Prophylactic Antibiotic for Pacemaker Surgery: What is Optimal Duration?

Thomas M. O., Ogunleye E. O.

SUMMARY

Background: Pacemaker infections occur worldwide. There is no report of any research on prophylactic antibiotic usage for Pacemaker Surgery in Nigeria. There is also no agreement on duration of prophylactic antibiotics for pacemaker surgery.

Aims and Objectives: We sought to determine the efficacy of Prophylactic Ceftriaxone in Pacemaker Surgery using the short and long regimen.

Methodology: Our team did a series of transvenous pacemaker insertions over a 7-year period. Some of the patients were given prophylactic ceftriaxone for 3 days while others were given for seven days. Aseptic techniques were strictly adopted. They were followed up for varying periods looking out for possible pacemaker related infections.

Results: Out of the 100 pacemakers inserted, infection occurred in 3 patients. One of them, a bed-ridden patient developed severe pocket infection necessitating explantation and replacement 3 weeks later.

Conclusions: We noted with satisfaction that short regime of prophylactic parentral ceftriaxone is effective in preventing pacemaker infection and there is no need for the long regimen.
Niger Med J. Vol. 50, No. 1, Jan. – March, 2009: 9 – 11.

Key words: Prophylactic Ceftriaxone, Pacemaker Surgery

INTRODUCTION

Pacemaker associated infections are not very common but they are potentially serious complications of pacemaker implantation [1, 2]. The reported incidences vary from 0.5 to 5%[1, 2,3]. The various predisposing factors include prolonged periods of operation, repeat procedures and trisomy 21 among others [2,3].

The common organisms involved are skin commensals, which contaminate surgical wounds and may cause superficial or deep pocket abscesses. The organisms are mainly Staphylococcus aureus and Staphylococcus epidermidis. A common reason for pacemaker infection is pacemaker (lead or generator) erosion[2]. Prophylactic antibiotics are generally recommended in pacemaker surgery but there is no consensus regarding its duration[4]. Durations of 1 to 10 days have been variously practised[4]. In Nigeria, the cost of purchasing a Pacemaker is beyond the reach of an average citizen. It is also a known fact that the operating environment may not be ideal on many occasions.

Therefore, going the extra length to administer antibiotics for unusually long periods for implant surgery may be beneficial. This can be understood because it is known that 80.5% of pacemakers – needing patients rely on charity for pacemaker procurement and implantation in Nigeria[6]. Should such a pacemaker be explanted on account of infection, the implication can better be imagined. Ceftriaxone is a third generation cephalosporin with significant efficacy against both gram positive and gram-negative bacteria. Activity against pseudomonas is less than with ceftazidime. It has a long half-life and low toxicity[5]. It is widely used prophylactically in implant surgery.

The objectives of this study were three-fold. Firstly, to determine the efficacy of prophylactic ceftriaxone for permanent pacemaker surgery. Secondly, the study was to compare short-term (72 hours) with long-term (7 days) prophylactic ceftriaxone administration for permanent pacemaker operations under different conditions. The third reason for conducting the research was to attempt to determine a safe dosage regime for prophylactic ceftriazone for pacemaker surgery in Nigeria.

METHODOLOGY

One hundred consecutive patients who underwent permanent pacemaker implantation done by our team from December 1999 were included in the study. It was a multi-centre study carried out in Lagos Metropolis in Nigeria.

The patients were evaluated before they were prepared for surgery. We could not do a proper double-blinded study in view of the cost that may go with an infected pacemaker especially in Nigeria.

Procedure

Some of the patients were operated in ideal theatre conditions with C – arm guidance. The others were operated in a less ideal location (a general x-ray suite) under fluoroscopic guidance. The selection of location for operation was randomised. We observed aseptic rules as required by making sure that the surgeon, the assistant and the nurse assistant(s) scrubbed up and wore sterile gowns and gloves for the procedures.

From: Lagos University Teaching Hospital/ College of Medicine of University of Lagos, Nigeria

Correspondence: **Dr. M. O. Thomas,** Cardiothoracic Surgery Unit, Lagos University Teaching Hospital/ College of Medicine of University of Lagos, Nigeria. Tel. +234 808 308 8891

The main author performed all the operations as the lead surgeon. Operation sites were properly cleaned with savlon or hibitane and methylated spirit was applied. Sterile drapes were used for all the cases. Oral diazepam 10mg was given to the patients two hours before operation and 1% xylocaine in adrenaline was used for field block. Intravenous ceftriaxone (Rocephin) 1gm was commenced at time of anaesthesia and continued for varying length of time.

The duration and frequency of administration were randomised. Fifty seven patients were given 1gm daily for 72 hours (Regime A) while the others had it once daily for one week (Regime B). We used the transvenous route for most patients through direct cannulation of the subclavian vein or cephalic vein cut down at the delto-pectoral grooves. Wounds were closed in two layers using chromic catgut for subcutaneous layer and interrupted nylon for skin (or absorbable subcuticular) closure. All wounds were dressed with dry gauze held with non-occlusive adhesive tapes.At the end of the exercise, we analysed the data. We tested the duration of prophylactic antibiotic regime (A or B) against operation location (theatre or x-ray suite).

RESULTS

One hundred patients were involved in the study. Two of them were for generator replacement operations. All of them had prophylactic ceftriaxone administered intravenously. Fifty three patients were given 1gm intravenously 12 hourly for three days. Twenty four of them were operated in the general x-ray suite while 29 of them were operated in ideal theatre suites. Forty seven patients had 1gm daily for 7 days. Seventeen of them were operated in general x-ray suites while 30 of them were operated in ideal theatre suites. The first doses were intravenously administered while the remaining six doses were given intramuscularly). Two patients developed acute staphylococcal infections (within two weeks of implantation) while one patient developed late pseudomonas infection (seven weeks after operation). The patients who developed pacemaker infections had further management as follows:

One patient had oral Clavulanate-potentiated Amoxicillin (augmentin) successfully for four weeks. A case with pocket abscess, which did not respond to above treatment measure necessitated pacemaker explantation and re-insertion through the other side three weeks later. Another pocket abscess was irrigated with 1% hydrogen peroxide and the wound was closed over a corrugated drain inserted into the most dependent aspect of the pacemaker pocket.

The drain was left for seven days and the wound was cleaned with methylated spirit daily and dressed with dry gauze for ten days before the stitches were removed.Oral augmentin and perflacin were given to the patient for 10 days followed by oral ciprofloxacin 500mg bid for two weeks. All other patients did well with a mean follow up of about 29 months.

Table 1: Infection rate based on duration of antibiotic therapy

	Long therapy	Short therapy	Total
Infected	2	1	3 (3.0%)
Non infected	45	52	97(97.0%)
Total	47 (47.0%)	53 (53.0%)	100 (100.0%)

Table 2: Infection rate based on operation location

Location	Infected	Non-infected	Total
Theatre	2	57	59 (59.0%)
X-ray suite	1	40	41 (41.0%)
Total	3 (3.0%)	97 (97.0%)	100 (100.0%)

DISCUSSION

Pacemaker insertion requires strict measures to maintain the chain of sterility. This is very important because it involves implantation of devices that are generally expensive to replace as may be necessary with severe infections. Out of the 100 pacemakers implanted during the study period three (3.0%) of them developed pacemaker related infections. Two of the patients were fully treated conservatively while only one (1.0 %) required replacement. This is quite within the 0.5 – 5% infection rate in literature[1,2,3]. There were two cases of pulse generator replacement. The average follow-up time was 29 months. It is therefore significant to note that only one late infection was noted.

None of the major factors predisposing to pacemaker infections like skin erosion by the leads or the generator was seen in any of the patients studied even though the most common cause of infection in literature is erosion of either the pulse generator or the pacing lead[2]. The fact that these did not occur may explain the low infection rate in our series. It therefore means that, if the predisposing factors are avoided, pacemaker infection rate will be reduced.

One of our patients had cerebrovascular accident preoperatively and she was bed ridden for several years. She developed pacemaker infection when she was bedwetting. There was no correlation between infection rate and duration of prophylactic antibiotic therapy.

One of the patients who had short therapy was infected. The other two infected cases had long periods of prophylactic antibiotics. The pocket abscess that necessitated explantation occurred in the patient who had cerebrovascular accident. This patient had obvious predisposition to sepsis. Therefore co-morbidity is the only contributory factor to infection going by the results of this study. However larger series is needed to justify this assertion. Our conclusion is that there is no significant difference between the short-term and long term usage of ceftriaxone for pacemaker surgery. The short term regime is therefore recommended because of the reduced cost of care.

REFERENCES

1. Mounsey J. P., Griffith M. J., Tynan M., Gould F. K., MacDermott AF, Gold RH, Bexton RS. Antibiotic Prophylaxis in permanent pacemaker implantation; a prospective randomized trial. *Br. Heart J.* 1994; **72(4):** 339 – 343.
2. Mokaddem A., Bachraoni K., Sdiri W., Kachboura M. R. Pacemaker infections; *Tunis Med* 2002; **80(9):** 509 – 514.
3. Cohen M. I., Bus D. M., Gaynor J. W., Vetter V. K., Tanel R. E., Rhodes L. A; Paediatric pacemaker infections: twenty years of experience *J Thorac Cardiovasc Surg* 2002; **124(4):** 821 – 827.
4. Dwivedi S. K., Saran R. K., Khera P., Tripathi N., Kochar A. K., Narain V. S., Puri V. K. Short-term (48 hours) versus long-

term (7 days) antibiotic prophylaxis for permanent pacemaker implantation. Indian Heart J 2001; **53(6):** 740–742.

5. Sabiston D. C. Surgical Infections and choice of antibiotics in Textbook of surgery: The biological basis of modern surgical practice: 14th Edition 1991; Pg. 231 – 234.

6. Thomas M. O. Cost Issues in Pacemaker Surgery in Nigeria. *Nigerian Quarterly Journal of Medicine* 2004; **14(2):** 140 – 142.