CASE STUDY OF FIBROSARCOMA IN PET RAT

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Abstract. Skin and respiratory diseases, as well as tumours are the most frequently diagnosed diseases in pet rats. From among all the types of tumours found in this species of animals, fibrosarcoma is rarely observed. In this clinical case, a fast growth of fibrosarcoma and its expansion in the left middle and inner ear led to a head tilt (torticollis) and facial nerve paralysis on the same side and were a decisive argument for euthanasia. The aim of the study was to reveal that the individual approach to each patient and a thorough clinical examination are extremely important. They allow to avoid mistakes, put a correct diagnosis and start an appropriate treatment.

Key words: pet rat, fibrosarcoma, inner ear

INTRODUCTION

Laboratory rats are animals exposed to a number of diseases. This condition results from a limited number of individuals in the founding group, which undoubtedly, affects low genetic variety. High inbreeding rate in these animals is the reason for various disorders, including lowered immunity. According to data presented in references, the most common diseases in pet rats include skin and respiratory diseases, as well as tumours [Quesenberry and Carpenter 2004].

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Predominant respiratory diseases include those of upper and lower respiratory tract. Usually they are of infectious origin and the main pathogens include: Mycoplasma pneumoniae, Sendai virus and CAR (cilia-associated respiratory) bacilli. Some Streptococcus pneumoniae and Corynebacterium kutscheri are also observed [Committee... 1991].

Growing respiratory infections may lead to otitis media and interna, which most commonly manifest by head tilt (torticollis) [Quesenberry and Carpenter 2004]. Apart from infections, the other causes of middle and inner ear diseases include: innate anomalies, noninfectious inflammations, injuries, intoxications and tumours [Jaggy 2005]. The latter ones occur quite rarely, therefore their diagnosis is most complicated.

DESCRIPTION OF THE CASE STUDY

Patient: a female pet rat, 300 g bodyweight, husky colour, 1.5 years old. The clinical study performed during the first visit revealed the following: the body temperature of 38°C, pink mucosa, accumulation of porphyrins around eyes and nostrils and mixed dispnea. The patient sneezed frequently and during inspiration some wheezes could be heard. While auscultating the lungs, an extensive respiratory murmur was observed. The above mentioned symptoms suggested upper and lower respiratory tract infection. Therefore, enrofloxacin (2.5% Baytril®, Bayer) was administered in a dose of 25 mg/kg per day in form of subcutaneous injections as well as a probiotic containing Laktobacillus acidophilus (Lakcid, Biomed) in ½ dose per animal per day. On the day of the medical examination an intramuscular injection of dexamethasone (Dexafort®, Intervet) was administered in a dose of 2 mg/kg. Apart from the above mentioned symptoms, the left exophthalmia was observed with a pear-shaped pupil and the left incisor was 4 mm longer than the right one.

After three days of treatment some improvement was observed. Sneezing became less frequent and the patient breathed more easily and quietly. The amount of porphyrins also decreased. The antibiotic therapy continued for the next 11 days. After 5 days from the end of the treatment the general condition of the animal suddenly deteriorated. The patient lost appetite, became lethargic and its body temperature dropped to 36.5°C. During the medical examination, porphyrin accumulation was again observed around the eyes and nostrils as well as left-sided torticollis, exophthalmia and corneal opacity of the left eye and intensive dispnea indicated by extensive work of the abdominal press. Moreover, lack of palpebral and corneal reflexes in the left eye was observed, which together with lack of tears secretion, suggested deficits in left facial nerve and keratoconjunctivitis sicca in the left eye. The upper incisor was longer than the right one, which indicated reduction of tension on the left side of the oral cavity when chewing. Palpable examination of the left side of the neck revealed the presence of a nodular, cherry-sized formation, which was thick, painless, unmovable with smooth surface. The skin in the deformed fragment was shaved and disinfected with iodine solution and then punctured. Approximately 1 cm³ of a cloudy, creamy liquid with some fuzzy particles was aspirated. The puncture did not affect the shape of the deformation. The liquid sample from the puncture was analyzed microbiologically.

In the otoscopic study, it was revealed that a solid formation protrudes into the lumen of the left external acoustic meatus from the middle ear. Due to bad prognosis, a decision of euthanasia was taken. Medetomidine (Cepetor®, CP-Pharma) was administered in the
dose of 1 mg/kg and next ketamine (5% Narkamon®, Biofaktor) in the dose of 50 mg/kg and after 10 minutes pentobarbital was given intracardially in the dose of 160 mg/kg (Morbital®, Biowet).

RESULTS

Bacteriological and mycological analysis

The aspirate specimen was analyzed microbiologically (bacteriological and mycological analysis). The sample was spread on Columbia Agar with sheep blood, MacConkey Agar, Schaedler Broth under paraffin oil (bioMerieux France) and Sabouraud Agar (Biocorp). The solid media were incubated aerobic and microaerobic conditions in 37°C for 72 hours. The growth of microorganisms was controlled every 24 hours. Broth medium was incubated in 37°C for 7 days. Incubation of Sabouraud Agar was conducted in 30°C for 7 days. From the clinical specimen direct microscopic preparations were performed, stained with Gram and Ziehl-Neelsen methods and with methylene blue. No aerobic or anaerobic bacteria or fungi were isolated. In the direct slides no bacterial nor fungus cells were found.

Anatomopathological analysis

The owner agreed to perform an anatomopathological examination of the corpse. In the area of the left side of the neck a nodular, cherry-sized formation was observed. It was thick, unmovable and with smooth surface (Fig. 1). The cross-section of the tumour revealed a cavity of approximately 1 cm diameter containing cloudy, creamy liquid with some fuzzy particles (Fig. 2). The brain was removed and no macroscopic changes were found. On left side of the inner surface of the skull base a solid formation was observed. It had an irregular surface and it was protruding into the skull cavity. This lesion was also filling the inner ear, the tympanic cavity and protruded into the lumen of the external ear. In the lungs, liver and kidneys blood stagnation was observed.

Histopathological analysis

For the histopathological analysis a tumour from the left side of the neck was used. It was fixed in 10% formalin and embedded in paraffin (Paraplast, Sigma) and sectioned using a rotary microtome on fragments of 4 μm each. The paraffin sections were routinely stained with hematoxylin and eosin (HE), Masson-Fontana, toluidine blue. Moreover, the preparations were stained using the immunohistochemical method in order to detect microfilaments of vimentin. The preparations were evaluated using a microscope Olympus BX50.

The histological image of the tumour revealed spindle cells with oval nuclei and basophilic cytoplasm, often formed in herringbone pattern. Some cells of pleomorphic character were also detected. Between the cells dispersed masses of collagen were present. Moreover, some necrotic foci were observed. Immunohistochemical staining revealed microfilaments of vimentin. Besides, numerous mitotic division figures were visible – the mitotic index was 2% (Fig. 3, Fig. 4).

Basing on morphological features of the tissue the fibrosarcoma of Hardisty et al. classification was diagnosed [Hardisty et al. 2007]. An additional histochemical analysis was performed to exclude melanoma and mastocytoma.
Fig. 1. A nodular formation in the left side of the rat’s neck. External jugular vein going on the surface of the tumour (a)

Ryc. 1. Guzowata deformacja okolicy bocznej szyi po stronie lewej u szczura. Żyła szyjna zewnętrzna biegnąca po powierzchni guza (a)

Fig. 2. Gross pathology A cancerous tumour on the left side of the neck (a) and at the cranial basis (b). Elongated crown of the left incisor (c)

Ryc. 2. Badanie makroskopowe. Guz nowotworowy w okolicy bocznej szyi po stronie lewej (a) oraz u podstawy czaszki (b). Wydłużona korona lewego zęba siecznego (c)
DISCUSSION

Quite often, in consequence of respiratory infections, otitis media and interna occur. The infection expands from the cavity of the pharynx, through the auditory tube to the tympanic cavity, next to the inner ear and through the internal acustic meatus it may achieve the skull cavity leading to encephalitis and meningitis. Otitis interna has some characteristic vestibular signs, i.e. head tilt, horizontal or rotary nystagmus, positional strabismus, ataxia, circling and falling toward the side of the lesion [Ettinger and Feldman 2005, Jaggy 2005].
The vestibular signs appear when a lot of exudate accumulates in the tympanic cavity and the inflammation affects the petrous part of temporal bone [Committee... 1991, Gotthelf 2009]. Otitis media may be associated with no visible clinical changes. In cases of severe infection in some patients, it is quite likely to produce a pain reaction while palpating the tympanic bulla and while opening the mouth [Ettinger and Feldman 2005, Gotthelf 2009]. What is also very important is that the facial nerve and sympathetic innervation of the eye are closely associated with the middle ear. In the rat facial nerve has even more superficial position, than in other animals [Judkins 1997, Pinilla et al. 2001, Ettinger and Feldman 2005, Sumarelli et al. 2009]. Therefore otitis media and interna may be accompanied by:

- deficits in cranial nerve VII (uneven position of the lip commissures, unequal ear carriage, abnormal palpebral and corneal reflexes, unilateral ptalism),
- keratoconjunctivitis sicca, as facial nerve also provides parasympathetic innervation to lacrimal glands,

In diagnosing otitis media it is very helpful to assess the look of the tympanic membrane during the otoscopic examination (the membrane may be ruptured, congested, not transparent, sometimes convex into the external acustic meatus) and to perform radiographs of tympanic bulla, possibly from several angles [Jaggy 2005, Gabrisch and Zwart 2008, Gotthelf 2009].

An immediate and longterm treatment with a broad-spectrum antibiotic (in order to control the infection) and a glucocorticosteroid (in order to reduce the tissue oedema) may result in the retreat of symptoms. However the mentioned above neurologic signs associated with otitis media and interna are often permanent [Ettinger and Feldman 2005].

In the described case, the vestibular signs and one-sided facial paralysis occurred due to the increase and expansion of a malicious tumour – fibrosarcoma in the middle and inner ear. Despite the significant size of the tumour, it did not cause any pressure on the external jugular vein and did not disturb the blood outflow from the brain. Otherwise, we would be able to observe various types of neurological disorders, including loss of consciousness, which would produce additional difficulties in correct diagnosing of the disease.

Following chronic respiratory infections, tumours are second most common health problem in pet rats. Fibroadenoma of the mammary glands (fibroadenoma mammae) are the most common tumours diagnosed in this species. Other tumours often observed include: pituitary adenoma, tumours originating from the testicular stroma and carcinoma planoeothelial of the Zymbal glands. It is much more rarely that uterus and thyroid tumours or lymphosarcoma are diagnosed. From among all the types of tumours found in this species of animals, fibrosarcoma is rarely observed. It is a malignant cancer originating from the fibrous connective tissue and is characterized by fast growth, invasion into neighbouring tissues and produces early metastasis [Quesenberry and Carpenter 2004].

If it is only possible, it is recommended to remove the tumour with an adequate tissue margin, which is particularly important in case of malignant tumours [Quesenberry and Carpenter 2004]. In the situation where a complete resection is impossible, for example due to a large size of the tumour or its location, partial surgical removal should be con-
sidered, however local recurrence is then quite probable. In the described clinical case, the location, and as it was later discovered, a severe damage to soft tissues and bones by a malignant tumour (fibrosarcoma) did not classify the patient to a surgery.

In cancer treatment in humans and animals, where surgeries are impossible or to increase the effectiveness of the treatment, chemotherapy and radiotherapy are used. It is universally known that pet rats are often a model for studies on effectiveness and side effects of the use of various medicines, including those used in chemotherapy [Muralikrishnan et al. 2001]. Despite the fact that sometimes a remission of cancer is achieved, in clinical practice chemotherapy and radiotherapy in rats are rather not used. It is usually related to a short life cycle of these animals and to significant costs of treatment.

In the presented clinical case, the symptoms defined during the first visit, i.e.: accumulation of porphyrins around eyes and nostrils and mixed dispnea, sneezing, wheezing and respiratory murmur suggested an infection of respiratory tract, quite common in rats [Quesenberry and Carpenter 2004]. The diagnosis was however wrong and the performed treatment improved the patient’s condition only for a short time. Five days following the treatment, a left-side torticollis of the neck and head was diagnosed, as well as left facial nerve paralysis, a nodular formation on the left side of the neck and a solid formation protruding into the left lumen of the external ear from the middle ear. Clinical changes observed during the second visit suggested rather a cancerous than infectious background of the condition. It is assumed that a short improvement could have been related to anti-inflammatory action of dexamethasone on the growing tumour and to suppressing a possible secondary infection of the respiratory tract by enrofloxacin. After a thorough anatomopathological examination and considering the wrong general condition of the patient and negative prognosis, a decision to euthanize the patient was taken, which was assumed to be the most humanitarian. Proliferous changes in the area of the neck, middle and inner ear and skull cavity were larger than supposed initially on the basis of the observed clinical symptoms. In the nearest future new symptoms would probably appear originating from the central nervous system, resulting from cerebral oedema and, in consequence, leading to death of the animal.

An individual approach to each patient and a thorough clinical examination are extremely important. They allow to avoid mistakes, put a correct diagnosis and start an appropriate treatment. Despite complex examination performed we did not escape from errors and the described clinical case may become helpful for veterinary surgeons in resolving similar problems.

REFERENCES


Streszczenie. Choroby skóry, układu oddechowego oraz nowotwory to najczęściej diagnozowane choroby u szczurów. Spośród wszystkich rodzajów nowotworów stwierdzanych u tego gatunku zwierząt, włókniakomięśak (fibrosarcoma) występuje rzadko. W przedstawionym przypadku klinicznym jego szybki wzrost i ekspansja w lewym uchu środkowym i wewnętrznych spowodowały z czasem wystąpienie torticollis i porażenia nerwu twarzowego po tej samej stronie oraz zaważyły na decyzji o eutanazji zwierzęcia. Celem pracy było przedstawienie przypadku klinicznego, który może okazać się pomocny dla lekarzy weterynarii w rozwiązywaniu podobnych problemów.

Słowa kluczowe: szczur, włókniakomięśak, ucho wewnętrzne

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