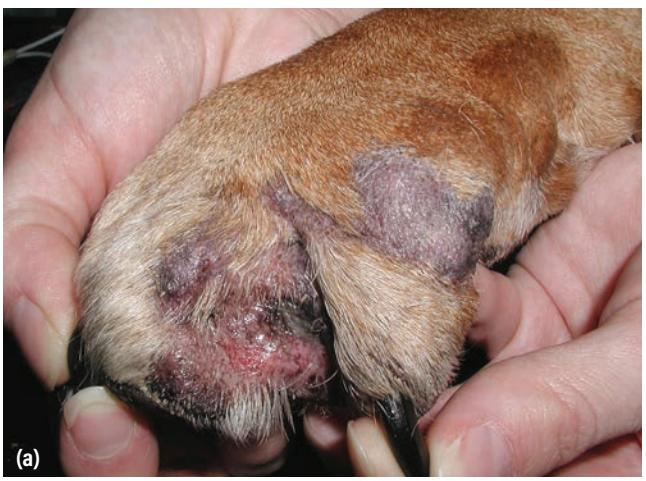
MANAGING CHRONIC PODODERMATITIS

Dr Tim Nuttall, Royal (Dick) School of Veterinary Studies, University of Edinburgh, discusses the causes, diagnosis and treatment of chronic interdigital furunculosis or pododermatitis

Chronic interdigital furunculosis or pododermatitis (Figure 1) is a common and frustrating problem with multiple trigger factors. It is very important to manage the underlying causes to reduce or prevent chronic changes. Chronic changes such as hyperplasia or new pad formation make long-term control much harder and more complicated.



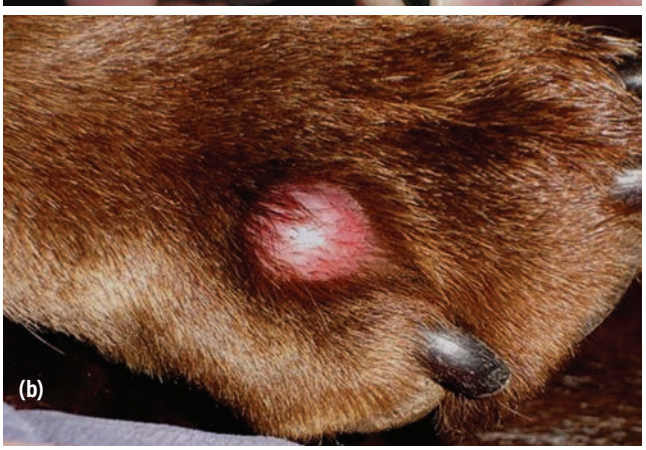


Figure 1: Clinical presentations of chronic pododermatitis: a) interdigital furunculosis in an English bulldog with atopic dermatitis; b) a recurrent sinus tract and interdigital abscess ('interdigital cyst') in a Labrador with elbow dysplasia.

CAUSES

Pododermatitis has multiple primary, secondary, predisposing and perpetuating causes.

Primary factors

These trigger the initial foot inflammation. They may be subtle and missed, especially in chronic cases. There are a very wide range of potential primary causes (Table 1). However, nearly 75% of our cases are associated with atopic dermatitis, adverse food reactions, orthopaedic disease, and foot or limb conformation.

Table 1: Primary causes of chronic pododermatitis.

Atopic dermatitis	Adverse food reaction
Contact allergy	Foreign bodies/contact irritants (eg. hair, stone, sand, salt, etc.)
Idiopathic sterile pyogranuloma	Footpad hyperkeratosis and other cornification disorders
Hypothyroidism	Hyperadrenocorticism
Demodex	Hookworm
Dermatophytosis (Trichophyton)	*Leishmania*
Orthopaedic conditions	Poor limb/foot conformation

Immunomodulatory-responsive pododermatitis is characterised by severe lymphocytic-plasmacytic inflammation and secondary infection. It has been described as a distinct clinical problem, and it responds well to immunosuppressive treatment. However, it is unclear whether it is a primary problem or a chronic change (ie. an inflammatory response to free keratin and sebaceous material from ruptured hair follicles).

Predisposing factors

These increase the risk of pododermatitis but less commonly cause disease themselves. Predisposing factors include short hairs (which are more easily driven into the skin to cause foreign body reactions and chronic inflammation); increased weight bearing (obesity and large breed dogs); and altered weight bearing (limb deformity, conjoined pads, and/or osteoarthritis and other musculo-skeletal disorders [Figure 2]).

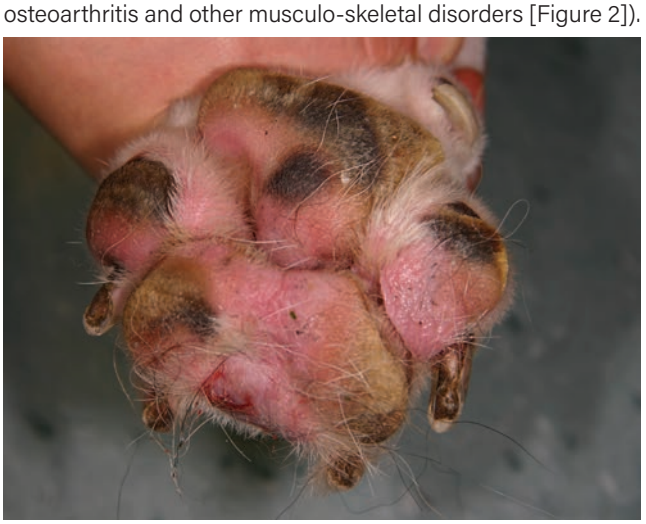


Figure 2: Ventral fore foot of an English bulldog with an adverse food reaction. Most dogs with adverse food reactions won't develop chronic pododermatitis – predisposing factors in this dog included obesity, short hairs, and a valgus limb conformation.

Perpetuating factors

These prevent resolution, inducing a cycle of inflammation and altered conformation associated with severe lymphocytic-plasmacytic inflammation. Changes include altered weight bearing, weight bearing on haired skin, hyperkeratosis and lichenification, scarring and chronic inflammation, conjoined pads, new pad formation, deep tissue pockets, ingrown hairs and sinus tracts (Figure 3).

Figure 3: Perpetuating changes in chronic pododermatitis: a) early changes with conjoined pads, altered weight bearing and weight bearing on haired skin (note the even pad wear and come dones); b) more severe changes with conjoined pads, new pad formation, weight bearing on haired skin, interdigital folds and pockets, ingrown hairs and cystic hair follicles.

Secondary factors

The altered micro-environment and inflammation predispose to secondary infections with *Staphylococcus pseudintermedius*, streptococcus species, *Escherichia coli, Klebsiella, Pseudomonas* and *Malassezia.* There can be multiple infections at different depths, especially in chronic cases. Antimicrobial resistance is frequent in dogs that have had multiple courses of antibiotics.

DIAGNOSTIC APPROACH

A detailed history and full clinical examination is needed to determine the likely primary, predisposing and perpetuating causes in each case (Table 2). Both the dorsal and palmer/planter foot surfaces should be inspected, with the interdigital spaces carefully opened out.

Table 2: Clinical findings and their associations.

Erythema: Diffuse on both interdigital surfaces Plantar surfaces only Focal or macular-papular	Atopic dermatitis and/or adverse food reaction Contact dermatitis Infection; *Demodex*
Follicular casts and comedones	*Demodex* Weight bearing on haired skin and ingrown hairs
Single paw/digit	Trauma, foreign body, neoplasia, acral lick granuloma, abnormal conformation
Uneven pad or nail wear	Altered conformation and/or weight bearing
Interdigital furunculosis and sinus tracts	Infection, cystic hair follicles, foreign body reaction
Conjoined pads and new pad formation Deep skin folds and pockets Scar tissue	Chronic pathological changes
Joint pain and reduced range of movement	Osteoarthritis
Saliva staining	Licking; pain or pruritus
Self-induced alopecia Spontaneous alopecia	Pruritus *Demodex*; dermatophytosis; endocrine

Hair plucks, skin scrapes and impression smears should be taken to rule out *Demodex*, but histopathology may be required in chronic cases. Histopathology can also achieve a definitive diagnosis of chronic pododermatitis. Impression smears should be used to confirm bacterial and/or *Malassezia* infection, but bacterial culture and sensitivity is mandatory if there is deep infection. Samples can be taken from freshly ruptured pustules or draining sinus tracts, but a biopsy is often necessary to isolate organisms from deep tissues.

If a foreign body or tumour is suspected, CT scans, radiographs and/or ultrasonography may be appropriate. Haematology, serum biochemistry, thyroid tests, urinalysis and/or diagnostic imaging should be performed if systemic disease is suspected. Regional lymph nodes are frequently enlarged due to local inflammation but lymphoma should be ruled out. Fungal culture and faecal analysis can be performed if dermatophytosis or hookworm are suspected. Further investigations may include a diet trial and intradermal or serological allergy testing.

MANAGEMENT OF PRIMARY AND PREDISPOSING FACTORS

This is crucial for successful long-term control. The most common primary conditions are atopic dermatitis and/or adverse food reactions. Obesity is a common predisposing factor. Pododermatitis is more common in the forelimbs, which bear approximately 60-70% of bodyweight. Excess weight also exacerbates changes in limb conformation and weight-bearing surfaces. Management of pain-altered weight bearing and abnormal conformation could include analgesia and/or corrective surgery (Figure 4). Protective boots (eg. Ruff Boots) can be helpful, especially in dogs reluctant to exercise due to pain. Lubricating barrier creams (eg. Bio Balm, Winterpad or Sudocrem) can be applied to the interdigital skin before exercise to help reduce rubbing and frictional hair follicle trauma.

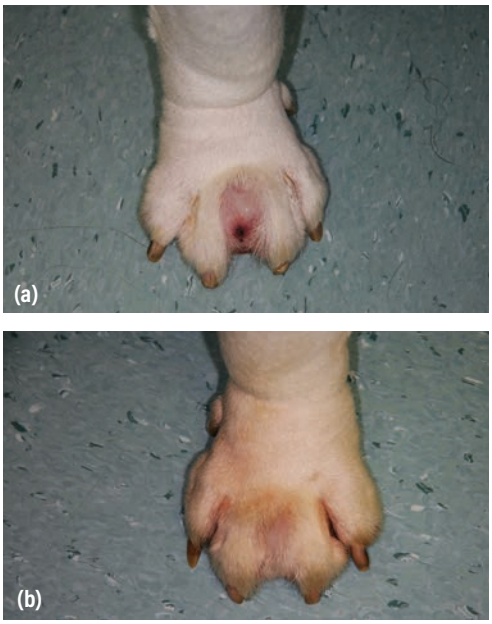


Figure 4: Managing primary and predisposing factors in an English bulldog: a) before treatment; b) after management of an adverse food reaction, 10kg weight loss, analgesia for osteoarthritis, and topical cleaning and anti-inflammatory treatment.

CONTROL OF SECONDARY INFECTIONS

Systemic antimicrobial therapy

Systemic antibiotics should be selected using culture and sensitivity. Treatment may take four to six weeks. The presence of cysts, micro abscesses and scar tissue can inhibit the penetration of water-soluble antibiotics, and this should be considered when selecting drugs and doses. Dogs with a staphylococcal hypersensitivity or recurrent infections may benefit from Staph Phage Lysate (SPL). This could induce tolerance to *staphylococcal*proteins and/or enhance anti-staphylococcal immunity.

Some cases of *Malassezia* overgrowth require systemic antifungal therapy, especially with *Malassezia* hypersensitivity. Options include itraconazole, ketoconazole or terbinafine. Allergen-specific immunotherapy with *Malassezia* extracts can help dogs with *Malassezia* hypersensitivity.

Topical antimicrobial/antifungal therapy

Daily cleaning of the paws is ideal, but the frequency can be reduced for maintenance. Owners should be shown how to spread the digits and thoroughly clean deep pockets or sinus tracts. Chlorhexidine is a highly effective antimicrobial but requires a five-minute contact time. Chlorhexidine wipes are easier to use, but have no residual activity and are not effective against *Pseudomonas*. Hypochlorous acid is a safe and potent antimicrobial, but has no residual effect.

Topical antibiotics are often highly effective, but penetration can be variable, and they are less suitable for deep infections. Useful antibiotics include fusidic acid, silver sulfadiazine (which can be combined with gentamicin or marbofloxacin), neomycin or polymyxin B. Many products also contain a steroid.

Anti-inflammatory treatment

Anti-inflammatory therapy should be initiated early to limit the development of chronic inflammation and other perpetuating factors. The correct diagnosis is important since immuno-suppressive treatment may exacerbate demodicosis and bacterial infections. Both systemic and topical therapies are often required.

Systemic anti-inflammatory treatment

Glucocorticoids are frequently used to reduce inflammation, although they will cause adverse effects and patients on long-term therapy need regular clinical monitoring, blood pressure checks and urinalysis. Prednisolone or methyl-prednisolone at 1-2mg/kg PO every 24 hours are generally used, but dexamethasone at 0.1-0.2mg/kg every 24 hours can be useful in more severe cases. However, the longer duration of activity makes it less suitable for long-term use and dogs should be switched to prednisolone/methyl-prednisolone or to twice weekly dexamethasone therapy as soon as possible. Longer term control usually requires 0.4-1mg/kg prednisolone every other to twice weekly (or the dexamethasone equivalent). Ciclosporin at 5-10mg/kg every 24 hours is also beneficial. The frequency or the daily dose can be reduced to the lowest that maintains remission. In severe cases, twice weekly glucocorticoid can be combined with every other day to twice weekly ciclosporin. Ciclosporin is well tolerated by dogs but regular checks for gingival hyperplasia and hyperkeratosis, as well as urinalysis are advised.

Oclacitinib and lokivetmab are licenced for controlling pruritus

and atopic dermatitis in dogs. However, the chronic pedal inflammation in dogs with allergic skin disease does not respond as well to these drugs as to glucocorticoids or ciclosporin.

Topical anti-inflammatory treatment

Topical treatment is most commonly used with systemic therapy to improve clinical remission, although it can be used alone in mild cases and to maintain remission. Once or twice daily therapy is used initially, tapering the frequency as the inflammation reduces.

Deep pockets of inflammation and scar tissue limit the efficacy of topical hydrocortisone aceponate. Nevertheless, it is useful for maintenance once the initial inflammation is controlled. More penetrating steroids such as fluocinolone or betamethasone acid are usually required. However, long-term use of these products can lead to local and systemic adverse effects - 0.1% tacrolimus is also beneficial and well tolerated.

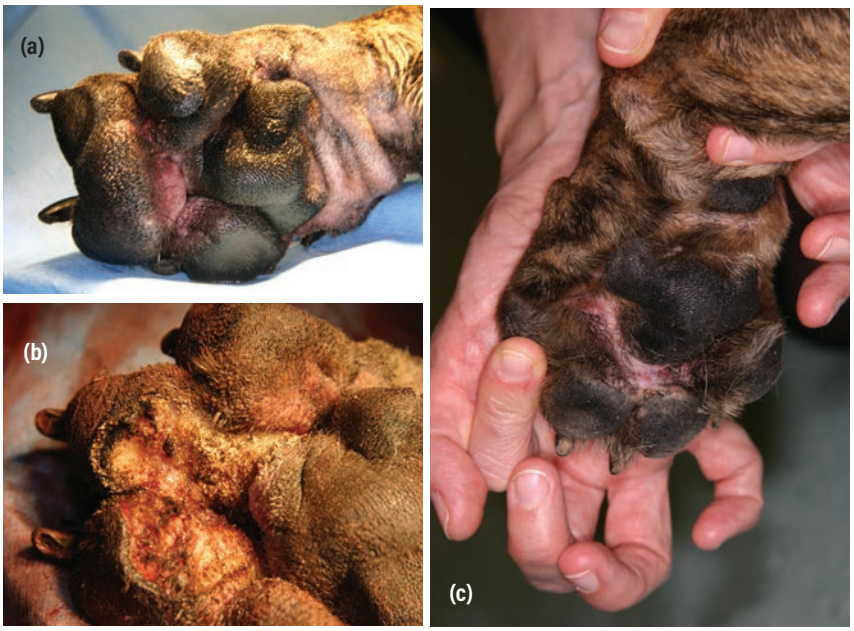


Figure 5: Laser podoplasty in an English bulldog: a) prior to surgery with severe chronic changes including new pad formation; b) during surgery where the abnormal tissues associated with digits three and four have been excised and ablated; c) the foot fully healed four weeks post-surgery with normal weight bearing.

Cytotoxic drugs

Where inflammation cannot be fully controlled and/or there are concerns over adverse effects, glucocorticoids can be combined with cytotoxic drugs such as azathioprine, chlorambucil, mycophenolate or methotrexate. All of these have the potential to cause bone-marrow suppression and other side effects so regular haematology and serum biochemistry are mandatory. The owners should give informed consent and be shown how to safely handle these drugs.

END STAGE DISEASE AND SURGERY

Surgery may be required in cases refractory to medical treatment. Fusion podoplasty has been used but is associated with post-operative pain, wound dehiscence and infections. Partial fusion podoplasty may be appropriate where there are localised recurrent cystic hair follicles due to poor conformation.

Laser podoplasty (Figure 5) has minimal post-operative pain and a quicker recovery period (patients usually weight bear immediately after the procedure). A CO_2 laser is used to remove all the abnormal tissue, ablate hair-follicle cysts and sinus tracts, and to resurface the foot. Lasers cut, ablate and coagulate tissues, resulting in less haemorrhage, pain and wound dehiscence, and destroy any bacteria, reducing the risk of post-operative infection. Treated tissues take about four weeks to granulate and heal. Post-operative treatment in most cases simply requires daily cleaning and topical antimicrobials. Light bandages with daily changes are advisable for the first seven to 14 days, but these are not usually necessary once there is a healthy granulation bed. Boots can be used to protect the foot outdoors until fully healed. Recurrence is less likely following laser podoplasty, as hair follicles, follicular cysts and sinus tracts are ablated and re-placed with scar tissue.

CONCLUSIONS

Chronic interdigital furunculosis or pododermatitis is a common and frustrating problem with multiple trigger factors. It is very important to manage the underlying causes to reduce or prevent chronic changes. Chronic changes such as hyperplasia or new pad formation make long-term control much harder and more complicated.

FURTHER READING

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