ANTIBIOTIC PROPHYLAXIS IN CLEAN NEUROSURGICAL PROCEDURES (A retrospective Study*)

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SUMMARY : 1076 operations were performed in our department between January 1989 and December 1991. The effectiveness of antibiotics administered intraoperatively has been compared in 340 electively operated cases. Clean and clean - contaminated cases have been selected for the study, including cranial, spinal and peripheral nerve operations. Cefotaxime was given intravenously to 100 patients during anaesthesia induction. Amoxycyllin-Clavulanate was administered to another 100 patients with the same manner. In the third group, Amoxycyllin-Clavulanate was given to 100 patients in the postoperative period. Forty patients were followed without any antibiotic regimen. We observed that single dose, intraoperative antibiotic prophylaxis had exhibited the best results when compared to postoperatively administrated antibiotics.

Key Words : *Neurosurgery, Antibiotic Prophylaxis, Infection, Cefotaxim, Amoxycyllin.*

INTRODUCTION

Many studies revealed that antibiotic prophylaxis is a reasonable method for the prevention of postoperative infections, especially in the abdominal and orthopedic operations (Al Mefty and Glessa, 1988; Huizinga and Robbs, 1983; Playforth and Smith, 1987). Although the presence of many studies which have proved the beneficial effect of peroperative antibiotic prophylaxis in clean neurosurgical procedures; the role of this concept is still controversial (Bullock and Dellen, 1988; Dempsey and Rapp, 1988; Djindjian and Lepresle, 1990; Geraghty and Feely, 1984; Haines and Goodman, 1982; Horwitz and Curtin, 1975; Malis, 1979; Quartey and Polyzoidis, 1981; Young and Lawner, 1987). Most of the neurosurgical centres have an infection rate of less than 5 % in clean cases. This rate can be lowered by antibiotic prophylaxis.

MATERIALS AND METHODS

The retrospective analysis of 340 cases operated upon between 1989 and 1991 was done regarding the use of intra and postoperative antibiotics. All of the patients had been electively operated on in the normal daily working hours. Two hundred and five of them were male and 135 female with the age distribution between 18 and 70. This study included 256 spinal, 72 cranial and 12 peripheral nerve surgical procedures. Mean duration of these procedures were about 2-3 hours. Foreign material application procedures (i.e. ventriculo-peritoneal shunting, cranioplasty with allografts) have been excluded.

Chlorhexidine was used for the preoperative hand cleaning. The operation site was prepared

with Povidone-Iodine solution, and sterile adhesive surgical drapes were used in all cases. Closed drainage systems with vacuum were left subcutaneously for 6-12 hours in all craniotomy procedures.

The patients were divided into 4 groups : *Group 1 : 1,2 gr. of Amoxycyllin-Clavulanate was intravenously (IV) given in a single dose, during the anaesthesia induction (100 patients). *Group 2 : 2 gr. of Cefotaxime was given, during the anaesthesia induction, in a single dose via IV route (100 patients). *Group 3 : During the first postoperative week, 600 mg. Amoxycyllin-Clavulanate were given in every 8 hours (100 patients). *Group 4 : We did not give any antibiotics to 40 spinal operations in this group.

Patients with a medical history of recently performed neurosurgical operation (within 1 month) or any antibiotic usage (within 1 week) were excluded.

The conditions in which the patients had been accepted as "infected" were as follows : 1) purulent drainage from the incision site and positive result of wound culture, with or without fever, 2) bacterial meningitis following the operation. 3) the presence of white blood cells in the cerebro-spinal fluid with wound inflammation and meningism.

The results were then statistically analysed with the standart t test.

RESULTS

The infection rates of our patient groups are shown in table I. There were 3 infections (1.5 %) in the intraoperative antibiotic group (200 patients) with two of these seen after cranial operations and under Cefotaxime regimen; and one S. aureus wound infection after a peripheral nerve surgical procedure. In one of the cranial operations, the infection was H. influenzae meningitis, while the cultures had been negative in the other patient, although he had demonstrated the signs and symptoms of meningitis.

There were 6 infections (6 %) in the postoperative antibiotic group, 3 seen following cranial and 3 after spinal procedures. The infections in the spinal procedures were : 1) skin and subcutaneous tissue infection with S. aureus, 2) paravertebral muscle abscess with Klebsiella, 3) osteomyelitis due to Klebsiella, Meningitis with S. aureus + E. coli in 1 case and signs of meningismus with negative cultures were seen in 2 cases after cranial operations with postoperative antibiotics.

In the third group (no antibiotics given), the infection rate was 7,5 %.

Table II shows the infection rates of the intraoperative antibiotic groups. The infection rate was 0 % in the Amoxycyllin-Clavulanate group and 3 % in the Cefotaxime group. This difference is not statistically significant.

Despite of the high rate of infection in the third

Surgical Procedure	Intraoperative Antibiotic*		Postoperative Antibiotic**		No Antibiotic		TOTAL
	total	infected	total	infected	total	infected	
Spinal	134	0	82	3	40	3	256
Cranial	57	2	15	3	-	-	72
Peripheral Nerve	9	1	3	0	-	-	12
TOTAL	200	3	100	6	40	3	340

Table - 1 : The distribution of cases.
* : Amoxycyllin - Clavulanate or Cefotaxime. ** : Amoxycyllin - Clavulanate.

Infection	Amoxycyllin+Clavulanate	Cefotaxime	Total
present	0 % (0)*	3 % (3)	1,5 % (3)
absent	100 % (100)	97 % (97)	98.5 % (197)
total	100 % (100)	100 % (100)	100 % (200)

Table - 2 : Infection rates of intraoperative antibiotic groups.

group, statistical analysis did not include these patients because of the low number of cases.

Table III demostrates the infection rates of the intraoperative and postoperative antibiotic groups. The infection rate was found to be 1,5 % in the intraoperative antibiotic group; while 6 % of cases were infected when postoperative antibiotics were used, with a statistically significant difference.

Infection	Intraoperative antibiotic	Postoperative antibiotic	Total
present	1,5 % (3)	6 % (6)	3,75 % (9)
absent	98,5 % (197)	94 % (94)	96,25 % (291)
total	100 % (200)	100 % (100)	100 % (300)

Table - 3 : Infection rates of intraoperative and postoperative antibiotic groups.

No side effects due to the use of antibiotics had been encountered.

DISCUSSION

The results of this study suggest that intraoperative antibiotic regimen seems to be more effective than postoperative antibiotic treatment. Various reports have been published in the medical literature about peroperative antibiotic usage. With only soap and water the infection rate was less than 1 % in cushing's disease (Dempsey and Rapp, 1988). In the operations for lumbar disc disease, Horwitz and Curtin reported that the infection rate was 1 % in 402 Lincomycine-treated patients; while 9,3 % of the 128 cases had been infected when no antibiotics had been used (Horwitz and Curtin, 1975).

Malis tried a double antibiotic regimen (Gentamycine single dose, 80 mg. intramuscularly, plus Vancomycine 50 mg. single dose IV) in 1732 clean neurosurgical procedures (Malis, 1979). In addition to this medication,he irrigated the wound with Streptomycine solution (50 mg/lt.) during the operation. The infection rate was 0 % in his cases. His method was used by some authors. Quartey reported 0,8 (Quartey and Polyzoidis, 1981), Haines 0,9 % (Haines and Goodman, 1982), and Geraghty 0,5 % (Geraghty and Feely 1984) as rates of infection with this method.

Savitz described another single dose intraoperative antibiotic regimen (2 gr. Cephalotine IV or 1 gr. Cephazoline IV) in 1602 clean neurosurgical procedures (Savitz and Katz, 1986). They did not see any infection in these cases.

Young gave Cephazoline 1 gr. +Gentamycine 80 mg. IV, 1 hour before the operation and in every 6 hours during the operation (Young and Lawner, 1987). The infection rate was 0.96 % in their cases.

Bullock found an infection rate of 2 % with peropeative Piperacylline (Bullock and Dellen, 1988).

With Oxacylline prophylaxis, Djindjian's infection rate was 0.06 % in 356 cases; while 4.9 % of the control group were infected (Djindjian and Lepresle, 1990).

It is clear that peroperative antibiotic application can decrease the probability of postoperative infection. However, there is no consensus on the sort of the most effective antibiotic or antibiotics. The most frequently isolated microorganisms are S. aureus and S. epidermidis in the infected neurosurgical cases in the Western countries (Dempsey, 1988; geraghty, 1984). It may well be postulated that besides the Gram (+) microorganisms, Gram (-) causative agents also may have an important role in the etiology of postoperative infections in Turkey. We determined 9 infections in our 340 cases. The causative agents could be isolated in 6 of them; 2 were Gram (+) and 3 were Gram (-) microorganisms. In one case, both Gram (+) and (-) microorganisms were isolated. We could not see any significant difference between the spinal and cranial operation groups.

Two different antibiotics were used in this study. Cefotaxime, a third generation Cephalosporine, effective on Gram (-) microorganisms, with variable effect on Gram positives. This antibiotic was deliberately chosen, because of the relatively high frequency of serious Gram (-) postoperative infections in our country. We could not see any significant difference between the intraoperative Amoxycyllin+ Clavulanate and Cefotaxime groups. Hence we think that Amoxycylline+ Clavulanate combination is a rather safe and reliable choice for intraoperative use. Because of the high risk of

resistance development, Cefotaxime must only be given depending upon the results of culture and antibiogram.

As a conclusion, in clean neurosurgical procedures, intraoperative single dose antibiotic prophylaxis is a safe, cheap and beneficial method.

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