Antimicrobial Prophylaxis for Surgical Site Infections in Surgical Wards in NorthWest Iran

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Abstract: Surgical Site Infections (SSIs) are associated with a high morbidity, mortality and healthcare costs. The prevention of SSIs is based on a combination of preoperative preparation, surgical techniques, Preoperative Antibiotic Prophylaxis (PAP) and postoperative wound care. The aim of this study was to determinate the current drug use patterns and measuring the improvement of practices on antimicrobial prophylactic usage in the surgical wards. The present cross-sectional study was conducted at referal Medical-Educational centers from northwest of Iran in a 24-months period since Feb 2009 to Feb 2011. A total of 328 hospitalized patients which were undergone different surgical procedures, were enrolled to the study. Antibiotics that were administrated in this study consisted of Cefazolin, Gentamicin, Ceftriaxone, Metronidazole, Vancomycin and Erythromycin. In overall, the most frequent antibiotics which were used in patients were as follows: Cefazolin in 296 cases (90%), gentamicin in 61 cases (18.5%), Ceftriaxone in 28 cases (8.5%). Comparisons of surveillance data in these referral medical-educational centers with international benchmarks provided useful information for infection control interventions to reduce the incidence of SSI.

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1. Introduction

Surgical Site Infection (SSI) continues to be a significant part of healthcare-associated infections. The impact on morbidity, mortality, and cost of care has resulted in SSI reduction being identified as second commonest hospital-acquired infection (1,2). SSIs are a devastating and common complication of hospitalization, occurring in 2-5% of patients undergoing surgery and increasing to 20% of patients undergoing intra-abdominal procedures will improve a SSI (3-6). Patients who develop SSI have 2 to 3 times higher mortality in comparision to uninfected, and hospital readmission rates are significantly increased (7, 8). The prophylactic use of antimicrobial agents has become an important component of the standard of caution in practically all surgical procedures when good and proper principles of prophylaxis are applied (9-12). The efficacy of antimicrobials administered shortly before skin incision for prevention of SSIs was established in the 1960s and has been repeatedly demonstrated since (9-11, 13-15). However, the chosen antibiotic should be continued for a limited time only to prevent the adverse consequences of long-term antibiotic administration. Clean surgeries do not need antimicrobial prophylaxis unless there is a high risk of infection or the consequences of a surgical site infection are tragic (16-18).

The efficacy of antimicrobial prorhylaxis has been studies for decades. However, despite this approved proof of antimicrobial prorhylaxis efficacy, publications of guidlines for antimicrobial prophilaxis is often suboptimal. Some data recommend that approximately 30-50% of antibiotics used in hospitals are prescribed for surgical prophylaxis and 30-90% prescribtions are unsuitable (11, 13-15). Beside this data, many other studies indicate that inappropriate administering of prophylactic antibiotics (wrong antibiotic selection, wrong timing and excess duration of administration) affects prophylaxis procedure (16-19).

In study a by Silver et al. patients undergoing abdominal aortic aneurysm repair, hip replacement, or large-bowel resection in 44 hospitals it was concluded that 14% did not receive antimicrobial prophylaxis, and only 63% of those who received antimicrobials had them administered in the 2 hours before incision (16).

In 2002, the Centers for Medicare & Medicaid Services, in collaboration with the Centers for Disease Control and Prevention, implemented the National Surgical Infection Prevention Project. The project promotes prophylactic practices that have been shown to reduce the risk of SSI, and thus reduce morbidity and mortality in the medicare population. This project builds on experience that the centers for disease control and prevention has gained from implementation of the National Nosocomial

Infections Surveillance System (20,21).

According to the need to produce guidelines for use pattern of prophylactic antibiotics and sufficient information and guidelines for antimicrobial prophylaxis in surgical wards study was designed to evaluate the present use of perioperative antibiotics as prophylactic agents among patients undergoing surgical procedures in referral medical-educational centers from northwest of Iran.

2. Material and Methods

The present cross-sectional study was conducted at refferal Medical-Educational Centers from northwest of Iran in a 24 months period since Feb 2009 to Feb 2011. A total of 328 hospitalized patients which had undergone different surgical procedures, were enrolled in the study after obtaining informed written consent. The study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (TUMS), which was in compliance with the Helsinki Declaration.

Antibiotics which were administrated in this study were consisted of Cefazolin (1gr), Gentamicin (1.7 mg/kg), Ceftriaxone (2 gr), Metronidazole (2 gr), Vancomycin (1gr) and Erythromycin (1gr). This study involved data collection from patient case records. Some demographic data containing sex and age of the patients were considered necessary for the overall conclusions and were collected from each of our participants.Also administered antibiotics and surgery type was extracted from records. In this study, patients were selected from different departments of the Surgery, Urology and burn unit and 50 different surgical procedures have been selected. Stratified methods were used to for sampling process.

Discriptive statistical methods (Mean ± Standard Deviation (SD), frequency (%)) and SPSS 16.0 software was used to analyse the data.

3. Results

A total of 328 patients (256 male (77.8%) with a 44.17±5.28 years age average and 72 female (19.2%) with an average age of 46.06±4.11 years) were included in the study. The majority (85%) of patients taken an elective procedure while 15% were operated on an emergency basis.Distribution of different surgeries among patients was examined (Figure1). All patients with surgical procedure received antibiotic prophylaxis, Cefazolin was prescribed in majority of these cases. A total number of 409 antibiotics were prescribed in our study. The most frequently prescribed classes of antibiotics were Cefazolin (90%), Vancomycin (1.8%), Ceftriaxone (8.5%), Metronidazole (4.5%), Erythromycin (1%) and gentamicin (18.5%). Six different combinations of antimicrobial drugs were used. Seventy-eight percent of patients received a single drug for prophylaxis while 22% received two drugs. 6% received three drugs and one received 4 drugs for prophylaxis (Table 1).

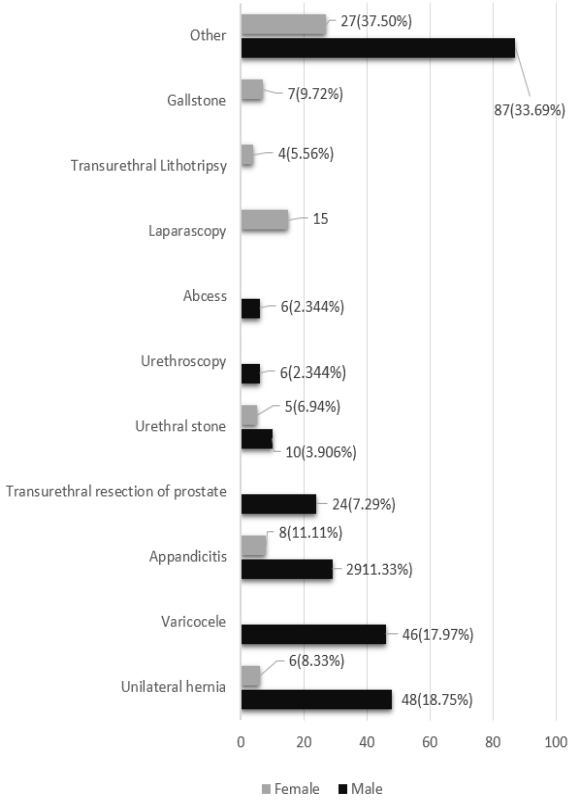

Figure1.Distribution of different surgeries among patients

The use of antimicrobials in all the cases was empirical based on operating surgeon's clinical experience. One of the study patients who was prescribed a combination of drug for prophylaxis experienced nausea. No other adverse drug reaction was reported in the study.

4. Discussion

According to results of this study, The current study shows that adherence to the international guidelines for antimicrobial prophylaxis in our hospital is far from optimal level, also surgeons in Tabriz- Iran are conscious about the importance of antibiotics in preventing SSI. Although guidelines are revised regularly, it is observed that there is a lack of awareness of these revised versions by surgeons. The electronic distribution of guidelines and the existence of a standard protocol specifying antimicrobials for specific operations on prescription charts in every ward and operating room would improve the whole situation (19).

For surgical prophylaxis it is important to select an antibiotic with narrowest antibacterial spectrum to reduce the emergence of resistance and also because broad spectrum antibiotics may be required later if patient develops a serious sepsis

(22,23). But unfortunately our study indicates that most of antibiotics used in Sina hospital has broad spectrum of antimicrobial activity.

Therefore, it is recommended that the use of third generation cephalosporins such as ceftriaxone and cefotaxime should be avoided in surgical prophylaxis (22,24), also our study approves that this method is followed in Sina hospital.

S.aureus is responsible for more SSIs than any other microorganism. The incidence of SSI due to this organism appears to be increasing, as are the numbers of infections due to methicillin-resistant clones. Thus, there is considerable interest in approaches that could help prevent the development of SSI due to S.aureus, including those due to MRSA (25). The CDC guidelines indicate that routine use of vancomycin is not recommended, although it may be the agent of choice when there is a cluster of SSI due to MRSA or coagulase-negative staphylococci (26), fortunately our study shows adhesion to these guidelines either.

The American Society of Hospital Pharmacists (ASHP) suggests prophylaxis with cefazolin as a single agent for most procedures (23, 24, 27). In addition, in this study cefazolin was the most common regimen used accordance with the ASHP guidelines.

A combination of several antibiotics may be used in surgical site when certain Gram-negative bacteria not responsive to cefazolin are involved in addition to Gram-positive bacteria. However, Gram-negative bacteria involved in the surgeries are mostly Gram-negative bacilli and cefazolin alone is able to cover these pathogens; therefore there is no necessity for this combination (21, 26-28). But patients in this study undergoing Prostate procedure received mostly cefazolin and gentamicin.

In contrast with our results, in some centres, an increasing frequency of SSIs caused by MRSA and coagulase-negative staphylococci has led to the use of glycopeptide prophylaxis (28). In a study by Finkelstein et al., vancomycin was compared to cefazolin for treatment of patients undergoing sternotomy. Those authors concluded that the antibiotics had similar levels of efficacy; however, there was a significant increase in the levels of methicillin-susceptible staphylococci in patients receiving vancomycin (29).

In a study by Tijerina et al. about effectiveness of systemic antibiotic application followed by either topical ionized solution (IS) or topical saline solution (placebo) as SSI prophylaxis in appendectomy, it was concluded that topical IS as a prophylactic measure to combat post-operative SSI in patients undergoing appendectomy for nonperforated appendicitis appeared to be more effective than topical placebo, but the results failed to reach statistical significance (30), so it was in contrast with trends shown in this study.

According to the fact that microorganisms in in each area might be different, developing a local hospital guideline may be more appropriate. Our study shows that there is an urgent need to develop such guidelines for surgical prophylaxis in our hospital.

Standardization efforts should be overseen by a committee that includes surgeons, anesthesiologists, microbiologists, pharmacists, and members of hospital epidemiology and infection control departments. Guidelines should be based on hospital-specific bacterial epidemiology patterns, the best literature evidence, and surgeon preference. Standardized protocols should then be provided to surgeons, in an effort to achieve consensus, before implementation (23, 24, 31, 32).

Strategies such as development of local hospital guidelines may improve current antimicrobial prophylaxis practice in this medical-educational center. There is a need to increase adherence to clinical guidelines for antimicrobial prophylaxis in surgery patients these medical-educational centers. Additional effort should also be directed towards increasing the awareness of practitioners about the dangers of inappropriate use of antimicrobials before, during, and after surgeries.

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