



Assessment on the “Tail Pull Injuries”: Case Series of 8 Cats

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Abstract: Tail-pulling injuries in cats often occur with trauma or pinching of the tail. This condition often causes damage to the nerves that supply the tail, bladder, perineum, and anus. An accurate and good neurological examination is necessary to grade the severity of the injury. The aim of this study in a case series of 8 cats with "Tail Pulling Injuries" was to discuss the clinical results and to provide practical information. Medical records of cats with tail-pulling injuries, loss of voluntary movement of the tail, and loss of pain perception were reviewed retrospectively. Among the cats with tail pull injuries, those with open tail fractures, tail wounds requiring amputation, and spinal trauma were excluded from the study. According to neurological examination findings and tail condition, medical treatment and tail amputation were performed if necessary. Seven of the eight cats in the study had fully recovered by the end of the second week. As a result, in the case of tail pull injuries in cats, if there is no fracture or luxation-related gap, amputation should not be considered immediately. It can be supported by an effective medical treatment. In addition, amputation will be inevitable if there is a gap due to a fracture or luxation in the tail.

Keywords: Cat, Nerve damage, Tail pull injuries, Urinary and fecal continence.

Kuyruk Çekme Yaralanmaları” Üzerine Değerlendirme: 8 Kedilik Vaka Serisi

Özet: Kedilerde kuyruk çekme yaralanmaları genellikle travma veya kuyruğun kısırılması ile ortaya çıkar. Bu durum genellikle kuyruğu, idrar kesesini, perineumu ve anüsü besleyen sinirlerde hasara neden olur. Yaralanmanın ciddiyetini derecelendirmek için doğru ve iyi bir nörolojik muayene gereklidir. "Kuyruk Çekme Yaralanmaları" olan 8 kedi vaka serisindeki bu çalışmada, klinik sonuçların tartışılması ve uygulamaya yönelik bilgiler verilmesi amaçlanmıştır. Kuyruk çekme yaralanması, istemli kuyruk hareketi kaybı ve ağrı algısı kaybı olan kedilerin tıbbi kayıtları retrospektif olarak incelendi. Kuyruk çekme yaralanması olan kedilerden açık kuyruk kırığı, amputasyon gerektiren kuyruk yarası ve omurga travması olanlar çalışma dışı bırakıldı. Nörolojik muayene bulguları ve kuyruğun durumuna göre medikal tedavi ve gerekli görüldüğünde kuyruk amputasyonu yapıldı. Çalışmadaki 8 kediden 7'si ikinci haftanın sonunda tamamen iyileşmişti. Sonuç olarak kedilerde kuyruk çekme yaralanmalarında kırık veya luksasyona bağlı boşluk yoksa hemen amputasyon düşünülmemelidir. Etkili bir medikal tedavi ile desteklenebilir. Ayrıca kuyrukta kırık veya çıkık nedeniyle boşluk oluşursa amputasyon kaçınılmaz olacaktır.

Anahtar Kelimeler: İdrar ve fekal kontinans, Kedi, Kuyruk çekme yaralanmaları, Sinir hasarı.

Introduction

"Tail pull injury" in cats, is a common traumatic situation caused by tail pulling. This situation occurs because of pulling the tail when the cat is trying to escape when it gets stuck somewhere. It usually occurs with trauma affecting the pelvis (Barnes, 2020; Brooks, 2021; Couper and Decker, 2020; Meeson and Corr, 2011; Tatton et al., 2009). The cause of the developing neurological deficit is associated with hemorrhage, edema, and rupture of nerve roots in the terminal spinal cord (Couper and Decker, 2020; Tatton et al., 2009). In addition, coccygeal fractures and/or dislocations and caudal sacral fractures are also considered tail-pulling injuries. Because almost all of them have similar clinical symptoms their treatments are identical. A tail pull injury may also occur as a single lesion following trauma or in association with multiple pelvic fractures/iliosacral luxations, hind limb fractures, spine fractures, lung contusions, or other soft tissue injuries (Brooks, 2021; Davies and Walmsley, 2012; Flegel, 2016; Meeson and Corr, 2011).

Clinical signs in cats that develop tail-pulling injuries may include urinary and fecal incontinence, paraparesis, and tail paralysis (Barnes, 2020; Brooks, 2021; Caraty et al., 2018; Couper and Decker, 2020; Davies and Walmsley, 2012). Caudal nerve lesions cause tail paralysis, while damage to the pelvic or pudendal nerves causes urinary and fecal dysfunction (Couper and Decker, 2020; Davies and Walmsley, 2012; Lanz, 2002; Tatton et al., 2009).

Diagnosis of tail-pulling injuries is usually straight forward, and sacrocaudal luxation, subluxation, or fracture is often easily identified by radiological examination. The prognosis in cats with tail-pulling injuries varies depending on the severity of the nerve damage. While paraparesis is usually temporary, the return of urinary and fecal continence may take longer (Couper and Decker, 2020; Davies and Walmsley, 2012; Meeson and Corr, 2011).

This study aimed to evaluate "Tail Pull Injuries" in a case series of 8 cats.

Material and Methods

In this study, the medical records of cats with tail-pulling injuries, loss of voluntary movement of the tail, and loss of pain perception between 2019 and 2023 were retrospectively reviewed. This study protocol was approved by the Dicle University Health Sciences Application and Research Center Local Ethics Committee (E-35582840-020-471830). Among the cats with tail pull injuries, those with open tail fractures, tail wounds requiring amputation, and spinal trauma were excluded from the study. However, cats presenting with orthopedic problems in the hind limbs were not excluded.

A detailed neurological examination was performed after a general and systemic examination for each cat included in the study. During the neurological evaluation, the focus was on the somatic caudal and pudendal nerves because the somatic nerve is responsible for the voluntary motor function of the tail and pain perception. The pudendal nerve is responsible for perianal and perineal reflexes.

The behavior of the cat during urination was observed. The position of urinating on the sand with the normal flow was evaluated as normal urination behavior. In addition, if the urinary bladder was empty or not filled on palpation of the caudal abdomen and there was wetness on the sand, this was considered incontinence.

Ventrodorsal and lateral images were taken for tail radiographic evaluation of all cats.

The classification in Table 1 was categorized into five grades as previously defined by the authors (Grierson, 2011; Smeak and Olmstead, 1985).

Table 1. Classifications for tail pull injuries in cats (from Smeak and Olmstead, 1985; Grierson, 2011).

Grade	Neurological signs	Nerves	Prognosis for urination
I	Hyperesthesia	-	Excellent
II	Flaccid tail paralysis	Coccygeal	Excellent
III	-Flaccid tail paralysis, -Some residual urine	Coccygeal Pelvic	Good in most cases
IV	-Flaccid tail paralysis, -Some residual urine, -Perineal reflex and anal tone reduced	Coccygeal Pelvic Pudental	75 per cent recovery rate
V	-Flaccid tail paralysis, -Some residual urine, -Perineal reflex and anal tone reduced, -Urethral tone diminished or absent (easy to express bladder)	Coccygeal Pelvic Pudental	50 per cent recovery rate

For cats with tail pulling injuries, either cage rest was recommended or surgically amputated. In cases where the bladder could not be emptied due to decreased detrusor tone and/or increased urethral sphincter tone, bethanechol (cholinergic): (Myocholine® 10 mg, Glenwood GmbH, München/Germany) 1.25–7.5 mg/cat (twice a day) was used to increase bladder detrusor muscle tone as medical treatment. Alfuzosin (α 1 blocker) (Xalfu® XL 10 mg,

Eczacıbası, İstanbul/Türkiye): 2.5 mg/cat (once a day) was used to decrease urethral sphincter tone.

Results

In this retrospective review, eight cats (five males, three females) were investigated from 2019 to 2023 for tail pull

injuries. Their average age was two years (min 7 months, max four years). All eight cats had a history of trauma. These were in the form of a traffic accident (3 cats) and pinching his tail (5 cats).

According to the classification given in Table 1, 4 cases were grade III, 3 cases were grade IV, and 1 case was grade V.

All cats included in the study, one had sacrocaudal luxation, 2 had caudal luxation, 3 had a fracture of the caudal vertebra, and 2 had a fracture of the end plate of the caudal vertebra.

Clinical examination, showed that all cats lost voluntary motor functions and pain sensation in the tail. Urinary incontinence was detected in 5 out of 8 cats. Only 1 of 5 cats with urinary incontinence also did not have perianal and perineal reflexes.

According to radiographic findings, the reason for tail amputation in five cats was luxation and an elongated space in the end plate fracture. In the other three cats, medical treatment was applied with cage rest. In the controls at the end of the second week, improvement was achieved in 7 cats, while urinary incontinence continued in only one. Although using bethanechol and alfuzosin partially relieved this cat, no permanent improvement was achieved. Although this cat was cared for in this way from 6 months to 2.5 years old, it was eventually requested to be euthanized by the family.

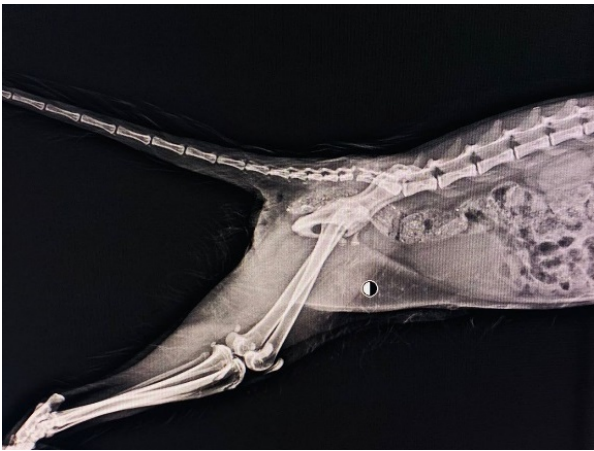


Figure 1. C1 vertebral fracture. A case in which cage rest and medical treatment were applied.



Figure 2. A case of sacrocaudal luxation. The tail was amputated and no urine leakage or dripping was observed.

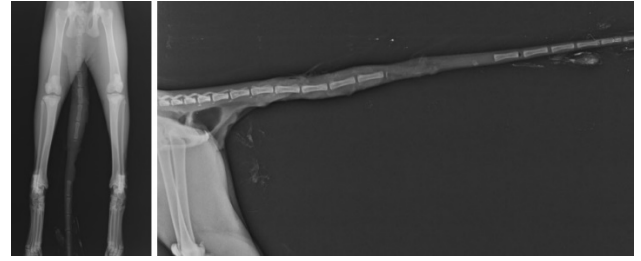


Figure 3. A case of end plate fracture in the tail vertebrae.

Discussion and Conclusion

Tail-pulling injuries are seen chiefly in traffic accidents. It is thought to develop when the body moves when the cat's tail is pinched in the accident. In this context, coccygeal fractures and/or dislocations, and caudal sacral fractures are also considered under tail pulling injury. Because all of these can cause similar clinical symptoms and therefore need to be handled similarly (Davies and Walmsley, 2012; Flegel, 2016). All our cases had a traumatic history. Among these, traffic accident (3 cases) was more common, but it was also caused by the force of the cat when the tail was compressed (5 cases). Tail-pulled injuries with spinal trauma were not included in the case selection. Cats with another fracture with tail pull injuries were not restricted, but these eight cats did not have a second orthopedic or neurological disorder.

A tail pull injury may be a single post-traumatic lesion, but it should be remembered that it may be associated with orthopedic or soft tissue trauma. Tail pull injuries can sometimes be associated with pelvic fractures/sacroiliac separation, hindlimb fractures, spine fractures, lung contusions, pneumothorax, or head injuries (Davies and Walmsley, 2012, Flegel, 2016). Therefore, trauma should be considered in tail-pulling injuries, and chest radiographs should be taken and evaluated for additional lesions. Similarly, the hind leg or pelvis should be carefully examined (Caraty et al., 2018; Flegel, 2016). Tail-pulling injury was alone in all cases included in our study. Cats exposed to trauma will likely experience the conditions described above, along with a tail pull injury. However, the small number of cases (8 cats) in our study and the fact that five of them had a history of compression does not change the situation. Therefore, it should be evaluated regarding thorax and head trauma as well as other orthopedic problems.

In coccygeal spinal cord injuries, it is expected to cause sensory and motor defects only in the tail. However, tail-pulling injuries can cause significant traction on nerve roots. Also, sacral and caudal lumbar spinal segments may be affected (Caraty et al., 2018; Flegel, 2006). Therefore, hindlimb motor dysfunction and voiding disorders may be common (Barnes, 2020; Flegel, 2016, Granger et al., 2020). Depending on the severity of the traction, spinal cord segments may be affected. When the pelvic nerve (S1–3) is affected, a "drooping tail" condition occurs (Flegel, 2006; Gandini, 2017). However, voiding disorders resulting from impaired innervation of the bladder detrusor muscle and urethra are more critical for the long-term prognosis of the cat (Barnes, 2020; Flegel, 2006; Gandini, 2017; Granger et al.,

2020). Therefore, the pudendal nerve should also be evaluated (Flegel, 2016; Tatton et al., 2009). In our study, conditions other than tail-pulling injury were investigated in all cats who were examined in general. After head and chest trauma evaluation, an orthopedic examination was performed. After ruling out other conditions, he focused on the tail pull injury. In this context, in the neurological evaluation, tail voluntary motor function and tail pain perception evaluation were performed for the somatic caudal nerve. Perianal and perineal reflexes were evaluated for pudendal nerve evaluation.

The classification method for tail pull injuries in cats, described in previous studies (Brooks, 2021; Grierson, 2011; Smeak and Olmsteas, 1985), has provided great convenience. The results obtained from our study were consistent with this classification. Only one case had urinary leakage and tail amputation was not performed in this case. Moreover, it was grade V according to the classification.

Therapeutic options include medical treatment and different surgical approaches (Bernasconi et al., 2001; Brooks, 2021; Davies and Walmsley, 2021; Flegel, 2016). In many cases, when detrusor tone decreases and/or urethral sphincter tone increases, the bladder cannot be fully emptied as a result. Both of these conditions are treatable. Bethanechol (cholinergic) improves bladder detrusor muscle tone (Brooks, 2021; Davies and Walmsley, 2021; Flegel, 2016). Agents such as alfuzosin (α 1 blocker), phenoxybenzamine (a non-selective alpha blocker), prazosin (α 1 blocker) or acepromazine, diazepam (striated muscle relaxant) are recommended to reduce urethral sphincter tone (Davies and Walmsley, 2012; Flegel, 2016). In our study, cats with grade IV (3 cats) and grade V (1 cat) were supported with medical treatment. While only bethanechol was given to grade IV cats, alfuzosin was used with bethanechol for grade V. However, there was no radical improvement in one cat in grade V. The other seven cats recovered entirely at the end of the second week.

There are two different considerations for the decision to amputate the tail. The first is that a paralyzed tail will be useless to the cat. In addition, the tail in this condition is contaminated with urine and feces and may cause skin reactions (Brooks, 2016; Brooks, 2021; Caraty et al., 2018; Tatton et al., 2009). Second, it is believed that if there are still a few intact nerve sheaths, a paralyzed tail can exert sustained traction on the sacral and lumbar spinal segments due to its weight. This constant traction can cause additional injury to the spinal cord. If there is a large gap fracture/dislocation, it is necessary to amputate the tail, assuming that no nerve survives such traction (Caraty et al., 2018; Flegel, 2016). In our study, amputation was performed in cases with slack due to fracture or luxation. In other cases, cage rest was recommended.

As a result, after tail trauma in cats, the trauma should be evaluated as a whole and other conditions, such as possible thoracic and pelvic trauma should be investigated. There may be conditions such as pain in the tail or not using the tail. However, amputation should not be considered if there is no gap due to fracture or luxation. We believe that

the results of this study and 8 cases with tail pull injuries will contribute to clinical practice.

Conflict of interest

The authors declare that there is no conflict of interest.

Ethical Approval

This study was approved by the Dicle University Health Sciences Application and Research Center Local Ethics Committee with the number E-35582840-020-471830.

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