



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.3360813>Available online at: <http://www.iajps.com>

Research Article

**CLINICAL AND MORPHOLOGICAL COURSE OF
INTERDIGITAL FOLLICULAR CYST IN DOGS****Vyacheslav Gorokhov, Anatoly Stekolnikov, Alexander Bokarev, Marina Narusbaeva,
Anastasia Bluzma.**

St. Petersburg State Academy of Veterinary Medicine, St. Petersburg, Russia.

Article Received: June 2019**Accepted:** July 2019**Published:** August 2019**Abstract:**

Using macromorphological, thermographic, ultrasound and radiographic (intravenous retrograde radiopaque angiography) methods of visual diagnostics, we investigated the correlation between pathogenesis and clinical signs of interdigital follicular cyst in dogs. And also, its clinical signs and course in comparison with other nonspecific pododermatitami. Studies have shown that, despite the external similarity with other nonspecific pododermatitis, interdigital follicular cyst has characteristic features as it proceeds with a certain staging. The first stage is characterized by inflammatory hyperemia, a local slight increase in temperature, coarsening of the plantar skin with the formation of comedones, but no changes in echogenicity and vascular pattern of the pathological focus. The second stage is characterized by even greater edema, hyperemia and a local increase in the temperature of the interdigital fold. There is a slight diffuse increase in the echogenicity of the pathological focus. But the vascular pattern, visualized by CPAA, in the area of the pathological focus, is not changed. The third stage is characterized by clearly visualized pustules from the dorsal side of the interdigital fold. An ultrasound clearly visualizes a cavity filled with fluid. The hyperemia is even more visualized and the local temperature increases. In the energy doppler mode, increased blood flow along the periphery of the cyst is visualized. CPAA visualizes the defect of the vessels in the area of the interdigital fold. The fourth stage is characterized by the formation of an ulcer from the dorsal side of the interdigital fold. At the same time, the ultrasound continues to clearly visualize the cavity filled with fluid. The CPAA visualizes a significant enhancement of the vascular pattern in the area of the lesion. The fifth stage is characterized by the formation of connective tissue scar at the site of cyst localization. At the same time, the area of the pathological focus becomes highly echogenic. In it vessels are poorly visualized and the intensity of blood flow is lowered. Thus, a clear staging of the clinico-morphological course of the interdigital follicular cyst indicates the specificity of this disease, which distinguishes it from the subdermatitis of another etiopathogenesis and must necessarily affect its treatment method.

Key Words: *interdigital follicular cyst, dog, radiography, ultrasound, thermography.***Corresponding author:****Vyacheslav Gorokhov,**

St. Petersburg State Academy of Veterinary Medicine,

St. Petersburg, Russia.

QR code



Please cite this article in press Vyacheslav Gorokhov et al., *Clinical And Morphological Course Of Interdigital Follicular Cyst In Dogs.*, *Indo Am. J. P. Sci*, 2019; 06[08].

INTRODUCTION:

Interdigital follicular cyst (IFC) in dogs is a type of chronic granulomatous pododermatitis in the area of the interdigital arch and is characterized by a relapsing course. It should be noted that the term "granulomatous pododermatitis" is only a kind of surgical pathology in the area of the fingers but does not explain the exact pathomorphological difference between the interdigital follicular cyst and other pododermatitis.

The putative pathogenesis of interdigital cyst in dogs has been described by some foreign authors [Duclos D.D., Hargis A.M., Hanley P.W.]. According to this hypothesis, an interdigital follicular cyst develops as a result of coarsening of the plantar skin, and obstruction of the excretory ducts of the sebaceous glands. At the same time, comedones are visualized at the initial stage of the disease. The authors argue that the development of this pathology can occur against the background of a bacterial infection, but in relation to the latter, the formation of a cyst in the interdigital fold should be considered the primary pathology [4]. However, the coarsening of the skin on the plantar side of the limb can be caused by various factors that contribute to the breakdown of the skin barrier and the development of a dermatological reaction. For example, long walks of large dogs on sandy ground, or uneven distribution of body weight on the fingertips when the paws are not correctly set, and maceration of the plantar skin due to wet weather, or an accompanying allergic reaction of the body, etc. [1, 2, 4, 5]. Thus, most etiological factors lead to the development of a dermatological reaction and a weakening of the skin barrier with the penetration of conditionally pathogenic microflora. Therefore, the macromorphological features of the interdigital follicular cyst are often visualized in combination with other signs characteristic of the Pododermatitis, i.e. they have a mixed picture. For example, abscesses, folliculitis and furunculosis, scars, erythema, edema, purulent or purulent-hemorrhagic exudation, the formation of corn pyoderma, deformation of fingertips, fistulas and ulcers. Often, interdigital cyst proceeds typically, with the formation of a single abscess or interdigital fistula, but the pathology can be mistaken for a consequence of injury or confused with a furuncle, and even with a neoplasm [1, 2, 4, 5, 6]. Thus, for accurate diagnosis of interdigital follicular cyst and its subsequent adequate pathogenetic treatment, a clear understanding of its clinical and morphological picture is necessary.

Purpose of the study. Investigate the course of interdigital follicular cyst in order to visualize and

describe the dynamics of changes in its clinical manifestations. Find the similarities and differences in the clinical course of IFC in comparison with other sub-dermatitis.

Objectives of the study. To accomplish this goal solved the following tasks. 1 - using methods of visual diagnostics to conduct a study of interdigital follicular cyst in dogs, in acute, subacute, chronic periods of the disease, as well as in the period of remission and relapse. 2 - compare and interpret the data of ultrasound, thermography and X-ray in different periods of the course of the IFC, and in comparison, with other sub-dermatitis. 3 - to classify the stages of IFC in the dynamics of the pathogenesis of the disease on the basis of data of visual diagnostics.

MATERIALS AND METHODS:

The study was carried out on the basis of the St. Petersburg State Aviation Clinical Hospital. For the study selected 15 dogs of different breeds and ages, with signs of interdigital follicular cyst. In order to diagnose interdigital follicular cysts in dogs, anamnestic data, general clinical and macromorphological signs, as well as the results of a hematological study of biochemical and clinical blood parameters were taken into account. To assess the stages of interdigital cyst, thermographic, ultrasound, and X-ray methods of diagnosing distal extremities were used. Thermography was carried out at room temperature, in a room protected from the sun's rays, using a GEMDT 980 thermal imager, while the thick hair in the area of the fingers was clipped. Ultrasound examination was carried out in "B-mode", using an ultrasound machine of the company Mindray, brand DC-T6/DC-N6, with a linear transducer, frequency 7.5 MHz. In the area of the corresponding interdigital space, thick hair was cut off, and a medium-viscosity buffer gel was applied to the skin of the test area. To determine the vascularization of the affected area was used energy Doppler mode. As an x-ray, intravenous retrograde radiopaque angiography (BPPA) was performed in the area of the fingers using a DONGMUN CO., LTD x-ray unit, model DM-100P, using a Kodak Point-of-Care digitizer CR 120. parts of the limbs, used radiopaque agent "trazograf".

RESULTS AND DISCUSSION:

According to the results of external examination of the limbs of animals with interdigital follicular cyst, it was established that this pathology is characterized by the presence of an acute inflammatory reaction of the plantar skin bordering the fingertips. In addition, there is marked skin roughness in this area, with the

formation of comedones, calluses, sclerotic changes of the pads, as well as pain and thickening of the interdigital fold. Macromorphological signs of interdigital follicular cyst, along with a

dermatological reaction, are characterized by the formation of interdigital fold pustules, the presence of fistulas or ulcers on the dorsal surface of the fold, or cicatricial fold thickening (Fig. 1).

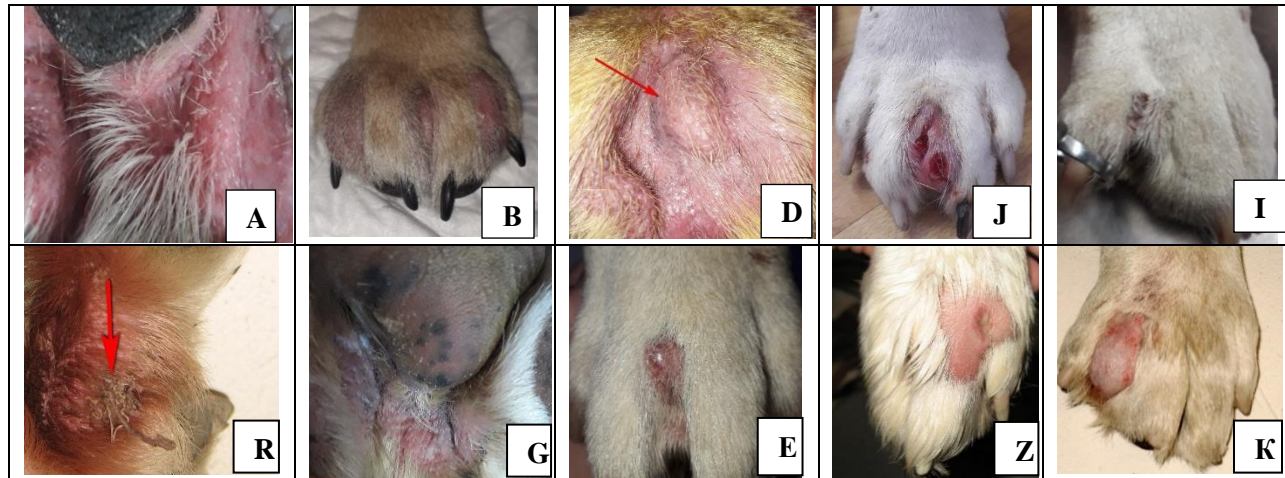


Fig. 1: External signs of the course of IFC in dogs:

Stage 1: **A** - erythema and edema of the plantar skin; **R** - comedones on the skin of the sole.

Stage 2: **B** - edema of interdigital folds; **G** - hyperpigmentation.

Stage 3: **D, E** - pustule of the dorsal surface of the interdigital fold.

Stage 4: **J** - interdigital fistulous drainage; **Z** - ulcer of interdigital arch.

Stage 5: **I** - formed scar of interdigital fold; **K** - keloid scar of interdigital fold at the site of healing of the ulcerative defect.

According to the results of a thermographic study of the interdigital follicular cyst, it was established that

the disease proceeds against the background of a diffuse or local dermatological reaction, which is characterized by a local increase in the temperature of the skin surface. The temperature of the skin surface is displayed on the display of the thermal imager as a diffuse or limited area of dark red. The presence of a diffuse dermatological reaction indicates a high intensity of inflammation, and a local one indicates a limited inflammatory process in the initial stage of the disease or in the period during its chronic course. A significant weakening or disappearance of the intensity of infrared radiation is observed only in the period of remission of the IFC (Fig. 2).

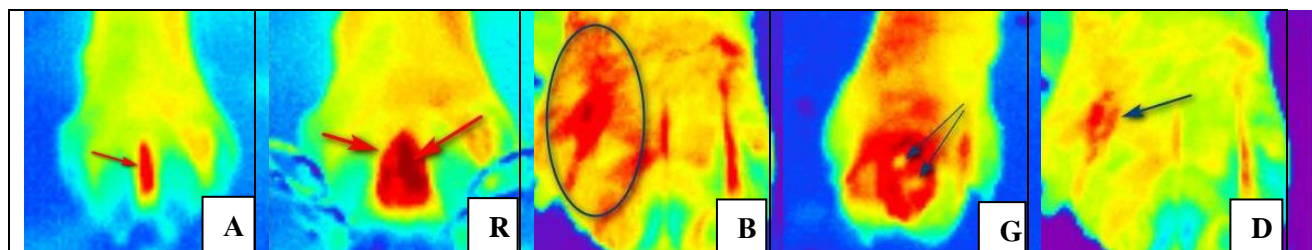


Fig. 2: Thermography of the IFC localization area at different stages of the flow:

Stage 1: **A** - local hyperthermia of the interdigital fold.

Stage 2: **R** - hyperthermia of the interdigital fold with the seizure of adjacent tissues.

Stage 3: **B** - hyperthermia of the nidus with capturing the metacarpus (metatarsus) tissue.

Stage 4: **G** - hyperthermia of the nidus with capture of the metacarpus (metatarsus), arrows indicate the

fistulous openings with local foci of necrosis visualized as zones of hypothermia.

Stage 5: **D** - decrease in temperature in the area of scar tissue formation due to weak vascularization of fibrous tissue.

According to the results of ultrasound diagnosis of interdigital folds, with signs of pustular formation, the presence of a cavity of low echogenicity, which is limited by the contours of increased echogenicity, is clearly visualized. However, in case of chronic inflammation and limited painless thickening of the interdigital fold, a continuous limited area of increased echogenicity is visualized. An ultrasound examination of the interdigital fold pustules in the mode of energy dopplerography revealed that blood supply is carried out around the demarcation zone of

the pathological cavity. In the case of a chronic course of pathology with the replacement of the pathological focus with fibrous tissue, the echogenicity in the thickness of the interdigital fold increases significantly, but the blood supply is visualized very weakly. In the initial stage of the IFC, the signs of pathology are not visualized, the structure of the interdigital fold is homogeneous, of medium echogenicity, the energy Doppler mapping displays the cumulative blood flow (Fig. 3).

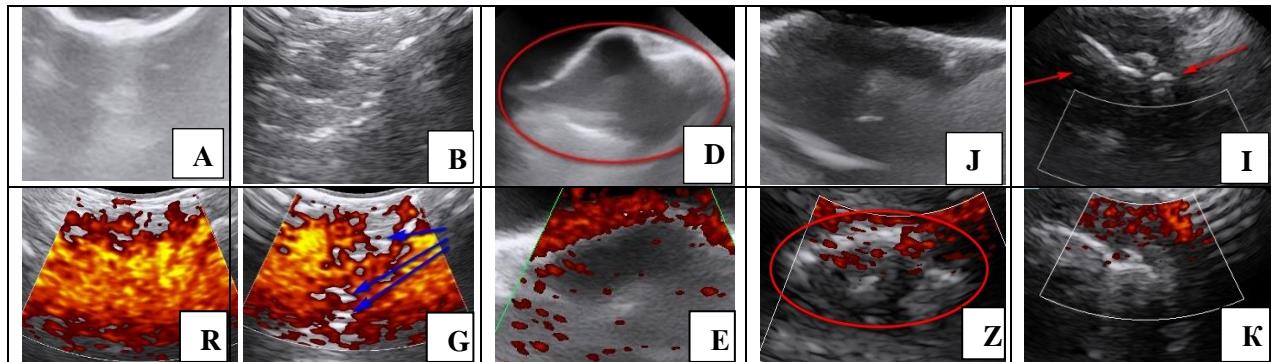


Fig. 3: Ultrasonic visualization of the interdigital fold at different stages of the IFC:

Stage 1: A - no changes, homogeneous structure of medium echogenicity; **R** - no change, energy Doppler mapping displays cumulative blood flow.

Stage 2: B - a slight diffuse increase in echogenicity, with local areas of ischemia - **G**.

Stage 3: D - a limited and rounded area of low echogenicity, highlighted by an oval; **E** - visualization of energy Doppler mapping on the periphery of a rounded section with its absence in the center.

Stage 4: J - a limited area of low echogenicity of irregular shape; **Z** is the enhancement of the energy Doppler mapping along the periphery of the area marked by the oval.

Stage 5: I - arrows indicate a heterogeneous structure with areas of increased echogenicity and increased energy Doppler mapping on the periphery of the site - **K**.

According to the results of intravenous retrograde radiopaque angiography (CPRA) of distal limbs of dogs with signs of IFC, it was found that the nature of

the vascular pattern in the area of the fingers varies depending on the degree of inflammation of the interdigital folds. That is, due to the development of an acute or chronic inflammatory process in the vessels, stagnation is visualized, and the branching of the vascular pattern becomes atypical. For example, in the case of the formation of interdigital fold pustules, the blood supply of this area is disturbed, which is characterized by a delay of the radiopaque agent in the end parts of the metacarpal vessels or the metatarsus. Thus, the shadow of the vascular pattern is abruptly interrupted, having the appearance of incompleteness or "steepness". In addition, due to inflammatory edema and vascular hyperemia of the interdigital fold, the radiopaque agent is retained in the collateral vessels of the inflammatory focus. In the case of cicatricial sclerosis of the interdigital fold, the radiopaque agent does not enter the vessels of this region. In the initial stage of the IFC, signs of pathology are not visualized, the distribution of the radiopaque agent in the metacarpus / tarsus and fingers is even. (Fig. 4).

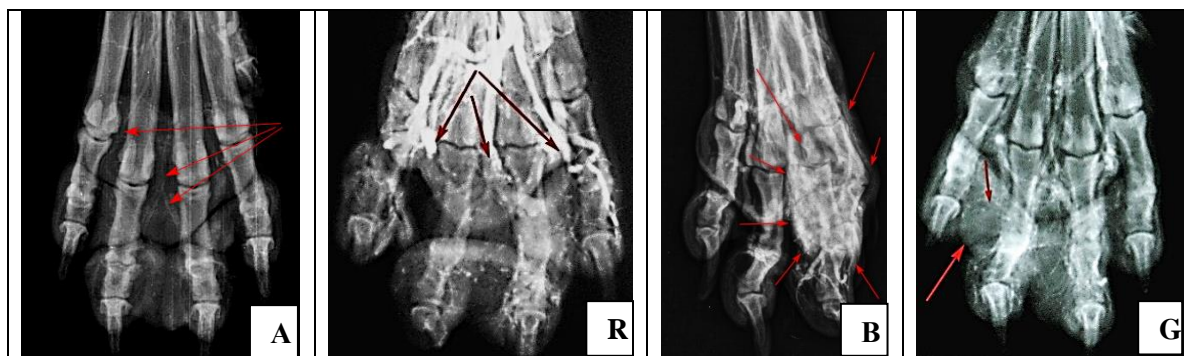


Fig. 4: BPAA of the metacarpus / tarsus and fingers at different stages of the IFC:

Stages 1, 2: A - there are no changes in vascular architectonics. The arrows indicate continuous vascular shadows and a uniform intravascular distribution of the radiopaque agent.

Stage 3: R - Arrows indicate areas with an interruption of the vascular pattern in places of delay of the radiopaque agent.

Stage 4: B - confluent enhancement of X-ray density in the area of the second and third fingers, due to excessive accumulation of X-ray contrast agents in the divided vessels of the pathological focus.

Stage 5: G - arrows indicate a section of scar tissue and a weak filling of vessels with a radiopaque agent.

Thus, on the basis of the results of visual methods of research, it can be concluded that the morphological picture of interdigital follicular cyst in dogs, on the one hand, corresponds to the standard pathogenesis of the inflammatory process. But on the other hand, it is specific as a result of the development of the primary pathological process in the glands of the interdigital fold. That is, the pathogenesis of the interdigital cyst begins with inflammation of the skin on the plantar side of the limb, its coarsening and thickening, which leads to obstruction of the ducts of the sebaceous glands and the formation of retention follicular cysts in the interdigital fold - 1 stage. The cyst filled with fat-sweat secretion squeezes the surrounding tissues, and the interdigital fold thickens and inflames, since it is disturbed by vascular hemodynamics and an acute inflammatory process develops - 2 STAGE. As a result of hemostasis, fibrinogen, the effusion of the liquid part of the blood, and the breakdown of tissue protein are released, as a result of which the cyst overflows with inflammatory exudate. Further,

purulent exudate can diffuse into the surrounding tissues, as a result, the interdigital fold pustule or abscess of the interdigital arch on the dorsal side of the extremity develops - 3 STAGE. The interdigital fold of the pustule formed on the dorsal side undergoes disintegration and opens up with the formation of a fistulous opening, with the presence of purulent or purulent-hemorrhagic exudate - 4 STAGE. With the release of purulent exudate, the acute phase of the inflammatory process is completed and the cells of the reticulo-endothelial system are activated. This is the way the next phase develops - chronic proliferative inflammation. Proliferative changes lead to the formation of fibrous or granulomatous tissue, sometimes causing irreversible sclerosis of the interdigital fold with the presence of "keloid scars" - 5 STAGE. In some cases, extensive scarring is not formed, and the skin of the interdigital fold is restored, acquiring a morphologically normal interdigital space. However, as a result of persistent changes in the plantar skin, due to its coarsening and callousness, as well as due to sclerosis of the excretory duct of the sebaceous gland, the pathological process recurs. Thus, interdigital cyst in dogs acquires a protracted and recurrent nature, and does not respond to conservative treatment.

CONCLUSION:

Based on the studies of interdigital follicular cysts in dogs, it should be noted that most of the clinical manifestations mimics other nonspecific subsidermatitis. However, the use of several methods of visual diagnostics makes it possible to identify a clear staging of the IFC, which is not observed with other sub-dermatitis (Table 1).

Table 1: Visual signs of the clinical stages of IFC.

Stages of the MPFC	Visualized signs				
	External signs	Thermography	Ultrasound diagnostic		BPPA
			overview	Power doppler	
Stage of obstruction of sebaceous glands	Edema, erythema, hyperkeratosis, comedo.	Local hyperthermia	No change	No change, Doppler mapping displays cumulative blood flow	No change
Stage inflammatory infiltration	Edema, macula, hyperpigmentation	Hyperthermia pathological focus with the capture of adjacent tissues	Does not mean. diffuse increase in echo	Displays a cum. blood flow from the locale. areas of ischemia	No change
Stage of pustule formation	Pustule on the dorsal surface of the interdigital fold	Hyperthermia of the nidus with the seizure of most of the pasterns / tarsus	roundish area of low echogenicity, with	peripheral Doppler energy mapping	Violation of the uniform filling of the venous vessels with a radiocontrast in the area of the pathological focus
Stage of ulceration	Ulcer / fistulous drainage on the dorsal surface of the interdigital fold	Hyperthermia of the nidus with the seizure of most of the pasterns / tarsus	plot of low echogenicity and irregular shape, with	enhanced power Doppler mapping on the periphery	increased accumulation of X-ray contrast in the vessels of the pathological focus and on its periphery
Stage of scarring	Scar formation at the site of ulcer healing	Decrease in temperature in the area of scarring ulcer	In the thickness of the interdigital fold, the area of increased echogenicity, without clear boundaries	power Doppler mapping on the periphery of the site	Very weak accumulation of X-ray contrast in the vessels of the area of the healed ulcer.

REFERENCES:

1. Bokarev AV, Stekolnikov AA. Diagnosis of inflammatory and neoplastic pathology of distal limbs of dogs by intravenous retrograde radiopaque angiography (VRPA): method. Benefit. SPb. FGBOU VPO SPbGAVM, 2015.
2. Bokarev AV., Stekolnikov AA, Lakovnikov EA, Spynu MD, Suvorov ON, Solomatova ES. Cytomorphology of distal limb inflammations in dogs. *Veterinary Consultant*. 2008; 5:15-17.
3. Konoplyov VA, Gorokhov VE, Bokarev AV, Kovalev SP. Infrared thermography of the pathology of the distal limb in domestic and farm animals. *International Journal of Veterinary Medicine*. SPb. 2018; 1:93-97.
4. Duclos DD, Hargis AM, Hanley PW. Pathogenesis of canine interdigital palmar and plantar comedones, and follicular cysts and their response to laser surgery. *Veterinary Dermatology*. 2008; 3:134-141.
5. Berger D. Canine Interdigital Follicular Cysts. *Clinician's Brief*. June 2015; 12-14.
6. Douglas Slatter, *Textbook of Small Animal Surgery*—3rd Edition. 2003; 1:342-344.