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Original Research Article

Incidence of wound infection in common paediatric day care surgeries following a no-antibiotic protocol: a viable recommendation for a public hospital in India

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ABSTRACT

Background: The use of broad spectrum antibiotic administered intravenously 1 hour before incision has a well-established role in preventing surgical site infection following major surgeries. However, the benefit of this practice in clean, day care surgeries is less clear. The aim of our study is to determine the incidence of wound infection in paediatric day care surgeries where antibiotics were not used. The objective of the present study was to observe the rate of Surgical Site Infection in paediatric day care surgery at a tertiary care public hospital where prophylactic antibiotics are not used empirically.
Methods: We reviewed all paediatric patients undergoing day care common procedures namely herniotomy, open orchiopexy, circumcision and other minor procedures such as lymph node biopsy, lipoma excision, mucous retention cyst excision and dermoid cyst excision at our institute in a public hospital between January 2015 and December 2016. Those with heart diseases requiring infective endocarditis prophylaxis, those with immunosuppression and those who had received antibiotics perioperatively for any reason other than treatment of surgical site infection were excluded. Surgical site infection (SSI) was classified as superficial or deep as defined by the Centre For Disease Control (CDC).
Results: A total of 576 paediatric patients underwent clean day- care procedures at our institute between January 2015 and December 2016, of which 478 patients met the inclusion criteria and were included in the study. 2 (0.41%) of these 478 patients developed surgical site infection. 1 patient had serous discharge at one point along the suture line while the other developed pus and required debridement.
Conclusions: Clean day- care surgeries in children can be carried out safely without the empiric use of perioperative antibiotics even in the setting of a public hospital in a developing country.

Keywords: Antibiotic prophylaxis, Paediatric day-care surgery, Resource limited settings Surgical site infection

INTRODUCTION

The use of perioperative antibiotics to prevent surgical site infections in patients undergoing major surgeries is a well-established practice. Prophylaxis is generally warranted in all clean-contaminated surgeries, in surgeries involving prosthetic implants or the placement of synthetic materials (such as a mesh) and in surgeries

where the consequences of infection can be grave (eg. meningitis, mediastinitis).[1,2] However, the benefit of antibiotics in clean surgeries without implants is less clear.[2,3] It remains a common practice in many centres to administer at least a single dose of antibiotic perioperatively to children undergoing procedures such as herniotomies, open orchiopexies and circumcision.[3,4] The argument for their use is that the morbidity and cost of even infrequent infection can be considerable. This must be weighed against the risks of adverse drug reactions and antibiotic resistance. We studied the rate of surgical site infection in 478 patients undergoing common clean day-care procedures at our centre, which is a tertiary level public hospital. The objective of the present study the incidence of surgical site infection in clean day-care paediatric surgeries without the use of pre-operative antibiotics at a tertiary level public hospital in India.

METHODS

The records of all patients admitted to the paediatric surgical service for common day-care surgical procedures namely namely herniotomy circumcision, orchiopexy (open) and other procedures such as lymph node biopsy, dermoid cyst excision, lipoma excison and mucous retention cyst excision between January 2015 and Dec 2016 were reviewed. These are procedures for which prophylactic antibiotics are not routinely given at our institute. Standard preoperative preparation of the patient was carried out which included adequate fasting, maintenance of local hygiene, bath with an antiseptic soap on the morning of the procedure and tetanus toxoid immunization where indicated.

No preoperative antibiotic was given. All the procedures were carried out in the operation theatre of our institute with standard aseptic precautions. However, the operation theatres at our institute do not have Hepa filters.

The skin at the surgical site was prepared using povidone iodine solution allowing a contact time of 3 to 5 minutes. The surgeons were required to follow the standard protocol of scrubbing for 5 minutes. The Centre For Disease Control (CDC) Guidelines for definition of surgical site infection (SSI) were used, which are as follows[5]:

Superficial SSI

The event for infection occurs within thirty days of the operative procedure (where Day1= day of procedure) AND involves only the skin and subcutaneous tissues of the incision AND the patient has at least one of the following:

- Purulent drainage from the superficial incision site
- Organisms identified in an aseptically obtained specimen from the superficial incision or the subcutaneous tissue by a culture or non-culture microbiological test done for the purpose of clinical diagnosis and treatment.
- The superficial incision has been deliberately opened by the surgeon, attending physician or designee and culture or non-culture testing has not been performed AND the patient has at least one of the following: pain or tenderness, erythema, heat or localized swelling.
- A diagnosis of SSI is made by the surgeon, attending physician or designee outcome.

Deep SSI

The event for infection occurs within thirty (ninety days in case of implants) of the procedure (where Day1= day of procedure) AND involves the deep soft tissues of the incision (fascial and muscle layers) AND the patient has at least one of the following:

- Purulent drainage from the deep incision.
- The deep incision spontaneously dehisces or is deliberately opened or aspirated by the surgeon, attending physician or designee and an organism is identified by culture or non- culture based microbiologic testing for the purpose of clinical diagnosis and treatment and the patient has at least one of the following: fever ≥38°C; localized pain or tenderness.
- An abscess or other evidence of infection of the deep tissues that is evident on gross anatomical or histopathological examination, or imaging.

Inclusion Criteria

- All paediatric patients (i.e., age less than twelve years at this centre) undergoing clean day care procedures such as herniotomies, open orchiopexies, circumcisions and other procedures such as lymph node biopsy, dermoid cyst excision, lipoma excision or mucus retention cyst excision were included in the study.
- Former pre-term infants who were admitted overnight for post anaesthesia observation in whom antibiotics were not needed for any indication other than treatment of surgical site infection were also included in the study.

Exclusion Criteria

- The following cases were excluded from the study: Children requiring prophylaxis against infective endocarditis.
- Immunosuppressed children.
- Children receiving antibiotics for any concomitant condition (e.g. children with vesicoureteral reflux receiving chemoprophylaxis).
- Laparoscopic procedures and all procedures other than those listed above.

RESULTS

A total of 576 paediatric patients underwent clean day-care procedures at our institute between January 2015 and December 2016, of which 478 patients met the inclusion criteria and were included in the study. Their ages ranged from 1 month to 12 years. The surgeries these patients underwent included 282 herniotomies, 143 circumcisions, and 24 open orchiopexies and 29 other day-care procedures namely lymph node biopsy, dermoid cyst excision, lipoma excision and mucus retention cyst excision. Of the 282 herniotomies, one developed a deep surgical site infection. This was a 5-month-old boy weighing 6.4 kg. The child required opening of the wound including removal of sutures on the external oblique aponeurosis and debridement. The wound swab grew *E. coli*. A five-day course of intravenous ceftriaxone was given. One patient out of the 24 undergoing orchiopexies developed serous discharge at the suture line. He was a three-year-old boy weighing 11.6 kg. No organism could be isolated on wound swab culture.

The youngest patient in the study was 1 month old and weighed 2.1 kg. The child underwent a herniotomy with an ipsilateral orchiopexy. No antibiotics were given. Being a former preterm baby, the child was kept under observation for 24 hours post-surgery. He was then discharged home and followed up in the out-patient department as with all the other patients in this study. He had no surgical infection.Thus, out of 478 patients who underwent day care procedures without empiric antibiotics, only two developed surgical site infections, i.e., an incidence of 0.41%. (Table 1).

Table 1: The distribution of cases and the number of surgical site infections encountered.

Surgery	No. of patients	No. of Superficial SSI	No. of deep SSI
Herniotomy	282	-	1
Orchiopexy	24	1	-
Circumcision	143	-	-
Others*	29	-	-

*Others includes dermoid cysts, mucous retention cysts, lipoma excisions and lymph node biopsies.

DISCUSSION

Our study was carried out in a public hospital in a developing country which implies that the above results were obtained in:

- A resource-limited scenario
- Patients of a lower socio-economic stratum.
- Higher prevalence of malnutrition and nutritional anaemia in the patient population.
- Sub-optimal local hygiene.

These socio economic and nutritional factors would be understood to predispose to surgical site infection. However, in our study of those paediatric patients who underwent a clean surgical procedure without any antibiotic prophylaxis at all, we observed an incidence of surgical site infection of 0.41%. These were procedures that required small incisions, minimal tissue handing and short procedure times. 478 such patients underwent surgery in the last two years of which 476 had no surgical site infection. None of these procedures involved the use of implants. One patient developed a deep surgical site infection requiring debridement along with intravenous antibiotics while the other could be managed with antibiotics alone.

Recommendations on the use of antibiotics in clean soft tissue surgeries not involving implants have not been conclusively made. While some studies appear to demonstrate a decrease in wound infection in these kinds of surgeries, meta-analyses have not been able to identify any clear benefit.[6,7] However, it remains a practice among many institutes and surgeons to administer antibiotics perioperatively to children undergoing procedures such as herniotomies, circumcisions and orchiopexies.[2-4] The incidence of surgical site infection in clean surgeries is reported to be <2%. while in developing countries, the incidence is reported to be nearly 8-10%.[4,5,8-10]

Current guidelines for perioperative prophylaxis are not clear on the routine use of antibiotics in children undergoing clean surgeries.[1,2] Based on evidence, antibiotic prophylaxis is recommended for:

- Clean procedures involving the use of implants,
- Clean procedures in close proximity to vital organs, where the consequences of infection could be disastrous (i.e., CNS procedures, intrathoracic procedures, intra-peritoneal procedures).
- Clean contaminated wounds/ procedures.

It must be noted that antibiotic administration in contaminated and dirty wounds constitutes treatment and not prophylaxis.[1,2,5]

While antibiotic prophylaxis is of indisputable value in clean-contaminated surgeries, antibiotic prophylaxis is not without risks. Inappropriate antibiotic use is associated with significant risk of adverse drug reactions and emergence of bacterial resistance.[1,2] According to one study, 92% of surgical patients receive antibiotics, of which 79% receive antibiotics purely for prophylactic purposes.[11] In another study, up to 40% of paediatric surgical patients received antibiotics when not indicated.[4] Use of antibiotics when not indicated was also found to be associated with a higher risk for adverse reactions.[4] In fact, of all perioperative anaphylactic reactions, of which 6% are fatal, 8% to 27.3% have been found to be cause by antibiotics.[12,13]

With the increasing emergence of bacterial resistance, there is also a rising concern over the association of prophylactic antibiotics with virulent and resistant *Clostridium difficile* infections. In a study carried out in adult patients, investigators found a *C. difficile* infection rate of 7.9 per 1000 in patients receiving antibiotics for treatment only, 26.2 per 1000 in those receiving antibiotics for prophylaxis and treatment, and 0 in those receiving no antibiotics.[14] The authors concluded that, "when the only purpose of perioperative prophylaxis is to prevent infrequent and relatively benign infections, the risks may outweigh the benefits in some elderly patients."[14] Another study found that children receiving antibiotics had an Odds' Ratio of 4:1 for developing *C. difficile* infection.[4] In their study, 76 out of 123,604 children receiving antibiotic prophylaxis developed *C. difficile* infection versus 4 out of 122,632 children who did not receive antibiotic prophylaxis.

The economic burden caused by unnecessary use of antibiotics cannot be understated, especially in developing countries.[15,16] It results in significant costs to the government as well as to the patient.

CONCLUSION

Thus, we infer that in the setting of a public hospital in a developing country, the performance of paediatric day-care procedures without the empirical use of prophylactic antibiotics is a viable recommendation. Standard pre-operative preparation and maintenance of intra-operative asepsis is sufficient to prevent surgical site infection in these cases. Healthcare costs can be reduced by avoiding unnecessary antibiotic administration, which is of significance in resource-limited settings. We recommend that paediatric day care procedures be carried out without the use of empirical prophylactic antibiotics.However, this study is only a single centre observational study in a small cohort of patients. Large multi-centre randomized controlled trials will be required before strong recommendations for carrying out certain surgeries without the use of antibiotics can be made.

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