

# **COMPARATIVE STUDY OF SYRINGE PRESSURE IRRIGATION OF NORMAL SALINE WITH AND WITHOUT POVIDONE IODINE IN PREVENTING SURGICAL SITE INFECTION**

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## **INTRODUCTION**

Surgical site infection (SSI), also known as surgical wound infection<sup>1</sup>, is the most common surgical complication and is associated with prolonged hospital stays, high costs, morbidity, and mortality<sup>2,3</sup>. At 3% in the US, SSI can range from 5% for clean surgeries to above 20% for emergency colon surgery in a dirty area.

11% of surgery patients in low- to middle-income nations are infected. SSI causes around 400000 extra hospital days in the US, costing 10 billion dollars annually. SSI patients have longer, more expensive hospital stays and a higher likelihood of ICU time. They also had 5 times the chance of readmission and 2 times the risk of mortality.

Within 30 days of surgery, surgical site infection can arise at any depth, from the surface to the deepest cavity that remains after organ dissection.

**CDC defines SSI4 diagnosis criteria. It's divided:**

- 1) Surgical site infection at the incision.
- 2) Deep incisional surgical site infection.
- 3) Infection at the surgery site.

To obtain useful data, hospital, outpatient, and post-discharge SSI surveillance must be effective 5, 6, 7.

Christou N V et al. revealed various risk variables, including poor host defenses and acute and chronic physiological derangement.

Albumin and age-related bacterial contamination at surgery predisposes to SSI (8).

In 2004, Leaper et al. found that study design, data collection, analysis, and reporting must be improved to reliably determine SSI baseline rates for cost-effective measure evaluation<sup>9</sup>.

Multiple studies have compared normal saline irrigation, pressure irrigation, pressure irrigation + povidone iodine, chlorhexidine, alcohol, and others, with inconsistent efficacy and cost effectiveness. Pressure irrigation may prevent SSI better than surgical incision irrigation, according to research. These preparations are routinely utilised during surgeries, but surgeons choose them based on lack of data on SSI prevention.

Thus, this study compared syringe pressure irrigation of normal saline and normal saline + povidone iodine to avoid surgical site infection.

**Methods and materials**

A tertiary care hospital's Department of General Surgery did this randomized control trial on emergency and elective laparotomies for peritoneal contamination. This 2-year study of 15–65-year-olds ran from October 2021 to October 2023.

Excluded patients were immunocompromised, took steroids or immunosuppressive drugs, had type II diabetes, or were allergic to piperacillin/iodine.

Randomised

Computer-generated randomization was used to divide the study population into two groups.

Group A: syringe-pressure normal saline irrigation patients.

Group B Syringe pressure irrigation with normal saline and povidone iodine

### **PROCEDURE:**

The Shija Hospitals and Research Institute, Imphal Manipur Ethical and Scientific Committee approved the study. Selection criteria were used to evaluate peritonitis patients undergoing open laparotomy at Shija Hospitals and Research Institute's Department of General Surgery. Detailed medical history, physical exam, and investigations selected patients. The selected patients were informed about the study and interventions in their local language and gave signed informed consent.

Gender, age, and pertinent history were recorded on predesigned and pretested Performa. The results of a complete clinical examination were documented.

Laboratory tests included complete blood count, blood urea, and serum creatinine. Randomization determined patient assignment.

procedure.

### **Pre-operative**

The abdomen was cleaned with 10% povidone iodine three times on the operating table. All study subjects received PIPERACILLIN+TAZOBACTUM (after skin test) and METRONIDAZOLE.

To eliminate bias, antibiotic dosage is adjusted by age and weight before skin incision. Our institution's antibiotic protocol determined these drugs.

### **During operation**

First peritoneum and rectus sheath are closed with synthetic nonabsorbable nylon suture (ETHILON) loop in single layer during abdominal wall closure. Irrigating the subcutaneous tissue with the solution according to the group is next.

Group A: wound irrigated with 300 ml 0.9% normal saline using a 20 ml syringe and 19-gauge IV catheter.

Group B: wound irrigated with 40 ml of 10% povidone iodine and 120 ml of 0.9% normal saline in a 20-ml syringe with 19-gauge IV catheter.

After wound irrigation, suction removed all irrigated fluid, a fresh dry mop dried the wound, and skin stapler clips closed the wound.

#### Post-operative

Our hospital policy had patients take PIPERACILLIN+TAZOBACTUM and METRONIDAZOLE postoperatively. Pain management was provided by injectable systemic analgesics until the fifth post-operative day and oral analgesics until the eighth.

All study materials were sterilised according to our institute's protocols.

Post-op wound inspections occurred on days 3, 5, and 7. His vitals (pulse rate, temperature) and wound assessment (local erythema, edoema, and pain at surgical site) were recorded on the seventh post-operative day. Post-op total leucocyte count was performed on day 7. Ten days after surgery, skin clips were removed and wound was evaluated. Follow-up occurred in the second and fourth post-operative weeks. Follow-up vitals included temperature and wound examination for infection. Pus specimens from surgical site infection patients were cultured and sensitivity tested. S.S.I. was confirmed by two surgeons.

All participants received the patient information leaflet and informed consent form.

#### Definition of Wound Infection

Definition of wound infection:

Surface incisional SSI—Infection only affects skin and subcutaneous tissue.

Infection affects fascial and muscle layers in deep incisional SSI.

Organ/space SSI—Infection concerns any anatomy (organs and spaces) other than the incision that was opened or modified during surgery.

#### Statistical analysis

The collected data was reviewed for consistency and completeness before being entered and analysed by SPSS 21. Percentages, mean, standard deviation, and 95% confidence interval were shown. Analysis used Student's t-test. A P value of  $< 0.05$  indicated statistical significance.



**Figure 2: Clean wound without SSI.**



**Figure 3: superficial incisional SSI.**



**Figure 4: deep incisional SSI.**



**Figure 5: deep incisional SSI.**

## RESULTS

Average age in both the groups was comparable, and in both groups males are more than females. Additionally, there was no significant difference between hemoglobin concentrations was found between these two groups.

Blood urea level was 31.3 mg/dl in group A on average whereas it was 31.35 mg/dl on average in group B. No significant difference existed between these two groups considering blood urea levels.

Average duration of surgery in group A was 2 hours whereas duration was 2.2 hours in patients of group B. Hence, the average duration of surgery was comparable in both the groups.

There was decreased occurrence of erythema in patients of group B but that was statistically insignificant ( $p$  value = 0.3268). Similarly, there was decreased occurrence of local swelling at surgical site (on seventh postoperative day) in patients of group B but that was statistically insignificant ( $p$  value = 0.3268).

There was decreased occurrence of local pain in patients of group B but that was statistically insignificant ( $p$  value = 0.3268). So in our study for those patients who had local pain on seventh post-operative day (9.33% in group A and 3% in group B), oral analgesics was given for more post-operative days compared to other patients in the study. There was decreased

occurrence in patients of group B but that was statistically insignificant (p value = 0.3268)

Additionally, decreased occurrence of tachycardia in patients of group B but that was statistically insignificant (p value = 0.3268), with which was decreased occurrence in patients of group B but that was statistically insignificant (p value = 0.3268).

In group A who were irrigated with syringe pressure irrigation of normal saline SSI was found in seven patients out of which one was noted on 3<sup>rd</sup> post-operative day, four were on fifth day and two were on seventh post-operateday.

In group B who were irrigated with normal saline + povidone iodine under syringe pressure SSI was found three patients of which two were noted on fifth post-operative day and one was on seventh post-operative day. So, in our study all the patients who had SSI noted in first week i.e. within seventh post-operative day.

Out of 7 patients who had SSI in group A (who were irrigated with syringe pressure irrigation of normal saline) 6 patients had superficial incisional SSI and one had deep incisional SSI. In group B (B who were irrigated with normal saline + povidone iodine under syringe pressure) out of 3 patients who was having SSI, two patients had superficial incisional SSI and one patient had deep incisional SSI. SSI was decreased in patients of group B i.e. Those who were syringe pressure irrigated with normal saline + povidone iodine compared to normal saline only but this difference was statistically insignificant (p value = 0.3268).

## DISCUSSION

This study was designed to compare syringe pressure irrigation of normal saline and syringe pressure irrigation of normal saline + povidone iodine in prevention of surgical site infection, over follow up of 30 days after surgery.

A prospective analysis on 816 patients with wounds healed by using sterile gloves or clean non-sterile gloves indicated that there is no statistically significant difference in infection rate between the 2 groups (6.1% in the sterile gloves group versus 4.4% in the clean non-sterile gloves group) (14). This was the conclusion of a trial that was conducted on 816 patients. An earlier study by Ghafouri and colleagues (15) demonstrated that the use of clean gloves, as opposed to sterile ones, does not raise the risk of infection in contaminated uncomplicated wounds that are being healed in the emergency department rather than sterile gloves. In addition, Ruthman and colleagues demonstrated that there is not an increased risk of infection in laceration repairs that do not make use of caps or masks during the process of wound repair (16).

We have investigated the potential influence that the irrigation solution plays in lowering the overall infection rate. The results of another study conducted by Lammers et al on 33 highly infected acute traumatic wounds showed that soaking the wounds for 10 minutes in 1% povidone-



iodine has no advantage over soaking them in normal saline or doing nothing (the control group) in terms of the quantitative wound bacterial counts (17). We came to the conclusion that a Povidone-iodine solution with a concentration of 1% was not more effective than regular saline in lowering the infection rate in uncomplicated traumatic wounds that were treated in the emergency department. There are also further studies that recommend using regular tap water rather than normal saline for the treatment. For instance, in a review of clinical trials, the rates of infection in acute and chronic wounds that were irrigated with either normal saline or water were compared and contrasted. Tap water is associated with a lower rate of infection (than normal saline) in adults, but the rate of infection is similar in both groups of children in acute wounds. In chronic wounds, the relative risk of infection when irrigated with tap water is 0.16 compared with normal saline (18). This study showed that there is no statistically significant difference in infection rates when wounds are cleansed with tap water versus not purified at all. The findings of our research have been replicated in other research including non-traumatic wounds and ulcers of a more complex kind. For instance, Yavascan et al. demonstrated in their research that irrigating the exit-site of peritoneal dialysis catheter with normal saline can reduce the an infection rate of exit-site as effectively as povidone-iodine (19). Additionally, a review conducted by O'Meara et al. on venous leg ulcers demonstrated that the effectiveness of povidone-iodine and other anti-septic solutions (such as chlorhexidine,

## CONCLUSION

This study concludes that there is no statistically significant difference in prevention of surgical site infection when patients were syringe pressure irrigated with normal saline when compared to those patients who were syringe pressure irrigated with normal saline + povidone iodine. Hence pressure irrigation with normal saline alone is a cost effective, easily available, easy to do and more economic alternative to syringe pressure irrigation with normal saline + povidone iodine. Also patients should be evaluated clinically and with biochemical investigations for early diagnosis of surgical site infection and its prompt treatment within period of 30 days of surgery.

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