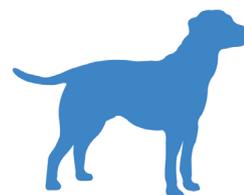


Caudectomy for resolution of tail fold intertrigo in brachycephalic dogs: a report of eleven cases



Skin fold dermatitis or intertrigo is a common disease in brachycephalic dogs. The perineal region is among the most frequently affected anatomical sites. Conservative treatment usually results in only transient improvement of the clinical signs and surgical excision becomes usually necessary.

This retrospective study evaluates 11 cases of caudectomy in brachycephalic dogs (10 English Bulldogs and 1 Boston terrier), with a minimum of 2 months of post-operative follow-up. On examination all dogs had severe anatomical malformations of the tail and chronic dermatitis of the skin folds around the base of the tail. Surgery consisted of amputation of the tail at the point of deviation of the coccygeal vertebrae associated with excision of the skin folds. Despite mild post-operative complications, surgery was curative in all dogs.

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INTRODUCTION

Skin fold dermatitis or intertrigo is a superficial inflammatory condition occurring on two closely apposed skin surfaces (skin fold) as a result of moisture, friction and lack of ventilation.¹

Excessive skin-to skin contact and friction leads to local irritation, skin breakdown and creates an entry port for secondary bacterial and fungal infections such as *Staphylococcus spp.*, *Malassezia* and more rarely *Candida spp.*¹ The characteristic clinical signs of skin fold dermatitis include pruritus, malodorous skin, exudate and cutaneous erythema.²

The initial approach is conservative, involving topical treatment with skin-cleansing solutions, antiseptics, anti-inflammatories and antibiotics agents. In some cases, topical glucocorticoids are also indicated due to their

anti-pruritic and anti-inflammatory effect.¹ Obesity appears to predispose to the development of deep skin folds and skin fold dermatitis. Weight loss is therefore recommended in these patients.

Conservative treatment commonly results in only transient improvement of the clinical signs, so that surgical excision becomes necessary.³

The term “corkscrew or ingrown tail” commonly refers to a malformation of the tail, which grows inwards instead of outwards, and develops in a spiral shape. This malformation is very common in Bulldogs (either English or French) and, on occasion, it has been described in Pugs and Boston Terriers.^{3,4} This morphological feature tends to leave a cleft just where the tail would normally be. The deformed tail can bend ventrally leading to the formation of a ventral skin fold covering partially

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or completely the anus. This area is particularly prone to gathering moisture and debris, leading to bacterial infections. Typically the first and most noticeable sign of bacterial infection in the area will be a very foul smell coming from the tail and rump. Dogs may be prone to rub their rear on the floor and owners may find faecal accumulation beneath the tail.^{3,4,6}

Caudectomy associated with excision of the skin folds is the treatment of choice for dogs with skin fold dermatitis that does not respond to medical treatment.^{2,3} A radiographic assessment should be performed prior to amputation in order to identify precise anatomical landmarks of the abnormality; in addition, during the

operation with two orthogonal views allowed the point and degree of the deviation of the coccygeal vertebrae to be evaluated so that surgery could be planned properly.

All the patients were given prophylactic antibiotic therapy: seven (cases 1-7) with intravenous cefazoline (Cefazolina - Teva) 22 mg/kg of body weight (b.w.) 30 to 60 minutes prior to the surgical incision; three (cases 8-10) with amoxicillin/clavulanic acid (Konclav[®]-Ati) 12.5-20 mg/kg b.w. every 12 hours for 2 weeks prior to surgery; and one (case 11) with cefalexin (Therios[®] Laboratoires Sogeval S.A.) 15 mg/kg b.w. every 12 hours for 3 weeks before surgery. The antibiotic administration plan was established by the surgeon in accordance with the protocols used in their own facility.

The anaesthetic protocol included premedication with medetomidine (Domitor[®] - Pfizer) 10 mcg/kg i.m. and methadone (Semfortan[®] - Eurovet Animal Health) 0.2 mg/kg i.m.; induction with propofol (Vetofol[®] - Esteve) sufficient to achieve the desired effect (dosage between

Intertrigo is an inflammatory disease that develops in areas of the body in which the skin folds on itself. The clinical signs include itching, malodorous skin, moist exudate and erythema.

operation itself, great care must be paid to the underlying anatomical structures, including the anus and rectum,^{4,7} in order to avoid serious post-operative complications such as faecal incontinence and neuroma formation.⁷

CLINICAL CASES

A total of 11 dogs aged between 2 and 10 years old underwent a clinical assessment because of chronic, relapsing bacterial dermatitis, with production of a malodorous, purulent exudate at the caudal skin folds. Ten out of 11 dogs were English Bulldogs and one was a Boston Terrier. Seven dogs were male (1/7 neutered) and 4 were female (2/4 neutered).

Following general clinical examination, the perineal/perianal region and the tail were inspected. The cutaneous alterations and the presence or absence of concomitant diseases was noted. Through digital and with the aid of a probe exploration was concluded in order to determine the width, depth of the folds, and for surgical planning (Video 1).

Six of the dogs had concomitant diseases; three had facial skin fold dermatitis (cases 2, 3, and 11), one had atopic dermatitis (case 6), one had dermatitis of the vulvar folds (case 10), two had chronic otitis externa (cases 10 and 11) and one had developed an adenocarcinoma of the apocrine skin glands located at the base of the tail (case 5) (Fig. 2); all patients also manifested compulsive behaviour, rubbing the perineal/perianal region on the ground.

A radiographic study of the sacro-coccygeal re-



Figure 1 - Intertrigo of the tail fold (A). Digital exploration (B).



Video 1
 Digital exploration - note the depth of the skin folds
<http://cms.scivac.it/it/v/13607/1>

3-4 mg/kg i.v.); and maintenance, after orotracheal intubation, with isoflurane (Vetflurane® - Virbac) in 100% oxygen.
 Once the patient had been fully anaesthetised, a large area was clipped and the operating field was prepared. A horizontal elliptical skin incision, around the base of the tail, was performed. Following dissection of the subcutaneous tissues, the tail was isolated and both the dor-

En bloc excision of the tail and skin folds, cranial to the deviated vertebra is performed. Post-operative radiographs are always recommended.



Figure 2 - Apocrine adenocarcinoma. Case 5.

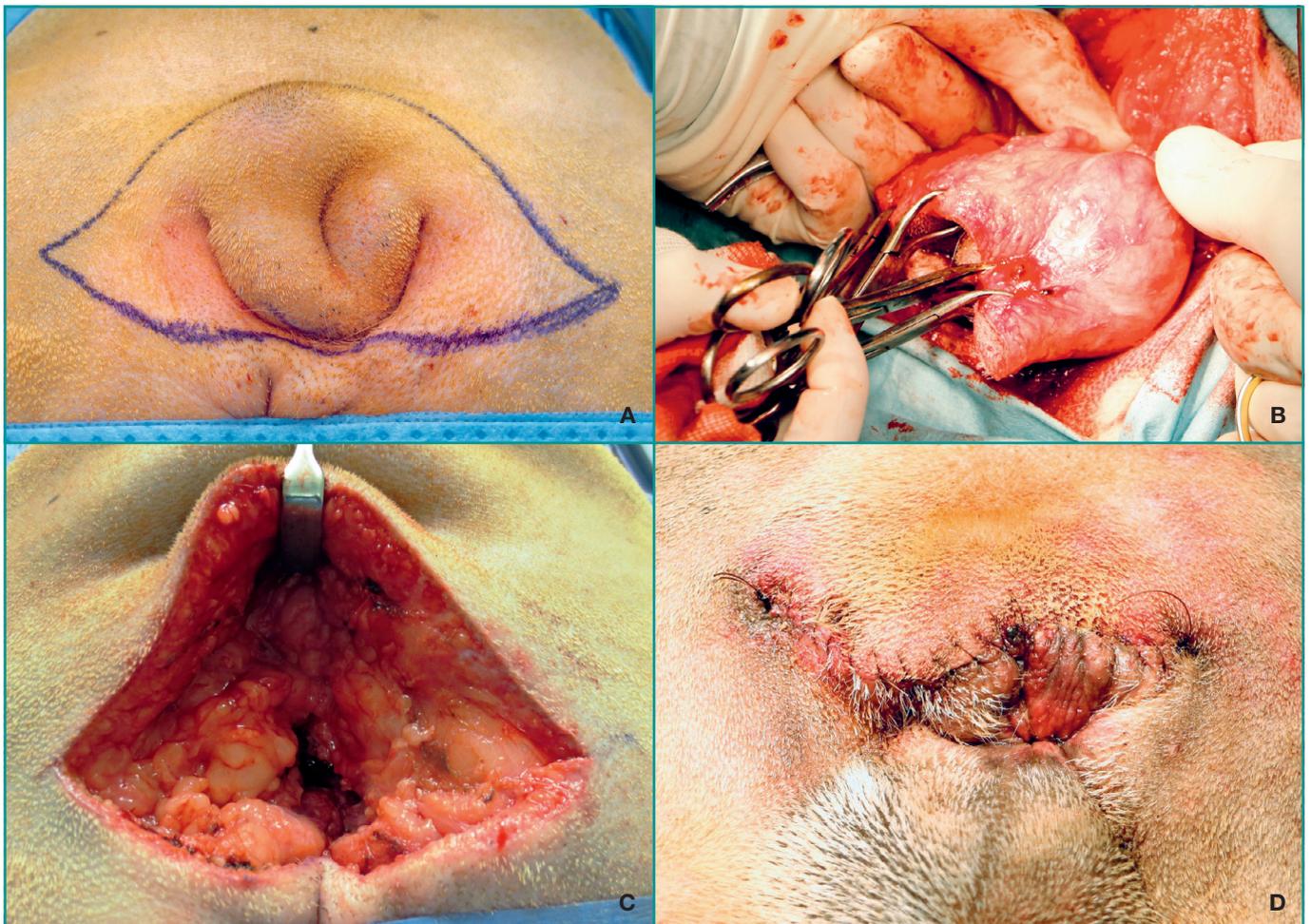


Figure 3 - Stages of the surgical intervention (A-B). Elliptical skin incision at the base of the tail (A). Closure of the tail with Backhaus clamps to reduce contamination (B). Large post-amputation dead space (C). Surgical suture (D).

sal and the ventral surfaces of the incised part were anchored using several clamps (Fig. 3).

The dissection included the insertions of the levator ani, recto-coccygeal and coccygeal muscles. The medial and lateral coccygeal arteries and veins were sealed with bipolar forceps.

Once the vertebral deviation had been identified, the tail and skin folds were removed *en bloc*, with the help of bone rongeurs (five cases) or bone cutter (six cases) for the osteotomy. This was concluded cranial to the vertebral deviation.

Prior to suturing, the surgical site was flushed thoroughly and in three cases a drain was placed (active in two cases, passive in the third). The muscle and subcutaneous tissue layers were closed with absorbable monofilament suture EP 2 or 3 (glycol trimethylene carbonate - Maxon®) and the skin with nylon EP 2 (Ethilon™ - Ethicon). Post-operative radiographs were taken to follow up that the osteotomy had been performed correctly. Postoperative management included the administration of oral carprofen (Rimadyl® - Pfizer) 1-2 mg/kg b.w. every 12 hours for 7 days and prophylactic antibiotics for 10 days.

Stitches were removed between 12 and 28 days post-operatively.

In one case (case 5), a histological examination of the sample excised was performed because of the presence of a neoformation.

In the first week after surgery, three cases developed complications (27%). Cases 3 and 11 had a subcutaneous abscess which resolved with the use of passive drainage, flushing and antibiotics for 7 days. In one case (case 4), despite the application of a passive drain intra-operatively, an abscess formed, resulting in wound dehiscence. The wound was dressed daily and covered with a “tie over”

bandage; complete healing by second intention occurred in 18 days. All patients had at least 2 months of post-operative follow-up (Table 1).

The local bacterial contamination is generally heavy. To limit contamination, it is recommended to isolate the tail with several clamps that approximate the dorsal surface of the incised portion to the ventral one.

DISCUSSION

Tail skin fold dermatitis is a common disorder in brachycephalic breeds and is often underestimated by owners.

The majority of patients reported in this series were English Bulldogs (90.9% cases).

This breed does, in fact, frequently have tail malformations,⁸ which, in turn, leads to dermatitis of the skin folds.⁷ The cause of this anatomical defect is not known but it may be the expression of inherited phenotypic characteristics.⁸

All patients included in this clinical report were affected by chronic pyodermatitis, which had been treated for long periods with topical and systemic medications. Historically, it appeared that improvements were only temporary, with repeated relapses of the clinical signs. In line with data in the literature,⁷ the dogs were restless, had cutaneous lesions and malodorous skin.

For ten patients, caudectomy was the only intervention possible to address the intertrigo; in one animal (case 5), the decision to perform caudectomy was dictated by the need to excise an apocrine adenocarcinoma at the base

Table 1 - Surgical cases of caudectomy from 2007 to 2016.
Male (M), castrated male (MC), female (F), spayed female (FS), years (y), months (m), weeks (w)

| Case | Breed | Sex | Age | Drainage | Complications | Other | Last F.U. |
|------|-----------------|-----|------|-------------|---------------------|--|-----------|
| 1 | English Bulldog | M | 7 y | YES active | NO | Fistulised abscess | 10 m |
| 2 | English Bulldog | M | 5 y | NO | NO | Abscess and intertrigo of nasal folds | 2 y 6 m |
| 3 | English Bulldog | M | 2 y | NO | Abscess | Intertrigo of nasal folds | 2 m |
| 4 | English Bulldog | M | 6 y | YES passive | Abscess, dehiscence | / | 4 m |
| 5 | English Bulldog | F | 10 y | YES active | NO | Apocrine adenocarcinoma | 4 m |
| 6 | English Bulldog | FS | 6 y | NO | NO | Atopic dermatitis being treated | 1 y |
| 7 | English Bulldog | M | 4 y | NO | NO | / | 2 m |
| 8 | Boston Terrier | F | 4 y | NO | NO | / | 2 w |
| 9 | English Bulldog | MC | 2 y | NO | NO | Dermatitis with purulent exudate | 2 w |
| 10 | English Bulldog | FS | 5 y | NO | NO | Otitis externa, dermatitis of vulvar folds | 2 w |
| 11 | English Bulldog | M | 4 y | NO | Abscess | Intertrigo of nasal folds, otitis externa | 2 w |

of the tail, in addition to resolving the intertrigo. The patients were aged between 2 and 10 years old (mean age, 5 years), a range similar to that reported in a previous study of 17 patients.⁴ Preoperative antibiotic therapy (from 1 week to 30 minutes prior to surgery, depending on the clinical case and the care facility) was used in all patients to reduce the bacterial load and limit contamination of the surgical field.

The procedure was concluded with patients placed in sternal recumbency, with the hind limbs hanging down the operating table. This positioning allowed the surgeon to maintain good references for symmetry and natural relaxation of the skin folds.

In the case of a “corkscrew tail”, twisting on its own axis creates areas where it is impossible to shave the skin appropriately (Fig. 4) (Video 2). The bacterial growth can be heavy in these areas. In order to limit contamination during the operation it is important to isolate it, so that the dorsal surface of the incised portion can be approximated to the ventral one.

The ventral fold of the tail was removed completely, whereas the dorsal one was only partially excised.³ This strategy enabled effective healing while maintaining a pleasing aesthetic appearance.

Placement of a wound drain was an operator’s dependent choice, based on the surgeon’s experience. The strategy followed was to use active drainage in patients with extensive subcutaneous dead spaces. In fact, there are not sufficient data in the literature to indicate that placement of a drain is necessary.³ Some authors, however, do recommend using active suction drainage.^{7,9} It is interesting to report that patients treated with active drainage did not develop post-operative complications, despite they were considered at greater risk. In contrast, the three complications that did occur developed in



Video 2

Tail trapped in the skin folds after amputation.

Exteriorisation of the tail and identification of the skin lesions caused by the inflammatory process

<http://cms.scivac.it/it/v/13607/2>



Figure 4 - Tail trapped in the folds after amputation (A). Exteriorization of the tail (B). Identification of the skin lesions caused by the inflammatory process (C).

the only case with passive drainage and in two of the eight cases without drain.

Post-operative control radiographs of the coccygeal vertebrae were useful in assessing whether the tail amputation had been performed correctly.

The complications of caudectomy reported in the literature include faecal incontinence, rectal blood loss, tenesmus, pain and neuroma.

One month after surgery, all patients were in a good general condition, with complete healing of the surgical wound. Unlike reports in the literature,⁷ we have not observed any long-term complications, such as faecal incontinence, rectal bleeding, tenesmus, pain and neuroma. Furthermore, our experience (albeit limited) allows us to state that it is difficult to cause neurological dam-

age with this procedure, since the cauda equina in the dog ends at the level of the sacrum.

Complications that did occur were treated successfully. Although the number of cases included in this series is limited, our data are in line with those reported in the literature.⁴

Compulsive rubbing of the perineal/perianal region on the ground, reported by other authors^{3,4} and present in all our patients, resolved in the immediate post-operative period.

CONCLUSIONS

Based on the author's experience it can be stated that caudectomy is a curative treatment for intertrigo of tail skin folds.

The complications that may occur can always be resolved in a short time, if properly managed, and in the final analysis they are not a cause of failure of the procedure.

KEY POINTS

- When intertrigo of tail skin folds is caused by a skeletal malformation, surgery is required to resolve the problem.
- It is important to perform good pre- and post-operative evaluations with a clinical examination and radiographic studies.
- Use of a drain should be evaluated intra-operatively.
- The patient's stress is greatly reduced after surgery.
- The potential complications associated with this surgical procedure do not lead to failure of the intervention.

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