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Original Research Article

Comparative study of use of prophylactic antibiotic for elective hernia repair with use of prosthetic material: observational study in a tertiary care institute

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ABSTRACT

Background: There is widespread misuse of antibiotics leading to increasing reports of drug resistance. This has been highlighted by the World Health Organization (WHO). Wrong antibiotics are chosen, used when not indicated and used in dosages or patterns that are not recommended. We tried to analyse the pattern of antibiotic use for elective hernia repair using polypropylene mesh among the surgical units in our hospital for elective clean cases. The antibiotic use pattern and the incidence of surgical site infections were to be analysed to create uniform policies for antibiotic use across the institution.
Methods: We looked at the case records of patients undergoing elective hernia repair in one month in our institution under different surgeons. Inguinal, umbilical and simple incisional hernias were taken into study. Both open and laparoscopic hernia repairs were included in the study. Emergency hernia repairs were excluded. We looked at the type of prophylactic antibiotic given, the dose and approximate time difference between injection and incision time, whether patient received further doses of intravenous or oral antibiotic. If further doses were given, we also looked for reasons if documented. These cases were followed for one month to see if there was any difference in the incidence of surgical site infections.
Results: There were thirty-one cases, of which 16 received only a single dose of prophylactic antibiotic while 15 received more than one dose of antibiotic. Only one patient in the prophylactic antibiotic only group developed a culture positive wound infection. There was seroma formation in two patients.
Conclusions: There was no evidence of higher incidence of wound infection in patients receiving only prophylactic antibiotic. There is a need for developing institution specific policies on antibiotic use. This will reduce the treatment costs and also avoid the development of antibiotic resistance in the society.

Keywords: Antibiotic prophylaxis, Clean surgery, Prosthetic material

INTRODUCTION

Antibiotic usage in clinical practice is many a times not based on evidence based medicine and written policies. Even for similar surgeries, there is wide variation in use of antibiotics. National guidelines recommend the use of single dose of prophylactic antibiotic before elective hernia repair.[1] However, there is wide difference in actual practice. The guideline on use of only prophylactic dose of antibiotic for elective clean surgeries is not strictly followed. Various reasons are put forward to justify extra doses of antibiotics, including different types of patients, co-morbidity and routine practice. There is no definite indication or reason for prolonged use of antibiotics. We

tried to analyse the pattern of antibiotic use in our hospital for elective hernia repair using prosthetic material in the surgery department and see the outcomes. Elective hernia repairs are categorized as clean surgeries as per the system of classification for operative wounds based on the degree of microbial contamination.[2] We analysed the elective hernia repairs undertaken in our hospital by different surgeons over a period of one month. The data was taken from case records, operative notes and anesthesia records. Demographic data was collected including any co-morbidity. The time at which the antibiotic was given with respect to incision was also noted. The case records were checked to see if the patients received post-operative antibiotic and the reasons for the same. Any positive cultures in case of surgical site infection were followed up with microbiology. The patients were followed up for upto two months to see if any patient developed wound infection. Ideal follow-up for surgical site infection in a clean case with prosthetic material use requires a follow up of one year.[3] We did not find significant difference in infection rates between patients who received only prophylactic antibiotic and those who received multiple doses. It is not possible to state statistical significance as the numbers in each arm were limited. There is also a financial and societal impact because of improper antibiotic use. The World Health Organization (WHO) has highlighted antibiotic resistance and the emergence of resistant bacteria as a public health concern.

METHODS

We identified all the patients who underwent elective hernia repair in one month in the department of General Surgery in our hospital. These included inguinal, umbilical and paraumbilical and simple incisional hernias. Simple incisional hernias were defined as those with a single defect less than or equal to 5 cm diameter and requiring no bowel procedures. Both open and laparoscopic hernioplasties were considered. There was a total of thirty-one elective hernia repairs in one month. Demographic data was retrieved from the case records and it was tabulated unit wise to check adherence with institutional antibiotic policy. Of the thirty-one patients, 16 patients had received only the prophylactic dose of intravenous antibiotic (Cefazolin 2 gm).

Fifteen of the thirty-one patients received more than one dose of antibiotic, including oral antibiotics from post-operative day one. The case records were analysed to see the reason for continuation of post-operative intravenous or oral antibiotics. The time at which the prophylactic antibiotic was given with respect to time of incision was also identified. The time of incision and closure of incision was noted from the operative notes. It was classified into 4 categories- A type where the antibiotic was given within 30 minutes before the incision, B type where the antibiotic was given between 30 to 60 minutes before the incision, C type where the antibiotic was given more than 60 minutes before the incision and D type where the time of administration could not be properly identified. The dose of the antibiotic given was also identified.

The day of surgery was considered as day zero and the next day is considered as post-operative day one. The mesh used for all the repairs were from a single company to avoid bias from usage of two different types of mesh. The size of the mesh used however varied based on the operating surgeon's perception of the size of the defect. Patients were followed up for a period of two months. Surgical site infections (SSI) were stratified using the ASEPSIS wound score.

RESULTS

Of the 16 patients in the group who received no antibiotic or prophylactic antibiotic only, nine patients received 1 gm as prophylactic dose, 6 patients received 2 gm as prophylactic dose and one patient was given no antibiotic. This was a 7-year-old girl where no prosthetic material was used. The age of the patients ranged from 36 to 88 years. There were 10 males and 6 females. The common comorbidities noted were Type 2 diabetes mellitus, hypertension, dyslipidemia and coronary artery disease. Eleven patients received the antibiotic inside of 30 minutes from the incision time, three received the antibiotic within 30 to 60 minutes and one patient received the antibiotic more than 60 minutes before incision time. One patient developed wound infection with pus culture showing methicillin sensitive staphylococcus aureus and was started on oral cephalexin (ASEPSIS score 20). The 88-year-old patient developed necrosis of the flap edge requiring minor debridement (ASEPSIS score 5). There was no requirement of antibiotic therapy and wound healed with daily dressing.

There were 15 patients in the group which had received more than one dose of antibiotic. The age ranged from 36 to 73 years. There were nine male and six female patients. Similar pattern of co-morbidity was seen in both the groups. Thirteen patients received 1gm as prophylactic dose while two patients received 2gm as prophylactic dose. Eleven patients received the antibiotic inside of 30 minutes before the incision time, two patients received it between 30 minutes and 60 minutes and one patient received it more than one hour before the incision. No entry was found pertaining to one patient in this group. All patients in this group received another dose of intravenous antibiotic in the evening. The reason for giving this was not documented. Six patients received intravenous antibiotics for more than one day, two patients for more than two days and one patient for more than three days. Two of these patients also received oral antibiotics on post-operative day 2 and 3. One patient developed fever on day 5. Urine culture showed greater than 10^5 colony forming unit (CFU). The wound aspirate did not have any growth on culture. Two of the patients in this group developed redness and seroma in the wound (ASEPSIS score 5 and 10 respectively). There was no

growth on culture in the patient with seroma. The other patient had no culture sent. There was no statistical difference between the two groups with respect to wound infection. Using only a single dose of prophylactic antibiotic did not lead to increased risk of surgical site infection.

DISCUSSION

There is increasing awareness of the misuse of antibiotics at the global level. This includes not just in humans but also in the agriculture and animal husbandry industry.[4] The WHO has also warned against this. Antibiotics are routinely used in elective clean cases where a prosthetic material is used, like in elective hernia repairs. However, there are studies which question the role of prophylactic antibiotic use in hernia repair.[5] Where a prosthesis is used, there may still be a role for prophylactic antibiotic.

However, the 2009 EHS guidelines recommend avoiding the use of prophylaxis in low-risk patients but considering it in patients at a high risk of SSI.[6] One randomized controlled trial on use of prophylactic antibiotic against placebo in inguinal hernia recommended that routine antibiotic prophylaxis is not indicated.[7] However, another recent study indicates that antibiotic prophylaxis is effective for the prevention of SSI after open mesh-plug hernia repair.[8]

Reviewers at the Cochrane Collaboration concluded in 2012 that evidence derived from 17 randomised controlled trials (RCT) regarding the use of antibiotic prophylaxis in inguinal hernia repair both with and without mesh was inconclusive, neither allowing them to encourage nor discourage its use.[9]

A separate meta-analysis, also published in 2012, focussed purely on inguinal hernia repair with mesh and included six of the 11 RCTs identified by the Cochrane review. This analysis concluded that there was a significant benefit associated with prophylaxis.[10] Another RCT has found no significant difference in risk of infection between use of prophylaxis and placebo.[11]

Because of the differing conclusions from various studies, the clinical guidelines vary. The National Institute of Clinical Excellence (NICE) recommend the use of antibiotic prophylaxis in clean surgery with implanted material.[12] The Scottish Intercollegiate Guideline Network (SIGN) state that antibiotic prophylaxis is not needed in inguinal hernia repair with or without implanted mesh.[13] The European Hernia Guidelines state that routine antibiotic prophylaxis is not indicated in elective open or laparoscopic hernia repair. Prophylaxis should be considered for those patients at higher risk for wound infection.[6]

There was variation in the practice of antibiotic use between surgeons. Not all surgeons in an institution adhere to the antibiotic policy. One study found that the effectiveness of hospital guidelines in influencing the practice of surgeons regarding the choice of antibiotic seemed poor: less than half of surgeons adhered to the hospital antibiotic policy. Surgeons were guided by their own beliefs about the advantage of prolonged antibiotic use.[14] This can be seen in the fact that there were no reasons documented in the case notes for continued used of intravenous or oral antibiotics.

The cost of treatment was higher in the group which received longer duration of antibiotics. There is also the risk of spread of antibiotic resistance. This has financial implications not just for the individual patient but also to society.[4] However, all the patients received the same antibiotic and there was no variation in the type of antibiotic used. Antibiotic stewardship should be promoted through incentivizing and measuring prescriber compliance with the antibiotic formulary, promoting antibiotic stewardship within programmes of continuing professional development and communicating with the public the reasonable expectation of not being prescribed antibiotics unless clearly indicated.[15]

Drawbacks

The number of infections was not significant and hence it is not possible to comment on the ideal time at which the prophylactic antibiotic is to be given with respect to time of incision. In a two-year period prior to the study, only 7 wound infections were reported in 650 elective and emergency hernia cases (unpublished data). This study compares only the cases done in one month and the numbers are limited.

CONCLUSION

There is need for strict vigilance in the use of antibiotics. Elective clean surgeries with use of prosthetic implant like mesh should receive only single dose of propylactic antibiotic. There should be strict adherence to hospital antibiotic policy guidelines. This will lead to lower treatment costs for the patient and reduce the spread of antibiotic resistance. Further, randomized control trials are necessary to see whether the prophylactic use of antibiotics for elective hernia repairs can be avoided.

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