

ACETIC ACID TREATMENT OF PSEUDOMONAL WOUND INFECTIONS

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Aim: *Pseudomonas aeruginosa* is a classic opportunistic pathogen with innate resistance to many antibiotics and disinfectants. It is ubiquitous in hospital environment and because of its ability to survive in hospital environment it creates threat to patient's care. The antibacterial effect of acetic acid against multiple antibiotic resistant strains of *Pseudomonas aeruginosa* isolated from nosocomial wound infection cases was studied.

Methods: For this study, seven hospitalized patients with wound infections, not responding to traditional therapy for more than 10 days, were selected. A specimen of pus was collected before application of acetic acid and after completion of treatment (only one reculture was done) and processed for culture study. Seven clinical isolates of *P. aeruginosa* were studied for in vitro susceptibility to acetic acid and all were found to be inhibited by 3 % acetic acid.

Results: The pus culture yielded isolation of *P. aeruginosa* in all seven cases under study. No other bacterium was isolated from these cases; hence they were labeled as pseudomonal wound infections. All isolates were found to be resistant to four or more antibacterial agents but all of them were found to be inhibited by 3% acetic acid in vitro when exposed for 15 minutes or more. Topical application of 3 to 5% acetic acid to wounds for 2 to 12 times successfully eliminated *P. aeruginosa* from wounds.

Conclusion: The use of acetic acid is therefore recommended for effective elimination of multiple antibiotic resistant strains of *P. aeruginosa* from infection site.

Key words: *P. aeruginosa*, acetic acid, antibiotic resistance, nosocomial wound infections

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INTRODUCTION

Pseudomonas aeruginosa is a classic opportunistic pathogen with innate resistance to many antibiotics and disinfectants. It is ubiquitous in hospital environment and because of its ability to survive in hospital environment it creates threat to patient's care. It is the most difficult nosocomial pathogen to be eliminated from infection site. In spite of availability of newer antimicrobial agents with a broad spectrum of activity, it is difficult to treat wound infections caused by nosocomial strains of *P. aeruginosa*. The susceptibility of *P. aeruginosa* to acetic acid in vitro and use of acetic acid in the treatment of pseudomonal infections of skin and soft tissue has been reported earlier (1-3).

In the present study an attempt has been made to use acetic acid as a sole antimicrobial agent for the treatment of pseudomonal wound infections and to substantiate the earlier findings reported.

MATERIALS AND METHODS

For this study, seven hospitalized patients with wound infections, not responding to traditional therapy for more than 10 days, were selected. A specimen of pus was collected before application of acetic acid and after completion of treatment (only one reculture was done) and processed for culture study. Isolation of *P. aeruginosa* was confirmed by using standard techniques (4). The in vitro susceptibility to antimicrobial agents

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Table 1. Details of patients

Age / Sex	Particulars	Susceptibility pattern	Acetic acid concentration	Applications n
45 yr / M	Perinephric abscess	S - Ak, Ca	5%	02
60 yr / F	Post operative wound infection	S-G, Ak, Cb, Ca	3%	10
50 yr / F	Post operative wound infection	S-Tb, G, Ak, Cb, Ca	3%	10
90 yr / F	Infected fore arm	S - Ak, Ca	3%	10
02 yr / F	Gluteal abscess	S- Tb, AK, Cs, Ca	3%	12
52 yr / M	Diabetic foot ulcer	S-Ak, Ca, Cb, Pc	3%	12
45 yr / F	Wound infection Rt. Foot	S-Ca	3%	08

S - Susceptibility, Ak- Amikacin, Ca - Ceftazidime, Cb - Carbenicillin, G - Gentamycin, Tb - Tobramycin, Cs - Cefoperazone, Pc - Piperacillin

of each isolate was studied by Kirby-Bauer disc diffusion method (5) and susceptibility to 1 to 5% acetic acid was determined in nutrient broth by adding 100µl of overnight broth culture of the *P. aeruginosa* to equal volume of each concentration of acetic acid in a separate test tube and subcultures from these were made on Pseudomonas isolation agar (Difco) after 10, 15, 20 and 25 minutes of exposure. The plates were incubated at 37°C for 18 hours and the lowest concentration of acetic acid inhibiting growth was recorded.

For use in patients, 3% acetic acid (5% in a case of drained perinephric abscess, which was not responding to antibiotic therapy for 28 days and repeatedly yielding *P. aeruginosa* on culture resistant to 15 different antimicrobial agents) was applied in the form of wound irrigation and wound wash, and a gauze soaked in acetic acid was placed on wound daily until the wound healed completely and reculture of swabs yielded no growth. No antibiotics were given to any of the patients during this course of management.

RESULTS

The pus culture yielded isolation of *P. aeruginosa* in all seven cases under study. No other bacterium was isolated from these cases; hence they were labeled as pseudomonal wound infections. All isolates were found to be resistant to four or more antibacterial agents but all of them were found to be inhibited by 3% acetic acid in vitro when exposed for 15 minutes or more.

All seven patients showed successful elimination of *P. aeruginosa* from their wounds and successful healing of their wounds in 2 to 12 applications. For complete healing 10 or less than 10 applications were needed in perinephric abscess (02 applications), wound infection right foot (08 applications) and post operative wound infections (10 applications), however in two cases (gluteal abscess and diabetic foot ulcer one case each) a total of 12 applications were needed. Wounds in all seven patients were healed by second intension and no grafting or flap procedure was required for wound closure. No adverse effects were



Figure 1. Diabetic foot ulcer – before application



Figure 2. Diabetic foot ulcer – after 12 applications

noted in any of the patients. Particulars of wound infection, susceptibility pattern of *P. aeruginosa*, concentration of acetic acid used for the treatment and number of applications are given in the table.

DISCUSSION

Pseudomonal infection in hospitalized patients has always been a problem to the clinicians. Traditional therapies with antipseudomonal agents have their own limitations because of multiple antibiotic resistance in nosocomial strains of *P. aeruginosa*.

The use of acetic acid has been reported from time to time as a topical agent for the treatment of pseudomonal infections and in most reports has been used for burns and superficial infection (1-3). Topical use of acetic acid at concentrations between 0.5 to 5% eliminated *P. aeruginosa* from the burns and soft tissue wounds of 14 out of the 16 patients within two weeks treatment (2). In our study, considering the in vitro susceptibility, 3% acetic acid was used that successfully eliminated *P. aeruginosa* in 12 days from all except one case of perinephric abscess in which 5% acetic acid was used. Acetic acid may act against *P. aeruginosa* simply by lowering of the pH and thereby making an environment unsuitable for growth and multiplication of *P. aeruginosa*.

From the results of present study, it is concluded that 3% acetic acid is nontoxic, inexpensive and efficient topical agent for effective elimination of *P. aeruginosa* from superficial infection site. It is the best alternative when infection is caused by multiple antibiotic resistant strains and where there is shortage of therapeutic options.

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