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Effectiveness of single application alcohol based antiseptic solution in preventing surgical site infection

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Abstract

Background: Surgical site infections are the most commonly encountered problem in all surgical procedure. The main aim of the study is finding out the effectiveness of single application alcohol based antiseptic solution during preoperative preparation to reduce the surgical site infections.

Materials and Methods: It is a prospective study of patients who underwent major and minor procedure in the duration of August 2019 - December 2019. The primary outcome of the study was evaluated on the basis of type of procedure, days of hospital stay, postoperative complications like seroma and pus discharge.

Results: Out of two hundred patients included in this study, 100 patients underwent minor procedure and the other 100 underwent major procedure. Age distribution for minor cases less than 25 is 3, 26-50 is 42 and 51-75 is 103 with mean \pm SD is 50.41 ± 14.25 and for major cases less than 25 is 1, 26-50 is 51, 51-75 is 48 with mean \pm SD is 50.87 ± 13.59 . Sex distribution of minor cases male - 48 & female -52, major cases with distribution of male -45 and female -55. Hospitalisation of all minor cases are less than 1 day with mean value of 1 and major cases less than 1 day are 4, 2-3 days are 86 and more than 3 days are 10 with mean value of 2.3. Each patient was carefully monitored for the period of 30 days from the day of surgery and the complications, if any was treated accordingly. Out of 100 minor cases, seroma formation was noted in 3 patients and pus discharge in 4 patients. Collections were evacuated thorough wound wash and saline dressing were done (no antibiotics were given for these cases both preoperative as well as postoperative period). Whereas, Out of 100 major cases (single dose of preoperative antibiotics are given) seroma formation were noted in 7 patients, seroma collections were evacuated, thorough wound wash and saline dressing were done (no antibiotics were given for these cases), Pus discharge was found in 7 patients, among them 4 were treated with I V Antibiotics for 5 days according to pus culture and sensitivity report.

Conclusion: The 200 patients who underwent procedure with single application of alcohol based antiseptic solution (2% chlorhexidine) for pre-operative preparation, was found to be effective against surgical site infections.

Keywords: Chlorhexidine digluconate, surgical site infection, preoperative preparation, postsurgical infection management

Introduction

Any infection or collection near the site of surgical incision within 30 days of procedure is named as Surgical Site Infection (SSI); it is the third most common infection & nearly accounts for 15% of all nosocomial infections which directly contribute to the surgical mortality and morbidity each year worldwide [1]. The CDC has developed the set of standard criteria in management of surgical site infections. In an attempt to understand the mode of spread and to calculate the surveillance rate of SSI occurring after the successful procedure. They are broadly classified into three types: A) Superficial incisional SSI which involves only the skin and subcutaneous layer. B) Deep incisional SSI which involves skin, subcutaneous layer along with the fascia. C) Organ /space SSI which involves any other part of anatomy which is open. The most common source of SSI in majority of cases is the native patient's flora skin and visceral organs [2]. *Staphylococcus*, a gram positive aerobic cocci are the most common organism involved in SSI other organism includes *E.coli*, *Bacillus*, and *Yeast* [3]. When skin is incised, underlying tissue is exposed to overlying endogenous flora which leads to the formation of surgical site infections [4]. The first and foremost step needed to reduce the surgical site infection is by providing appropriate preoperative antibiotics, use of effective preoperative preparation technique.

Materials and Methods

In this study, 200 patients were selected who visited our hospital in the period of August 2019 – November 2019. A prospective study analysis is made for all two hundred cases on the basis of types of illness, type of procedure, hospital stay and postoperative complications. All the patients who gave consent for this study are subjected to preoperative evaluation and they were categorised on the basis of diagnosis as major and minor groups. Minor group were treated on outpatient (day-care) basis with hospital stay less than one day, with nil preoperative and post-operative antibiotics. After successful procedure each patient was managed with analgesics alone (T. Paracetamol 500 MG). Major group were treated as inpatients with hospital stay more than 1 day, and were given a single dose of pre-operative antibiotics 30 mins prior surgery. The same protocol was followed for all the patients and their response was analysed by Statistical analysis was done using SPSS 23.0.

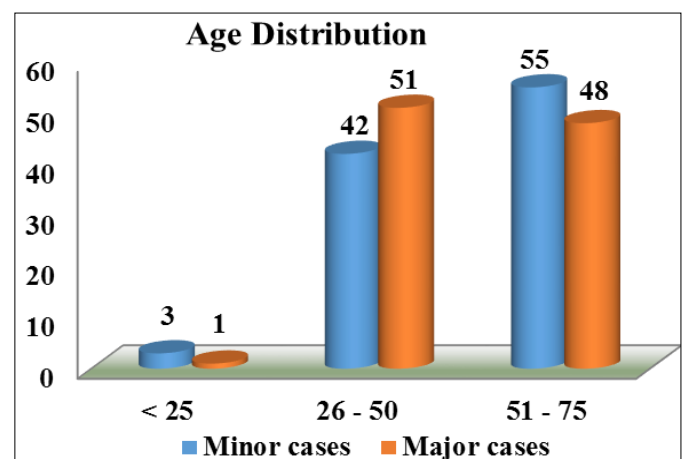
Results

Out of two hundred patients included in this study, 100 patients underwent minor procedure and the other 100 underwent major procedure. Age distribution for minor cases less than 25 is 3, 26-50 is 42 and 51-75 is 103 with mean \pm SD is 50.41 ± 14.25 and for major cases less than 25 is 1, 26-50 is 51, 51-75 is 48 with mean \pm SD is 50.87 ± 13.59 (Graph-1). Out of 200 patients, Sex distribution of minor cases male - 48 & female -52, major cases with distribution of male -45 and female -55. Comparing male patients females were at higher distribution rate in both minor and major patients (Table-1). Out of all 200 cases, all 100 minor cases are treated as day care procedure, every case is discharged in less than 1 day and Out of 100 major cases, 4 patients are discharged in less than 4 days, 86 patients in 2-3 days and 10 cases in more than 3 days. All minor procedures patients are subjected to preoperative evaluation and procedure were done under local anaesthesia, Out of 100 cases, incision and drainage was done in majority which accounts for 49 cases, 36 excision and biopsy, 8 disarticulations, 3 incisional biopsy, 2 nail removals, 2 trucut biopsy (Graph-2, 3). Out of 100 cases in major category, modified radical mastectomy and mesh repair accounts for 13 cases, total thyroidectomy 12, laparoscopic cholecystectomy 11, haemorrhoidectomy 9, inguinal hernia 8, excision and biopsy 7, lateral sphincterotomy 2, amputation 7, appendectomy 2, Webster procedure, other procedure 8. Out of all 100 cases in minor procedure, 3 patient presented with seroma formation and 4 patient presented with pus discharge, collections and discharge are evacuated and they are treated conservatively no antibiotics were given to them. Out of 100 cases in major cases, seroma was noted in 7 cases and pus discharge in 7 patients these cases are treated conservatively with thorough saline wash and daily saline dressing were given. Out of 7 pus discharge cases, 4 patients were treated with I V Antibiotics for 5 days according to pus culture and sensitivity report (Table-2 and Graph-3, 4)

Discussion

The cornerstone practises in reducing the danger of surgical site infection is by reducing the microbial skin burden on the operative site. A huge amount of research has addressed with methods aimed to prove chlorhexidine in view of effective in reducing the surgical site infections in surgical programs.

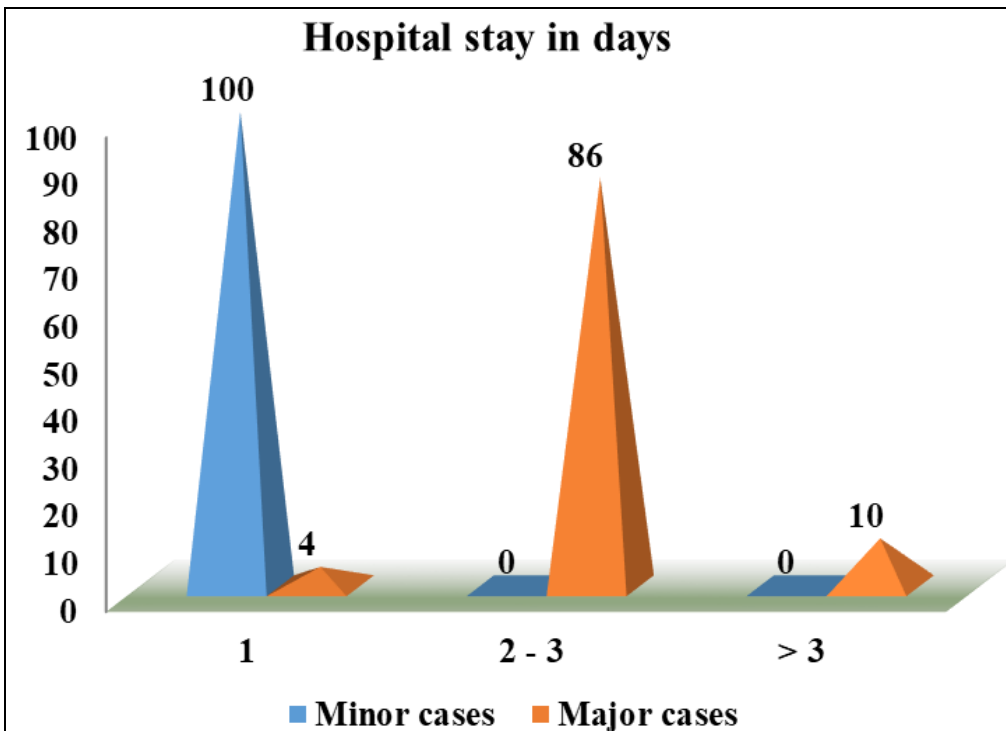
Maintaining normothermia as against mild hypothermia has been shown to decrease the SSI rate from 19% to 6% and to decrease hospital stay in patients ^[9]. In our analysis, we have studied the effectiveness in 200 patients which clearly states that the utilization of chlorhexidine –alcohol based antiseptic solution in preoperative period has found effective in reducing the SSI. Edmiston *et al.* (2010) ^[8] chlorhexidine is a simple, effective in reducing the risk of SSIs. Single-dose of broad-spectrum antibiotic alongside alcohol-based preparation within the perioperative period has been shown to scale back infection rates in surgical patients. Ishai Levin *et al.*, (2011) ^[9] demonstrates that antiseptics with chlorhexidine and alcohol was related to a big reduction within the rate of SSIs compared to povidone-iodine antiseptics in patients undergoing elective gynaecological laparotomies. Culligan *et al.* ^[15] demonstrated that cleansing with chlorhexidine as opposed to povidone-iodine reduced the rate of bacterial colonization in the operative field. Sowapat *et al* ^[16] didnt find a big difference in patients undergoing total abdominal hysterectomy after cleansing with chlorhexidine or povidone-iodine solutions. Michael T Adler *et al.*, (2012) ^[17] made a study on 50 participants which shows 2% chlorhexidine – alcohol-based solution had excellent bactericidal efficacy and was superior to povidone-iodine for cleansing the maternal abdomen. Aaron *et al.*, (2010) ^[7] studied preoperative chlorhexidine preparation in 1134 patients among them 157 patients completely complaint to chlorhexidine preparation with an infection rate of 1.6% proves that chlorhexidine is that the better antiseptic solution to scale back infection. Charles E. Edmiston *et al.* ^[8] clinical studies have shown chlorhexidine gluconate to be a secure and effective perioperative skin-prepping agent. By employing a standardized protocol which ends up in high skin surface concentrations sufficient to inhibit/kill skin colonizing flora, including methicillin-resistant *Staphylococcus aureus*. Gulden Menderes *et al.*, (2012) ^[10] there's good evidence that CHG-alcohol is superior to aqueous PVI – a crucial competitor – altogether three areas of skin antiseptics and he also states that perceived efficacy of CHG in skin antiseptics is usually actually supported evidence for the efficacy of the CHG-alcohol combination. Matthias Maiwald *et al.* ^[12] perceived efficacy of CHG in skin antiseptics is usually actually supported evidence for the efficacy of the CHG-alcohol combination. It's better in reducing the danger of surgical site infection.



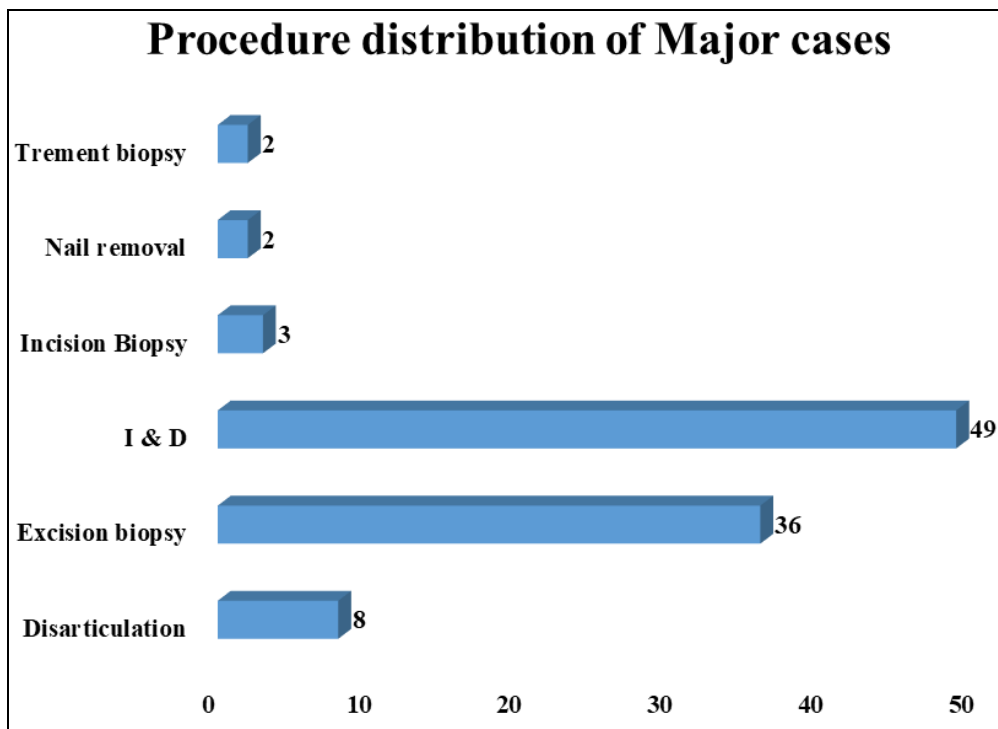
Graph 1: Distribution of patients based on the age

Table 1: Distribution of patients based on the gender

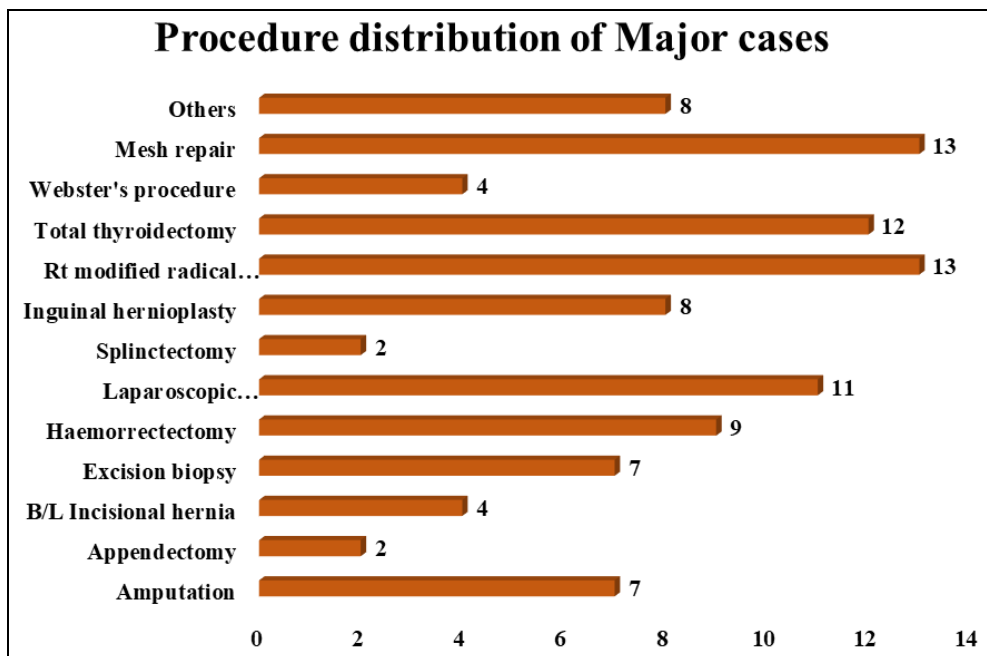
Gender	Minor cases		Major cases	
	Number	Percentage (%)	Number	Percentage (%)
Male	48	48.00	45	45.00
Female	52	52.00	55	55.00
Total	100	100.00	100	100.00



Graph 2: Distribution of patients based on the hospital stay



Graph 3: Distribution of patients based on the procedure



Graph 4: Distribution of patients based on the procedure

Table 2: Distribution of patients based on the complications

Complications	Minor cases		Major cases	
	Number	Percentage (%)	Number	Percentage (%)
Pus Discharge POD	4	4.00	7	7.00
Seroma & discharge	3	3.00	7	7.00
Nil	93	93.00	86	86.00
Total	100	100.00	100	100.00

Conclusion

As per the research analysis, one application of chlorhexidine is found to possess better antiseptic properties in preparing surgical site which is found to possess better efficacy and cost-effectiveness comparing other antiseptic methods. Alcohol-based solutions are quick, sustained, and sturdy with a broader spectrum of antimicrobial activity. These properties made it ideal for extended open surgeries with the potential for infection or surgical spillage, for percutaneous procedures with indwelling catheters, and for prosthesis implantation when minimizing skin colony counts so as to stop infection from the hardware. When using these products care should be taken in two ways 1) allow adequate drying time and 2) remove excessive hair from the prepared field which can delay the vaporization ability of alcohol. Findings of this study in conjunction with previous study reports of general surgery and gynaecology further support our belief that the utilization of an antiseptis protocol of twenty-two chlorhexidine- the alcohol-based solution should be used as a routine antiseptis protocol for all the procedures.

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