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An Audit of Surgical Antibiotic Prophylaxis at the Veterinary Teaching Hospital, Ibadan.

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SUMMARY

An audit of surgical antibiotic prophylaxis at the Veterinary Teaching Hospital, Ibadan between 2008 and 2011 was conducted to evaluate the level of compliance with standard practices. The study involved retrospective case note audit of surgical procedures performed during the period. A total number of 108 operations were audited. Wound (29.62%) and fracture (18.51%) repairs were the procedures most frequently performed respectively.

Majority of procedures (64.81%) were categorized as clean. Penicillin-streptomycin (59.25%), ciprofloxacin (14.81%), amoxicillin (12.96%) and oxytetracycline (9.25%) were the most prescribed antibiotic. Records of duration of procedures, fluid administration and anesthetic protocols were either lacking or poorly documented. There was substantial noncompliance with standard practices. Prolonged administration of antibiotics post-operatively without justification was the most frequent deviation from the guidelines. We recommend the implementation of regular audit of surgical antibiotic prophylaxis.

KEY WORDS: Audit, surgical, antibiotic, prophylaxis.

INTRODUCTION

Antibiotic therapy has had tremendous impact on the practice of surgery. The use of antibiotics to prevent and treat wound infection has created a significant reduction in infection rates. Administration of parenteral antibiotics during a critical peri-operative interval has markedly reduced wound infection rates after a wide variety of operative procedures in human surgical patients (Rosin, 1990). However, confirmation of a similar reduction in infection rates in small animals has not received commensurate attention.

The use of antibiotics for treatment is perhaps less controversial than their use for prophylaxis. In both circumstances, it is important to understand the basic considerations involved in the use of antibiotics. These include adverse effects, mechanism of action and the relationship of pharmacokinetic parameters to the therapeutic response (Rosin et al., 1993).

Although antibiotics can be important in decreasing post-operative wound infection, the best way to reduce the incidence of surgical infection is to use excellent surgical techniques in which asepsis, gentle handling of tissue, meticulous hemostasis, judicious use of suture materials and accurate apposition of tissue without obstructing blood supply are accorded prime consideration.

The use of antibiotics to prevent infection is

indicated in surgical procedures that have high risk of infection and in which the consequences of infection seriously endanger a patient or the success of an operation (Ludwig et al., 1993). There has been categorization of wound based on estimate of contamination. Such classification described procedures as clean, clean-contaminated, contaminated and dirty (Page et al., 1993, Rosin et al., 1993, Song and Glenny, 1998). Several other studies have also been performed that investigated the utility of prophylactic antibiotic in surgery (Fabian et al., 1992, Dellinger et al., 1994, Bratzler and Houck, 2005, Luchette et al., 2006). Recommendations for appropriate use of antibiotics in surgical prophylaxis include the following:

- Prophylactic antibiotics should target anticipated organisms.
- For majority of procedures, prophylaxis should not exceed 24 hours
- Prophylaxis is unnecessary if the patient is already receiving antibiotics that cover likely pathogens
- A single dose of antibiotics is as effective as a full 5-day course of therapy in uncomplicated procedure.
- Complicated, contaminated or dirty procedures should receive additional post-operative coverage
- Timing of administration of antibiotics should be adjusted to maximize prophylactic efficacy (Page et al., 1993; Rosin et al., 1993, Bratzler and Houck, 2005).

There is however, a divergence of opinion with regards to surgical prophylaxis, as the data from these studies seem to support several recurring themes. Records of minimum data set to document the administration of surgical antibiotic prophylaxis that could facilitate audit of the appropriateness and utility of surgical antibiotic prophylaxis are lacking or totally non-existent in some practices.

Standard practices on the use of antibiotics prophylactically in surgery demand appropriate classification of operation, justification for giving prophylaxis, timing and duration of administration among others. While the benefits of surgical prophylaxis are not in doubt, the disruption of ecological balance of gut microflora associated with its use may result in colonization by exogenous potentially pathogenic micro-organisms (PPMOs) and in the outgrowth of indigenous PPMOs (Vollard and Classener, 1994), with the resultant emergence of resistance (Livermore, 2003).

Emergence of antimicrobial resistance is an increasing concern in both human and veterinary medicine (Guardbassi et al., 2004). Increased prevalence of antimicrobial resistance in various bacterial species from pet animals has been reported in the United States of America and the United Kingdom, with resistance generally associated with antimicrobial therapy (Guardbassi et al., 2004, Prescott et al., 2002).

There is presently a dearth of information either on the prophylactic use of antibiotics in surgery or established guidelines on surgical antibiotic prophylaxis in the Veterinary Teaching Hospitals, of the University of Ibadan, Nigeria.

The present study is designed to evaluate the level of compliance with standard practices with regard to administration of antibiotic prophylaxis for surgical patients and to provide evidence-based justification for the establishment of a guideline on the use of prophylactic antibiotics in surgery at the Veterinary Teaching Hospital, Ibadan.

MATERIALS AND METHODS

The present study was carried out between January and May, 2012 at the Small animal Surgery unit of the Veterinary Teaching Hospital, University of Ibadan. It involved a retrospective study of case records of all surgical patients presented and attended to at the hospital between 2008 and 2011. An audit

of surgical procedures performed during the period was undertaken to obtain data with regard to the administration of surgical antibiotic prophylaxis. The minimum data set to document and facilitate audit of the appropriateness of surgical antibiotic prophylaxis obtained from the case records. This was based on the types of procedures, classification of operation, duration of procedure, justification for prophylaxis, justification for not giving prophylaxis, type of antibiotic used, time of administration, duration of administration, record of adverse reaction/allergies to antibiotics, fluid administration, anesthetic protocols and documentation of prophylaxis (Bratzler and Houck, 2005).

Statistical analysis

The data obtained from the case records were subjected to descriptive statistical analysis. Values were presented as percentages of cases attended to in the period under consideration.

RESULTS

One hundred and eight (108) operations in small animals were audited during the study. Wound and fracture repairs were the procedures most frequently performed with incidence of 29.62% and 18.8%, respectively. (Table I).

Table I: Incidence of small animal surgical procedures performed at the VTH, Ibadan (2008-2011)

Surgical conditions	Frequency	Percentage
Orchidectomy	6	5.55
Fracture repair by open reduction	20	18.51
Luxation repair by open reduction	6	5.55
Aural hematoma	16	14.81
Wound repair/Laceration	32	29.62
Herniorrhaphy	4	3.70
Caesarean section	4	3.70
Caudectomy	6	5.55
Otoplasty	2	1.85
Gastric torsion/gastropexy	2	1.85
Eye enucleation	2	1.85
Tumor removal	8	7.40
	108	100%

Figure I show the classification of procedures performed during the period of study. Majority of procedures were categorized as clean (64.81%), while contaminated, clean-contaminated and dirty wounds constituted 18.51%, 9.25% and 7.04%, respectively. The types of antibiotics used for surgical prophylaxis is presented in Figure II. Penicillin-Streptomycin was the most prescribed antibiotic for prophylaxis (59.25%), while 14.81%, 12.96%, 9.25% and 3.70% of cases administered Ciprofloxacin, Amoxicillin, Oxytetracycline and Gentamycin for prophylaxis, respectively.

Figure I: Wound classification of procedures performed at the VTH

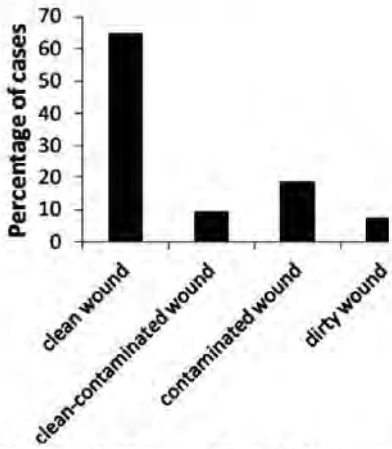
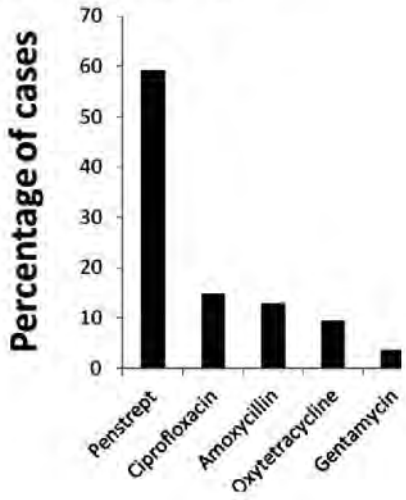
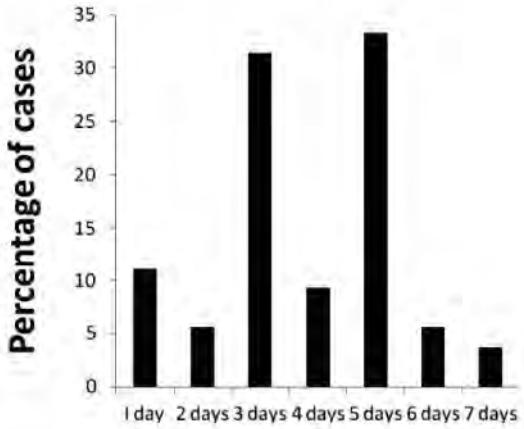


Figure II: Types of antibiotic used for surgical prophylaxis at the VTH



Significant number of patients received antibiotic prophylaxis for three (31.48%) and five (33.33%) days. Prolonged administration of surgical prophylaxis for 3 or more days was documented in about 83.35% of procedures (Figure III). The timing of administration of surgical prophylaxis is presented in Figure IV. Prophylactic antibiotic was administered post-operatively in all the procedures, while in 7.40% and 29.62% cases, prophylaxis was administered pre-operatively and peri-operatively, respectively.

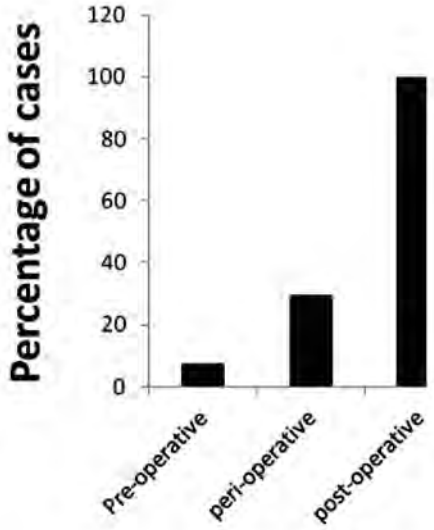
Figure III: Duration of surgical prophylactic antibiotic administration in the VTH



Administration of prophylaxis was justified in only 35.19% of procedures while in a larger proportion of procedures, antibiotic prophylaxis was given without justification (Figure V).

Duration of procedures performed was not documented in the majority of procedures. However, in 3.70%, 11.11% and 16.66% of procedures, the operations lasted for less than I hour, 2-3 hours and above 3 hours, respectively (Figure VI). Records of fluid administration and anesthetic protocols during surgical procedures were either scanty or totally lacking.

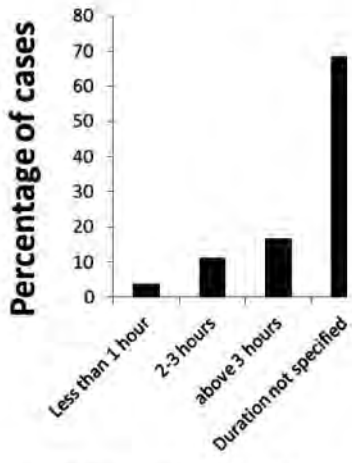
Figure IV: Timing of surgical prophylaxis administration



DISCUSSION

An important aspect in the delivery of professional veterinary services is the availability and use of a wide range of effective veterinary medicines. The significance of this professional activity

Figure VI: Duration of procedures performed at the VTH during the period of study



prescribing, authorizing and dispensing veterinary medicines. The veterinarians' authority to prescribe and administer such substances carries significant legal and ethical responsibilities. The rationale for prudent use of antimicrobial agents is to maximize

therapeutic success and at the same time minimize development of antimicrobial resistance, thereby safeguarding antimicrobials for future veterinary and human use. Veterinary antimicrobials are the same as, or closely related to antimicrobials used in human medicine. It is therefore vitally important that the veterinary profession uses antimicrobials prudently in order to minimize selection of resistant veterinary pathogens and safeguard animal health and also to minimize possible resistance transfer to human pathogens.

Although the use of antibiotics to prevent and treat surgical infection has created significant reduction in infection rates (Rosin et al., 1993), best results are obtained only with substantial compliance with standard practices. The present study therefore evaluated the level of compliance at the Veterinary Teaching Hospital with regard to administration of surgical antibiotic prophylaxis.

A total of one-hundred and eight operations were audited during the period of study. The number was unexpectedly low for a veterinary teaching hospital that was supposed to serve as referral centre for most practices in the southwest zone of the country. This finding may be ascribed to clients' failure to present their animals for surgery after diagnosis, as it was observed from the records that many cases were actually presented, diagnosed for surgical disease but failed to honor appointment for operation.

Of the cases operated upon, a significant number (64.81%) were categorized to be clean procedures that normally should not have attracted the use of antibiotic prophylaxis while only about 25.91% may have merited the administration of prophylaxis. Our findings, however, revealed that all the cases operated received antibiotic prophylaxis irrespective of wound class. This finding is not in line with recommended practices and guideline on the administration of surgical antibiotic prophylaxis (Page et al., 1993; Rosin et al., 1993; Martins, 1994; Bratzler and Houck, 2005).

The most prescribed antibiotic for surgical prophylaxis in the procedures audited was Penicillin-Streptomycin, accounting for 59.25%, while Ciprofloxacin, Amoxycillin, Oxytetracycline and Gentamycin were accorded lesser preferences in declining order. What informed the choice of antibiotic could not be ascertained from the case records. Perhaps the surgeons may have been guided by the need for antibiotics selected for prophylaxis to be effective against the micro-organisms most likely to cause post-operative wound infection.

The report of Rosin (1990) indicated that coagulase-positive Staphylococcus and E. coli predominate as the bacteria most frequently cultured from wounds in small animal patients. Since culture and sensitivity data were not documented in cases audited, the choice of Penicillin-Streptomycin for prophylaxis in most cases may not have been justified. The use of quinolones and third/fourth generation cephalosporins with superior antimicrobial sensitivities might be a viable alternative for cases in which prophylaxis is indicated. Administration of Penicillin-Streptomycin and other antibiotics without clear indication and justification as observed in this study, to us, amount to inappropriate antibiotic prescribing and may encourage development of resistance.

The duration of surgical prophylactic antibiotic administration in the procedures audited revealed that significant number of cases (83.4%) received antibiotics for three or more days. This finding appears not to be in tandem with standard practices. For many types of commonly presumed surgery, there is consistent evidence that a single dose of antimicrobial with a long half-life to achieve activity throughout the operation is adequate (Song and Glenny, 1998; Fabian et al., 1992;

Luchette et al., 2006). There is also evidence from several studies that longer dosage duration has no increased benefit over a short course (Bozorggadah et al., 1999; Dellinger et al., 1994; Fabian et al., 1992; Takahashi et al., 2005).

The timing of administration of prophylaxis in this study expectedly was characterized by a prolonged period, as all the cases audited received antibiotics post-operatively. This practice did not seem to be in line with standard practices. The pharmacokinetic profile and route of administration of an antibiotic determines the time taken for it to reach an effective concentration in any particular tissue (Martin, 1994). This, along with other factors such as the type and duration of procedure should be considered in arriving at appropriate timing of administration.

With regard to justification for giving antibiotic prophylaxis based on wound classification and the duration of procedures performed, our findings revealed lack of justification in majority (64.81%) of operations audited. Equally, justification could not be substantiated based on the duration of procedures because the records were not documented in substantial number (68.51%) of cases. Both findings, to us, suggest non-compliance with standard practices being characterized by indiscriminate and inappropriate use of antibiotic prophylaxis.

It is also instructive that records of fluid administration and anesthetic protocols were either scanty or totally lacking in almost all the cases audited. These information are vitally important to achieving the goals of prophylactic administration of antibiotics to surgical patients. Since serum antibiotic concentrations are reduced by blood loss and fluid replacement, especially in the first hour of surgery, when drug levels are high (Dehne et al., 2001), standard practices dictate that in the event of major intra-operative blood loss, additional dosage of prophylactic antibiotic should be considered after fluid replacement (Dellinger et al., 1994; Dehne et al., 2001; Bratzler and Houck, 2005), in addition to improved oxygenation (Grief et al., 2002).

Our findings from this study revealed substantial non-compliance with standard practices with regard to administration of prophylaxis for surgical patients, with prolonged antibiotic administration in clean surgical procedures being the most frequent deviation from the guidelines. Previous study by Voit et al. (2005) reported that antimicrobial surgical prophylaxis is often inconsistent with recommended guidelines. Prophylactic antimicrobial drugs in surgery are not indicated for routine, aseptic surgery of less than 90 minutes duration where no pre-existing infection is present, where the gastro-intestinal, female reproductive or respiratory systems have not been invaded, and aseptic technique maintained. However, the use of antibiotics in a prophylactic manner may be justified in situations such as operative procedures in the field, dental procedures with associated bleeding, patients with leucopenia, contaminated surgery, prosthesis insertion or where the consequences of sepsis would be potentially irreversible, life-threatening or likely to cause prolonged pain or suffering. Indications have also evolved that considered wound contamination together with anesthetic risk and relative duration of operation (Ludwig et al., 1993).

Although records of fluid administration and anesthetic protocols were poorly documented in this study, we are of the opinion that consideration be given for additional dosage of prophylactic antibiotics (Dellinger et al., 1994; Dehne et al., 2001, Bratzler et al., 2005) and supplemental oxygenation (Grief et al., 2002) in prolonged procedures with blood loss and fluid replacement. Substantial non-compliance with standard practices and guidelines with regard to surgical antibiotic prophylaxis observed in the present study may be

associated with disruption of ecological balance of the microflora in the bowel with consequent colonization by exogenous potentially pathogenic microorganisms and outgrowth of indigenous potentially pathogenic micro-organisms, spread of infection and emergence of resistance (Vollard and Classener, 1994).

Recommendations emanating from such exercise should be based on a common set of operations. A protocol that clearly delineates responsibility for prophylactic antibiotic administration and documentation should also be developed for use in the Veterinary Teaching Hospital.

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