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ORIGINAL ARTICLE

How good is compliance with surgical antibiotic prophylaxis guidelines in a tertiary care private hospital in India? A prospective study

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Abstract

Purpose There is a need to study compliance with surgical antibiotic prophylaxis guidelines in India.

Methods In this prospective study, 100 consecutive surgical procedures performed at a tertiary care private hospital in Mumbai, India were observed. The choice of antibiotic, timing and duration of administration were recorded and compared to the hospital guidelines.

Results Appropriateness of choice of antibiotic was seen in 68%, timing in 89%, dose in 75% and duration in 63% of cases. Hundred percent compliance to all criteria was observed in 52% of cases. The SSI rate was 3.3%.

Conclusions These compliance rates though suboptimal are similar to those reported in world literature. There is an urgent need to improve compliance with optimal surgical antibiotic prophylaxis guidelines so as to reduce risk of SSI and to prevent resistance and costs potentially associated with antibiotic misuse.

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Introduction

Surgical site infections (SSI) are the second most common type of nosocomial infections and are an important cause of morbidity, mortality and resource utilisation [1, 2]. Two to 5% of patients undergoing clean extra-abdominal operations and upto 20% undergoing intra-abdominal operations will develop a SSI [3]. Perioperative antibiotic prophylaxis is widely used to reduce the occurrence of SSI. Optimal prophylaxis ensures that adequate concentrations of an appropriate antimicrobial are present in the serum, tissue and wound during the entire time that the incision is open and at risk of bacterial contamination. However excessive or incorrect antimicrobial use increases costs and favours the emergence of antimicrobial resistance.

Published guidelines modified as per local susceptibility patterns are used in various hospitals to reduce rates of SSI [4, 5]. These guidelines encompass the correct drug, timing, dose and duration of antibiotics. Operational inadequacies however may result in poor compliance with such guidelines.

There are few studies reporting patterns of surgical antibiotic prophylaxis from India. This study was undertaken in a private tertiary care hospital to study compliance with hospital guidelines for antibiotic prophylaxis in surgery.

Patients and methods

This prospective study was conducted in a private tertiary care 350 bedded hospital in Mumbai, India in 2005. In this study consecutive elective surgical procedures were

observed by the investigator (LP) without the knowledge of the surgeon, anaesthetist or other operation theatre (OT) staff. Details of the type of surgery, choice of antibiotic, dose of antibiotic, time of administration in relation to incision time, duration of surgery and administration of the second dose and continuation of antibiotics were recorded on a predesigned proforma. The hospital antimicrobial prophylaxis guideline was used as a benchmark for analysing compliance and appropriateness of antibiotic prophylaxis in the 100 cases. This local hospital guideline is detailed as Appendix 1 and is based on previously published standard guidelines [4]. Prophylaxis was considered appropriate only if all criteria were met (viz. choice, dose, time of administration and duration of antibiotics).

All study patients were also followed up for 1 month for an SSI as defined by standard criteria [4].

Results

A total of 100 consecutive elective surgical procedures were observed. The average age of these surgical patients was 50 years (range 8–77 years). Fifty-seven were males and 43 were females. These included 20 orthopaedic surgeries, 20 general surgeries, 15 urology surgeries, 13 cardiothoracic and 15 ophthalmology procedures. Other procedures were 4 cases in gynaecology, 3 in neurology, 4 oncology cases, 4 plastic surgery cases and 2 vascular surgery cases.

Fifty-six were clean, 35 clean contaminated, 7 contaminated and one was a dirty procedure (total 90). Two cases did not merit antibiotic prophylaxis and were not given any (one was a green stick fracture for closed reduction and the other was a hip dislocation in a case of operated total knee replacement (TKR) for reduction). Further analysis on appropriateness of antimicrobial prophylaxis/compliance with hospital guidelines was confined to the 90 cases that were either clean/clean contaminated and merited antibiotic prophylaxis. Of these 90 cases antibiotic prophylaxis was given in all but one patient.

The choice of antibiotic was appropriate in 61/90 (68%) cases. This included cefazolin alone in 46 cases and cefuroxime alone in 15 cases. Other antibiotics which were used included, coamoxiclav, cefiprome, netilmycin, amikacin, gentamycin, metronidazole, vancomycin, ceftazidime, cefotaxime and ampicillin-sulbactum. The dose of antibiotic was appropriate in 67/90 (74.4%) cases.

The antibiotic was administered at the appropriate time (within 60 minutes prior to the surgical incision) in 80/90 (89%) cases. The mean time for antibiotic administration was 9.8 minutes prior to the surgical incision (range 0–240 minutes). Surgery was prolonged beyond 4 hours in 8/90 cases and hence a repeat antibiotic dose was necessary. Three out of these 8 cases had received vancomycin as preoperative prophylaxis, hence were excluded from the patients who required a second dosing. However none of the remaining 5 cases who needed a second dose received the second antibiotic dose.

Antibiotics were stopped within 24 hours of completion of surgery in 57/90 (63%) cases. Only 47 of the 90 cases (52%) were fully compliant with the hospital guideline and hence received appropriate surgical antibiotic prophylaxis.

On follow up, 3/90 (3.3%) patients showed evidence of a SSI. All 3 patients had undergone coronary artery bypass grafting (CABG) by a single surgeon. All 3 patients did not receive antibiotics as per hospital guidelines (antibiotics given were coamoxiclav, netilmycin and vancomycin in correct doses). The timing was appropriate for coamoxiclav and netilmycin in 3/3 cases but the infusion for vancomycin could not be completed prior to the surgical incision in all the three cases. Antibiotics were also continued inappropriately for 5–7 days in all 3/3 cases.

Discussion

This is the first of its kind of study from India assessing compliance with surgical antibiotic prophylaxis. The findings are accurate and valid as this was a prospective study under direct observation. Hundred percent compliance with the guidelines was observed in only 52% cases. Appropriateness of choice of antibiotic was seen in 68%, timing in 89%, dose in 75% and duration in 63% of cases. A considerable amount of misuse of antibiotics viz. use of multiple antibiotics/high-end antibiotics/irrational combinations and prolonged duration was apparent. This is despite the fact that the protocol for antibiotic prophylaxis in surgery at the hospital is periodically distributed to surgical colleagues. Additionally, the hospital has a very active infection control committee wherein all members of the surgical team are regularly informed and updated on surgical prophylaxis through seminars and infection prevention weeks.

Several studies assessing compliance with surgical prophylaxis guidelines in hospitals abroad have been published [6–24]. Overall compliance to guidelines has varied from as low as 0–53%, usually in the range of 20–30%. All studies revealed a high frequency of prescription of antibiotics when not needed, inappropriate choice and use of multiple antibiotics and prolonged duration of administration. The timing of administration of antibiotic in most studies was more satisfactory than other criteria (commensurate with what was seen in our study).

The overall SSI rate of 3.3% observed in our setup is comparable to those in the best centres [1, 2]. Barriers towards implementation of surgical prophylaxis guidelines have been studied and identified as lack of awareness, non-accountability, perception of guidelines as bureaucratic rather than education tools or perception of guidelines as cookbook medicine rather than allowing oneself to make ones own medical decisions [25]. Another major reason for non-compliance is the false belief that high-end/multiple antibiotics and prolonged therapy will be more effective in preventing SSI as compared to short duration of narrow spectrum antibiotics.

Measures to promote rational surgical antibiotic prophylaxis include drafting of guidelines, education and communication of guidelines to those concerned, frequent reminders and training and finally periodic compliance audits and communication of results to all concerned [26].

Conclusion

We observed complete compliance with surgical prophylaxis guidelines in only around half of the surgical procedures performed at our hospital. Though not acceptable, this is superior to rates of compliance observed in most hospitals around the world. There is an urgent need to improve compliance with optimal surgical antibiotic prophylaxis policies so as to reduce risk of SSI and to prevent resistance and costs potentially associated with antibiotic misuse. A focus on the cause of errors in the system rather than mistakes of individuals is needed.

Conflict of interest The authors do not have any disclosable interest

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Appendix 1 Hospital guideline for surgical antibiotic prophylaxis

Antibiotic timing

The first antibiotic dose can be given any time within 60 minutes preceding the surgical incision but preferably just before the induction of anaesthesia. For surgery lasting for more than 4 hours the antibiotic dose should be repeated.

Duration of prophylaxis

Prophylactic antibiotics should be discontinued within 24 hours after the end of surgery.

Table 1 Antibiotic choice

Procedure	Preferred drug
Clean surgeries	Cefazolin/cefuroxime
Orthopaedic surgeries	Cefazolin/cefuroxime
Cardiovascular/vascular surgeries	Cefazolin/cefuroxime
Neurosurgery	Cefazolin/cefuroxime
Ophthalmic surgery	Topical quinolone, immediate preoperative betadine, systemic cefazolin/cefuroxime
Head and Neck and ENT surgery	Cefuroxime/cefazolin
Gastroduodenal	Cefazolin/cefuroxime
Appendicular/colorectal surgery	Cefuroxime/cefazolin and metronidazole
Biliary	Cefuroxime/cefazolin
Abdominal/vaginal hysterectomy/caesarian section	Cefazolin/cefuroxime
Urologic surgery	Cefazolin (or as guided by urine culture)

Table 2 Antibiotic dosing

Drug	Standard dose	Weight based dose	Duration for bolus injection (infusion)
Cefazolin	<80 kg 1 g >80 kg 2 g	20–30 mg/kg/dose	3–5 min (20–60 min)
Cefuroxime	1.5 g	50 mg/kg	3–5 min (20–60 min)
Metronidazole	0.5–1 g	15 mg/kg initial dose (7.5 mg/kg subsequent doses)	30–60 min