, L.G., Galatos, A.D., Patsikas, M.N., Savas, I., Leontides, L., Trifonidou, M., Karayianopoulou, M. (2001). High-rise syndrome in cats: 207 cases (1988e1998). *Australian Veterinary Practitioner 31*(3), 98-102.

Reynolds, B.M., Balsano, N.A., Reynolds, F.X. (1971). Falls from heights: a surgical experience of 200 consecutive cases. *Ann. Surg. 174,* 304-310.

Robinson, G.W., 1976. The high-rise trauma syndrome in cats. *Feline Practice 6,* 40e43.

Smith, M.D., Burrington, J.D., Woolf, A.D. (1975). Injuries in children sustained in free falls: an analysis of 66 cases. *Journal of Trauma 15*, 987-991.

Zaghloul A. E. and Samy A. (2018). High Rise Syndrome: A Correlation Between Height and Affections In 45 Cats from Urban Areas. *Alexandria Journal of Veterinary Sciences AJVS. Vol. 59*(1): 43-48.

Whitney, W.O., Mehlhaff, C.J. (1987). High-rise syndrome in cats. *Journal of the American Veterinary Medical Association 191*, 1399-1403.

ANIMAL PRODUCTION, PUBLIC HEALTH AND FOOD QUALITY CONTROL