
Management Of Pseudomonal Wound Infection

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Citation

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Abstract

Introduction: Pseudomonas aeruginosa is an opportunistic microbe with resistance to a wide range of antibiotics. In economically deprived areas, the problem gets complicated by inability of patients to afford newer drugs which are usually costly. In such circumstances, dilute acetic acid which is easily and cheaply available has been found to be effective. **Materials and methods:** The study was done prospectively on 8 cases of proved pseudomonal infection in whom systemic antibiotics could not be given due to various reasons. 5% acetic acid was used topically for dressing of wounds till cultures yielded no growth of bacteria. **Results:** Inability of the patients to purchase the newer and costly antibiotics to which Pseudomonas was sensitive was the major cause of resorting to the use of 5% acetic acid for control of infection. All the cases showed positive response and Pseudomonas got eradicated after periods varying from 4 to 16 days. **Conclusion:** Acetic acid can be cheaply and effectively used for control of pseudomonal soft-tissue infection.

INTRODUCTION

Ever since the creation, man has been struggling to treat infected wounds and in the process man devised a large number of dressings and drugs. But even today in 21st century, there remains a huge chunk of infected patients in whom even modern drugs are of little use, either due to lack of affordability or sensitivity or onset of adverse effects. In such circumstances, surgeons resort to rather unconventional means of wound management. This study was done in the Department of Surgical Specialties of Sheri Kashmir Institute of Medical Sciences, Srinagar, Kashmir, India, from March 2006 to December 2007 to study the efficacy of acetic acid in the management of wounds infected by Pseudomonas.

MATERIALS AND METHODS

This study was conducted prospectively and includes 8 patients in whom soft-tissue wounds were infected with pseudomonas aeruginosa. Five of these patients were managed as inpatients and the rest of the three patients were treated in the outpatient department. In all these patients, pseudomonas was cultured from swabs taken from wound discharges, before the application of acetic acid. The acetic acid was used in 5% concentration, which is commonly and cheaply (500ml for around 12 Indian Rupees equivalent to 30 US cents) available in the market, being primarily used for cooking purposes. In these patients, sterile gauze soaked

in acetic acid was replaced every four hours till the wounds showed clinical improvement in form of absence of purulent and foul-smelling discharge and regression of inflammatory features. None of these patients received any other antibiotic. There were 3 other patients who received antibiotics simultaneously with application of acetic acid, but these were excluded from the study. In none of the patients, in-vitro susceptibility of microbes to acetic acid was studied. The swab cultures were repeated once the wounds improved and acetic acid was applied till swabs yielded no growth of pseudomonas.

RESULTS

In all the 8 patients under study, Pseudomonas aeruginosa was cultured and in 2 cases acinetobacter sp. was also present. The profile and outcome of these patients is given in Table 1.

Figure 1

Table 1: Profile of patients treated with acetic acid

No	Age	Sex	Nature of wound	Co-morbidity	Drug sensitivity of Pseudomonas	Indication for use of acetic acid	Duration of treatment (days)
1	27	M	Gluteal abscess	None	PT, Cp, Mr	Drugs not affordable	6
2	42	M	Sacral pressure ulcer	Paraplegia	PT, Im, Cp, Mr	Drugs not affordable	13
3	49	M	Tube thoracostomy	Pleural effusion	PT, Ak	Adverse effects to drugs	8
4	53	M	Diabetic foot	Diabetes, ischemic heart disease	None	Resistant to all available drugs	16
5	34	F	Post laparotomy	None	PT, Cp, Mr	Drugs not affordable	5
6	19	M	Below knee amputation stump	None	Cf, PT, Cp, Mr	Drugs not affordable	9
7	61	F	Trochanteric pressure ulcer	Bedridden, old stroke	PT, Cp, Mr	Drugs not affordable	11
8	36	M	Plantar abscess	None	PT, Cp, Im, Cl	Drugs not affordable	4

PT – Piperacillin/Tazobactam, Cp – Cefipime, Cf – ceftazidime, Ak – Amikacin, Mr – Meropenam, Im – Imipenam, Cl – Colistin

Figure 2

Figure 1: Sacral pressure ulcer with Pseudomonas infection

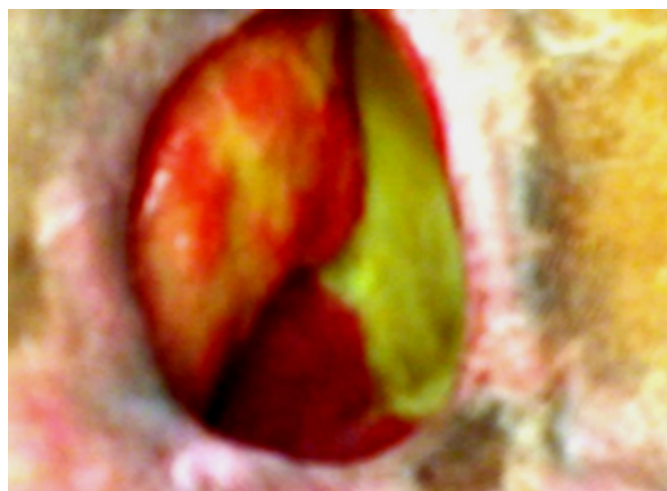
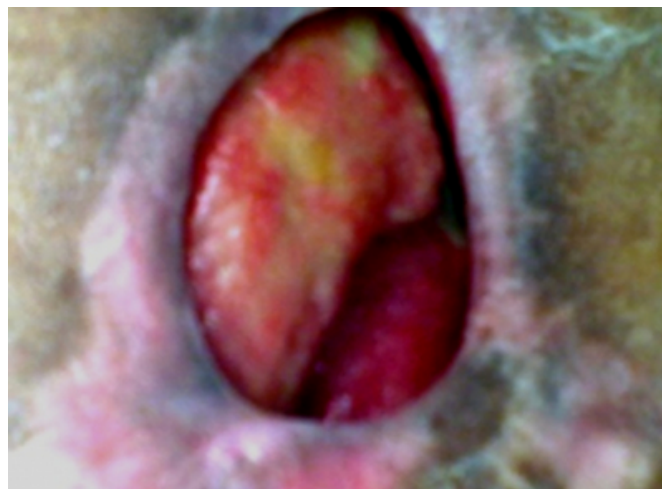


Figure 3

Figure 2: Same wound as in Fig. 1 after treatment with acetic acid for 13 days



DISCUSSION

Pseudomonas is a classical opportunistic bacterium with innate resistance to a wide range of antibiotics or sensitivity to some newer and often costlier antibiotics. As evident from Table 1, we resorted to the use of acetic acid due to economic reasons in 6 (75%) out of 8 patients and one of the patients was resistant to all the available drugs whereas the last one tended to develop pancytopenia after 5 days of using tazocin forcing discontinuation of the systemic antibiotic. The inspiration to use acetic acid was drawn from various series in the literature. In fact, as early as in 1916, elimination of pseudomonas (than called Bacillus pyocyaneus) in superficial war wounds with the application of 1% acetic acid was reported.¹ Again in 1968, a 5% solution of acetic acid was shown to be effective at eliminating Pseudomonas aeruginosa from infected wounds but during the treatment, the number of Staphylococcus aureus and Proteus species was found to increase significantly.² In 1995, a study with patients with venous leg ulcers showed that gauze dressings soaked with acetic acid were effective in decreasing the number of Staphylococcus aureus and Gram-negative rods.³ In our experience, only one patient would complain of mild stinging sensation at the wound site at the time of dressing changes and there was no other complication which would have compelled us to stop the acetic acid application, though some workers have reported significant pain or discomfort as adverse effect.² Similar evidence of absence of pain comes from Milner who, in 1992, conducted a prospective study involving the use of 5% acetic acid in 9 patients. None of his patients complained of discomfort. Two wounds lost Pseudomonas species

within 2 days and a further four within one week. Only one patient had grown bacteria after three weeks. Following eradication of *Pseudomonas*, the wounds were found to heal rapidly.⁴

There are series where, besides by swab culture and clinical examination of soft tissue and burn wounds, *Pseudomonas* cultured from wounds has been found to get inhibited by acetic acid in vitro.^{5,6} Some studies have suggested cytotoxic effects of acetic acid in vitro but clinically no such effects have been found.⁷

It is possible that the application of acetic acid may confer other benefits on the healing process as well as the removal of bacteria. The effect of acetic acid on re-epithelization has been studied in animal and human models and it has been found to have no negative impact on wound healing⁸, although one study found that acetic acid initially delayed re-epithelization, but after the eighth day this effect did not persist and tensile wound strength was not influenced.⁹

As far as the mechanism of action of acetic acid is concerned, it is suggested that acidification of a wound also increases the pO₂ and reduces the histotoxicity of ammonia which may be present (ammonia being less toxic in an acidic environment). This acidification of a wound is, however, relatively short-lived and it has been found in one study that the wound does not maintain acidity for periods longer than about one hour and therefore soaks would require frequent replacement.¹⁰ In our series, we changed the acetic acid

soaked gauze every four hours though some workers have got excellent results with even single daily gauze replacement.^{3,5}

CONCLUSION

From our experience and from the review of literature, we conclude that dilute acetic acid can be safely, effectively and very economically used in the management of superficial soft tissue wounds infected with *Pseudomonas aeruginosa*.

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