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## Surgical management of screw tail and tail fold pyoderma in dogs

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## Χειρουργική αντιμετώπιση της βιδωτής ουράς και της πυώδους δερματίτιδας των δερματικών πτυχών

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**ABSTRACT.** Screw tail is an abnormal deviation of the terminal coccygeal vertebrae resulting in tail fold pyoderma. This condition is commonly met in brachycephalic breeds, especially English bulldogs. Tail fold pyoderma, the end result of skin maceration and bacterial colonization, may create pain and discomfort in these dogs. Local antibacterial combined with systemic antibiotic therapy are aiming at decreasing the number of surface bacteria of the skin and alleviate clinical signs before surgery. Complete caudectomy will lead in permanent resolution of clinical signs with minimal complications.

**Keywords:** *Ingrown tail, screw tail, tail deviation, tail fold, pyoderma, dog, brachycephalic breed*

**ΠΕΡΙΛΗΨΗ.** Η βιδωτή ουρά προκαλείται λόγω ανώμαλης παρεκτόπισης των κοκκυγικών σπονδύλων με αποτέλεσμα την πυώδη δερματίτιδα των πτυχών της ουράς. Η κατάσταση αυτή συναντάται συχνότερα στα Αγγλικά bulldog και σε άλλες βραχυκεφαλικές φυλές. Η πυώδης δερματίτιδα αποτελεί το τελικό αποτέλεσμα του συγκάματος και της βακτηριακής μόλυνσης και προκαλεί πόνο και ανησυχία στους σκύλους που προσβάλλονται. Η χορήγηση τοπικών και συστηματικών αντιμικροβιακών προεγχειρητικά σκοπεύει στην ελάττωση της παθογόνου χλωρίδας του δέρματος και στη βελτίωση της κλινικής εικόνας. Η ολική εκτομή των κοκκυγικών σπονδύλων που πάσχουν αποτελεί την οριστική αντιμετώπιση του προβλήματος με τις ελάχιστες επιπλοκές.

**Λέξεις ευρετηρίασης:** *βιδωτή ουρά, παρεκτόπιση της ουράς, πτυχές της ουράς, πυώδης δερματίτιδα, σκύλος, βραχυκεφαλικές φυλές*

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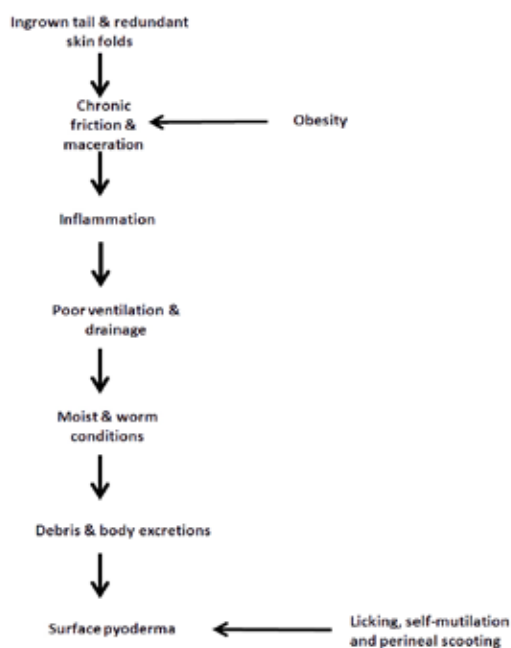
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**Figure 1.** Tail deviation in an English bulldog. The dorsal tail fold is evident.



**Figure 2.** Screw tail with severe ventral deviation and pyoderma in an English bulldog



**Figure 3.** Pathophysiological mechanisms involved in screw tail and tail fold pyoderma.

## EPIDEMIOLOGY AND PATHOPHYSIOLOGY

Screw tail (Ingrown tail or corkscrew tail) is a condition characterized by deviation and inward growth of the tail due to ventral and cranial diversion of the terminal coccygeal vertebrae. This condition often creates redundant and deep skin folds around the base of the tail (Fig.1). Screw tail is mainly encountered in English bulldogs; other brachycephalic breeds including French bulldogs, pugs, Boston terriers, and Schipperke dogs also may be affected (McLouglin, 1990; Bellah, 1993; Krahwinkel, 1995; White, 2003; Knight et al., 2013). The size of the dog, the amount of loose skin and fat accumulation around the tail base and the degree of the coccygeal vertebrae deviation determine the depth of skin folds (McLouglin, 1990).

The loose skin around the tail base leads to chronic apposition and overlap that results in fold formation. Obesity plays a role in exacerbating the condition. Chronic friction between these folds results in microtraumatization and irritation leading to secondary maceration and inflammation. Inadequate fold ventilation and poor drainage may create a moist and worm environment allowing accumulation of surface debris including sebum, urine, and feces resulting in surface bacterial overgrowth to occur. This bacterial infection is called surface pyoderma of the tail folds (Fig.2). Licking, self-mutilation and perineal scooting exacerbate the condition (McLouglin, 1990; Bellah, 1993; White, 2003; Knight et al., 2013). The pressure of the deformed tail creates pain. Microorganisms isolated from tail fold pyoderma include coagulase-positive Staphylococci, *Staphylococcus intermedius*, *Streptococcus*, *Escherichia coli*, *Pseudomonas*, *Proteus*, *Malassezia pachydermatis*, and *Candida* (McLouglin, 1990; Bellah, 1993). As more irritants are produced a vicious cycle is created. Impairment of immune response, coexisting disease, other inflammation, severe pruritus, scar tissue formation, and unwarranted initial therapy are all negative prognostic factors making the disease more difficult to manage (Bellah, 1993; White 2003; Knight et al., 2013). The main pathophysiological mechanisms that involved in screw tail and tail fold pyoderma are shown in figure 3.

## CLINICAL SIGNS

Initial clinical signs of tail fold pyoderma include erythema and slight exudation. Gradually the skin



**Figure 4.** The dog is placed in dorsal recumbency with a towel role under its hind limbs.

lesions extend affecting all fold surface and the exudation increases in time. Pain, pruritus, rubbing and scooting are some common clinical signs and in more severely affected dogs erosions ulcers and sinus tracts may be seen, while foul odor from the affected area may also be noticed (McLouglin, 1990; Bellah, 1993; Knight et al., 2013).

**Preoperative medical management**

Medical treatment of tail fold pyoderma is usually palliative. Recurrence is highly likely because infection in these cases is secondary to a tail deformity (McLouglin, 1990; Bellah, 1993). A one week medical treatment is necessary before surgery to decrease the bacterial numbers and the amount of skin inflammation at the time of surgery since infection rates before surgery account for 40% of the dogs of a study (McLouglin, 1990; Bellah, 1993; Knight et al., 2013). Medical therapy includes local and systemic antibiotic administration and application of scrubs and antiseborrheic shampoos aiming at removing the



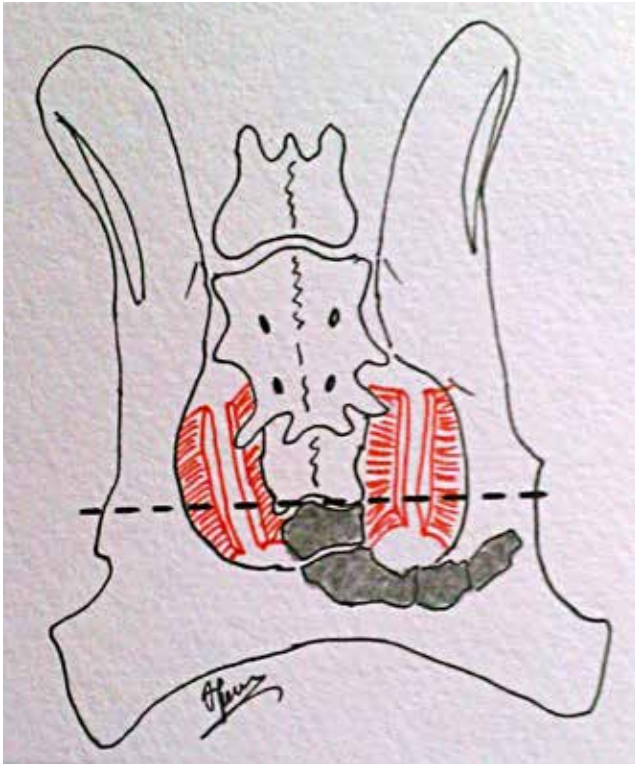
**Figure 5.** An elliptical skin incision is made to include the whole tail base distal to the caudectomy region. The skin dorsal to the tail base is preserved for a tension free closure.

surface organisms and entrapped debris before surgical intervention (McLouglin, 1990; Bellah, 1993). Antibiotics can be selected empirically and they must have a broad spectrum of activity mainly against *S. intermedius*, which is the most commonly associated pathogen in canine tail fold pyoderma. Culture and sensitivity are helpful in selecting the appropriate antibiotic treatment in some dogs (Bellah, 1993).

**SURGICAL MANAGEMENT**

The goal of surgery is to remove the skin folds and to amputate the screw tail (caudectomy) in the majority of the dogs. Preoperative or perioperative antibiotics including cephalosporins, amoxicillin-clavulanate acid or enrofloxacin should be given and continued after surgery since most surgeries are classified as contaminated or dirty (Knight et al., 2013). The hair is amply clipped from the perineal area, tail base and tail folds and a purse string suture is placed around the



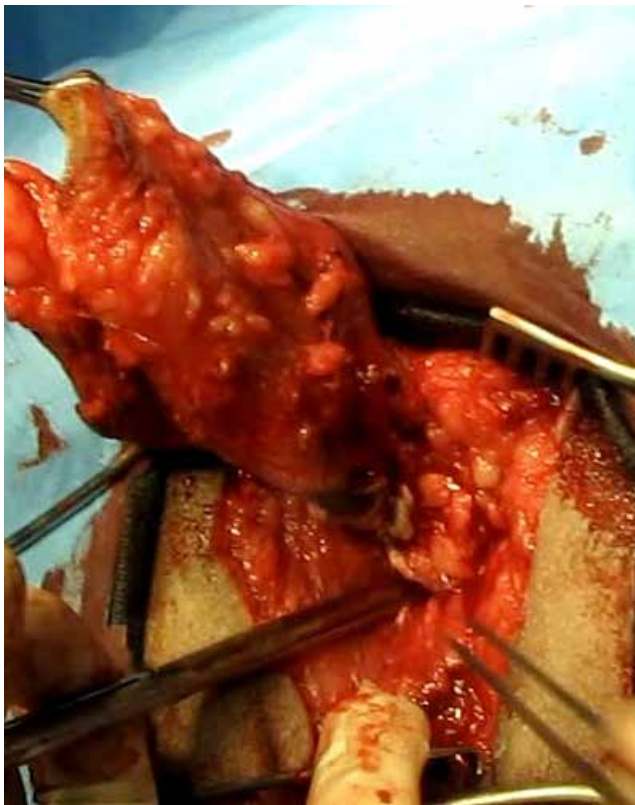


**Figure 6.** The muscular attachments are divided (red color) and the terminal coccygeal vertebrae are transected (dashed line)

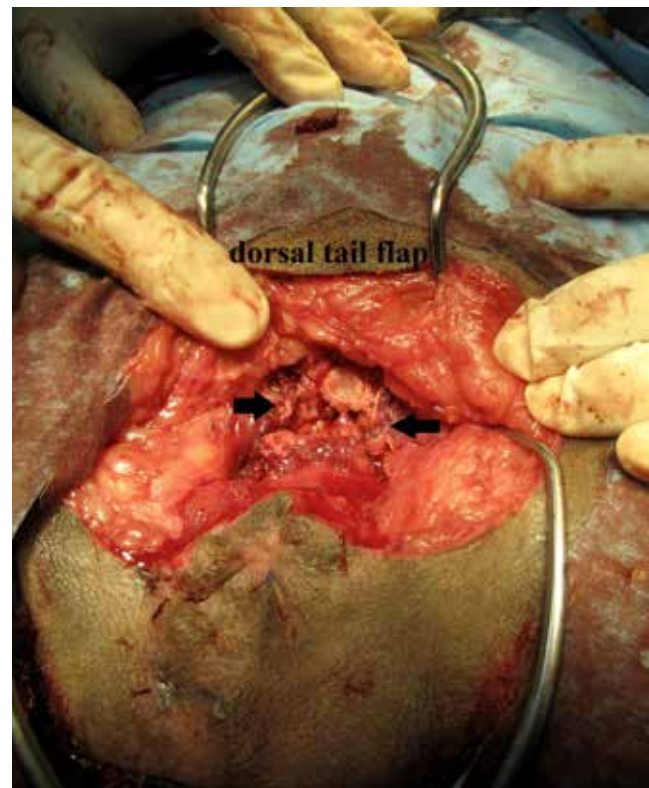
anus. The dog is placed in sternal recumbency with a towel roll under the hindlimbs, which are flexed over the end of the surgical table (Fig.4). In the presence of skin fold pyoderma incisions should include the whole diseased and redundant tissue taking care to avoid spreading the bacteria along the surgical field.

#### **Caudectomy (McLouglin, 1990 White, 2003; Bellah, 2006; Knight et al., 2013)**

A wide horizontal elliptical incision is performed around the whole tail base distal to the caudectomy site after the tail was grasped and elevated with towel forceps. The skin dorsal to the tail base is preserved to allow a tension free closure (fig.5). The coccygeal, rectococcygeal and levator ani muscles are divided at their attachments to the coccygeal vertebrae (figs.6 and 7). Care was taken to avoid dissection ventral to the coccygeal vertebrae to preserve the pelvic diaphragm and rectum. The caudal arteries were isolated and cauterized or ligated. Caudectomy is done by disarticulation or transection with bone cutters (figs. 8 and 9). Bone hemorrhage is controlled by bone wax application



**Figure 7.** Tail has been freed from its muscular and fascial attachments.



**Figure 8.** Tail was amputated. Muscular attachments are marked with arrows. A skin flap has been created from the dorsal tail fold to allow a tension free closure.



**Figure 9.** Amputated tail.

(McLouglin, 1990 White, 2003; Bellah, 2006; Knight et al., 2013). The wound is closed by careful apposition of transected muscles followed by a routine closure of subcutaneous tissue and skin (figs. 10 and 11).

**Vertebrectomy and tail fold preservation (White, 2003; Bellah, 2006)**

Some owners are unwilling to proceed in caudectomy since tail fold preservation is an important conformation feature of show animals (White, 2003). Tail fold maintenance in these dogs however, may result in a continuous inflammatory process, which needs long term medical management and will not lead to definite resolution of the pyoderma (White, 2003; Bellah, 2006). A curved incision (tail flap) is made dorsal to the tail that permits coccygeal vertebrectomy rostral to the deviated vertebrae following transection of their muscular attachments. Wound is routinely closed (Bellah, 2006).

**Complications**

Postoperative complications in dogs undergoing partial caudectomies performed for reasons unrelated to screw tail and tail fold pyoderma include incisional crusting, delayed wound healing associated with dehiscence, self mutilation and severe inflammation both required revision of the tail stump (Simons et al., 2014). Complications following caudectomy in brachycephalic dogs for the management of screw tail and tail fold pyoderma are considered of minimal significance (Knight et al.,



**Figure 10.** Subcutaneous tissue is closed in a simple interrupted fashion.



**Figure 11.** An English bulldog following reconstruction of caudectomy region.

2013). In this study 2 of 17 dogs showed complications soon after surgery including decreases rectal sensation, failure to posture to defecate and draining tracts. Another 2 dogs from the same study had long term complications including prolonged wound healing and inflammation, tail chasing and temporary changes in defecation habits. Most complications resolve following appropriate medical or surgical treatment (Knight et al., 2013).

**Conflict of interest statement**

The authors declare no conflict of interests ■

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