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Surgical Management of Skin Abscesses in New Zealand White Rabbits – A Clinical Case Report

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ABSTRACT: Abscesses are common in rabbits and can occur anywhere in the body. Unlike in other small animals, abscesses in rabbits are filled with thick, caseous or dried-out pus, surrounded by a capsule of scar tissue that is difficult to drain. Abscesses with bony involvement can be extremely difficult to treat, requiring surgery and prolonged medical care. The present study reports the successful surgical management of skin abscesses in rabbits. Six adult male New Zealand White rabbits from a private rabbit farm were found with large, hard masses along the jawline, neck, and near shoulder regions. On clinical examination, they were found to be skin abscesses of non-dental origin. Pus samples taken from the abscess for bacterial culture revealed staphylococcal infection. Antibiotic sensitivity test results showed higher sensitivity to gentamicin. Treatment was initiated with surgical debridement and wound packing with antiseptic impregnated gauze of the abscess cavity followed by antibiotic therapy with gentamicin and anti-inflammatory therapy with meloxicam until complete recovery. All the rabbits successfully recovered after two weeks without any other complications.

Keywords: Gentamicin, Meloxicam, New Zealand White, Staphylococcus

I. INTRODUCTION

An abscess is a confined pocket of pus that has built up within the tissues, organs or spaces in the body. Abscesses are usually caused by a bacterial infection. Signs and symptoms of abscesses include redness, pain, warmth, swelling and sometimes pyrexia. Accumulation of pus in the dermis or subcutaneous tissue results in the formation of skin abscess which appears as a swollen, red, tender mass, often with surrounding cellulitis. Diagnosis of a skin abscess is simple and proved correct by incision and drainage of purulent material. However, diagnosis of abscesses that remain deeper into the dermis and subcutaneous tissue is difficult due to the overlying structures [1&2].

In rabbits, abscess of bacterial origin (septic) most commonly occur in the face or neck regions due to infections in the teeth roots, nasolacrimal ducts or bite wounds. They also occur in internal organs and bones, affecting other parts of the body. The most possible causes for abscessation in rabbits include trauma, dental problems, bites, surgery or damage to the skin that leads to the spreading of a primary bacterial infection to the sites of abscessation [3]. They can be either slow growing or become large very quickly, and often extend aggressively into surrounding tissues and bone. As a result, the pus generally causes deep infections that need to be thoroughly cleaned down to the underlying bone.

Staphylococcus aureus is a widespread commensal bacterium in humans and rabbits which causes a wide range of infections including bacteremia, pneumonia, septic arthritis, toxic shock syndrome and cellulitis. Abscesses are the most prominent manifestation of *S. aureus* skin and soft tissue infections [4, 5 & 6]. The skin serves as a physical barrier against invading bacterial pathogens from the external environment and opportunistic skin microbes. It prevents their entry into deeper layers of tissue and internal organ systems. Skin and soft tissue infections (SSTIs) are among the most common infections worldwide. SSTIs are most commonly caused by the pathogenic bacterium *Staphylococcus aureus*. In addition to SSTIs, pyogenic bacterial abscesses can form in the underlying tissue, and bacteria can disseminate to form abscesses at distal sites and affect any internal organ system [4, 7].

The formation of pyogenic abscess is a result of localized host acute inflammatory response to bacterial infection. Keratinocytes possess pattern recognition receptors that detect invading microbes and initiate the pro-inflammatory response [8]. These host cells also produce antimicrobial peptides which act against S. aureus. As an abscess forms, it obtains several characteristic features. The central part of the abscess contains an acute inflammatory exudate composed of polymorphonuclear leukocytes (PMNs), tissue debris, fibrin, and live bacteria.

Maturation of the abscess is accompanied by proliferation of fibroblasts and tissue repair at the abscess margin and the formation of a fibrous capsule at the periphery [9, 10]. SSTIs that present as bacterial abscesses form in the dermis, epidermis, or subcutaneous tissue and are often accompanied by cellulitis. Abscess formation is a defense mechanism by the host to eliminate the pathogen. Some SSTIs resolve spontaneously without treatment. PMNs play a prominent role in the formation and resolution of abscesses [11, 12].

Many clinical reports on the management of abscesses in rabbits published by veterinarians from different countries, mainly deal with abscesses of odontogenic (dental) origin [13-21]. Numerous treatment options have been advocated for abscesses of dental origin but those reports are decade old and can be affected by many factors such as, animal housing, management of local conditions, causative organism, advancement in the treatment and diagnosis etc. There is a lack of reports for the treatment of skin abscesses in rabbits. Thus, the latest report on the management of skin abscesses in rabbits will be of great importance for future researchers and field veterinarians. The purpose of the study reported here was to evaluate the effectiveness and treatment outcome of a minimal surgical debridement and antiseptic-impregnated gauze packing technique along with systemic therapy for the treatment of skin abscesses in rabbits.

II. MATERIALS AND METHODS

A. Clinical Observations

Six adult male New Zealand White rabbits from private farm were presented with unusual lumps on their shoulder, jaw line, and neck and regions (Fig. 1-3). On palpation, they appeared hard and doughy, firmly attached to the surrounding tissue. In one rabbit, the swelling was ripened and found to have a drainage tract towards a peripheral site (Fig. 2). As it contained thick caseous pus, it was diagnosed as an abscess of non-dental origin and other possible conditions such as tumour, polyp, and granuloma or bone cyst were ruled out. No pain or pyrexia was noticed in any of the animals with an intact abscess. Other clinical signs exhibited by the animals were reduced appetite and increased water intake.

B. Pretreatment Evaluation

Animals were properly restrained and radiography of the affected sites was done. Radiographic analysis revealed swelling and no bony involvement at the site of abscessation. Blood samples were collected from the marginal ear vein in EDTA coated vials for hematological investigations. Hematological parameters were analyzed by automated animal blood cell counter (Horiba, ABX Micros ESV60). Complete Blood Count (CBC) revealed anemia and neutrophilia. The remaining parameters of the CBC were within normal ranges (Table 1).

Table 1: Measured Complete Blood Count of New Zealand White Rabbits.

Parameter	Rabbit 1	Rabbit 2	Rabbit 3	Rabbit 4	Rabbit 5	Rabbit 6	Normal Range[#]
RBC ($\times 10^6$/ mm^3)	3.87	2.98	3.16	4.12	3.78	3.50	4.46-7.94
HCT (%)	30	19	24	32	28	27	36-50
Hb (g/dL)	9.4	7.2	8.7	10.2	8.9	8.4	10.4-17.4
MCV (fL)	77.51	63.75	75.94	77.66	74.07	77.14	61-70
MCH (pg)	24.28	24.16	27.53	24.75	23.54	24	19-26
MCHC (g/dL)	31.33	37.89	36.25	31.87	31.78	31.12	30-37
PLT ($\times 10^3$/ mm^3)	516	416	497	576	541	510	304-656
WBC ($\times 10^3$/mm^3)	10.6	7.8	9.4	11.3	10.2	8.4	5.5-12.5
Neutrophils %	66	70	63	58	60	65	38-54
Lymphocytes %	30	22	30	37	33	29	28-50
Eosinophils %	0	2	1	0	1	0	0.5-3.5
Basophils %	1	2	1	1	1	1	2.5-7.5
Monocytes %	3	4	5	4	5	5	4-12

RBC = Red Blood Cells; HCT = Hematocrit; Hb = Hemoglobin; MCV = Mean Corpuscular Volume;
MCH = Mean Corpuscular Hemoglobin; MCHC = Mean Corpuscular Hemoglobin Concentration; PLT = Platelets; WBC = White Blood Cells.
[#]Reference intervals for hematological parameters of New Zealand White Rabbits from literature [29-32].

C. Microbiological Examination

Identification and confirmation of bacterial species was assessed by observation of colonial morphology, biochemical criteria and Gram's staining. Pus samples taken from the abscess were inoculated on blood agar supplemented with 5% sheep blood. The plates were incubated at 37ºC for 24 hrs. After 24 hrs of incubation, golden yellow round, opaque colonies of 1-3 mm in diameter surrounded by zones of clear beta hemolysis were seen on blood agar. Gram's staining revealed gram-positive cocci, arranged in irregular grape-like clusters. Biochemical tests revealed catalase positive, oxidase negative, coagulase positive, indole negative, gas negative, citrate positive, urease positive and fermentative organism. Based on these results, *Staphylococcus aureus* infection was confirmed. Antibiotic sensitivity test (ABST) was carried out by the Kirby-Bauer disk diffusion method [22]. The ABST results showed higher sensitivity to Gentamicin followed by Amoxycillin/clavulanate, Chloramphenicol, Tetracycline, Ciprofloxacin, and resistant to ceftriaxone and ofloxacin.

D. Surgical Procedures

1% povidone-iodine ointment was applied on closed abscesses by inunction to speed up its maturation and surgical drainage. After ripening, the skin over the abscess was incised, the purulent material from the abscess pocket was manually removed and the abscess cavity was cleaned and flushed with normal saline. The debrided abscess pocket was packed with povidone iodine-impregnated gauze until a clean wound pocket was achieved. Cetrimide cream was applied externally around the ruptured spot to promote healing. The dressing was removed and re-packed freshly every day for the first five days, after that every alternate day until complete healing of the wound. The abscess cavity was left uncovered. Treatment was discontinued when the abscess cavity was replaced by granulation tissue and no pus remained. Antibiotic and anti-inflammatory treatment was followed once daily orally for 7 days with gentamicin @ 5mg/kg b.wt. and meloxicam @ 0.5mg/kg b.wt. Vitamin B-complex and iron syrup were given as a supportive therapy, once daily orally for 2 weeks to improve anemic conditions.

III. RESULTS AND DISCUSSION

The condition of all rabbits was gradually improved and recovered completely without any other complications within 15 days of operation. An abscess can occur in rabbits of any age, breed, or gender, anywhere in the body, the most common sites are head, neck and dental regions. According to the location, it may be odontogenic (dental) or non-odontogenic (non-dental) in nature. In the present study, the abscesses were present in the shoulder, lower jaw and neck regions and identified as non-odontogenic skin abscesses.

In Rabbit, abscesses are generally caused by organisms such as *Staphylococcus aureus, Pasteurella multocida, E. coli. Streptococcus* sp., *Pseudomonas* sp., *Corynebacterium pyogenes or Klebsiella* sp. [23]. Unlike other animals, abscesses in rabbits are not associated with pain and pyrexia until they rupture. In the present study, the abscesses were non-odontogenic and the animals did not show the symptoms of pain and pyrexia. Bacterial culture of purulent material from the abscesses revealed the presence of *Staphylococcus aureus* infection. This finding is consistent with those of the 2 studies [24, 25], investigating the bacterial pathogen of head and facial abscesses in rabbits.

Needle exploration revealed the presence of caseous material and radiographic examination revealed swelling of the affected area and no bony involvement. Complete blood count examination revealed decreased levels of red blood cells (RBC), hemoglobin (Hb), packed cell volume (PCV) and increased levels of neutrophils. Inappetance might be the reason for anemia. These results are in agreement with the findings of Taylor [17] and Das *et al.,* [19]. The dense and thick consistency of pus in the abscess is due to low levels of the liquefying enzyme, myeloperoxidase in rabbit heterophil cells. This results in slow digestion and liquefaction of pus material that remains thick and sticky. This makes it difficult to be treated effectively with drains [3]. The pus exudate usually contains dead phagocytic cells and live or dead microorganisms. As the quantity of pus increases within the cavity, the abscess encapsulates from surrounding tissues. Mature abscesses rupture, making it painful to treat and often lead to secondary bacterial infections or sepsis [26]. In the presented cases, four animals had hard, doughy and not ripe abscesses on shoulder and neck regions (Fig. 1). One rabbit had semi-ripened abscess below the ear (Fig. 3) and one rabbit had completely ripened, soft abscess found to have a drainage tract towards a peripheral site in the lower jaw (Fig. 2).

Fig. 1. Hard not ripe abscess in shoulder.

Fig. 2. Ripened abscess in lower jaw.

Abscesses have been successfully treated by packing the debrided abscess cavity with heat-stable antibiotic-impregnated acrylic beads, bone cement or synthetic polymer. The beads release the antibiotics slowly and provide high localized tissue concentration. Regardless of the wound, a systemic antibiotic therapy is chosen based on the microbial culture and sensitivity testing. However, the treatment of an abscess depends on its location and its extent at the affected site [16]. Our results on skin abscesses in rabbits treated with a wound-packing technique and followed up for a minimum period of 2 weeks indicate that minimal surgical intervention combined with antiseptic

impregnated gauze packing of the abscess cavity and systemic treatment with an appropriate antibiotic is an effective treatment option. Our results are opined with the findings of Taylor [17].

Fig. 3. Semi ripened abscess in neck region.

Complete elimination of bacterial infections in rabbit farm is difficult since they occur as commensals in nasopharynx and digestive tract [27]. It is advised to provide better ventilation, adequate floor space, provision of autoclaved feed and purified drinking water, proper cleaning of cages with disinfectant, usage of personal protective equipment, isolation and treatment of affected animals and hygienic management of farm premises to prevent the incidence and spread of bacterial infections [27, 28].

IV. CONCLUSION AND CLINICAL RELEVANCE

Treatment of abscesses in rabbits is little difficult than in other species and depends on its size and location. Surgical debridement followed by wound packing with antiseptic impregnated gauze of the abscess cavity combined with systemic treatment with appropriate antibiotics anti-inflammatory agents is an effective and practical option for the resolution of non-odontogenic skin abscesses in rabbits.

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