Efficiency of some disinfectants and extracts of medicinal plants on bacterial pathogens isolated from post-operative wounds

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The most likely organisms to infect clean operation wounds in hospital are *Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli*, as with accidental wounds local treatment often sufficient. Evaluating the effects of plant extracts of *Myrtus communis, Eucalyptus, and Nerium oleander* on the types of bacteria, in comparison with the standard antibiotics. A total of 40 specimens were collected from surgery units of teaching Hospital, and AL-Basrah General Hospital during September 2007 to April 2008. Four disinfectants: Hibitan, Septol, providine Iodine, and savlon, plant extracts of *Myrtus communis, Eucalyptus* and *Nerium oleander*, in comparison with the standard antibiotics were testing against bacterial pathogens associated with postoperative wounds. From a total of (40) post operative wounds 72.5% are positive cultured cases, while 27.5% are negative cultured cases. *S. aureus* and *Pseudomonas* spp are bacteria in percentage (75.86), while protease is the lowest isolated from (20.68%) from all positive cases. Four disinfectants (Hibitan, Septol, Iodine, and savlon), and three plant extracts of *M. communis, Eucalyptus*, and *N. oleander*, and eight standard antibiotic were used to determine antibacterial activity. Most diluted concentration of disinfectants, lowest con of extracts, and some antibiotics are not effective on the bacterial types effects plant extracts are locate within the limits of studied antibiotics that give inhibition zones between 10 to 30 mm against all bacterial pathogens. There are variety of effects of various disinfectants in comparison with plant extracts and antibiotics against bacterial pathogens associated with postoperative wounds.

Key words: Postoperative wounds, bacteria, disinfectants, plant extracts, antibiotics.

INTRODUCTION

Wound infection has been defined as wound with pus visible to the necked eye, whether or not organisms could be cultured from the purulent material (Maki, 1983). Open injuries whether caused a laceration, a crash injury or a penetrating missile wound have three facets in common and differ only in a matter of degree. All are considered to be primarily contaminated by microorganisms, all may contain foreign bodies and all are likely to contain a significant amount of devitalized or necrotic tissue (Bellcham et al., 1999).

The most likely organisms to infect clean operation wounds in hospital are *Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coli* as with accidental wounds local treatment often sufficient (Jibran, 1986). If infection is deep-seated or becomes generalized appropriate systemic treatment must be administered (murtlay et al., 1998).

In addition, the entry site should be cleansed daily and treated with one of the antiseptics such as Centaulon, Hibitane, and Quinolines (Kiernan, 1998). A vast amount of work has done over the past 50 years in attempts to explain the infection that can follow “clean” surgical operation, but still no complete satisfactory solution (s) has been documented. There is still uncertainly as to how often a wound is infected in the operating room, and how

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often at a later date during the healing of the wound (South, 1999; Murthy et al., 1998).
There are those who deny that air in the operating theatre is an important source of infection because bacterial pathogens from only a minute fraction of colonies grown from the air. In the ward, on the other hand, the aerial route for post-operative cross-infection is regarded as a potent one (Alababidi and Shah, 1998, Froham et al., 1996). The present study aimed to Isolate the major bacterial types associated with postoperative infected wounds, evaluate the efficacy of four disinfectants on the major bacterial types, and evaluate the effects of plant extracts of Myrtus communis, Eucalyptus, and Nerium oleander on the types of bacteria, in comparison with the standard antibiotics.

MATERIALS AND METHODS

Post-operative wounds
A total of 40 specimens were collected from surgery units of teaching Hospital, and AL-Basrah General Hospital during September 2006 to April 2007.

Bacteriology study
Sterile swabs used to collect the sample and inoculate in blood agar base (Oxoid) MacConkey agar (Oxoid), and nutrient agar (Difco). The identification of various bacterial types carried depend routine laboratory techniques (Finegold and Baron, 1986).
All cultures are incubate aerobically in incubator for 24 h on 37°C.
All media sterilized by autoclave qaz‘1(1.5 pond/ cm ) for 15
Disinfectants
All glassware’s sterilized by oven (180 to 200°C) for 2 h.
Four disinfectants are used in this study Hibitan, Septol, providine, iodine, and savlon.
Table 1 show two concentrations of each disinfectant that are used for susceptibility test (100 and 50%).

Plant extracts
Three medicinal plants were used in our study: M. communis L. (myrtaceae) common name: Camphor tree, Yass tree or Eucalyptus L. (Apodytes) N. (scientific name: Diflla tree).

Various aqueous concentrations (100, 500 and 1000 meg/ml) of leaves extract from each plants were prepared by superior (Ihsan AL-Saimary), and sterilized by filtration (Millipore filter 0.45 Mm 25 mm).

Antibiotics
Eight standard antibiotics (as antibiotic disc) were used for comparison effects: Penicillin G (P) 10 unit), Chloramphenical (C) 30 mcg, Cephalexin (CE) 30 meg, Bactrim Sxt (25 meg).
Tetracycline TE (30 mcg), Erythromycin E (15 mg), Kanamycin K (30 mcg), and Gentamicin CN (10 mcg).

Evaluation of the antibacterial activity
Plate (agar diffusion) methods used to evaluate the antibacterial activity of disinfectants, plant extracts and antibiotics on growth of bacterial types isolated from post operative wounds to determine inhibition zones (mm) by a sing Mueller- Hinton agar MHA (Oxoid).
The present study was carried out with improvement and agreement of Ethical and Medical Committee in College of Medicine and Al-Sadder Teaching Hospital and General Basrah Hospital - Basrah.

RESULTS
Presence percentage of major bacterial types are showed in Table 2 from 40 cases, 29 cases (72.5%) yielded positive culture results, while 11 cases (27.5%) are negative cultured cases (no growth).
From positive cases: the following types of bacteria and their percentages were found:
S. aureus and Pseudomonas (22 cases 75.86%) Staphylococcus epidermidis (16 cases 65.16%), E. coli (14 cases 48.27%, _hemolytic streptococci (13 cases (44.82%), _ hemolytic streptococci (10 cases 34.48%), Klebsiella (8 cases 27.58) and Proteus (6 cases 20.68).Total number of isolated (106) bacterial types from all positive cases. Result of antibacterial activity of disinfectants, plant extracts and antibiotics determine by agar diffusion (plate) method (determine growth inhibition zones (mm) are listed below:

The greatest effects are for 100% concentration of all disinfectants and for meg/ml of plant extracts while most others 50% of disinfectants and 100 meg/ml of extracts

<table>
<thead>
<tr>
<th>Disinfectants</th>
<th>Scientific name</th>
<th>Commercial conc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hibitan</td>
<td>Chlorhexidine gluconate</td>
<td>5%</td>
</tr>
<tr>
<td>Septol</td>
<td>Chloroxylenol</td>
<td>5%</td>
</tr>
<tr>
<td>Providine Iodine</td>
<td>Iodine</td>
<td>10%</td>
</tr>
<tr>
<td>Savlon</td>
<td>Chlorhexidine</td>
<td>0.3% Chlorhexidine</td>
</tr>
<tr>
<td></td>
<td>Cetrimide</td>
<td>3% Cetrimide</td>
</tr>
</tbody>
</table>

Table 1. Types and concentrations of disinfectants used in study.
Table 2. Percentage of bacterial types isolated from post-operative wounds (40 cases).

<table>
<thead>
<tr>
<th>Bacterial types</th>
<th>No. cases</th>
<th>% from total No. of +ve cases (29)</th>
<th>% from total No. of isolates (106)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. coli</td>
<td>14</td>
<td>48.27</td>
<td>13.2</td>
</tr>
<tr>
<td>Klebsiella</td>
<td>8</td>
<td>27.58</td>
<td>7.5</td>
</tr>
<tr>
<td>Proteus sp.</td>
<td>6</td>
<td>20.68</td>
<td>5.6</td>
</tr>
<tr>
<td>Pseudomonas sp.</td>
<td>22</td>
<td>75.86</td>
<td>20.7</td>
</tr>
<tr>
<td>S. aureus</td>
<td>22</td>
<td>75.86</td>
<td>10.3</td>
</tr>
<tr>
<td>S. epidermidis</td>
<td>16</td>
<td>75.86</td>
<td>20.7</td>
</tr>
<tr>
<td>*-hemolytic streptococci</td>
<td>10</td>
<td>34.48</td>
<td>9.4</td>
</tr>
<tr>
<td>*-hemolytic streptococci</td>
<td>13</td>
<td>44.82</td>
<td>12.2</td>
</tr>
<tr>
<td>Total no. of +ve cultured cases</td>
<td>29</td>
<td>72.5</td>
<td></td>
</tr>
<tr>
<td>Total no. of +ve cultured cases</td>
<td>11</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>Total no. of isolates</td>
<td>106</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

are not effective of the genera of bacteria. We can summarized the biggest inhibition zones as follow:

(8, 10, 8, 6, NE, 12, 10, 12) mm for 100% Septol.
(10, 12, 10, NE, 8, 12, 11, 10) mm for 100% Iodine.
(16, 15, 8, 11, 9, 12, 10) mm for 100% Savlon.
(20, 15,14,13,15, 12, 11, 14) mm for 1000 mcg/ml for extract of Eucalyptus
(12, 11, 13, 9, 12, 11, 12, 11) mm for 100 mcg/ml for extract of M. communis
(18, 20, 14, 11, 13,10,12,11) mm for 100 mcg/ml for extract of Nerium oleander on growth of E colI, Klebsiella, Proteus, pseudomonas, S. aureus, S. epidermidis, _--hemolytic streptococci, and _-hemolytic streptococci respectively.

In comparison with standard antibiotics, the ranges inhibition zones are between 10 to 30 mm, while some antibiotics are not effective some bacterial types. (NE : Mean not estimated).

DISCUSSION

Our result revealed a highly infected percentages of post-operative wounds with a many bacterial types, only 11 cases 27.5% are negative cultured, these facts may indicate a high contamination of post operative wound with aerobic and anaerobic bacteria depend on many factors, such as careless of patients, poor nursing services, highly diluted disinfectants, contamination of surgical instruments, contamination of theater room, not give a suitable antibiotics in treat a infected post operative wound and other factors (Platt and page, 1995; Sana et al.,1995).

The problem of hospital infection is a real one. Antibiotic-resistant S. aureus and various Gram-negative bacilli-in especially. Pseudomonas have played a predominant role (Frohm et al., 1996).

Self-infection (endogenous) may be due to bacteria causing infection (e.g. from boils) or carried by the patients without any systems on the skin, in the nose, mouth, or in the intestinal tact (Blair et al., 1995).

Cross-infection and infection from the environment (exogenous may occur with organisms transferred from patients or members of staff by contact or through airborne routs. Infection may be transferred on hands, or clothing of staff, visitors, or ambulant patients, on inadequately sterilized instruments, on fomites or in fluids (e.g. P. aeruginosa in cetrimide containing disinfectant) etc. (Bellchambers et al., 1999; Russel et al., 1982).

Also many another studies such as Lan and South (1999), Kiernan (1998), Murthy et al. (1998) show that nurses, doctors and others who attend to many patients can transfer infective organisms from one patient to another, visitors may transfer their own microorganisms. Airborne transfer may occur through the dispersal of minute skin scales or minute droplets from the mouth, wound dressings dust or nebulisers serves as a potential source of airborne infection.

Disinfection solutions contaminated with Gram negative bacilli are a particular hazard in hospital and infections originating from them have been reported (Russell et al., 1982).

Contamination is usually due to inappropriate disinfectants, the use of weak solutions, or "topping up" of containers (Jibrán, 1986).

Our study approved the results above and other studies, we found that many disinfectants in 50% of dilution and some of concentrated solution 100% are not
effective against some bacterial types.

The hospital staffs responsible for buying and using environmental disinfectants are often poorly trained in control of infection techniques and have little knowledge of microbiology. All disinfectants are more or less equally effective, irrespective of concentration, and no bacteria will survive in a disinfectants solution. If a surface is treated with a disinfectant, bacteria will continue to be killed even after the surface has dried (Frohme et al., 1996; Blair, 1995; Russell et al., 1982).

Extracts of *M. Communis*, *Eucalyptus*, and *N. oleander* give a useful effects on bacterial types, these may be due to a highly concentrated antibacterial agents present in these plants, therefore, some of them used in Arabic medicine for treating of many infections diseases, but little acknowledge or information available in word about antibacterial properties of these extracts. So, some of them was use in mummification, preservation, and other important process, such as in Egyptian civilization employed variety of balsams, camphor oil, which contained natural preservative. Natron, a crude of native sodium carbonate, was also used to preserve the bodies of human and animal alike, also wine, vinegar and honey were used on dressing and as cleansing agents for wounds, and it is interesting to note that diluted acetic acid has been recommended comparatively recently for the topical treatment of wound and surgical lesions infected by *P. aeruginosa* and *S. aureus* (Alwaili and Saloom, 1999; Alababidi and Shah, 1998; Saha et al., 1995).

REFERENCES


