

The Use of Prophylactic Antibiotics in Day Case Herniotomy at Abia State University Teaching Hospital, Aba, Nigeria

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Abstract: Background: There has been tremendous improvement in the knowledge of prophylactic antibiotics use in surgery. There are controversies on the use of prophylactic antibiotics clean surgical cases. This study aims to determine if there is need to use prophylactic cefuroxime in day case herniotomy at the Abia State University Teaching Hospital Aba. Objective: To determine if there is need for prophylactic antibiotics in paediatric day case herniotomy and to compare the rate of surgical site infection in patients that receive preoperative cefuroxime to patients that did not receive it. Method: This was a hospital based prospective study carried out between April 2017 and April 2018 during which 126 herniotomy were performed as day cases at the Abia State University Teaching Hospital Aba. The patients were randomly placed into two groups: 63 patients in group A that received prophylactic cefuroxime at induction of anaesthesia and 63 patients in group B that did not receive cefuroxime. The two groups were compared to determine the factors that influenced development of surgical site infection. Results: There were 115(91.3%) males and 11(9.7%) females. Their ages ranged from 1-14 years with a median of 2 years. The average duration of the operative procedure was 34.8 minutes (34.3 minutes in group A and 35.4 minutes in group B). After a follow up of 3 weeks, a total of 8 patients developed surgical site infection (3 patients in group A; 5 patients in group B) (p=0.358). The duration of operation (p= 0.549) and mode of transport (p=0.605) did not affect rate of surgical site infection. Conclusion: Development of surgical site infection after day case herniotomy in our hospital is not affected by the use of prophylactic antibiotics and duration of operation. The study confirms that day case herniotomy can be undertaken without prophylactic antibiotics.

Keywords: Day Case Herniotomy, Prophylactic Antibiotics, Surgical Site Infection

1. Introduction

Surgical antimicrobial prophylaxis refers to the use of antimicrobial agent administered prior to an operation, its function is to reduce the burden of contamination from endogenous flora of patient's skin and exogenous sources of surgical site infection like surgical personnel, operating room environment, instrument and materials brought to the sterile field to a level manageable by host defenses[1]. Advances in infection control by using skin antiseptics, adequate sterilization of instruments, good surgical techniques such as

less tissue trauma, obliteration of dead space and good haemostasis with the use of diathermy, tissue glues and haemostatic agents have made significant impact in the development of surgery. However, postoperative wound infection is still a major source of morbidity of surgical patients [1].

The use of pre-operative antibiotics to achieve adequate concentration in the tissue prior to contamination has significantly reduced the incidence of infection. [3-10]. The inappropriate use of prophylactic antibiotics in terms of the wrong choice of antibiotics, dosing, timing, duration and

sensitivity to prevailing micro-organisms has been shown to increase antibiotics resistance and it is associated with poor clinical outcome. [11-15]. The antibiotics of choice should be the one which the prevailing organism is sensitive to, have larger volume of distribution, lower toxicity, longer half-life and single dose administration. [16-19].

Surgical site infections [20-29] have enormous impact on the patient quality of life due to increase in morbidity and mortality, duration of hospital admission and contribute substantially to the financial cost of patient's care. Administration of prophylactic antibiotics in clean – contaminated and contaminated surgical procedures can decrease the rate of surgical site infection, morbidity and mortality, length of hospital stay and overall cost of surgical care. Cefuroxime [30] has a broad spectrum of coverage against gram positive and negative organisms. It is bactericidal and covers the spectrum of bacteria that causes surgical site infection.

The current practice at Abia State University Teaching Hospital Aba where prophylactic cefuroxime is being used for clean surgeries is not evidence based therefore a study is needed to convince practitioners if there is need to use prophylactic cefuroxime in clean day case herniotomy.

2. Methodology

The study is a hospital based prospective case control study. The patients recruited into the study after obtaining informed consent parents from the parents /guardian. They were randomized into two groups by tossing a special research coin with a head and tail: The head represents group A while the tail represents group B. Data collected include patient's initials, age, sex, weight, parents/guardian (age, level of education and occupation), mode of transport to the hospital, home distance from the hospital, diagnosis, type of operation, group A or group B, development of surgical site infection, duration of follow up, result of culture, antibiotics sensitivity to cultured organism and outcome. Ethical clearance was obtained from Abia State University Teaching Hospital ethical committee. The difference mean [31] formula $N = \frac{r+1/r}{d^2} \frac{(z_b+z_a)^2}{(\text{difference})^2}$ was used to determine the sample size. Data were analysed using statistical package of social sciences (SPSS17.0 version, SPSS inc. Chicago 111}. Chi –square test. [32,33] of significance using contingency tables, at 5% level of significance and degree of freedom of 1, was used for analysis. Analysis was in form of mean and percentage. P-values less than 0.05 was considered as significant and less than 0.01 as highly significant.

3. Results

3.1. Demography

The study was undertaken over a period of 13months {April 2017 and April 2018}. During this period, there were 63 patients in each of the two groups. Overall, there were 115{91.3%} males and 11{9.7%} females. In group A, there

were 56 males and 7 females while in group B there were 59males and 4 females. Their ages ranged from 1-14years with a median of 2years. The average weight of the patients was 16.7Kg {range 8-46kg}. The average weight of group A patients was 18.3Kg and group B was 15.1Kg. The average distance from home to the hospital is 12.1km (range 10-50km); for group A patients the average distance was 12.5km while in group B patients it was 11.6km. A total of 74(58.7%) parents were civil servants, 11(8.7%) traders, 25(19.8%) non skilled workers, 8(6.3%) professionals and 8(6.3%) unemployed.

3.2. Operative Procedures

All the patients had inguinal herniotomy; in group A 46{73%} patients had right inguinal herniotomy and 17(27%) patients had left inguinal herniotomy while in group B 55(87.3%) patients had right inguinal herniotomy and 8(12.7%) patients had left inguinal herniotomy. The average time for the procedures was 34.8 minutes; 34.3 minutes in group A patients and 35.4 minutes in group B patients. (Table 1).

Table 1. Diagnosis and duration of operation.

Parameter	Group A	Group B
Right inguinal hernia	46	55
Left inguinal hernia	17	8
Average operation duration	34.3minutes	35.4minutes

3.3. Follow up and Outcome

All patients were followed up for 3 weeks. A total of 8(6.3%) patients developed surgical site infection. These comprised of 3(4.8%) patients in group A and 5(7.9%) patients in group B. (Table 2)

Table 2. Outcome.

Wound status	Group A	Group B
Infected	3	5
Not infected	60	58

P-value 0.358 using a 2 x2 contingency table³³

3.4. Mode of Transport

The 65 patients that used private vehicles to the hospital, 4 patients had surgical site infection while 4 patients developed surgical site infection out of the 61 patients that used public vehicles. P-value of 0.60 (Table 3).

Table 3. Mode of transport and Surgical site infection.

Mode of transport	Surgical site infection	No surgical site infection
Private vehicle	4	61
Public vehicle	4	57

3.5. Duration of Operation

The 68 patients that the duration of operation was greater than 34 minutes, four patients developed surgical site infection while 4 patients developed surgical site infection out of the 58 patients that the duration of operation was less

than 34 minutes. P-value of 0.549. (Table 4)

Table 4. Duration of operation and development of surgical site infection.

Duration	Surgical site infection	No surgical site infection
>34 minutes	4	64
<34 minutes	4	54

3.6. Bacterial Isolates and Antibiotics Sensitivity in Infected Cases

Three cases of surgical site infection in group A that received preoperative antibiotics grew *Staphylococcus aerus* in the 3 cases. The group B patients that did not received antibiotics also grew *Staphylococcus aerus* in 3 cases and *Klebsiella* in 2 cases. The antibiotic pattern shows a common sensitivity to cefuroxime. They were resistant to erythromycin and gentamycin (Table 5)

Table 5. Bacterial isolates and antibiotics sensitivity.

Bacterial isolate	Group A	Group B	Sensitivity to	Resistant to
<i>Staphylococcus</i>	3	3	Cefuroxime	Erythromycin Gentamycin
<i>Klebsiella</i>	-	2	Cefuroxime	Erythromycin Gentamycin

4. Discussion

The pattern of sex distribution in this study shows a predominance of males over females in both groups. In group A, there were 56males and seven females in the ratio of 8:1. In group B, there were 59 males and four females in the ratio of 14:1. This corresponds with the finding of paediatric day case prophylactic study in other centers in Nigeria [17, 18, 34] and United Kingdom. [35, 37]. It is known that paediatric hernia is common in males. The younger ages dominated in this study with 93(73%) patients below the age of five years. This finding is similar to other studies [19, 20, 34] where the patients were operated to correct congenital hernias as early as possible to prevent intestinal obstruction.

The results of this study showed that the majority are domicile within 10km from the hospital with easy access in case of any emergencies which is comparable with study in Ilorin [34] but at variance with study done at Ile-Ife [19] where majority live at more than 10km from the hospital. Longer distance from the hospital may delay patient presentation to the hospital in emergencies following day case surgery. The distance from the hospital did not affect the rate of surgical site infection in our study.

Sixty-one percent (61%) of the parents had tertiary education, which is similar to a study done at Ilorin but is at variance with study done at Ile-Ife [19] where half of the mothers (47.7%) do not have secondary education. The parent's educational level did not affect the incidence of surgical site infection. The majority of the parents were civil servants in comparison with studies done elsewhere in Nigeria [34].

This study showed that equal number of patients used both

public and private transport which does not agree with findings of other studies in our sub-region[19, 34] in which a large number of patients use public transport. This does not conform to standard in high income countries [35-37] where private vehicles were used as primary mode of transport. The cross tabulation of mode of transport with complication showed no significant statistical difference between the two groups in our study. The use of public transport may lead to increase stress, metabolic response to trauma and rate of contamination that may lead to higher wound infection rate.

The mean operation time was 34.8 minutes which was short in comparison with other studies done in Nigeria [19, 34]. The operation time in this study did not affect the patient outcome which is similar to other studies done in Nigeria. Operation time that is more than the half life of the antibiotics can increase the rate of surgical site infections, this will necessitate a repeat dose of the prophylactic antibiotics [38].

The surgical site infection rate in this study was 4.7% (3 out of 63) patients in group A that used antibiotics and 7.9% (5 out of 63) patients in group B that did not use antibiotics. There was no statistical significant difference in the rate of surgical site infection between the two groups. This rate of surgical site infection is comparable to other studies done elsewhere in Nigeria [19, 34] but high when compared with studies done in United Kingdom [35-37]. A similar finding has been reported in previous studies from high income and other lower income countries [38, 39]. This may indicate that there are other factors involved in the development of surgical site infection. Studies have shown that factors such as inadequate haemostasis, hypothermia, dead space, rough tissue handling, improper use of suture materials and inadvertent entry into hollow viscus may play a more vital role in the development of surgical site infection after clean surgical procedures. The importance of this is that efforts are to be directed towards obviating these factors rather than concentrating on giving antibiotics. On the other hand [38-42], some studies have shown that in settings where the operating environment might be contaminated or the hygienic state of the patient's home is uncertain, it may be prudent to give prophylactic antibiotics to minimize or prevent surgical site infection.

The infected wounds were swabbed and microscopy, culture and sensitivity test were done. The culture yield showed *staphylococcus* specie as the commonest infecting organism. All isolates were resistant to erythromycin and gentamycin but sensitive to cefuroxime. This bacteriology is in line with findings on nosocomial infection within and outside Nigeria [11, 43].

This study showed that the difference between the rates of surgical site infection in the two groups studied was not statistically significant. This finding is comparable with that of previous studies in Nigeria [19, 29, 34] other lower income countries [40, 41] and high income countries [36, 37]. Appropriate patient selection, proper counselling of parents and care givers will make day case paediatric hernia surgery feasible without the use of prophylactic antibiotics in

our sub-region.

5. Conclusion

This study was a hospital case control study in which patients were randomized into two groups, cefuroxime was used for the case and no antibiotics was given for the control. Results showed that in paediatric day case herniotomy, prophylactic cefuroxime did not significantly decrease the development of post-operative surgical site infection. The study confirms that day case herniotomy is safe without use of prophylactic antibiotics in our setting.

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