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Efficacy of different irrigating solutions for wound washing in musculoskeletal injuries

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Abstract

Background: There is much to learn about the effectiveness of different methods currently used for the irrigation of open wounds. The purpose of this study was to compare various irrigating solutions for wound washing in musculoskeletal injuries.

Materials and methods: The proposed study is a hospital based prospective study. It was done between 2013 and 2016. 120 patients of open fractures were included in the study. The cases were randomized into 3 group's normal saline, amikacin and povidone iodine. All wounds received sharp débridement and irrigation. Necessary plastic surgery intervention was given. Post-operative wound and implant infection rates were compared

Results: In the Study, the irrigation treatment lowered the post-operative infection rates in all treatment groups. The normal saline group had 7.5% (n=3) infection, amikacin group had 10% (n=4) infection, povidone iodine group had 10% (n=4) infection post operatively. The average wound healing time was more in povidone iodine group and these wounds had more serous discharge.

Conclusion: All the 3 methods decreased the post op infection rate in open fractures. Normal saline is more effective and cheaper method for wound wash.

n=number of cases

Keywords: Open fractures, wound irrigation

1. Introduction

Open Fractures are common especially in young patients with motor vehicle accidents. Open fractures of extremities commonly have post-operative infection (13%) [17]. They have been reported to account 3% of all fractures. Most of them are highly contaminated. Wound irrigation is very essential to decrease the chances of wound infection. Disagreement exists regarding reliability of irrigating solution. Different surgeons prefer different solutions. We have compared efficacy of normal saline, povidone iodine, amikacin in preventing wound infection.

2. Materials and methods

The proposed study is a hospital based prospective study. It was done between 2013 and 2016. Patients of open fractures were studied with a mean follow up 1 year. The present study was conducted to assess the effectiveness of three irrigating fluids in controlling infection in open fractures. On admission of the patient a careful history was elicited from the patients and/or attendants of injury and severity of trauma. The patients were then assessed clinically to evaluate their general condition and the local injury. The general condition of the patient and the vital signs were recorded. Methodical examination was done to rule out fractures at other sides. Local neurologic and vascular deficit was assessed.

Patients had varying grades of open fractures from type 2 to type 3b (Gustillo Anderson classification). They were aged between 20-40 years and did not have any other systemic illness known to increase infection risk (diabetes, immunocompromised state, liver disease, renal failure) 120 patients of open fractures were included in the study. The cases were randomized into 3 group's normal saline, amikacin and povidone iodine. The 3 groups of patients were randomly assigned one of the above mentioned fluids for irrigation of the wound. The fractures were fixed with various fixation devices. Wound Covered primarily with various methods (direct closure, SSG, flaps). The number of wound infection were assessed.

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3. Results

In our study all the patients were between 20-40 years and average age being 32 years. Most of the patients in our study were due to fractures following in violent road traffic accidents. Wounds are contaminated with mud dirt and grease. The average interval between fracture and treatment was 7 hours in our study.

In the Study, the irrigation treatment lowered the post-operative infection rates in all treatment groups. The normal saline group had 7.5% (n=3) infection, amikacin group had 10% (n=4) infection, povidone iodine group had 10% (n=4) infection post operatively. The average wound healing time was more in povidone iodine group and these wounds had more serous discharge.

solution	Normal saline	Povidone iodine	Amikacin
Total no of patients	40	40	40
infection	3	4	4
Serous discharge	0	4	1



Fig 3



Fig 1



Fig 4



Fig 2



Fig 5

4. Discussion

Traffic accidents are the leading traumatic events in Western countries and are becoming one of the leading types of accidents in India [7]. Open bone fracture, often seen in these traffic accidents, is first treated with debridement by irrigation of a wound surface with irrigation solutions in order to remove bacteria from contaminated tissues [8-10]; therefore, it is medically significant for the most effective irrigation solutions, which cause the least inflammation in the debridement treatment, to be identified.

It is clear that the wound infection rate is positively correlated with the number of bacteria retained following debridement [11]. Maximal removal of bacteria from the contaminated wound surface is one of the most important measures to prevent wound infection. We believe that in the early stages of open fractures bacteria only exist on wound surfaces and have not yet had the opportunity to propagate rapidly; therefore, efficient removal of the majority of the bacteria by irrigation is critical to infection prevention. This study showed a statistically identical 99.9% effectiveness in bacterial removal in the three groups, suggesting that those bacteria were likely to have been washed away by irrigation rather than being killed by these solutions.

Currently, among the various irrigation solutions, normal saline, povidone iodine, amikacin are all used in our hospital. It has been reported that the iodine in iodophor can kill bacteria, improve microcirculation at the wound surface, promote wound healing and release iodine compounds with anti-inflammatory effects [13-15]; however, iodophor has toxic effects on *in vitro*-cultured human skin fibroblasts and immunocytes. In addition, iodine can induce and aggravate hyperthyroidism and hypothyroidism, and iodine at high concentrations can promote apoptosis, which is disadvantageous to wound healing. Amikacin is costly and also chances of systemic toxicity and hypersensitivity persist though not seen in our study

In conclusion, normal saline, iodophor and amikacin are all effective irrigation solutions in bacterial clearance following debridement, while normal saline resulted in little inflammatory reaction compared with the other two solutions. It is, therefore, conceivable to recommend using normal saline alone as the irrigation solution for the debridement of early-stage wounds in trauma clinics.

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