Prevalence and chemotherapy of contagious skin necrosis in dromedary camels at Qassim region, central of Saudi Arabia

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Abstract

This study was executed in Qassim region, central of Saudi Arabia to determine the clinical and therapeutic impact associated with contagious skin necrosis (CSN) in dromedary camels. One thousand dromedary camels were used in this study. The prevalence of contagious skin necrosis among examined camels was 2.70%. The prevalence of the disease was significantly (p = 0.01) higher in camels under three years (4.55%) than camels older than three years (1.49). Concerning gender predisposition, the prevalence was significantly (p = 0.0001) higher in male camels (13.78%) than females ones (1.14%). Clinically, camels infected with contagious skin necrosis showed lesions in the form of multiple circular necrotic areas of the skin and sometimes multiple abscesses in brisket and chest areas. Treatment of the infected camels using Amoxycillin and clavulanic acid gave the same results as penicillin plus streptomycin but it offers a faster cure rate. Finally, it can be concluded that contagious skin necrosis in camels is common in Saudi Arabia and Amoxycillin and clavulanic acid is the best choice for treatment.

Key words:
Camels; Contagious skin necrosis; Prevalence; Signs; Treatment.

1. Introduction

The anatomical and physiological structure of camels makes the camels highly adapted to the difficult and adverse climatic conditions that they are exposed to it in the desert. However, camels are affected by many major diseases decrease their productivity and welfare [1]. Skin health and appearance of the skin reflect are usually reflect the camel health [2].

Contagious skin necrosis (CSN) is an infectious disease affecting the skin of young dromedary camels caused mainly by Staphylococcus aureus and characterized by skin lesions mostly in the shoulder and neck regions [3,4].

Contagious skin necrosis was described for the first time by Cross [5] who ranked the disease as second to mange in term of importance in all camel disease. Also, Higgins and McGrane [6] classified contagious skin necrosis as a common disease affecting camels in all camel raising countries.

Dietary salt deficiency has been associated with the occurrence of contagious skin necrosis and regular supplemental feeding of salt may reduce the incidence of disease [7].

Transmission of contagious skin necrosis occurs mainly by direct contact with infected camels or via indirect contacts with contaminated inanimate objects, such as blankets and baggage [8, 9]. The pus exudates from infected camels are the main source of infection [10].

Diagnosis of contagious skin necrosis based on clinical examinations whereas isolation and identification of the causative agents from the lesions are necessary for confirmation [1,11, 12].

Camels are sources of milk, meat, drought power and serve as means of transportation, and
hence, they support the survival of millions of people in different areas in camel-raising countries [7].

Camel skin diseases are common in Saudi Arabia. So, this study was directed to determine the clinical and therapeutic impact associated with contagious skin necrosis (CSN) in dromedary camels in Qassim region, central of Saudi Arabia.

2. Materials and methods

2.1. Animals

One thousand dromedary camels of different ages and sexes at Qassim region, central of Saudi Arabia used in this study.

2.2. Samples

Swabs were collected from the lesions and deep necrotic tissues after disinfection for bacteriological examination.

2.3. Clinical examination

Animals under study were subjected to careful clinical examination. Temperature, pulse, respiratory rate, state of lymph nodes were recorded [13].

2.4. Epidemiological investigation

Some epidemiological parameters including prevalence rate, age and sex susceptibility were estimated [14].

2.5. Bacteriological and mycological examination

**Direct microscopic examination**

Smears were prepared from the affected lesions, fixed by heating, stained with Gram’s stain, and examined under the microscope [15].

2.6. Bacteriological Culturing

Swabs were collected and inoculated onto 5% sheep blood, MacConkey, Edward’s and Manitol salt agars. These plates were incubated aerobically at 37°C and examined for growth at 24 - 48 hours. Hemolysis and colonial morphology were recorded after 24 - 48 hours. Identification and classification of the isolated bacteria were done based on the colonial and morphological characters [16].

2.7. Therapeutic trials:

Infected camels were divided into two groups. The first group (17 camels) was treated using Amoxycillin and clavulanic acid (Synulox®, Pfizer) once daily for 5 days as an intramuscular injection at a dosage rate of 8.75 mg/kg body weight (1 ml/20 Kg B.W). The second group was treated using penicillin-streptomycin (Pen & Strep® NorBrook company) administered by deep intramuscular once daily for 5 consecutive days at doses of 8 mg procaine penicillin and 10 mg dihydrostreptomycin sulphate per kg bodyweight (1 ml/25 Kg B.W). In both groups, flushing of the affected area of skin using povidone iodine and supplementation with sodium chloride salt were done.

2.8. Statistical analysis

Chi-Square was estimated for the obtained data using the SPSS for Windows (Version 15.0, USA) statistical software program and probability (P-values) of less than 0.05 was considered significant.

3. Results

Out of the examined 1000 camels, the prevalence of contagious skin necrosis was 2.70%. Owing to age predisposition, the prevalence in camel under three years was 4.55% and in camels over three years was 1.49% (Table 1).

Table 1. Prevalence of contagious skin necrosis in relation to camels’ age

<table>
<thead>
<tr>
<th></th>
<th>Total camels examined</th>
<th>Infected camels</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camels under 3 years</td>
<td>396</td>
<td>18*</td>
<td>4.55</td>
</tr>
<tr>
<td>Camels over 3 years</td>
<td>604</td>
<td>9</td>
<td>1.49</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>27</td>
<td>2.70</td>
</tr>
</tbody>
</table>

* Significant p = 0.01

Concerning sex predisposition, the prevalence of contagious skin necrosis was 1.14% among examined females and 13.38% among examined males (Table 2).

Table 2. Prevalence of contagious skin necrosis in relation to camels’ sex

<table>
<thead>
<tr>
<th></th>
<th>Total camels examined</th>
<th>Infected camels</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>873</td>
<td>10*</td>
<td>1.14</td>
</tr>
<tr>
<td>Males</td>
<td>127</td>
<td>17</td>
<td>13.38</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>27</td>
<td>2.70</td>
</tr>
</tbody>
</table>

* Significant p=0.0001

Camels infected with contagious skin necrosis (Figures 1, 2 and 3) showed skin lesions in the form of multiple circular necrotic areas of the skin and sometimes multiple abscesses in brisket and chest areas. The lesions begin as small painful nodules.
These lesions developed well-demarcated necrotic center, which sloughs off exposing an ulcerated, purulent or haemorrhagic layer underneath. The size of the lesion ranged from 3 to 5 cm in diameter. The hair covers these areas are lost. Enlargement of the adjacent lymph node occurred.

Early intervention by treatment of infected camels using Amoxycillin and clavulanic acid daily for 5 days, in addition, to flush the affected area of skin using povidone iodine and supplementation with sodium chloride salt gave faster cure rate than penicillin plus streptomycin (Table 3).

Table 3. Results of the treatment trials in diseased camels

<table>
<thead>
<tr>
<th>Treated group</th>
<th>No. treated animals</th>
<th>No. of cured animals at week no.</th>
<th>Total no. cured</th>
<th>Total no. cured (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>17</td>
<td>0 10 7 0</td>
<td>17</td>
<td>100</td>
</tr>
<tr>
<td>Second</td>
<td>10</td>
<td>0 2 5 3</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

4. Discussion

Camels are considered good sources of milk, meat, drought power, and used for transportation to support the survival of millions of citizens in barren areas of the world [7].

Concerning the prevalence of the diseases in relation to age, the prevalence was significantly \( p = 0.0001 \) higher in camels under three years (56.31%) than those older than three years (25.66%). This may be attributed to the ill-developed immune system of young [17].

The prevalence of contagious skin necrosis (CSN) among examined camels was 2.70%. Nearly similar prevalence reported previously by Zaitoun [18] in south Egypt who reported 1.83% prevalence in South Egypt. Higher rates were recorded by Yagoub and Mohamed [3] in Sudan who reported 5.75% prevalence rate, Megersa [19] in Ethiopia who reported 5.7% prevalence rate, AlKanzee [20] in Saudi Arabia who reported 9.6% prevalence and Megersa [21] in Ethiopia who reported 15.8% prevalence.

Concerning age predisposition, the prevalence of contagious skin necrosis was significantly \( p = 0.01 \) higher in camels younger than three years (4.55%) than those older than three years (1.49%). Similar observations recorded previously by Zaitoun [18], Megersa [19] and Yagoub [22] who reported a significant increase in the disease prevalence in young camels compared to adult ones. Previous exposure of adults to infection in addition to the immaturity of the immune system of the young camels explained the high prevalence in adult camels.

Concerning gender predisposition, the prevalence of contagious skin necrosis was
significantly \((p = 0.0001)\) higher in male (13.38\%) camels than female ones (1.14\%). Similar observation recorded by Megersa [19] who reported a significant increase in the disease prevalence in male camels compared to female ones. On contrary, Zaitoun [18] observed that CSN was not a sex-linked disease. The high prevalence in males may be attributed to that male camels were used to fetch water and transport people, huts, goods, goats, sheep, grain, firewood and building materials [23].

In this study, \textit{Staphylococcus aureus} was isolated from all 27 cases of CSN; it isolated in pure culture from 25 cases and mixed with \textit{Streptococcus agalactiae} from two cases. Nearly similar result observed previously by Wernery and Kaaden, [24] who mentioned that staphylococcal dermatitis primarily caused by \textit{Staphylococcus aureus}. In previous study, Yagoub and Mohamed [3] detected \textit{Staphylococcus spp.} as the predominant bacterial species isolated from cases of CSN either as a pure isolate or mixed with other bacteria as \textit{Corynebacterium pyogenes}, \textit{Lactobacillus, E. coli, Bacillus spp, Micrococcus spp., Proteus spp., Streptococcus spp., Nocardia cameli, Erysipelothrix spp., Actinomyces spp. 1.2\%, Aerococcus spp., Pasteurella spp, Actinobacter spp. and Aeromonas spp. Also, Abdalla and Salim [10] identified thirteen species belonged to eight different genera, where, the dominant bacterial species encountered in contagious skin necrosis was \textit{Staphylococcus aureus} (32.36\%) present either as a single isolate or mixed, in variable frequencies, with other bacteria species that belonged to the genera, Actinomyces, Bacillus, Corynebacterium, Enterobacter, Escherichia, Pseudomonas Salmonella and Staphylococcus were isolated. In addition, Hamed and Abd Ellah [4] reported \textit{Staphylococcus aureus} as the predominant bacteria isolated from cases of CSN, where, out of 10 examined cases of CSN, \textit{Staphylococcus aureus} isolated alone from 6 cases and coupled with other bacteria from the remained 4 cases, coupled with coagulase negative staphylococci in 3 cases and coupled with \textit{Streptococcus agalactiae} in one case. Clinically, camels infected with contagious skin necrosis showed skin lesions in the form of multiple circular necrotic areas of the skin and sometimes multiple abscesses in brisket and chest areas. Similar lesions were observed previously [3, 4, 20 and 25].

Treatment of the infected camels using Amoxycillin and clavulanic acid gave a faster cure rate than the use of penicillin plus streptomycin. Abbas and Omer [26] mentioned that, although highly contagious, the disease is not fatal, and responded well to treatment with parenteral antibiotics and local iodine tincture.

Finally, it can be concluded that contagious skin necrosis in camels is common in Saudi Arabia and Amoxycillin and clavulanic acid is the best choice for treatment.

**Acknowledgement**

This work was performed at Veterinary Teaching Hospital, Department of Veterinary Medicine, Faculty of Agriculture and Veterinary Medicine, Qassim University, Saudi Arabia.

**Compliance with ethical standards**

This study was approved by the Animal Care and Welfare Committee, Deanship of Scientific Research, Qassim University, Kingdom of Saudi Arabia.

**Conflict of interest**

The author declares that he has no conflict of interest.

**References**

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