Original Article

Pharmacology Section

Comparison of the Use of Single and Combined Antibiotics for Head and Neck Onco-Surgeries: A Cost effective Analysis

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ABSTRACT

Back ground and Objectives: The use of prophylactic antibiotics in surgical treatment is well-established. However, the duration and the dosage of the prophylaxis vary substantially among the surgeons. Therefore, we intended to explore the differences in the cost efficiency in single and combined antibiotics as the prophylaxis for the surgical treatment of major head and neck onco-surgeries.

Methods: 50 patients of either gender with head and neck cancer, who were to undergo major surgeries were chosen. The perioperative antibiotic prophylaxis and the antibiotics which were used to treat the post operative wound infections were noted. The data on the drug costs were obtained and the cost analysis was performed by comparing the costs which were incurred on using a single antibiotic and combined antibiotics as the prophylaxis. The wound infection controlled days, the time taken for wound healing and the duration of the hospital stay were followed up.

Results: 22 subjects were on single antibiotic therapy and 28 were on combination therapy. Among those who were on single antibiotic therapy and combined therapy, 11 (50%) and 7 (25%) had post operative wound infections respectively. The Mean ± SD of the cost which was incurred on using a single antibiotic as the prophylaxis was lesser than (803.15 ± 1104.56 rupees) that which was incurred on using combined antibiotics, i.e 1524.29 ±1468.28 rupees. But, the total cost (for the prophylaxis and the post operatively used antibiotics) had no significant difference between the groups, which used a single antibiotic and combined antibiotic prophylaxis. Among the patients who developed post op infections either with the single antibiotic or with combined antibiotic use, the prophylaxis did not show a significant difference in the total cost which was incurred. Also, it did not make a significant difference in the means of the time which was taken for wound healing.

Interpretation and Conclusion: There is no significant difference in the total cost which was incurred on using either a single antibiotic or combined antibiotics as the prophylaxis, due to the increased post operative infections in patients who used a single antibiotic as the prophylaxis.

Key Words: Head neck onco-surgery, Antibiotics, Prophylaxis

INTRODUCTION

Patients undergoing head and neck oncological surgeries carry risk factors like blood loss, chemotherapy, tracheotomy, malignant tumour etc. which contribute to operative wound infections [1]. Also, there is an additional risk of being contaminated with the oropharyngeal secretions [2]. Therefore, antibiotic prophylaxis has been made mandatory for patients who undergo oncological head and neck surgery surgeries [3]. Perioperative antibiotic prophylaxis has significantly reduced the wound infection rates in head and neck surgical procedures [4]. It has been demonstrated that most of the head and neck onco-surgical infections are polymicrobial in nature [5]. Some studies have suggested that antibiotics for gram-negative organisms or broadspectrum antibiotics may be unnecessary [6]. Thus, an optimal antibiotic regimen is still a matter of debate. Therefore, this study intended to explore the differences in the use of single and combined antibiotics as perioperative prophylaxis for the surgical treatment of major head and neck onco-surgeries. Cefazolin, Ciprofloxacin, Cefprozil and Clindamycin were tried as single prophylactic antibiotics based on previous studies [7], [8]. Wound infections following head and neck onco-surgeries are an important cause of post-operative morbidity, thus indicating the need for an aggressive management and for increasing the cost which was incurred on the antibiotic usage [9]. Therefore, this study also intended to perform the cost analysis for antibiotic usage as the prophylaxis and for post operative wound infections.

MATERIALS AND METHODS

This follow-up study was under taken by the Department of Pharmacology, Sri Devaraj Urs Medical College, Kolar and the Department of ENT, Jalappa Hospital and Research Centre, Kolar. This study was conducted after obtaining the approval of the research and ethical committees. Fifty (50) patients of either gender with head and neck cancer, who were posted for surgery were chosen. Patients suffering from HIV or Hbs'Ag', those who were consuming antibiotics in the preceding week of the surgery and those who were consuming steroids were excluded from the study. Informed consent was taken from all the patients for the performance of the surgery. After obtaining a detailed history, a physical examination was conducted at the time of admission for all the patients. All the necessary investigations like a complete haemogram, blood sugar analysis, urine analysis, evaluation of serum electrolytes and ECG were conducted and a biopsy of the lesion was obtained. The pre-operative oral swabs for culturing and for studying the antibiotic sensitivity were tested before instituting the prophylactic antibiotics and the culture and the sensitivity of the wound discharge was tested before instituting the antibiotics for the post-operative wound infections. The surgeons were at a liberty of choosing the antibiotics in order to avoid observer bias. The appearance of fever, stitch abscess, wound dehiscence, purulent discharge, oedema and swelling were considered as the signs of post operative wound infections. The antibiotics which were used

prophylacticaly and post-operatively and also any change in the antibiotic administration were noted for the same reason. The data on the drug costs were obtained and the cost analysis was performed by comparing the cost which was incurred on using a single antibiotic and combined antibiotics as the prophylaxis. The wound infection controlled days, the time which was taken for the wound healing and the duration of the hospital stay were followed up.

The data which was obtained was categorized into 6 groups, which are as follows:

Group 1: Patients on a single antibiotic as the prophylaxis
Group 2: Patients on combined antibiotics as the prophylaxis
Group 3: Patients with post-operative infections
Group 4: Patients without post-operative infections

The patients who had post-operative infections were divided into two groups based on their prophylactic antibiotics, namely:

Group 5: Patients on a single antibiotic as the prophylaxis and who developed post operative infections
Group 6: Patients on combined antibiotics as the prophylaxis and who developed post operative infections

The different groups were compared to test the difference in the mean values for the costs which were incurred on the single and combined antibiotic usage by using the Student's't' test. p values < 0.05 were taken as significant.

RESULTS

The antibiotic usages are shown in the [Table/Fig-1] and [Table/Fig-2]. [Table/Fig-1] shows the antibiotics which were used for the prophylaxis. Twenty two subjects were on a single antibiotic (Cefazolin, Ciprofloxacin, Cefprozil, and Clindamycin), of which 11 (50%) developed post operative wound infections. Among those 11 subjects, 9 were on Cefazolin and 2 were on Ciprofloxacin. 28 subjects were on combined antibiotics, of which 7 (25%) had post operative wound infections. All the 7 subjects were on Cefazolin and Metronidazole. [Table/Fig-2] shows the antibiotics which were used for post operative infections. [Table/Fig-3], [Table/Fig-4] and [Table/Fig-5] show the comparison between the various groups. [Table/Fig-3] compares the costs which were incurred on the antibiotic course between the patients on the single antibiotic and those on the combined antibiotics as the prophylaxis.

The mean cost which was incurred on the prophylaxis by using a single antibiotic was significantly low as compared to that which was incurred on that of the combined antibiotics but the mean of the total cost (prophylactic and post operative antibiotics) did not

Sl. No.	Antibiotics used	No. of patients	No. of patients in %
1	Cefazolin + Metronidazole	14	28
2	Clindamycin + Gentamicin	3	6
3	Ampicillin + Cloxacillin	2	4
4	Moxifloxacin + Metronidazole	2	4
5	Ciprofloxacin + Metronidazole	1	2
6	Cefprozil + Metronidazole	5	10
7	Cefazolin	13	26
8	Ciprofloxacin	5	10
9	Cefprozil	4	8
10	Clindamycin	1	2

[Table/Fig-1]: Antibiotics used for prophylaxis

Sl. No.	Antibiotics used	No. of patients	No. of patients in %
1	Cefprozil + Metronidazole	7	38.88
2	Moxifloxacin + Metronidazole	2	11.11
3	Moxifloxacin + Clindamycin	2	11.11
4	Amikacin + Clindamycin	3	16.66
5	Clindamycin + Gentamicin	1	5.55
6	Cefprozil	3	16.66

[Table/Fig-2]: Antibiotics used for post-operative infection

	Cost on prophylactic antibiotics in Rupees	Total cost on antibiotics in Rupees	Time taken for wound healing in days	Total No of hospital stay in days
Group 1 (N = 22)	803.15 ± 1104.56	2321.12 ± 1489.45	19.41 ± 6.40	35.09 ± 9.85
Group 2 (N = 28)	1524.29 ± 1468.28	2312.09 ± 1596.03	17.25 ± 4.57	33.75 ± 10.36
p-value	0.03 (S)	0.49 (NS)	0.19 (NS)	0.64 (NS)

[Table/Fig-3]: Comparison b/w Group 1 & Group 2
The values are expressed as their Mean ± SD, HS – Highly significant (p<0.001), S – Significant (p<0.05), NS – Not significant (p>0.05)

	Cost on prophylactic antibiotics in Rupees	Total cost on antibiotics in Rupees	Time taken for wound healing in days	Total No of hospital stay in days
Group 3 (N = 18)	347.43 ± 99.40	3428.21 ± 814.96	21.89 ± 4.61	36.83 ± 9.83
Group 4 (N = 32)	1690.48 ± 1495.03	1690.48 ± 1495.03	16.13 ± 4.87	32.94 ± 10.06
p-value	0.001 (HS)	0.001 (HS)	0.001 (HS)	0.10 (NS)

[Table/Fig-4]: : Comparison b/w Group 3 & Group 4
The values are expressed as their Mean ± SD, HS – Highly significant (p<0.001), S – Significant (p<0.05), NS – Not significant (p>0.05)

	Cost on prophylactic antibiotics in Rupees	Total cost on antibiotics in Rupees	Time taken for wound healing in days	Total No of hospital stay in days	Cost on post operative antibiotics in Rupees
Group 5 (N = 11)	274.78 ± 43.20	3310.73 ± 747.12	22.55 ± 4.39	37.73 ± 9.59	3035.95 ± 727.19
Group 6 (N = 7)	461.60 ± 0.00	3612.81 ± 941.50	20.86 ± 5.11	35.43 ± 10.80	3151.21 ± 941.50
p-value	0.001 (HS)	0.23 (NS)	0.23 (NS)	0.32 (NS)	0.35 (NS)

[Table/Fig-5]: : Comparison b/w Group 5 & Group 6
The values are expressed as their Mean ± SD, HS – Highly significant (p<0.001), S – Significant (p<0.05), NS – Not significant (p>0.05)

show any difference between the groups. [Table/Fig 4] compares the costs which were incurred on antibiotics in patients with and without post operative infections. Patients with post operative infections incurred more costs on antibiotics and had a significantly prolonged wound healing time. [Table/Fig 5] shows that there was no significant difference in the total cost which was incurred on antibiotics in patients with post-operative infections, irrespective of whether the prophylaxis was undertaken with a single or combined antibiotics, though the cost which was incurred on a single antibiotic as the prophylaxis was less costly.

DISCUSSION

The assessment of the quality of the surgical care is commonly performed by using the measures of the risk-adjusted outcome and the measures of cost are one of the aspects of the same [10]. This study has tried to estimate the wound infection rate following the administration of a single prophylactic antibiotic and combined antibiotics and the costs which were incurred on them. It was observed that out of the 50 subjects, 18 developed post operative wound infections (36 % wound infection rate). Twenty two subjects were on a single antibiotic, of which 11 developed post operative wound infections (50% wound infection rate) with the use of a single antibiotic. Twenty eight subjects were on combined antibiotics, of which 7 developed post operative wound infections (25% wound infection rate). The mean cost which was incurred on the prophylaxis by using a single antibiotic was significantly low as compared to that which was incurred on the combined antibiotics, but the mean of the total cost (prophylactic and post op antibiotics) did not show a significant difference between the groups. The cost which was saved with a single prophylactic antibiotic usage was nullified by the cost which was incurred on the antibiotics which were used on post operative wound infections due to the high infection rate with single prophylactic antibiotic usage. Patients with post operative infections incurred more costs on antibiotics and had a significantly prolonged wound healing time. The hospital stay was also prolonged for the patients with infections but not significantly, which can be attributed to the aggressive management. In patients with post operative infections, though the cost which was incurred on a single antibiotic as prophylaxis costed less, there was no significant difference in the total cost which was incurred on the antibiotics. The small sample size was the limitation of this study. A higher sample size would have helped in finding the wound infection rate with the usage of a particular antibiotic as the prophylaxis in head and neck onco surgeries.

In conclusion, this study observed that though single antibiotic prophylaxis costed less, there was increased risk of post operative wound infections in the head and neck onco-surgeries.

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