

Surgical Site Infection with and without Prophylactic Antibiotic in Children undergoing Elective Inguinal Herniotomy

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^{1,2,3} Conception of study

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^{1,2,3,4,5,6} Analysis/Interpretation/Discussion

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^{1,2,3,4,5,6} Critical Review

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Article Processing

Received: 01/06/2021

Accepted: 07/12/2021

Cite this Article: Napar, N.B., Shaikh, N.A., Baloch, I., Shah, A.A., Shaikh, B., Mahtam, I. Surgical Site Infection with and without Prophylactic Antibiotic in Children undergoing Elective Inguinal Herniotomy. *Journal of Rawalpindi Medical College*. 31 Dec. 2021; 25(4): 462-465.

DOI: <https://doi.org/10.37939/jrmc.v25i4.1681>

Conflict of Interest: Nil

Funding Source: Nil

Access Online:



Abstract

Objective: This study was aimed at determining the frequency of surgical site infection in children undergoing elective inguinal herniotomy with and without prophylactic antibiotics.

Study Design: Prospective comparative study.

Settings: Pediatric surgery Department, Ghulam Muhammad Mahar Medical College Sukkur.

Study Duration: From 1st January 2020 to 30th April 2021.

Materials and Methods: One hundred and sixty patients were selected for this study and were equally divided into two groups. Group A received antibiotic prophylaxis (Injection ceftriaxone 50mg/kg) before the induction of general anesthesia, whereas Group P received a placebo before the induction of general anesthesia. Demographic data and duration of surgery were noted on a proforma. The surgical procedure was carried out following standard surgical protocols. Post-operatively all patients were observed by an independent observer. Patients were observed for postoperative fever, inflammation of the surgical site, and discharge from the site of the incision. The wound was examined on the 1st, 3rd, 7th, and 30th postoperative days.

Results: Demographic data of both groups were comparable. The mean duration of surgery in group A was 29.61±7.47 minutes, while it was 32.97±8.73 minutes in group P with a p-value of 0.08. Out of 160 patients, twelve patients developed surgical site infection; 7 (8.75%) patients belonged to group A, while 5 (6.25%) belonged to group P with a p-value of 0.188.

Conclusion: It is concluded in our study that the use of prophylactic antibiotics in elective herniotomy cases performed in pediatric patients does not significantly decrease the incidence of Surgical Site Infection.

Keywords: Herniotomy, Pediatric surgery, Prophylactic antibiotics, Surgical site infection.

Introduction

Surgical site infections (SSI) are the infections that occur at or near the surgical incision within thirty days of surgery or within a year if the implant is placed. They contribute a significant share of hospital-acquired infections accounting for around 10 to 40 percent of all hospital-acquired infections globally.¹ The risk of surgical site infection in general surgical procedures is around 3 to 4 percent.² These infections increase morbidity and mortality and significantly increase the hospital stay, hence the overall cost of treatment.³ Several risk factors increase the risk of SSI, these include but are not limited to emergency procedures, bleeding disorders, chemotherapy, raised blood glucose levels, decreased albumin levels, and smoking.^{4,5}

Surgical antibiotic prophylaxis is defined as the antibiotic agent given just before the commencement of a surgical procedure. This prophylaxis aims to decrease the burden of contamination which is manageable by the host. The contamination sources include the endogenous sources like normal flora of the patient and exogenous sources like the surgical team, surgical instruments, and operating room environment.^{6,7}

Despite various national and international recommendations and guidelines for prophylactic use of antibiotics for clean surgical procedures use of inappropriate antibiotic prophylaxis is extremely common.⁸ Unnecessarily prolonged antibiotic administration after clean surgical procedures results in increased cost of treatment and risk of bacterial resistance.⁹

This study was aimed at determining the frequency of surgical site infection in children undergoing elective inguinal herniotomy with and without prophylactic antibiotics. Very few studies have been done in our general population and data from international literature is scarce, and their results cannot be generalized on all populations due to different hospital settings and protocols and different patient genetic makeup. Therefore, we planned to conduct the study to find out the incidence of SSI in herniotomy procedures done in the paediatric population of this region.

Materials and Methods

This prospective comparative study was conducted at the Paediatric Surgery Department, Ghulam

Muhammad Mahar Medical College Sukkur from 1st January 2020 to 30th April 2021. Permission was sought from the Ethical Review Board of the institute before the commencement of the study. The sample size was estimated to be 155 patients and was rounded to be 160 to increase the power of the test. The sample size was calculated using the WHO sample size calculator with a confidence level of 80% and a level of significance less than 5%, P1 as 6%, P2 as 2%.¹⁰ Non-probability convenience sampling technique was used to select the patients for this study. Patients were divided into two equal groups of A and P with 80 patients in each group. The lottery method was used to allocate the group to selected patients. Patients' age, weight, comorbidities were noted on a specially designed proforma. Patients with ages up to 12 years scheduled for elective herniotomy were included in this study. Patients with a history of any generalized debilitating disease, diabetes mellitus, malnourishment, immunosuppression, poor hygienic condition, on steroid therapy, with a history of taking antibiotics in the past 5 days for any reason, allergic to the antibiotic used for this study were excluded from the study. Patients with a surgical time of more than 100 minutes were also excluded from the study.

Written informed consent was taken from the guardians of the patients for anesthesia, surgery, and participation in the study. All patients were kept nil per oral for at least six hours before surgery. Intravenous cannulation was done and standard monitoring was attached as soon as the patient was shifted to the operating room. In group A, a prophylactic dose of ceftriaxone 30 mg/kg and not exceeding 1 gm was given; whereas a placebo was given in group P before the induction of anesthesia. All patients were given general anesthesia induction with intravenous anesthetics and muscle relaxation. Tracheal intubation was done and anesthesia was maintained with inhalational anesthetics. All patients were mechanically ventilated during the surgery.

Surgery was conducted with standard surgical protocols and methods. Surgical time was noted for each patient on the proforma. Post-operatively all patients were observed by an independent observer. Patients were observed for postoperative fever, inflammation of the surgical site, and discharge from the site of the incision. The wound was examined on the 1st, 3rd, 7th, and 30th postoperative days. For labeling SSI, Center of Disease (CDC) criteria was followed.¹¹

Data were analyzed with Statistical Package for Social Sciences analysis program (IBM-SPSS version 24). Mean \pm SD was presented for quantitative variables

like age and duration of surgery. Frequency and percentage of gender and SSI were computed. The Chi-square test was applied to compare both groups in terms of SSI. A P-value of 0.05 or less was taken as significant.

Results

A total of 160 patients were selected for the study. The age range of the selected patients was from 1 month to 12 years with an overall mean age of 3.91 ± 2.55 years. The age range in group A was from 1 month to 10 years with a mean age of 3.57 ± 2.31 years, whereas the age range in group P was from 1 month to 12 years with a mean age of 2.25 ± 2.74 years with a p-value of 0.094.

Out of 160 patients, 148(92.5%) were male and 12 (7.5%) were female. In group A, 75(93.75%) patients were male and 5 (6.25%) patients were female with male to female ratio of 15:1; whereas in group P, 73 (91.25%) patients were male and 7 (8.75%) patients were female, with a male to female ratio of 10.42:1. P-value was found to be 0.55 which is quite insignificant. Overall duration of surgery in both groups was 31.29 ± 7.96 minutes. Duration of surgery was comparable in both groups with a p-value of 0.08 which is insignificant. Details are shown in Table 1.

Table 1: Duration of surgery in both groups

Group	Duration of Surgery in minutes (Mean \pm SD)	P-value
Group A	29.61 ± 7.47	0.084
Group P	32.97 ± 8.73	

Out of 160 patients, twelve patients developed surgical site infections. Data of both groups was comparable with an insignificant p-value of 0.188. A detailed comparison is shown in Table 2.

Table 2: Surgical Site Infection in both groups

Group	Surgical site present n (%)	Surgical site infection absent n (%)	P-value
Group A	7 (8.75%)	73 (91.25%)	0.188
Group P	5 (6.25%)	75 (93.75%)	

Discussion

Herniotomy is considered to be a clean surgical procedure with minimal risk of surgical site infection in otherwise healthy patients with no risk factors for developing surgical site infection.⁶ Pediatrics patients reporting for hernia repair are usually in a good state of health except for their surgical issue, which has minimal systemic effects. Risk of surgical site infection increase if the patients have one or more risk factors which include but are not limited to diabetes mellitus, chronic debilitating disease, immunosuppression, corticosteroid therapy, prolonged hospital stay, etc.^{12,13} Perioperative administration of prophylactic antibiotics has its benefits and significantly reduces the risk of the surgical site in high-risk groups and hence the hospital's stay. Antibiotic carries many untoward effects, including bacterial resistance, increasing cost of treatment, anaphylactic reactions, etc. Therefore, there should be a careful selection of patients for prophylactic antibiotic therapy peri-operatively.^{14,15}

In this study, I found out that there was no significant difference between those who received prophylactic antibiotics and those who didn't. Similar results were observed in a study conducted at King Fahad Hospital, Saudi Arabia by Syed MH et al. They concluded in their study that the risk of SSI is exceedingly low in clean surgical procedures, and unnecessary antibiotic prophylaxis may promote antimicrobial resistance.¹⁶ In another study Anand T et al. concluded that routine use of prophylactic antibiotics in elective hernia surgery done in children does not serve any advantage and its use should be discouraged.¹⁷

In a Cochrane-based systemic review of SSI in hernia surgery; Orelia CC et al. concluded that it is uncertain that antibiotic prophylaxis decreased the incidence of SSI. They observed that peri-operative antibiotics probably make trivial or no difference at all in preventing SSI in an environment with a low risk of infection. They further concluded that in an environment of high risk for infection prophylactic antibiotics make little or no difference at all.¹⁸

In a local study conducted by Kayani, Z et al. concluded that in a clean surgical procedure use of prophylactic antibiotics does not significantly reduce the incidence of SSI.¹⁰

Keeping all the above findings in mind, it is suggested that the routine use of prophylactic antibiotics should be discouraged. Most of the clean surgical procedures do not require prophylactic antibiotic cover. Judicious

use of antibiotics will decrease the antimicrobial resistance and also the cost of treatment as well.

Conclusion

It is concluded in our study that the use of prophylactic antibiotics in elective herniotomy cases performed in pediatric patients does not significantly decrease the incidence of SSI.

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