

Original Research Article

Effect of iodine impregnated plastic adhesive drapes in preventing surgical site infection post spine surgeries

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ABSTRACT

Background: Surgical Site Infection (SSI) complicates roughly 1-3% of orthopaedic surgeries. This study aimed to assess the effect of iodine impregnated plastic adhesive drapes (PAD) in preventing surgical site infection post spine surgeries.

Methods: This non-randomized experimental study was conducted in the Department of Orthopedics, of a tertiary care hospital in Pathankot, Punjab, from January 1, 2022 till July 31, 2022, in which adult patients who underwent elective spine surgeries involving cervical, thoracic and lumbar spine and requiring post-operative care of at least 3 days were included. Every alternate patient received iodine impregnated surgical incise plastic adhesive drape (3M ioban 2) for draping before the skin incision. The patients were followed up on for six months after surgery.

Results: It was observed a significantly higher duration of surgery in the PAD group, as compared to those without PAD (140.4±45.6 vs 112.5±36.7 mins, p value <0.05). Furthermore, length of incision was not significantly different between the two patient groups (15.4±6.6 vs 17.3±8.5 cm, p value = 0.71). It was observed that overall infection rate in our study population was 3.85% (n=3). It was found to be 3% in the patients with iodine impregnated PAD and 5% in patients without iodine impregnated PAD, with no significant difference between them (p value = 0.88).

Conclusions: We found no data supporting or denying the use of iodine impregnated PAD for lowering the incidence of SSI in patients having elective spine surgery cases.

Keywords: Iodine, Spine surgery, Surgical site infection

INTRODUCTION

The Centers for Disease Control and Prevention (CDC) defines surgical site infection (SSI) as an infection that occurs after surgery in the body portion where the procedure was performed.¹ Infection at the surgical site is a common complication in orthopaedic operations and is difficult to manage. Around the world, SSI complicates roughly 1-3% of orthopaedic surgeries in all age categories.^{2,3} *Staphylococcus aureus* is the most common pathogen identified from the surgical site after orthopaedic surgeries.

Pre-operative factors such as extremes of age, smoking, diabetes and glycemic control, obesity, peri-operative steroid use, alcohol abuse, and intra-operative factors such as prolonged duration of surgery, site of surgery, open approach, use of implants, and omission of drain use have all been identified as risk factors for the development of SSI.

There have been several preventative techniques developed to limit SSI, with one currently in use being the usage of Incise curtains or Iodine coated plastic sticky drapes (PAD). Its function in the prevention of SSI has been called into doubt, with studies yielding contradictory

findings. It has been demonstrated to minimise skin flora as well as intraoperative wound contamination.⁴

Conflicting findings from diverse research in the literature have left a gap for the current study to fill. As a result, this study will shed some information on the role of iodine-impregnated curtains in SSI prevention. Iodine-impregnated PADs have been used in our hospital for a few years but are not currently the standard of care. This study aimed to assess the effect of iodine impregnated plastic adhesive drapes (PAD) in preventing surgical site infection post spine surgeries.

METHODS

This non-randomized experimental study was conducted in the Department of Orthopedics, SKR Hospital and Trauma Centre Pvt Ltd. Pathankot, Punjab, from January 1, 2022 till July 31, 2022, in which adult patients who underwent elective spine surgeries involving cervical, thoracic and lumbar spine and requiring post-operative care of at least 3 days were included. We excluded patients who had a previous spine surgery, had renal failure, were on ventilator pre operatively, had spondylodiscitis, required surgery for other limb fractures/tumors, had a history of dental extraction or urinary tract infection within 3 weeks or had a history of immunodeficiency disorders/HIV positive status. For sample size calculation, we used the formula, $n = (Z\alpha/2 + Z\beta) \times PQ \times 2/d^2$, where n = sample size, $Z\alpha/2$ = Z value at 1% error (2.58), $Z\beta$ = Z value at 20% (0.84), $P = (p_1 + p_2) / 2$, $Q = 1 - P$. In the study by Karanpinar et al, infection rate was 9.2% in the control group and 2.9% in the cases.⁵ So, P_1 was 0.092 and P_2 was 0.029. Using d – effect size (taken as 0.1), $n = (1.96 + 0.8) \times 0.83 \times 0.17 / (0.1)^2$, $n = 38$. The minimum sample size was 38 patients in each study group. The study procedure was explained to all the patients and their informed written consent was obtained before enrolment. The study was approved by the Institutional Ethics Committee. There is no conflict of interest of the authors and no funding was received for this study.

Operative details

Parts were produced in advance for all patients. Inside the operating room, the components are cleaned with 7.5% povidone iodine scrub (extension depending on the site of incision), then wiped dry with a sterile dry towel. Standard OT draping was done using impermeable sterilised cotton drapes and gauze soaked in 5% povidone iodine solution. Every alternate patient received Iodine impregnated surgical incise plastic adhesive drape (3M ioban 2) for draping before the skin incision. All exposed parts surrounding the surgery field were protected by the PAD. Intravenous antibiotics such as cefuroxime were given before the skin incision, throughout the procedure, and for 5 days afterward. All patients get conventional intraoperative wound care and Inj vancomycin 500mg powder is injected locally before closure.

Data collection and data analysis

A pre-designed semi-structured research proforma was used to gather data. Spine surgeons were educated to screen the patients. All patients who underwent elective spine surgery and met the inclusion and exclusion criteria were included. Patients admitted to general and concession wards were followed up on. Swabs were obtained from the specimen from the closed incision along its length and margins of the iodine impregnated PAD at the conclusion of surgery following skin closure. A swab was collected from the surgical site throughout its length and examined for organism development on post-operative day 2 or at follow-up if there were any signs or symptoms of SSIs/clinical suspicion of infection. To see if it was the same organism, the original culture was compared to the culture from the surgical site infection. The patients were followed up on for six months after surgery. As a consequence, the rate of SSIs and the proportion of positive cultures were calculated for both groups: those who received iodine-impregnated PADs and those who did not.

Descriptive analysis of quantitative parameters was expressed as means and standard deviation. Ordinal data were expressed as absolute number and percentage. Cross tables were generated and chi square test was used for testing of associations. Student t test was used for comparison of quantitative parameters. Patients in the PAD group and non-PAD group were compared for demography, medical history and personal history and operative. A p-value <0.05 is considered statistically significant. All analysis were done using SPSS software, version 24.0.

RESULTS

During the study period, we included 38 patients without iodine impregnated PAD and 40 patients with iodine impregnated PAD. Mean age of the patients was 41.3 years and 42.7 years in the PAD and without PAD groups respectively ($p=0.22$). Males comprised 60% of the PAD group and 61% of without PAD group ($p=0.32$). Furthermore, the two groups were similar with respect to personal history and past medical history (Table 1).

We observed that implant were used in 82% of without PAD group and 78% of with PAD group ($p=0.8$) and sutures were used in 97% with PAD and 95% without PAD patients ($p=0.24$). The most common site of surgery was lumbosacral (89% and 83% in without PAD and with PAD group respectively, $p=0.16$). Thus, we observed that both the patient groups were not significantly different with respect to baseline characteristics. We observed a significantly higher duration of surgery in the PAD group, as compared to those without PAD (140.4 ± 45.6 vs 112.5 ± 36.7 mins, p value <0.05). Furthermore, length of incision was not significantly different between the two patient groups (15.4 ± 6.6 vs 17.3 ± 8.5 cm, $p=0.71$). It was observed that overall infection rate in our study population

was 3.85% (n=3). It was found to be 3% in the patients with iodine impregnated PAD and 5% in patients without iodine impregnated PAD, with no significant difference

between them (p=0.88). For the three patients with post-operative infection, laboratory investigations are described as in Table 4.

Table 1: Comparison of baseline variables of the patients included in the study.

	Iodine impregnated PAD		P value*
	No (n=38)	Yes (n=40)	
Age groups (in years)			
18 to 40	N	12	0.22
	%	32	
41 to 60	N	17	
	%	45	
61 to 80	N	9	
	%	24	
Gender			
Female	N	15	0.32
	%	39	
Male	N	23	
	%	61	
Personal history			
Smoking	N	14	0.52
	%	37	
Alcohol	N	16	0.98
	%	42	
Comorbidities			
Yes	N	18	0.44
	%	47	
No	N	20	
	%	53	
Implant use			
Yes	N	31	0.8
	%	82	
No	N	7	
	%	18	
Suture use			
Staples	N	1	0.24
	%	3	
Suture	N	37	
	%	97	
Site			
Cervical	N	0	0.16
	%	0	
Cervical + Lumbosacral	N	2	
	%	5	
Dorsal	N	3	
	%	8	
Dorsal + Lumbosacral	N	0	
	%	0	
Lumbosacral	N	34	
	%	89	

*analyzed using Chi-square test.

Table 2: Comparison of operative parameters between PAD group and non-PAD group.

Parameters	No PAD		With PAD		P value*
	Mean	SD	Mean	SD	
Surgery duration (mins)	112.5	36.7	140.4	45.6	<0.05
Incision length (cm)	15.4	6.6	17.3	8.5	0.71

*analyzed using independent t test

Table 3: Comparison of infection rates between PAD group and non-PAD group.

Infection	Iodine impregnated PAD		Total
	No	Yes	
No	36	39	75
	95%	98%	96.15%
Yes	2	1	3
	5%	3%	3.85%
Total	38	40	78
	100%	100%	100.00%
P value* = 0.88			

*Analyzed using chi-square test.

Table 4: Description of laboratory investigations for patients with post-operative infection.

Post-operative laboratory investigations	Mean	SD
Post op Hb (gm%)	12.04	2.17
Post op PCV	35.7	8.06
Post op ESR (mm/hour)	58.1	8.62
Post op CRP	2.15	1.13
Post op Total count (cells/cumm)	9590	144.68

DISCUSSION

This non-randomized experimental study was conducted in the Department of Orthopedics, Hospital. Patients undergoing spine surgeries were divided in two groups, one who received Iodine impregnated PAD (n=40) and the other one who did not receive Iodine impregnated PAD (n=38). These two groups were followed up on to see if they developed SSI. There was no statistically significant difference in the incidence of SSI with or without the use of iodine-impregnated PAD. However, there is contradictory data in the published literature.

Sarath et al. conducted a similar trial in which 62 patients having laparotomies either got an incise drape impregnated with iodine (n=29) or did not receive an incise drape (n=33).⁶ There were 17 occurrences of SSI, with a 24% incidence in the drape group and 30% in the non-drape group (p value > 0.05). In another investigation, Miland et al found virtually identical amounts of germs with and without the use of iodine-impregnated incision drapes in a simulated knee operation.⁷ Moores et al examined 104 ventral hernia repairs divided into two groups, 56 repairs in Group 1 (with Ioban) and 48 repairs in Group 2. (without Ioban).⁸ There were 7% SSI in Group I and 2% in Group II (p). There were 7% SSI in Group I and 2% in Group II (p=0.23).

In contrast, a few studies found that using Iodine-impregnated drapes resulted in a much decreased infection rate. Hanada et al observed that among TKAs, the group DR introduced considerably less bacterial contamination than the group ND that had the drape peeled (p < 0.001).⁹ Karanpinar et al discovered a greater incidence of SSI (9.2%) in the control group than in the patients (2.9%) (p=0.001).⁵ However, the blood culture positive rate was identical in both groups (p=0.311). Bejko et al found a decreased overall infection rate in cardiac surgery patients who used iodine-impregnated incision drape compared to those who did not (6.5% vs 1.9%; p value <0.001).¹⁰ Rezapoor et al observed that at the end of surgery, only 12.0% of incisions with iodophor-impregnated adhesive draping were positive for bacterial colonisation, compared to 27.4% of patients undergoing hip surgery without adhesive drapes.¹¹

As a result, we can observe that different investigators have produced varying outcomes. The variations might be attributed to the various surgical procedures evaluated, as well as diverse surgical techniques and operations done by different teams with varying degrees of skill.

The mean length of operation was substantially shorter in the group without PAD (112.5±36.7 minutes) than in the group with PAD (140.4±45. minutes), p value <0.05.

Sarath et al found that seven patients in the drape group (incidence 24%) had surgical site infection, compared to 30% in the no-drape group. The authors discovered no statistically significant difference in SSI between the two groups.⁶ However, there was a substantial reduction in the frequency of surgical site infection in the drape group for procedures lasting more than 3 hours. As a result, the authors did not propose using iodine-impregnated incise drapes to reduce SSI. Reichman et al discovered that the duration of the surgery increased the risk of surgical site infection. The authors discovered that surgeries lasting more than 3 hours had a 33% incidence of SSI, compared to 25% for procedures lasting less than 3 hours. Sahane et al conducted a similar study and found comparable findings.¹² In another investigation, Hanada et al looked examined 74 TKAs and discovered 10 occurrences of positive bacterial contamination. Gibbons et al discovered a link between operating time and the occurrence of SSI.¹³ Kurmann also discovered that the length of surgery was related to the occurrence of SSI. Willis-Owen et al. showed in another research that extended procedure duration was related with a greater incidence of infection in patients receiving THA and TKA.¹⁴ Previous orthopaedic surgery studies found an odds ratio of 7.4 for periprosthetic joint infection in joint replacement surgery lasting more than 180 minutes, whereas thoracic and lumbar spine procedures lasting more than 3 hours were found to be independent risk factors for SSI.^{15,16}

This study has some drawbacks. First and foremost, this was a single-center research. As a result, the findings may not apply to other surgical locations with a different surgical team and degree of skill. We did not assess the patients' microbiological features. As a result, we may have overlooked individuals with no clinical indications of SSI but a positive blood or wound culture. Finally, environmental parameters such as patient traffic flow, door openings per hour, ambient temperature, and so on were not recorded and hence were not analysed in the current study

CONCLUSION

We found no data supporting or denying the use of iodine impregnated PAD for lowering the incidence of SSI in patients having elective spine surgery cases. More study is needed to understand the underlying processes of PADs, as well as to assess the costs related with their usage. Furthermore, there were no negative repercussions or side effects related with the usage of iodine-impregnated incision drape. As a result, a bigger sample size research including randomization and matching is advised.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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