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A Clinical Case of Proliferative and Necrotizing Otitis Externa (PNOE) in an Elderly Cat



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Abstract

Introduction. A clinical case of proliferative and necrotizing otitis externa (PNOE) in an elderly cat has been described, i.e. diagnostics and treatment with tacrolimus. This syndrome of unknown etiology occurs in cats aged from 2 months to 12 years. It bilaterally affects the concave pinnae and the external acoustic pore. Disease development in the ear canal is accompanied with the secondary bacterial or *Malassezia* otitides. Fifteen foreign studies investigating PNOE in cats and dogs published in the period of 2000–2025 have been reviewed.

Materials and Methods. In November 2024, the owners of a five-year-old cat attended to the veterinary clinic “Center” (Rostov-on-Don) with the complaint on frequent otitides in their pet. PNOE diagnosis was based on the animal’s medical history, clinical examination, microscopic and cytological examination of discharge from ears (performed in the “Vet Union” veterinary laboratory, Moscow). Treatment included topical application of 0.1% tacrolimus ointment.

Results. Examination of the inner surface of the auricles revealed stenosis of the external ear canals and a significant number of black, dry crusts. An ear culture test revealed secondary microbial contamination with *Pseudomonas aeruginosa*, *Klebsiella oxytoca*, and *Enterobacter cloacae*; whereas, *Candida* or *Malassezia spp* fungi were not isolated. Also, during microscopy of earwax, no mites of the genus *Otodectes cynotis* were isolated. After 4 weeks of treatment with 10 g of 0.1% tacrolimus ointment applied topically, normalization of condition was noticed during the otoscopic examination of the auricles.

Discussion and Conclusion. The efficiency of treating PNOE in cats with tacrolimus ointment applied topically to the auricle crusts has been proved. The data and photographs presented in the article may be useful for practicing veterinarians for diagnostics and treatment of this relatively rare disease.

Keywords: clinical case, cats, proliferative and necrotizing otitis externa, PNOE, tacrolimus

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Клинический случай пролиферативного и некротизирующего наружного отита (PNOE) у возрастной кошки

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Аннотация

Введение. Описан клинический случай пролиферативного и некротизирующего наружного отита (PNOE) у взрослой кошки — диагностика и лечение с применением такролимуса. Данный синдром неизвестной этиологии возникает у кошек в возрасте от 2 месяцев до 12 лет: билатерально поражается вогнутая часть ушной раковины и наружное слуховое отверстие; распространение заболевания по слуховому проходу сопровождается вторичными бактериальными или малассезиозными отитами. Рассмотрены 15 зарубежных исследований пролиферативного и некротизирующего наружного отита у кошек и собак, опубликованных в 2000–2025 гг.

Материалы и методы. В ноябре 2024 г. в ветеринарную клинику «Центр» (г. Ростов-на-Дону) обратились владельцы пятилетней кошки с жалобой на частые отиты у животного. Диагностика PNOE была основана на данных анамнеза, клинического осмотра, микроскопического и цитологического исследования содержимого ушного канала (ветеринарная лаборатория Vet Union, г. Москва). Терапия проводилась с применением 0,1% мази такролимуса наружно.

Результаты исследования. При осмотре на внутренней поверхности ушных раковин был обнаружен стеноз наружных слуховых проходов, значительное количество черных и сухих корочек. При посеве материала из слухового прохода на микрофлору выявлено вторичное микробное обсеменение (*Pseudomonas aeruginosa*, *Klebsiella oxytoca* и *Enterobacter cloacae*); при этом грибков рода *Candidaspp* и *Malasseziaspp* не выявлено. При микроскопическом анализе ушной серы клещей рода *Otodectes cynotis* также не выявлено. После проведения терапии с применением 10 г 0,1% мази такролимуса наружно через 4 недели при отоскопическом исследовании ушных раковин отмечена нормализация состояния.

Обсуждение и заключение. Доказана эффективность лечения PNOE у кошек с применением такролимуса наружно на корочки ушных раковин топикально. Представленные в статье данные и фотоматериалы могут быть полезными для практикующего ветеринарного врача при диагностике и лечении заболевания, регистрируемого достаточно редко.

Ключевые слова: клинический случай, кошки, пролиферативный и некротизирующий наружный отит, PNOE, такролимус

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Introduction. Proliferative and necrotizing otitis externa (PNOE) in cats is a syndrome of unknown etiology [1] that is quite rare. By 2025, 21 cases of PNOE had been reported in the literature [2]. Proliferative and necrotizing otitis in kittens was first described in [1, 3]. Initially, it was believed that only kittens under 1 year old were susceptible to the disease, but it has now been established that PNOE occurs in cats aged of 2 months to 12 years, and, most often the disease is being recorded by the age of 4 years [3–6]. Breed susceptibility has not been revealed, however, sex-based susceptibility is being recorded—out of 22 cases, 16 were recorded in male cats [6].

The etiology of the disease is unclear, although its relation to the immune system is assumed [1, 7]. This assumption is supported by the possibility of PNOE treatment with topical and systemic immunomodulators [2]. This is likely due to T-cell-induced caspase-positive apoptosis of epidermal keratinocytes, which has features common with such diseases as erythema multiforme [5]. So far, the infectious agents, including that of feline viral diseases, have not been associated with this disease; their involvement in its occurrence has not been proven [6]. The authors [1, 3] describe a similar case of otitis in a kitten with the histopathological features, immunohisto-

chemical staining results, and response to treatment consistent with keratinocyte apoptosis induced by skin-infiltrating T-cells.

Most often, PNOE bilaterally and symmetrically affects the concave pinna and the external acoustic pore, but can also develop along the ear canal and cause secondary bacterial or *Malassezia* otitides, accompanied by crusting and purulent discharge [3, 5–8]. Lesions are attributed with erythematous plaques with hyperkeratotic crusts tight to the pinna. Crusts are most often golden to dark brown in colour, indicating severe hyperkeratosis and parakeratosis [8]. In case of trauma, ulcers with some haemorrhages are observed. Characteristic lesions can also localize in the cat muzzle, in the periocular or perioral regions. Generalized lesions, which get spontaneously healed, are also reported in some publications [1, 5, 6].

The main changes observed during histopathological examination of skin biopsies in cats with PNOE were epidermal and follicular hyperplasia. This lesion underlies the term used to describe the disease, namely, the proliferative otitis [1, 5, 6]. Necrotic changes, which underlie the second term used to describe the disease, are less pronounced, and dyskeratosis is rarely observed. The histopathological analysis revealed the differences between otitis and dyskeratosis which mainly referred to dyskeratoses. The initial diagnosis would be an adverse reaction to topical medications; however, satellite cell apoptosis and fewer hyperplastic changes could be expected in this condition [3].

As reported in [9], treatment of PNOE variants, such as additional auricular dermatitis and middle ear lesions, with systemic immunosuppressants proves to be efficient: a sick cat responded favourably to treatment with cyclosporine, systemic prednisolone, and topical tacrolimus. In publication [10], two clinical cases of the successful use of oclacitinib in treatment of cats with PNOE were noted, when standard therapy with tacrolimus didn't result in the expected response. Oclacitinib is an inhibitor of Janus kinase-1 (JAK1), which affects the signaling pathways of cytokines participating in the development of pruritus and allergic dermatitis [11]. Although the use of oclacitinib is not recommended in cats, some publications indicate that this drug may have a therapeutic effect in various immune-mediated and autoimmune diseases in dogs and cats [3, 4, 12, 13].

Otitis externa is relatively rare reported in cats compared to dogs and is most often associated with ear mite infestations, inflammatory polyps, ear canal neoplasia, and associated allergic conditions.

The present article describes a clinical case of proliferative and necrotizing otitis externa in an elderly cat, the diagnosis and efficient treatment thereof with tacrolimus.

Materials and Methods. A five-year-old spayed Scottish Fold cat was admitted to the veterinary clinic “Center” (Rostov-on-Don) in November 2024 with atypical proliferative lesions in both ear canals. According to the owners, the animal had been suffering from recurrent otitis for two

years. The cat was kept in an apartment; the owners did not own any other pets.

PNOE was diagnosed based on the patient's medical history, clinical examination, and microscopic and cytological examinations of the ear canal discharge. Two samples were collected from each pinna for laboratory testing: one for microscopy (to exclude *Otodectes cynotis*) at $\times 10$ magnification (Olympus CX23 microscope, Japan); another for cytological examination. A swab sample was fixed, stained with “Di-ahim-Diff-Quick” dye (“ABRIS+” Research and Production Company, Russia), and examined using the same microscope at $\times 100$ magnification. Otoscopy was performed using a light otoscope (Welch Allyn Inc., USA).

Microbiological testing was performed at the “Vet Union” laboratory (Moscow). Earwax microscopy was performed in the laboratory of the clinic using an Olympus CX23 microscope at $\times 10$ magnification.

The ear culture test, antibiotic sensitivity test, and fungal culture test for *Candida spp.* and *Malassezia spp.* were also performed at the “Vet Union” veterinary laboratory.

Treatment included topical application of 0.1% tacrolimus ointment (Protopic, Astellas Pharma, Japan).

A general examination 4 weeks after treatment was performed using a Welch Allyn light otoscope.

Research Results. According to the medical history, in the previous months, the cat had been treated with numerous topical medications against ear parasites, yeast, and bacterial infections that included compound drops containing 5% Baytril and dexamethasone. The cat systematically received a single topical application of selamectin (Stronghold, manufactured by Zoetis (formerly Pfizer Animal Health), USA) and amoxicillin + clavulanic acid (Krka, Slovenia) at a dose of 15 mg/kg twice a day for 14 days.

The ear culture test and antibiotic sensitivity test, revealed the following microorganisms: *Pseudomonas aeruginosa*, *Klebsiella oxytoca*, and *Enterobacter cloacae* (Fig. 1). The results of microbiological analysis proved to be characteristic not of an infection, but of the secondary microbial contamination. The fungal culture test for fungi of the genus *Candida spp.* and *Malassezia spp.* did not reveal any fungi (Fig. 2).

A general examination revealed no other skin lesions. Bilateral lesions were found on the inner surface of the pinnae. Stenosis of the external ear canals and a significant number of black, dry crusts were also detected. Minor bleeding was noted during trauma and diagnostic testing (Fig. 3). An otoscopic examination could not be performed during first consultation due to stenosis of the ear canals. Examination of the nasopharynx revealed no anatomical or pathological changes.

Initially, the following differential diagnoses were considered: otoacariasis (parasitic otitis), which might have not been healed with a single application of spot-on drops, and chronic bacterial or yeast otitis externa secondary to otitis media (or, less likely, to bilateral ear polyps).

Ear culture test (discharge from external ear canal)

- 1 Pseudomonas aeruginosa 10⁷ SFU/swab
- 2 Klebsiella oxytoca 10⁷ SFU/swab
- 3 Enterobacter cloacae 10⁷ SFU/swab

Sensitivity to medications	1	2	3
AMPICILLIN		R	R
AMOXICILLINE CLAVULANAT		S	R
CO-TRIMOXAZOL	R		
CEFOTAXIME	R	S	S
CEFTAZIDIME		S	S
CEFTRIAxon	R	S	S
CEFEPIME	R	S	S
GENTAMICIN	S		
AMIKACIN	S		
ENROFLOXACIN	S	S	S

Comments

S – Susceptible

R – Resistant

I – Intermediate resistant

Comments to the lab test application

Localization: discharge from external ear canal

Test results are not a diagnosis; a consultation with a specialist is required.

Fig. 1. Results of ear culture test and antibiotic sensitivity test

The fungal culture test for fungi of the genus *Candida* spp. and *Malassezia* spp. and Antimycogram

- 1. *Candida* spp. growth is not detected
- 2. *Malassezia* spp growth is not detected

Fig. 2. Results of ear fungal culture test for fungi of the genus *Candida* spp. and *Malassezia* spp.



Fig. 3. Proliferative and necrotizing otitis in a cat before treatment

The earwax microscopy for the presence of *Otodectes cynotis* mites was negative, and cytological examination identified only keratinocytes (Fig. 4).

Treatment began with topical application of 10 g of 0.1% Protopic ointment to the auricular crusts. After three days of treatment, the condition of the pinnae improved significantly (Fig. 5).

The cat was re-examined after 4 weeks of therapy. Otoloscopic examination revealed both the ear canal and pinnae to be in normal condition. A small amount of earwax still obscured the tympanic membrane on the left side, whereas the tympanic membrane on the right side was normally visible (Fig. 6). Cytological examination of the earwax revealed only keratinocytes.

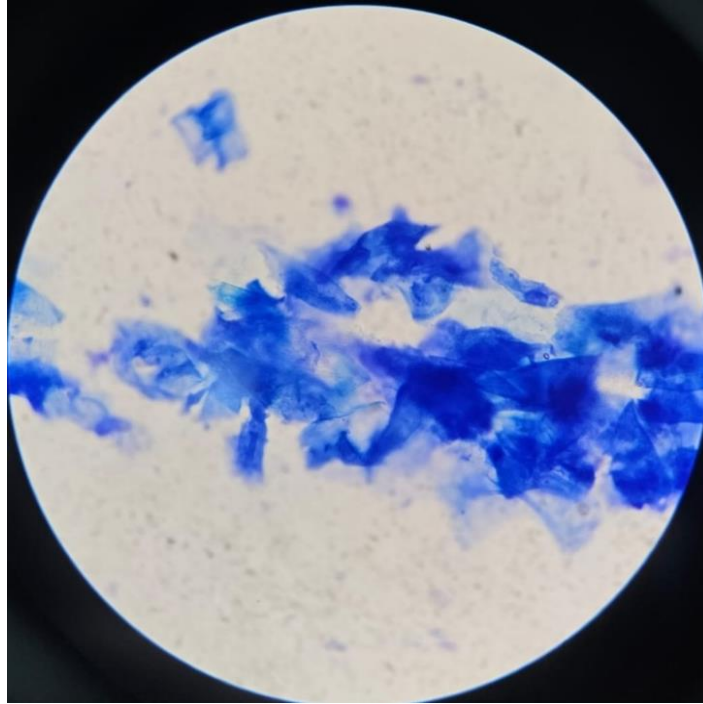


Fig. 4. Cytology of the swab sample from a cat with PNOE. Microscopy presents keratinocytes +++. Staining with “Diahim-Diff-Quick”. Magnification $\times 100$.



Fig. 5. View of the pinna after three days of using Protopic ointment



Fig. 6. Condition of the pinna in dynamics after 4 weeks of therapy

Discussion and Conclusion. If possible, the otoscopic examination to evaluate the condition of external acoustic pore and the integrity of the tympanic membranes should always be performed in animals with otitis externa [14, 15]. Otoscopy or video otoscopy allows a veterinarian to diagnose and prognosticate this disease. However, in cats with proliferative and necrotizing otitis externa, an otoscopic examination is not always possible due to the large number of crusts that accumulate in the ear canals. Pruritus may or may not be present, but secondary bacterial or yeast otitides externa are always present [1, 5]. In our case, the pinnae were not affected, and lesions similar to that discussed above affected only the external ear canals.

Based on the achieved treatment results and data obtained from the available literature, the efficacy of tacrolimus for treatment of PNOE in cats could be ascertained. Tacrolimus is sold in the form of ointment, which can be difficult to apply deep into the ear canals. Therefore, owners are advised to apply the ointment topically to the pinnae, wearing gloves first. Side effects that might occur after topical use of tacrolimus include burning or pruritus. The data and photographs presented in the present article may be useful for practicing veterinarians in diagnosing and treating this relatively rare disease.

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