THE OCCURRENCE OF SEPTIC ARTHRITIS IN CALVES:
BACTERIAL ISOLATION AND THEIR ANTIBIOTICS SENSITIVITY
PATTERNS

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SUMMARY

This study was carried on 50 calves with septic
arthritis. Synovial effusion was obtained by
arthrocentesis from the joints of these calves and
examined bacteriologically to determine the antibiotic
sensitivity patterns of the isolates to 14 antibacterial
agents. The results showed that the incidence of septic
arthritis was higher in male calves (74%) than in
females (26%). The higher incidence was found in calves
under two months of age.

The most frequent bacterial isolates were
Escherichia coli, Klebsiella spp., Proteus mirabilis,
Corynebacterium pyogenes, beta-haemolytic Streptococcus
spp., Staphylococcus aureus and Pseudomonas aeruginosa.

It was shown that most of gram positive isolates
were susceptible to ampicillin, cloxacillin,
erthyromycin, fusidin, garamycin and pencillin.
Pseudomonas aeruginosa was the most resistant
microorganism to all antibiotics used except amikacin
and garamycin.

INTRODUCTION

Septic arthritis in calves is a form of joint
disease that demands prompt diagnosis and therapy\(^{11}\).
It is an inflammation of all structures inside the
joint\(^{22}\). The most common form of the disease in calves
occurs as a result of infection of the umbilicus at
birth, or it may occur as a result of intrauterine
infection. The metastatic form of septic arthritis is most prevalent occurring intercurrent to a systemic infectious process or it may occur as a complication of septicemia.

The disease tends to be polyarticular in calves affecting the large joints (carpel and hock joints). The affected joints are swollen and the synovial tissue become oedematous and thickened causing pain and lameness of the affected limb. Systemic infection are so severe in some calves resulting in lateral recumbency of the affected animals.

There are various microorganisms principally involved as the aetiological agents of septic arthritis in calves; the most common of which are (E. coli, Pr. mirabilis, Kl. ozaenae, C. pyogenes, Staph. aureus, Streptococcus spp. and Salmonella spp.) Other microorganisms occasionally incriminated are (Erysipelothrix insidiosa, Fusobacterium necrophorum, Mycoplasma bovines, Chlamydia psittaci).

The antibiotics, most frequently used for the treatment of septic arthritis, were penicillin, erythromycin, tetracycline and chloramphenicol.

The purpose of this investigation is to study the occurrence of septic arthritis in calves, especially in relation to age and sex. The antibacterial sensitivity patterns of various bacteriail isolates were also studied.

MATERIALS AND METHODS

Collection of samples:

For the bacteriological examination, samples of synovial fluids were obtained by arthrocentesis from 50 calves with septic arthritis from Al-dijayla dairy station and Al-Thabab Al-Abiad village around Baghdad, during the period from 1990-1993. The occurrence of the infection in calves was determined in relation to age and sex groups.
Isolation of the bacteria:

The samples were inoculated onto brain-heart infusion (BHI) broth and incubated at 37°C for 24-48 hours. Blood agar plates, MacConkey agar plates and Mannitol salt agar plates were streaked from the broth culture and incubated as mentioned above. The microorganisms were isolated in pure cultures and identified by standard procedures for bacteria according to Cowan and Steel. 

Antibiotic sensitivity test:

The bacterial isolates were provided for in vitro antibiotic sensitivity test using agar diffusion technique (disc method)(oxoid). After incubation at 37°C for 24 hours, the results were evaluated. Lack of growth inhibition zones was recorded as "resistant", and a definite zone of bacterial growth inhibition was recorded as "sensitive".

The antibiotics used were ampicillin, cloxacillin, erythromycin, fucidin, garamycin, pencillin, amikacin, cephaloridine, chloramphenicol, kanamycin, lincomycin, dalacin, sulfathrimethoprim and tetracycline.

RESULTS

The results of microbial isolation are summarized in Table (1). The microorganisms most frequently isolated were in descending order of frequency, E. coli, Streptococcus spp., Klebsiella spp., C. pyogenes, Pr. mirabilis, Staph. aureus and Ps. aeruginosa.

The age and sex of calves are indicated in Table (2). Although, it was shown that the occurrence of the disease is higher in male (74%) than that in female (26%), there was no significant difference between the two sex and age groups of calves according to Qi square.

The antibacterial sensitivity patterns for the 40 positive joint isolates are presented in Table (3).
Most of the gram positive isolates were sensitive to ampicillin, cloxacillin, erythromycin, fucidin, garamycin and penicillin. In the other hand, most of the gram negative isolates were found to be sensitive to amikacin particularly E. coli and Ps. aeruginosa, while the latter bacteria was resistant to several antibacterial agents and sensitive to garamycin.

Table 1: Bacterial patterns observed in septic arthritis in calves.

<table>
<thead>
<tr>
<th>Bacterial isolates</th>
<th>No. of cases</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Klebsiella spp.</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Corynebacterium pyogenes</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Streptococcus spp.</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>No. bacterial growth</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 2: Incidence of positive cases in relation to age and sex of affected calves.

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Male No.</th>
<th>Male %</th>
<th>Females No.</th>
<th>Females %</th>
<th>Total No.</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth-1</td>
<td>15</td>
<td>30</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>1-2</td>
<td>13</td>
<td>26</td>
<td>3</td>
<td>6</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>2-3</td>
<td>4</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Over 3</td>
<td>5</td>
<td>10</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>37</strong></td>
<td><strong>74</strong></td>
<td><strong>13</strong></td>
<td><strong>26</strong></td>
<td><strong>50</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
**Table 3: Antibacterial sensitivity of bacteria isolated from infected joints.**

<table>
<thead>
<tr>
<th>Bacterial Isolates</th>
<th>No. of isolates</th>
<th>Antibacterial agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PW  AX  CR  C  OB  D  E  FD  CN  KN  L  P  ST  TE</td>
</tr>
<tr>
<td><em>C. pyogenes</em></td>
<td>6</td>
<td>5  1  2  4  2  4  2  4  2  5  1  2  4  4  2  5  1  4  2  4  2  5  1  5  1  5</td>
</tr>
<tr>
<td><em>Steph. aureus</em></td>
<td>4</td>
<td>4  0  1  3  2  2  3  1  4  0  2  2  4  0  4  0  3  1  3  1  4  0  3  1  3</td>
</tr>
<tr>
<td>Beta hemolytic-</td>
<td>8</td>
<td>5  3  2  6  3  5  4  4  6  2  3  5  3  6  2  5  3  5  3  6  2  7  1  5  3  5</td>
</tr>
<tr>
<td><em>Streptococcus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>8</td>
<td>7  1  8  0  1  7  3  5  1  7  2  6  3  5  1  7  4  4  6  2  5  3  0  8  3  5  1  7</td>
</tr>
<tr>
<td><em>Klebsiella spp.</em></td>
<td>6</td>
<td>2  4  4  2  2  4  5  1  1  5  2  4  3  3  2  4  5  1  5  1  4  2  1  5  2  4  2  4</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>4</td>
<td>4  0  3  1  4  0  3  1  0  4  2  2  1  3  1  3  4  0  2  2  1  3  0  4  2  2  3  1</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>4</td>
<td>0  4  4  0  0  4  0  4  0  4  1  3  0  4  0  4  2  2  0  4  0  4  0  4  0  4  1  3</td>
</tr>
</tbody>
</table>

Abbreviations:

PW = Ampicillin 10 μg, AX = Amikacin 30 μg, CR = Cephaloridine 30 μg, C = Chloramphenicol 30 μg, OB = Cloxacillin 5 μg, D = Dalacin 10 μg, E = Erythromycin 15 μg, FD = Facidin 10 μg, CN = Garamycin 10 μg, KN = Kanamycin 30 μg, L = Lincomycin 2 μg, P = Penicillin 10 μg, ST = Sulfa-Trimethoprim 25 μg, TE = Tetracycline 30 μg.

S/R = Sensitive/Resistant.
DISCUSSION

The spectrum of the isolates in this study was similar to those reported previously by other studies carried in United States of America (6, 7, 8) and in Iraq (9). However, in this study, isolation of Pseudomonas aeruginosa is reported for the first time from the joints of the calves with arthritis in Iraq, although the bacteria have been reported to be isolated from the joints of foals (10) and man (11).

This study demonstrated a much more greater frequency of E. coli isolates than that reported previously in this country (11). The failure of microorganisms isolation from synovial effusion samples of the affected calves could be attributed to the administration of the antibiotics or sulfonamides prior to the collection of the samples or absence of bacteria from the synovial effusion at the time of arthrocentesis, or it may be due to idiopathic septic arthritis (12).

Male calves revealed a higher incidence of infection (74%) than female (26%), which is in agreement with that reported by other research workers (6, 11, 12). This could be attributed to the fact that owners provided better attention to females than males. Among the calves examined, the highest incidence (40%) was recorded during the first month of life followed by (32%) during the second month of life. Similar trend was observed in calves and foals (8, 13).

In the present study, according to the results of the in vitro antibiotic sensitivity test, garamycin was found to be effective against most of gram negative isolates especially Pr. mirabilis, whereas penicillin proved to be the most effective antibiotic against all gram positive isolates especially Staph. aureus.

Due to insufficient data and lack of references in the field of antibiotics and treatment of arthritis in calves and even in cattle, so we will oblige to discuss
our results in comparison to a horse and man as great numbers of references were available. Rose and Love\cite{10} reported that Staph. aureus isolated from the joints of two horses was sensitive to chloramphenicol, erythromycin, tetracycline, lincomycin, methicillin and cloxacillin while the same bacteria isolated from the joint of another horse was sensitive to penicillin, tetracycline and chloramphenicol. This observation agrees with the finding of the present study that all of the staphylococci isolates tested were found to be highly sensitive to most antibiotics used except amikacin, cephaliroidine and dalacin (less sensitive).

All isolates of C. pyogenes tested were highly sensitive to ampicillin, dalacin, garamycin and penicillin and slightly sensitive to erythromycin, amikacin and cephaliroidine, but resistant to sulpha-trimethoprim and tetracycline. Nakama et al\cite{11} found that most of C. pyogenes were highly sensitive to penicillin, synthetic penicillin, tetracycline, erythromycin and kanamycin, and were resistant to sulphaisomezol.

Vanpelt and Rilley\cite{12} showed that beta-haemolytic Streptococci spp. isolated from foals were most sensitive to proc. penicillin. This observation and the results of other study in man\cite{13} agrees with those of the present study. However, the same research workers\cite{14} used chloramphenicol for the treatment of infectious arthritis caused by non-haemolytic E. coli in foals whereas our findings showed that E. coli isolates were highly sensitive to amikacin and ampicillin and markedly sensitive to chloramphenicol.

Cobbs and Kays\cite{15} stated that arthritis in man caused by Klebsiella spp. was frequently sensitive to colistin and kanamycin only, while our findings revealed that Klebsiella spp were most semensitive to amikacin, chloramphenicol, garamycin in addition to kanamycin.

In the present study, all Ps. aeruginosa isolated from cases of arthritis in calves were found to be
resistant to the most antibacterial agents tested except amikacin and garamycin, whereas in man, Pseudomonas strains were usually sensitive only to colistin and polymixin B (18).

REFERENCES


حدود التهاب المفصل الإنتاني في العجل: العزل البكتريولوجي وحساسية البكتريا للمضادات الحيوية

الاسماء: جبرئيل كله وسام عبد الزراق زيدان وعبدالكريم أحمد وه。
فرع الطب العلاج البيطري، كلية الطب البيطري، جامعة بغداد

الخلاصة

أجريت هذه الدراسة على 50 عجلة مماثلة بالتهاب المفصل الإنتاني. تم سحب السائل الزليلي من المفصل المصاب بطريقة البزل المفصل لغرض الفحص الجرثومي وإجراء اختبار الحساسية لـ14 من المضادات الحيوية.

ابتلعت النتائج بأن اعلى نسبة إصابة بالتهاب المفصل الإنتاني كانت في الذكور (41.6%) مقارنة بالإناث (23%). ووجدت اعلى نسبة إصابة في العجل التي اعمارها تتراوح اقل من شهرين. ومن أهم العوامل الجرثومية كانت:


وجد ان اغلب العوامل الموجبة لمتغيرة اكرام كانت حساسة لـ: Ampicillin, Cloxacillin, Erythromycin, Fucidin, Garamycin and Penicillin.

أما جرثومة Pseudomonas aeruginosa فكانت مقاومة Amikacin and Garamycin لمعظم المضادات الحيوية ماعدا.