The Journal of Laryngology & Otology
March 2004, Vol. **118,** pp. 213–216

Antibiotic prophylaxis in clean neck dissections

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Abstract

This study was designed to evaluate the effects of a prophylactic antibiotic regimen on the incidence of wound infection after clean neck dissections. A prospective series of 57 patients undergoing clean neck dissections with the use of perioperative ampicillin-sulbactam for 24 hours was compared with an historical control group of 51 patients undergoing clean neck dissections with no perioperative antibiotic use. The outcome variable was the incidence of post-operative wound infection. The two groups were similar for factors reported to influence the rate of post-operative wound infection. Wound infection occurred in one patient (1.7 per cent) in the study group and in seven patients (13.3 per cent) in the control group, the difference was statistically significant ($p = 0.02$). These data suggest that the use of a perioperative antibiotic for 24 hours in patients undergoing clean neck dissection results in significant reduction in the incidence of post-operative wound infection.

Key words: Antibiotic prophylaxis; Wound Infection; Radical Neck Dissection

Introduction

Post-operative wound infection is a considerable cause of patient morbidity. Many articles deal with the prevention of wound infection after major head and neck surgical procedures.[1–13] Most of these articles focus on clean-contaminated procedures.[1–8] The general consensus is that the use of perioperative antibiotics in patients undergoing major contaminated surgical procedures reduces the incidence of post-operative wound infection. However, it is surprising what little information is available regarding the development of post-operative wound infections in oncology patients undergoing clean neck dissections (CND). For these procedures, no conclusive evidence exists in the head and neck surgery literature concerning whether to administer antibiotics or not. To date, only one retrospective comparative study has been published to assess the use of perioperative antibiotics in CND, and it has reported a trend favouring the use of antibiotic prophylaxis.[9]

We recently reviewed our experience with patients who had undergone CND with no antibiotic use.[10] A post-operative wound infection was observed in seven of 51 patients (13.3 per cent). This rate is higher than that of other clean head and neck surgical procedures in which a wound infection rate of less than five per cent is expected.[11] After this report, we changed our policy and started the use of a perioperative antibiotic in this group of patients.

This prospective non-randomized study was designed to evaluate the safety and efficacy of antibiotic prophylaxis for 24 hours in patients undergoing CND.

Materials and methods

From April 1998 to December 2002 all oncology patients undergoing clean neck dissections at the ENT Department of Sisli Etfal Training and Research Hospital were eligible to participate. Besides the usual pre-operative explanation and consent, all patients underwent a pre-operative evaluation for head and neck oncologic surgery. The authors did not have any financial support from the evaluated product.

Exclusion criteria included the use of systemic antibiotics within three days before surgery, death within 10 days of surgery when no wound infection had developed, known hypersensitivity to penicillin, contamination from the aerodigestive tract during surgery, and deviation from the study protocol such as incorrect antibiotic administration or concomitant treatment with other antibiotics.

Neck dissections that were performed in a sterile field and never exposed to direct contamination were defined as clean neck dissections. They were classified into two types: radical or extended neck dissections. Extended neck dissections included cases undergoing other clean-uncontaminated associated procedures (eg, thyroidectomy, parotidectomy, skin excision) or bilateral neck dissections. Unilateral modified radical neck dissections were also considered under radical neck dissection cases

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Accepted for publication: 16 December 2003.

for practical reasons. Unilateral selective neck dissection alone was not a part of this study because there was no indication to perform it alone during this study period.

One and a half grams of ampicillin-sulbactam was given intravenously at the induction of anaesthesia (approximately 30 minutes before skin incision) and then 1 g was given every six hours post-operatively for an additional four doses. Wound infection was defined according to the criteria developed by Johnson *et al.*[1] If purulent drainage was identified either spontaneously, or by needle aspiration, or by incision, a wound infection was diagnosed.

All surgery procedures were carried out according to the general rules of sterility and performed by the staff surgeon or by residents under the staff surgeon's direct supervision. All wounds were irrigated with normal saline before closure. Suction drains that were removed when wound drainage was less than 50 cc in 24 hours were used on all patients. Patients were evaluated daily until they were discharged.

Each patient's disease was staged according to the AJCC (1988) TNM system. Data extracted for this study included age, sex, ASA score, systemic disease, stage of disease, location of primary tumour, type of surgery procedure (radical or extended neck dissection), prior treatment (surgery, radiotherapy), wound infections, and length of stay in hospital. The length of hospital stay was calculated from the time of neck dissection to the time of discharge.

The control group was composed of retrospectively reviewed patients who had undergone CND without the use of perioperative antibiotics in the same centre.

The date of the groups were analyzed and compared. The statistical analysis was performed by using the Student *t*-test for continuous variables and chi-squared with Yates correction or Fisher exact test as appropriate for categorical variables, and considered significant at $p<0.05$.

Results

There were 68 patients enrolled in this study. Eleven patients were considered unevaluable. Of these, one patient died of a myocardial infarction within 24 hours of surgery. In two patients, post-operative wound exploration was performed because of bleeding and chyle leak, and they were excluded from the study. The remaining patients received additional antibiotics because of a protocol violation or a non-wound infection, although they did not have a wound infection. In no instance was bilateral radical neck dissection performed simultaneously.

The groups were similar with respect to age, sex, surgical procedure distribution, and the potential risk factors for wound infection development such as prior radiotherapy, prior tracheotomy, systemic disease, and stage of disease (Table I).

A wound infection occurred in one patient (1.7 per cent) in the study group at post-operative day 4. Wound culture taken was polymicrobial. The infection was treated by using ampicillin-sulbactam for seven days with local wound care. When this rate was compared with that of 51 patients (13.3 per cent) in the control group, the difference was statistically significant ($p = 0.02$ Fisher's exact test).

TABLE I
PATIENT INFORMATION

	Study group (n = 57)	Control group (n = 51)
Mean ± SD age,y	52.4 ± 19	54 ± 18
Male:female ratio	45:12	46:5
Surgical procedure		
Radical neck dissection	37 (64.9%)	40 (78.4%)
Extended neck dissection	20 (35.1%)	11 (21.6%)
Previous radiotherapy	11 (19.2%)	8 (15.6%)
Previous tracheotomy or permanent stoma	18 (31.5%)	22 (43.1%)
Systemic disease	9 (15.7%)	11 (21.5%)
N stage		
N_1	16 (28%)	20 (39%)
N_{2-3}	41 (72%)	31 (61%)

Data are presented as mean ± standard deviation or N (%)
No significant differences between groups ($p>0.05$)

The mean ± SD length of hospital stay was 13.4 ± 3.1 days in patients who developed post-operative wound infection and 8.16 ± 2.2 days in patients with no evidence of wound infection ($t = 2.59$; $p<0.02$).

A non-wound infection occurred in three patients in the study group and in six of the control patients ($p>0.05$). In addition, four patients in the study group and three patients in the control group were noted to have wound necrosis along the suture line. All of them required local wound care. There were no complications attributed to antibiotic administration.

Discussion

In contrast to a previous report, the data presented were collected prospectively. Wound infection was evaluated according to an established grading system.[1] Our study included a retrospective control population from the same centre. Excluding the perioperative antibiotic regime, patients in the study and control groups were similar for factors reported to contribute the development of post-operative wound infection in major head and neck surgical procedures. These factors were stage of disease, surgical technique, duration of operation, hospital care, previous radiotherapy, previous surgical procedures, systemic diseases, patient's nutritional status, type of neck drainage, and concomitant surgical procedures. Our data, therefore, could be used as an argument for the superiority of antibiotic prophylaxis in post-operative wound infection outcome.

Johnson and Wagner,[11] in a retrospective analysis of 354 patients who had undergone clean, uncontaminated head and neck surgery excluding neck dissection and received no antibiotic therapy, found a wound infection rate of 0.56 per cent and concluded that prophylactic antibiotics are not needed in this group of patients.

https://doi.org/10.1258/002221504322927991 Published online by Cambridge University Press

In a review of 192 patients undergoing clean, uncontaminated neck dissection, Carrau *et al.*[9] found that wound infections developed in three (3.3 per cent) of the 93 patients who received perioperative antibiotics and in 10 (10 per cent) of the 99 patients who did not receive antibiotics. Although the difference did not reach statistical significant ($p = 0.08$), this study identified a trend favouring antibiotic prophylaxis in uncontaminated neck dissection.

Slattery *et al.*[12] retrospectively reviewed the records of 120 patients who had undergone uncontaminated neck dissections with the use of a perioperative antibiotic for 24 hours or longer. They have documented no wound infection. Coskun *et al.*,[3] on the other hand, reported a wound infection rate of 13 per cent in 54 patients who had undergone radical neck dissectoins, despite the use of a perioperative antibiotic for 24 hours or longer. They concluded that clean radical neck dissection carries a higher risk of post-operative wound infection than that other clean head and neck procedures ($p<0.001$).

While these data are in favour of the use of a prophylactic antibiotic, only a double-blind, placebo-controlled trial, after stratification for the risk factors associated with a high incidence of wound infection, could settle the role of routine antibiotic prophylaxis in CND. Our opinion is that such a study might be unethical. Furthermore, it is likely that this comparison will never be possible in a randomized prospective trial in our clinic. One reason, as mentioned by Blair *et al.*,[13] is that the relative infrequency of this operation, even in busy referral hospitals, makes such data collection difficult and prolonged.

The debate continues regarding the selection of the most appropriate prophylactic antibiotic regime in general. The same is true for major head and neck surgical procedures. In our study, ampicillin-sulbactam was preferred for prophylaxis because of its proven effectiveness as a prophylactic agent in clean-contaminated head and neck surgical procedures.[4,5] It was administered intravenously pre-operatively and maintained post-operatively for a total of four doses. It has also been demonstrated that prolonged administration of antibiotics for prophylaxis in head and neck surgical procedures was not effective in reducing the incidence of post-operative wound infection.[3,6,9,12]

The factors affecting wound infection development in CND are uncertain. We believe that two of the most important factors in preventing wound infection are the surgeon's attention to meticulous surgical technique with general rules of sterility and post-operative care including proper wound drainage. Another factor that undoubtedly contributed to the low infection rate in our study was the use of perioperative antibiotics. The impact of irradiation on the development of wound infection after head and neck oncologic surgical procedures remains unclear. While some authors have identified previous irradiation as a risk factor for post-operative wound infection,[7] other authors have not found this to be the case.[2,5,8] Eleven of the patients in our study group had received irradiation before surgery. The interval from the end of radiation therapy to neck dissection varied from five months to four years, with the mean interval being 13.2 months. None of these patients developed a wound infection. This observation suggests that previous radiation therapy does not increase the risk of a wound infection after CND.

- **Previous studies have suggested that prophylactic antibiotics reduce wound infection in head and neck procedures with bacterial contamination**
- **This study looked at the role of antibiotic prophylaxis in 57 patients undergoing elective neck dissection where no infection was evident. Post-operative wound infection rates were compared to a historical control group who were not given antibiotic**
- **The study suggests that prophylactic antibiotic therapy reduces the frequency of wound infection in patients undergoing routine radical neck dissection**

Some surgeons consider previous tracheotomy a risk factor for the development of wound infection after head and neck surgery procedures.[3,8] In our study group, 31.5 per cent of patients had a tracheotomy or permanent stoma, which suggests that previous tracheotomy is not an important factor in the development of post-operative wound infection.

It has also been speculated that the high prevalence of chronic pulmonary and liver disease, immunological dysfunction, anaemia, longer operative times, and wide surgical field in this group of patients may contribute to delayed wound healing and an increased wound infection rate.[3,9,12,13] Although the role of these factors deserves further study and a multivariate analysis occurs as a valid solution, most of them cannot be directly controlled by the surgeon. We were unable to confirm these findings and did not perform a multivariate analysis because of the relatively small size of our population and the low incidence of wound infection.

Conclusion

Clinical data obtained from the present study support the concept that the use of a perioperative antibiotic (ampicillin-sulbactam) for 24 hours in patients undergoing CND results in a significant reduction in the incidence of post-operative wound infections.

https://doi.org/10.1258/002221504322927991 Published online by Cambridge University Press

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Dr H Seven takes responsibility for the integrity of the content of the paper.
Competing interests: None declared

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https://doi.org/10.1258/002221504322927991 Published online by Cambridge University Press