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RESEARCH ARTICLE

Current status of post-operative antibiotic prophylaxis in surgical wards

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ABSTRACT

Background: Appropriate antibiotic prophylaxis can reduce the risk of post-operative wound infections, but misuse and overuse of antibiotics increase cost and emergence of resistant bacteria. Despite the existence of general recommendations for antibiotic prophylaxis, many deviations from these recommendations are still reported notably for antibiotic choice and duration of prophylactic administration. **Objective:** This study was conducted to evaluate the pattern of post-operative prophylactic antibiotics in surgical wards at Dhiraj Hospital, a tertiary care teaching hospital attached with SBKS Medical Institute and Research Center, Piparia, Vadodara, Gujarat, India. **Materials and Methods:** In this prospective observational study, a total of 200 patients from various surgical wards were included. Pretested pro forma which included information on choice of antimicrobial agents as well as their route, number and total duration of prophylaxis were completed. Furthermore, appropriateness of antibiotic prophylaxis was assessed as per standard guidelines. **Results:** All the patients received post-operative antibiotic doses. The majority of patients (98, 49%) were prescribed three antibiotics. Most of the post-operative use of antibiotics was not as per standard guidelines in terms of choice of antibiotics and total duration of treatment. The patients received post-operative antibiotics for a mean duration of 9.84 days during their hospital stay. **Conclusion:** In spite of existence of the written guidelines for antimicrobial surgical prophylaxis, there are significant deviations from the recommendations in current clinical practice. To promote the rational use of antibiotics in surgical prophylaxis, implementation of and adherence to evidence-based guidelines and recommendations for antimicrobial surgical prophylaxis is strictly required.

KEY WORDS: Antibiotic Prophylaxis; Post-operative; Evidence-based Guidelines

INTRODUCTION

Chemoprophylaxis is highly effective in some clinical settings. In others, it accounts for some of the most flagrant misuses of antimicrobials are totally without value and may be deleterious. The use of antimicrobial compounds to prevent the infections remains controversial in numerous situations.[1]

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Prolonged administration of drugs after the surgical procedure is unwarranted and potentially harmful. No data suggest that the incidence of wound infections is lower if antimicrobial treatment is continued after the day of surgery. Use beyond 24 h not only is unnecessary but also leads to the development of more resistant flora and superinfections caused by antibiotic-resistant strains. Chemoprophylaxis should be limited to operative procedures for which there are data supporting its use.[1]

The standard guidelines are hardly followed. Antibiotics are used improperly for surgical prophylaxis, and these include

wrong selection of antibiotics, wrong route or dose and most sadly, the duration of therapy.[2]

This practice is confined not only in India but is also the prevalent world over. However, the scenario in India is quiet pathetic. Superbug is a recent example of hospital infection due to irrational use of antibiotics. Recently, New Delhi metallo-beta-lactamase-1 a multidrug resistant Gram-negative bacteria due to the production of beta-lactamase was isolated from Chennai and Haryana.[3]

Thus, surgical antibiotic prophylaxis represents a large expenditure of drugs and money. Excessive prophylactic antibiotics may lead to emergence of bacteria resistant to the drugs used for prophylaxis.[4]

MATERIALS AND METHODS

This was a prospective and observational study conducted in Dhiraj Hospital, 1226 bedded tertiary care teaching hospital attached with S.B.K.S. Medical Institute and Research Center, Piparia, Vadodara, Gujarat, India. The study was carried out over a period of 18-month starting from December 1, 2010, to May 31, 2012. A total of 200 cases were included in the study.

The study protocol was approved by Institutional Ethics Committee before commencement of the study. All the patients were explained clearly about nature and purpose of the study in the language they understand and written informed consent was obtained.

The patients of either sex and of any age admitted to surgical wards including general surgery, orthopedic, obstetrics and gynecology, otorhinolaryngology (ENT) and ophthalmology wards and undergoing elective surgery were included in the study. Patients referred by or transferred from other departments and/or patients discharged or transferred to other departments within 24 h; patients unable to communicate, i.e., patients on ventilators and serious diseases; immunosuppressed patients (who require antibiotics); patients in whom pre/intra-operative contamination of a normally sterile space has occurred (e.g., perforated abdominal viscous); patients with current infection (systemic or local), or on antibiotics prior to 7 days of hospital admission were excluded from the study.

According to the rate of admission and rate of surgical procedures carried out in the hospital, 80 (40%) patients were randomly selected from surgery department, 40 (20%) each from orthopedics and obstetrics and gynecology departments and 20 (10%) each from Otorhinolaryngology and Ophthalmology department on prorata basis.

All the patients were examined on the day of admission. All the information like age, gender, disease history, and drug treatment was recorded. Subsequently, the patients were visited everyday till their discharge from the ward. A pre-structured and pre-tested pro forma (Case Record Form) was filled up for each participating patient throughout their stay in the hospital ward. In the case of any conflict, opinion of the treating surgeon was also taken and then the case was reported and analyzed.

Format of Analysis

All the data were analyzed for demographic parameters such as age, sex, ward wise distribution of patients, surgical prophylaxis given or not and if given, procedure in detail, and continuation of surgical prophylaxis after surgery.

Statistical Analysis

Data were represented as actual values, frequencies, percentages, mean, standard deviation, etc., as appropriate. Chi-square test was employed to analyze the data. Data were analyzed using Microsoft Excel 2010 version and SPSS version 20.0. The $P \leq 0.05$ was considered as significant.

RESULTS

Number of Antibiotics Prescribed

All the patients received post-operative antibiotic doses. The majority of the patients (98, 49%) were prescribed three antibiotics including orthopedics (24, 60%), obstetrics and gynecology (36, 90%) and otorhinolaryngology (12, 60%). In general surgery (38, 47.5%), patients were prescribed two antibiotics and in ophthalmology (20, 100%) patients were prescribed one antibiotic (Figure 1); which was also found statistically significant (Table 1).

Selection of Drug Class

Cephalosporins were the most frequently prescribed in 162 (81%) patients followed by nitroimidazoles (97, 48.5%) and aminoglycosides (92, 46%) in all departments except ophthalmology. In all patients of ophthalmology, fluoroquinolones were prescribed (Figure 2).

Table 1: Statistical significance of number of post-operative antibiotics

Departments	Number of antibiotics		Chi-square test	*P* value
	<3	≥3		
General surgery	44	36	χ^2=51.62 df=4	*P*<0.0001
Orthopedics	16	24		
Obstetrics and gynecology	3	37		
Otorhinolaryngology	7	13		
Ophthalmology	20	0		

Route of Drug Administration

As far as the route of administration of post-operative antibiotics is concerned in all departments except ophthalmology, all patients were given first through intravenous and then through oral route (Table 2). In ophthalmology, all patients were given antibiotics topically through intraocular route.

Duration of Antibiotic Administration after Surgery

In the most cases, antibiotics were given for prolonged duration after the end of the surgery. Average duration of administration of antibiotics in respective departments was 8.20 days (range 3-11 days) in general surgery, 11.58 days (range 3-17 days) in orthopedics, 6.14 days (range 1-11 days) in obstetrics and gynecology and 9.24 days (range 3-12 days) in otorhinolaryngology (Table 2 and Figure 3); which was not statistically significant. In ophthalmology, the average duration was 14.06 ± 0.72 days (range 7-21 days) by intraocular route (Figure 3).

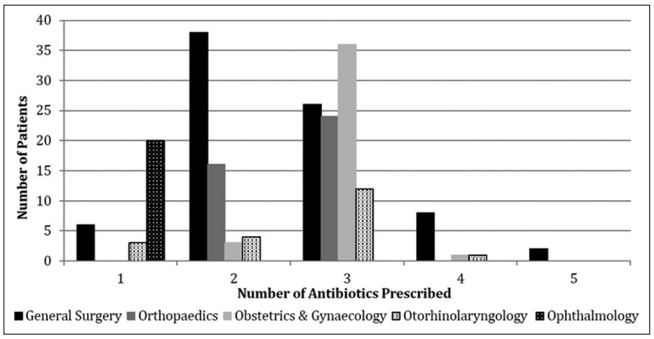

Figure 1: Number of post-operative antibiotics prescribed

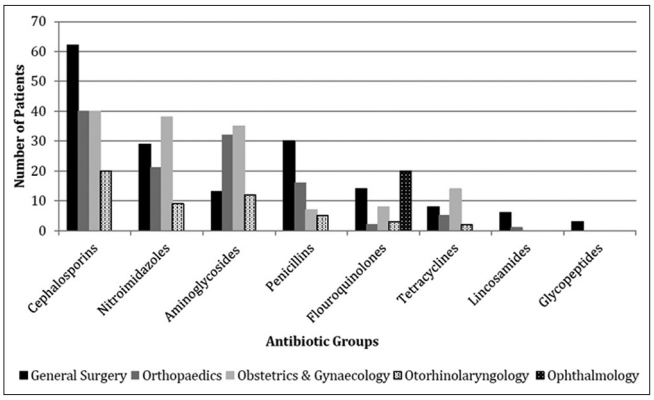

Figure 2: Groups of post-operative antibiotic prescribed

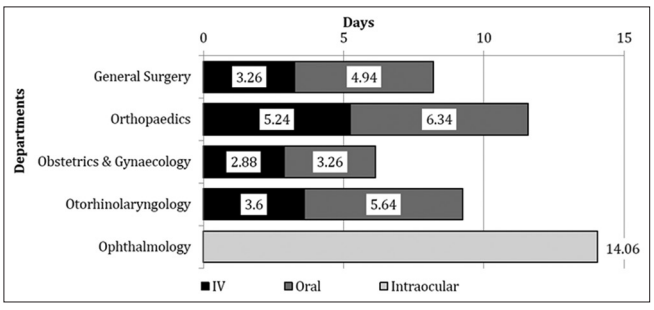

Figure 3: Average duration of post-operative antibiotics administration

DISCUSSION

Antibiotics are the most commonly prescribed drugs in Indian hospitals and approximately one-third of prescriptions are for antimicrobial prophylaxis.[5] As a result, appropriate prophylaxis should be viewed as an important issue.

Guidelines available for antibiotic prophylaxis in surgery suggests that there is no need of post-operative antibiotic except in type IV (dirty) surgeries.[6] All the patients received post-operative antibiotics and majority of patients (98, 49%) were prescribed three antibiotics. Shethwala and Gajjar[7] reported that 71.75% patients received two or more post-operative antibiotics. Shah et al.[8] also reported that 66.5% patients were prescribed two or more post-operative antibiotics either simultaneously or one after another. Although the use of two or more antimicrobials in combination may have a certain rationale, their indiscriminate use can have several negative consequences. Potentially harmful aspects of such inappropriate antibiotic combinations include the emergence of resistant bacteria, super-infection, risks of toxic and allergic reactions and increased the cost of therapy.[9] Hence, the use of prolonged post-operative antibiotics is irrational in these studies.

Choice of post-operative antibiotics was cephalosporins in the majority (162, 81%) of patients in all departments except Ophthalmology. In all patients of ophthalmology, fluoroquinolones were prescribed. Cephalosporins were also the most frequent group prescribed postoperatively in the study done by Shah et al.[8]

In all departments except ophthalmology, all post-operative patients were given antibiotics through both IV and oral route, first through intravenous and then through oral route. It was common practice to administer antibiotic through IV route for 2-3 days and then switch over to oral antibiotics. Patients undergoing ophthalmic procedures received antibiotics by topical route which is the primary mode of prophylaxis as recommended in such patients.

In most cases, antibiotics were given for prolonged duration after the end of the surgery. Average duration of administration of antibiotics in respective departments were 8.20 days (range 3-11 days) in general surgery, 11.58 days (range 3-17 days) in orthopedics, 6.14 days (range 1-11 days) in obstetrics and gynecology, 9.24 days (range 3-12 days) in otorhinolaryngology and 14.06 days (range 7-21 days) in ophthalmology. In another study done by Shah et al.,[8] the average duration of post-operative antibiotic administration was 7.13 days. A mean duration of 5 days during hospital stay and another 6 days following discharge has been reported in study done by Rehan et al.[9] Even though evidence

Table 2: Statistical significance of average duration of post-operative antibiotics administration

Departments	Average duration (days)			Chi-square test	*P* value
	IV	Oral	Total		
General surgery	3.26±0.14	4.94±0.30	8.20±0.44	χ^2=0.13 df=3	0.98 (*P*>0.05)
Orthopedics	5.24±0.22	6.34±0.34	11.58±0.78		
Obstetrics and gynecology	2.88±0.06	3.26±0.46	6.14±0.52		
Otorhinolaryngology	3.60±0.12	5.64±0.14	9.24±0.26		

from literature fails to support prolonged administration of antibiotics, usage of post-operative antibiotics beyond 24 h is common.[10] Longer courses of antibiotics are falsely believed to be a good preventive measure against surgical site infections.[8,9] As far as the duration of antimicrobial prophylaxis is concerned, one antibiotic dose is sufficient for operations lasting 4 h or less.[11] Further doses may be required in prolonged surgeries. A number of studies have compared administration of a single dose versus 24 h of administration and found equal efficacy.[12] Results from two large studies highlight the fact that single dose antibiotic prophylaxis are not associated with an increased rate of SSI when compared to multiple dose regimens.[13,14] Meta-analysis has failed to demonstrate the superiority of multi-dose regimens over single-dose prophylaxis.[15] Persistence of tissue concentrations past the period of surgery and recovery from anesthesia does not improve efficacy and increases toxicity and cost of therapy.[16] Currently, the surgeons' approach to post-operative antibiotic prophylaxis in patients undergoing surgery varies widely. Reducing the infectious complications of surgery is an important goal but it is also important to reduce the unnecessary use of post-operative antibiotics.

This study shows that post-operative prophylactic use of antibiotics in surgical patients was inappropriate in the majority of cases, irrespective of the surgical ward or department. Since prophylactic antibiotics take up a large part of prescribed antibiotics in the hospitals, adherence to standard guidelines regarding the duration of antibiotic prophylaxis would keep costs to a minimum which would be desirable especially in a resource-limited setting like ours.

One of the limitations of this study was to include only one institute for collection of data. The current study has also not evaluated the adverse drug reactions and financial burden on the patients because of unnecessary use of antibiotics.

CONCLUSION

It was concluded from the study that there was indiscriminate and excessive use of antibiotic prophylaxis postoperatively. Instead of the existence of the written guidelines for antimicrobial surgical prophylaxis, there were significant deviations from the recommendations in current clinical practice of surgical prophylaxis.

Various measures are needed to improve appropriateness of prescriptions and adherence include development of evidence-based guidelines in collaboration with surgeons, increased outcome based research to document benefits of appropriate antibiotic use, continuing education to disseminate information to practitioners, surveys of antibiotic use and reassessment of prescribing practices over time and providing regular feedback and organizing group education and consensus meetings.

REFERENCES

1. Hardman JG, Limbird LE, Gilman AG. Goodman & Gilman's the Pharmacological Basis of Therapeutics. 11th ed. New York: McGraw-Hill; 2006.
2. Norton JA, Bollinger RR, Chang AE, Chang SF, Lowry SJ, Mulvihill HI, et al. Basic Science and Clinical Evidence Surgery. New York: Springer; 2001. p. 205-7.
3. Sakong P, Lee JS, Lee EJ, Ko KP, Kim CH, Kim Y, et al. Association between the pattern of prophylactic antibiotic use and surgical site infection rate for major surgeries in Korea. J Prev Med Public Health. 2009;42(1):12-20.
4. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: Attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol. 1999;20(11):725-30.
5. Pathak A, Mahadik K, Dhaneria SP, Sharma A, Eriksson B, Lundborg CS. Surveillance of antibiotic consumption using the "focus of infection" approach in 2 hospitals in Ujjain, India. PLoS One. 2012;7(6):e38641.
6. Scottish Intercollegiate Guidelines Network. Antibiotic Prophylaxis in Surgery: A National Clinical Guideline. No, 104. Edinburgh, UK: SIGN Publication; 2008. p. 1-71.
7. Shethwala MH, Gajjar BM. Study of Pattern of Antibiotic Use for Surgical Prophylaxis in Surgical Departments of Tertiary Care Urban Hospital. PhD [Dissertation]. Vallabh Vidyanagar, Gujarat, India: Sardar Patel University; 2008.
8. Shah A, Gajjar B, Shankar R. Antibiotic utilization for surgical prophylaxis in a tertiary care teaching rural hospital. Int J User-Driven Healthc. 2011;1(4):1-14.
9. Rehan HS, Kakkar A, Goel S. Surgical antibiotic prophylaxis in a tertiary care teaching hospital in India. Int J Infect Control. 2010;6(2):1-6.
10. Bratzler DW, Houck PM. Antimicrobial prophylaxis for surgery: An advisory statement from the national surgical infection prevention project. Clin Infect Dis. 2004;38(12):1706-15.
11. McDonald M, Grabsch E, Marshall C, Forbes A. Single - Versus multiple-dose antimicrobial prophylaxis for major surgery: A systematic review. Aust N Z J Surg. 1998;68(6):388-96.

12. Luchette FA, Borzotta AP, Croce MA, O'Neill PA, Whittmann DH, Mullins CD, et al. Practice management guidelines for prophylactic antibiotic use in penetrating abdominal trauma: The EAST practice management guidelines work group. J Trauma. 2000;48(3):508-18.
13. Kanayama M, Hashimoto T, Shigenobu K, Oha F, Togawa D. Effective prevention of surgical site infection using a centers for disease control and prevention guideline-based antimicrobial prophylaxis in lumbar spine surgery. J Neurosurg Spine. 2007;6(4):327-9.
14. Fonseca SN, Kunzle SR, Junqueira MJ, Nascimento RT, de Andrade JI, Levin AS. Implementing 1-dose antibiotic prophylaxis for prevention of surgical site infection. Arch Surg. 2006;141(11):1109-13.
15. Lundine KM, Nelson S, Buckley R, Putnis S, Duffy PJ. Adherence to perioperative antibiotic prophylaxis among orthopedic trauma patients. Can J Surg. 2010;53(6):367-72.
16. Munckhof W. Antibiotics for surgical prophylaxis. Aust Prescr. 2005;28(2):38-40.

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