

Surgical Treatment of Coccygeal Fractures in Fat-Tailed Sheep

Tratamiento quirúrgico de fracturas coccígeas en ovejas de cola gruesa

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ABSTRACT

Fat-tailed sheep are a common breed in many parts of the world, and coccygeal fractures occur in these animals due to various traumas. As a result of these fractures, fracture hematoma occurs in the region and subsequently gangrene occurs due to circulatory impairment in the region. If the gangrened area is not treated, an open wound will form, and infection will be inevitable due to its relationship with the external environment. From this infected area, it causes sepsis and more serious complications that deteriorate the general condition of the creature, causing general condition disorders. However, it can be treated by surgical partial extirpation of the area where the coccygeal fracture occurs. In this study, the long-term recovery period of a total of 30 adult fat-tailed sheep and rams with coccygeal fractures treated with operative inverted V incision is followed. While all cases are observed to have recovered, it is observed that their productivity characteristics continued normal along with their walking and adaptation to herd management. It is concluded that the partial extirpation method, which is both cheap and effective, can be used in fat-tailed sheep with coccygeal fractures and can be applied in clinical practice. It is observed that the inverted V incision partial extirpation operative technique is both an effective treatment option and prevented economic losses in fat-tailed sheep.

Key words: Fat-tailed sheep; fatty tail healing; partial tail extirpation, tail operation

RESUMEN

Las ovejas de cola gorda son una raza común en muchas partes del mundo y en estos animales se producen fracturas coccígeas debido a diversos traumatismos. Como resultado de estas fracturas, se produce un hematoma por fractura en la región y posteriormente se produce gangrena debido a un deterioro circulatorio en la región. Si no se trata la zona gangrenada se formará una herida abierta y la infección será inevitable debido a su relación con el medio externo. A partir de esta zona infectada se produce sepsis y complicaciones más graves que deterioran el estado general de la criatura, provocando trastornos del estado general. Sin embargo, puede tratarse mediante la extirpación quirúrgica parcial de la zona donde se produce la fractura coccígea. En este estudio, se sigue el período de recuperación a largo plazo de un total de 30 carneros y ovejas de cola gruesa adultos con fracturas coccígeas tratados con una incisión operativa en V invertida. Si bien se observa que todos los casos se recuperaron, se observa que sus características de productividad continuaron normales junto con su caminata y adaptación al manejo del rebaño. Se concluye que el método de extirpación parcial, que es económico y eficaz, puede utilizarse en ovinos de cola gruesa con fracturas coccígeas y puede aplicarse en la práctica clínica. Se observa que la técnica operativa de extirpación parcial con incisión en V invertida es una opción de tratamiento eficaz y evita pérdidas económicas en ovejas de cola gorda.

Palabras clave: Oveja de cola gorda; curación de cola grasa; extirpación parcial de la cola; operación de la cola

INTRODUCTION

Domestic sheep (*Ovis Aries*) are classified into three biological categories according to their tail morphology. These categories include thick-tailed, thin-tailed and fat-rumped sheep [1, 2].

These animals are known to be the only mammal species that can accumulate dense adipose tissue in their tail during developmental stages [3]. Fat-tailed domestic sheep breeds have a uniquely evolved capacity to inhibit fat metabolism and use it as an energy source during prolonged starvation. In addition, the fat in the tail is an energy source for human consumption [2]. Excessive fat accumulation leads to many health complications in humans, which creates a predisposition for obesity, cardiovascular diseases, hypertension, diabetes, and cancer [4].

However, diet therapy can be considered as a useful adjuvant approach for the treatment of various diseases such as cancer [5].

On the other hand, dietary lipids like abnormal lipid metabolism has been shown to be a key feature of cancer cell development, thus, appropriate approach targeting lipid metabolism holds a promise for cancer therapy [6]. Heptadecanoic acid also known as margaric acid ($C_{17:0}$), is a representative single-chain saturated fatty acid (SCFA) in ruminants. $C_{17:0}$ intake is inversely associated with coronary heart disease [7] type 2 diabetes [8] and multiple sclerosis [9]. Therefore, foods rich in $C_{17:0}$ might have the potential to be used in the context of lung cancer treatment. It has been reported that $C_{17:0}$ is abundant in fat (STF) present in sheep tail [10]. Due to these advantages, the population of fat-tailed sheep breeds has increased and spread in Eurasia in the last century. It currently represents a significant portion of the global sheep population [2, 11].

There are many studies on the effects of tail cutting in lambs on the reproductive characteristics and physiological functions of fat-tailed sheep [12]. Tail cutting has been done by breeders or veterinarians all throughout history, due to reasons such as lack of feces accumulation and reducing the risk of myiasis, as well as thoughts on increasing meat yield, reproduction and carcass meat production in lambs [13]. Apart from this, since fat-tailed sheep are generally bred in rural areas, coccygeal fractures occur when they are attacked by predatory animals including (wolves, bears, and pigs), or when coccygeal bone fractures cannot bear the weight of the bone due to sudden movements during the attack, or because of tail injuries by predatory animals. Similarly, coccygeal fractures occur during the fights of the rams with each other during the oestrus period of the sheep. While there are many studies on total tail amputation in lambs in the literature review, total or partial amputation because of coccygeal fractures or injuries of fat-tailed sheep and rams has some advantages and disadvantages and is open to discussion. Therefore, due to the presence of C:17 tail fat, which is a food source for humans, in any of the traumatic situations listed above, it was believed that partial extirpation of the tail will increase the value of butchery in the future.

Partial amputation of traumatic coccygeal fractures in sheep, the choice of surgical technique and anaesthesia should be considered as a whole to improve the comfort of life, pain control and minimise possible complications in the operation and postoperative period.

This study aimed to investigate the effectiveness of partial extirpation in coccygeal fractures in adult sheep and rams and to conclude that this method is a safe technique in clinical practice. Thus, it is aimed to investigate the operability and success of this

problem, which is frequently encountered clinically, with an easy and inexpensive method with partial extirpation.

MATERIALS AND METHODS

Animals

The material of the study consisted of breed Akkaraman, Morkaraman and their hybrids with a total of 30 coccygeal fractures. 12 of them were sheep and 18 of them were rams. Age range was 2 ± 1 and live weight was 50 ± 18 kg. After controlling the physiological values of all animals, their suitability for the operation was evaluated and the suitable ones were taken into operation. The causes of coccygeal fracture include wild animal attacks, interspecies fights and idiopathic traumas.

Preparation for the operation process and analgesia management

All cases were firstly examined by inspection, palpation and radiological examination. All animals diagnosed with coccygeal fracture and evaluated to be suitable for operation were firstly shaved extensively in the tail area to be operated. (FIG. 1-2).

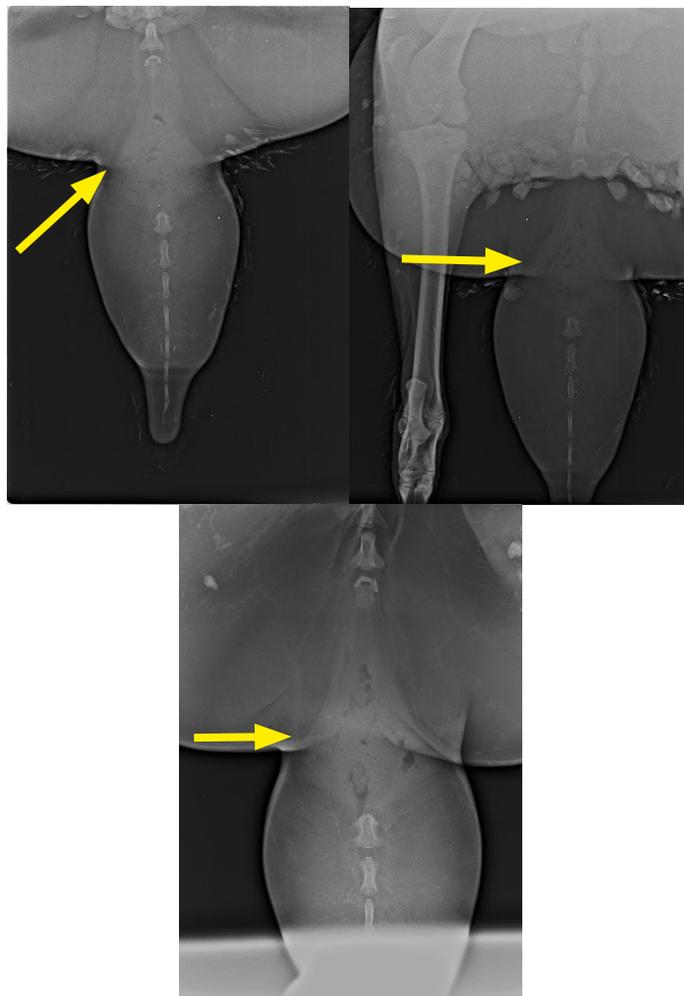


FIGURE 1. X-rays of coccygeal bone fractures of different cases.

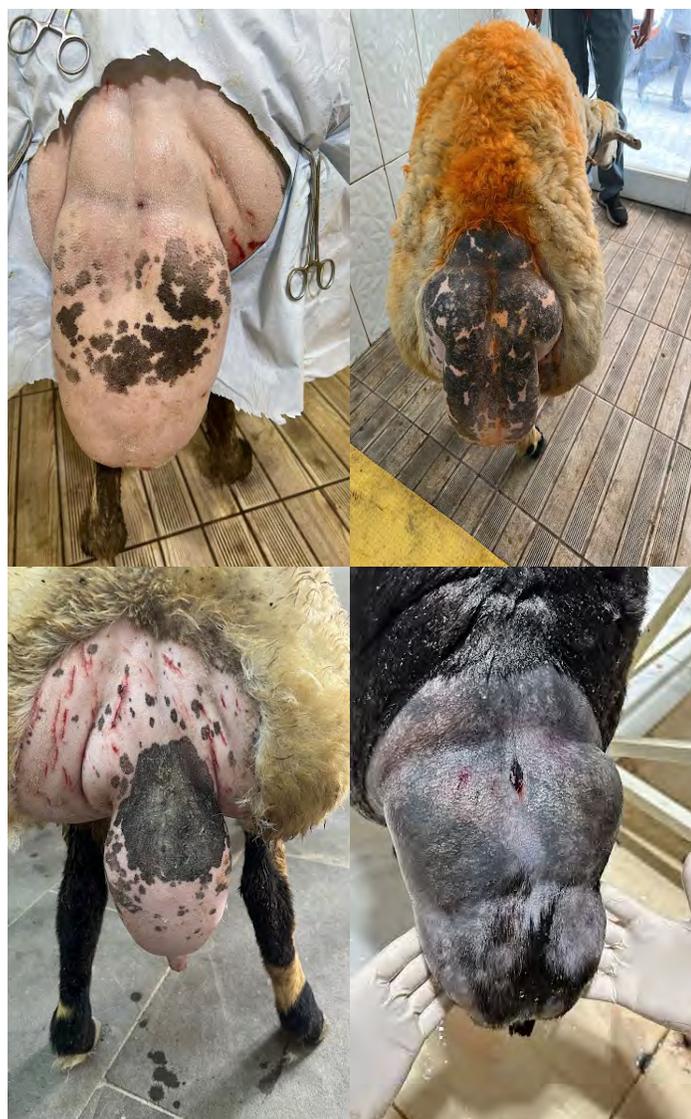


FIGURE 2. Fat tail with coccygeal fracture



FIGURE 3. Local infiltration anesthesia application

The area to be operated was prepared in accordance with the rules of asepsis and antisepsis. In this period, approximately 20 min to the start of the operation. First, meloxicam at a dose of $0.5 \text{ mg}\cdot\text{kg}^{-1}$ ($20 \text{ mg}\cdot\text{ml}^{-1}$ Boehringer, Metacam, Spain) for pain management analgesia, administered as a single dose SC [14, 15]. Subsequently, xylazine $0.1\text{--}0.2 \text{ mg}\cdot\text{kg}^{-1}$ IM as a preanesthetic (Rompun 2%, Bayer, Türkiye [16] and an opioid product, Butarphonal tartar, was administered IM at a dose of $0.1 \text{ mg}\cdot\text{kg}^{-1}$ (Butomidol, Richter pharma, Austria [17] Infiltration anesthesia 5–10 mL of Lidocaine (Vilcain, Vilsan, Turkey) was applied to the area where the skin incision was to be made (FIG. 3).

The animals anesthetized in a standing position, so that both sides are symmetrical in the selection of the midpoint of the tail and subsequent skin sutures in the area to be operated. For the post-operative period, Amoxicillin–clavulanic acid was administered SC once a day for 7 days at a dose of SynuloxR suspension (7.0 mg Amoxicillin, 1.5 mg Clavulanic acid $\cdot\text{kg}^{-1}$; Zoetis Turkey) according to veterinary prospectus information

for sheep. All animals were monitored before and during the operation, with pulse (P), respiration (R), body temperature (T), partial saturation of oxygen (SpO_2) values and baseline values (only NSAID administered) at the 5th minute from the start (when sedation and local anesthetic were administered) at the 15th minute after the start and 30th min values were recorded (TABLE I).

TABLE I
Average findings of animals during monitoring

	0 min	5 min	15 min	30 min
Heart rate	98±8	115±12	131±6	97±4
SpO ₂	93±4	118±7	103±4	89±7
Respiration	27±2	21±3	18±3	22±3
Temperature	39±1	38±1	38±1	38±1

Physiological values reached normal values in 30 minutes

Surgical procedure

It is incised from dorsal to ventral in an inverted V shape, starting 2–3 cm proximal to the point where the coccygeal fracture is identified (FIG. 4).

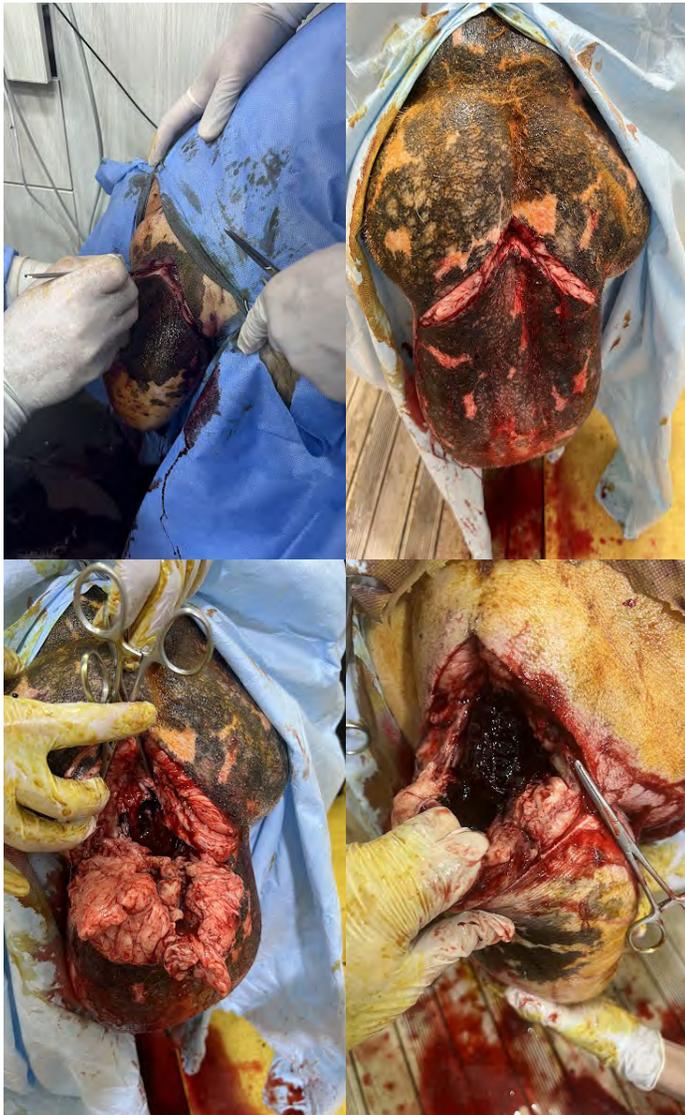


FIGURE 4. Inverted V incision application

The reason why the incision was in an inverted V shape was the continuous expansion of the tail towards the dorsum in fat-tailed sheep and this incision line was applied to create a perpendicular line when sutured again. The adipose tissue was taken from the inner part of the skin by blunt dissection (the fat should be cut deeper to avoid problems when re-suturing the inverted V-shaped skin part) and the capillaries between the tail fat were found and ligated. Afterwards, the skin lips on the remaining part of the partially removed tail were sutured with simple separate (with silk thread) sutures. Routine post-operative care and nutrition were recommended (FIG. 5).



FIGURE 5. Operational processes and healing

Clinical aspects (wound healing, gait characteristics, compliance with herd management, productivity) were measured.

RESULTS AND DISCUSSION

This study aimed to investigate the long-term (more than 6 months) follow-up and feasibility of treatment effectiveness in the partial extirpation method of coccygeal fractures in fat-tailed sheep and rams. In this context, a total of 30 Akkaraman crossbred cases (12 sheep and 18 rams) are operated, and long-term follow-up performed. While the results were evaluated according to the changes in the yield characteristics of the animals and their adaptation to herd management, no complications are encountered, and they continued their normal lives. Since the cases are standing during anaesthesia, complications (respiration, tympani) encountered in ruminants are not encountered. During the operation, the application of the inverted V incision line to be formed in the tail section is easier and more stable when the case is standing. It is important to start from the midpoint

of the median line and cut equal pieces from both sides. Thus, there is no balance problem in the tail section. French et al [18] and Fisher [19] reported that tail amputation or partial removal of the tail of fat-tailed lambs was performed for myiasis prevention. In our study, we did not encounter a similar advantage in terms of performing operations in adult ewes and rams.

Kridli et al. [20] argued that although it is important to keep the perianal area clean and free of faecal matter after tail amputations, it may interfere with the sexual signaling of ewes during estrus and thus sexual orientation and ram attraction. However, as a result of long-term follow-up in all cases, similar results are observed in terms of perianal area cleanliness, while no signs of sexual orientation and attraction are observed, on the contrary, it is noted that the rams were more active in vaccination. It is thought that the reduction of the weight in the hind part of the fat-tailed ewes and rams after partial tail extirpation helps the rams to perform vaccination, but more studies are needed on this subject. At the same time, French et al. [18] and Scobie [21] argued that tail amputations should be performed more carefully in environments where there are no health risks such as myiasis in sheep and that welfare concerns arising from tail amputation should also be taken into consideration. In the present study, since all operations are performed with animal welfare in mind, no problems were encountered in the pre- and post-operative period. Although many studies have shown that tail amputations cause acute pain in lambs, these methods are a common procedure and are usually performed by the breeder without pain management [22, 23]. The post-operative pain values of the anesthetic and analgesic agents used in our study were determined using the facial pain scale developed by Mclein et al. [24] was used in our study and no additional NSAID agent was needed since the values were within normal limits in all cases.

The practice of tail amputations differs between regions and countries and is most commonly performed ischemic by rapid amputation by surgical excision or by applying a rubber ring, despite clear evidence that it causes extreme pain [25]. Although these practices are widely used worldwide, they both argue in favor of the practice [18] have published studies against them [26]. However, available data on total or partial extirpation for therapeutic purposes in fat-tailed sheep of adult sheep and rams are limited in all literature reviews [27]. Especially in fat-tailed sheep Worldwide, coccygeal fractures occur for many reasons and osteosynthesis cannot be performed due to the tail fat carried by the coccygeal bones. If not intervened, the ventral part, which cannot be fed due to tail fat and broken hematoma, gangrelates over time, then causes myiasis and general condition disorder, and as a result, the animal encounters serious problems due to sepsis or is sent to slaughter by the breeder.

However, no complications are encountered in animals undergoing partial extirpation. It is an uncomplicated method that can be easily applied in the practical field due to its low cost of operation and can be used easily in the treatment of coccygeal fractures.

CONCLUSIONS

As a result, no complications are encountered when post-operative pain management and outpatient anesthesia protocol were applied in the treatment of coccygeal fractures in sheep, which are seen in large numbers in rural and barren areas.

It is concluded that the operation is completed successfully by standing sedation and infiltration local anesthesia to the area of

the operated with inverted V incision in sheep and rams. We believe that it is an appropriate surgical treatment method for traumatic coccygeal fractures in fat-tailed sheep and rams.

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Conflicts of interest

The authors have no declaration of competing interests.

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