



## Article Original

## Post Operative Infection in Patients with ENT Cancer. A Report of 138 Cases

*Infection post opératoire en cancérologie ORL : à propos de 138 observations*

Moustapha Ndiaye<sup>1</sup>, Ciré Ndiaye<sup>1</sup>, Ngor Ndour<sup>1</sup>, Malick Ndiaye<sup>2</sup>, Abdou Sy<sup>2</sup>, Mame Sanou Diouf<sup>3</sup>, Amadou Thiam<sup>1</sup>, Houra Ahmed<sup>1</sup>, El Hadji Abdou Aziz Sylla<sup>1</sup>, Birame Loum<sup>1</sup>, Baye Karim Diallo<sup>1</sup>, Louise Fortes Deguenonvo<sup>1</sup>, Richard Deguenonvo<sup>1</sup>, Evelyne Siga Diom<sup>3</sup>, Abdourahmane Tall<sup>1</sup>, Issa Cheikh Ndiaye<sup>1</sup>, Raymond Diouf<sup>1</sup>

### ABSTRACT

**Background.** Any surgical procedure involves an infectious risk due to the rupture of the barrier constituted by the skin or the mucous membranes. Through this study, we assessed the epidemiological, bacteriological and therapeutic profile of postoperative infections. **Methods.** This was a three year cross sectional retrospective study on a set of 138 patients with ENT cancer who had been extirpated. The circumstances of occurrence of post-operative infections were studied. **Results.** The frequency of post-operative infection was 23.9%. Among the 44 alcohol-smoking patients, 12 had a post-operative infection ( $p = 0.593$ ). One patient had been treated with preoperative radiochemotherapy and did not develop postoperative infection. The tumor size in the infected population corresponded to T2 (18.9%), T3 (22.5%), T4 (51.1%);  $p = 0.048$  and the types of closure with flaps represented 17.9% ( $p = 0.001$ ). Six class 1 Altemeier patients developed post-operative infection as well as 27 class 2; ( $p = 0.346$ ). The incidence of infection in patients with a tracheostomy tube was 27.7%. The most common germs were *Pseudomonas aeruginosa* (16 cases), *Enterobacter spp* (4 cases), *Staphylococcus aureus* (3 cases). After consideration of the antibiogram, the most commonly used molecule was ciprofloxacin (21 cases). **Conclusion.** The occurrence of post-operative infection is strongly associated to the use of a closure flap, hence the need to observe strict hygiene for these patients who should benefit from it.

- <sup>1</sup> Cheikh Anta Diop University, Dakar, Senegal
- <sup>2</sup> Université de Thies, Thies, Senegal
- <sup>3</sup> Université Assane Seck de Ziguinchor, Ziguinchor, Senegal

#### Auteur correspondant :

Moustapha Ndiaye

Adresse e-mail :

[moustapha0905@gmail.com](mailto:moustapha0905@gmail.com)

Boite postale : 9183

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### RÉSUMÉ

**Introduction.** Toute intervention chirurgicale comporte un risque infectieux du fait de la rupture de la barrière que constituent la peau ou les muqueuses. A travers cette étude, nous avons évalué le profil épidémiologique, bactériologique et thérapeutique des infections post opératoires. **Patients et méthodes.** Il s'agit d'une étude transversale rétrospective sur trois ans sur une série de 138 patients porteurs d'un cancer de la sphère ORL ayant été extirpé. Les circonstances de survenue des cas d'infections post opératoires ont été étudiées. **Résultats.** La fréquence de l'infection post opératoire était de 23,9%. Parmi les 44 patients alcoolotabagiques, 12 ont eu une infection post opératoire ( $p=0,593$ ). Un patient ayant été traité par radio-chimiothérapie préopératoire n'a pas développé d'infection post opératoire. La taille de la tumeur dans la population infectée était celle correspondant aux classes T2 (18,9%), T3 (22,5%), T4 (51,1%);  $p=0,048$  et les types de fermeture avec lambeaux représentaient 17,9 % ( $p=0,001$ ). Six patients de classe 1 d'Altemeier ont développé une infection post opératoire ainsi que 27 de classe 2 ; ( $p=0,346$ ). L'incidence de l'infection chez les malades porteurs d'une canule de trachéotomie était de 27,7%. Les germes les plus retrouvés avaient été le *Pseudomonas aeruginosa* (16 cas), *Enterobacter spp* (4 cas), *Staphylococcus aureus* (3 cas). Après l'adaptation à l'antibiogramme, la molécule la plus utilisée avait été la ciprofloxacine (21 cas). **Conclusion.** La survenue d'infection post opératoire a été fortement imputable à l'utilisation de lambeau de fermeture d'où la nécessité d'observer une hygiène stricte pour ces malades devant en bénéficier.

### INTRODUCTION

Any surgical procedure involves an infectious risk due to the rupture of the barrier constituted by the skin or the mucous membranes. The aseptic conditions used in the operating room mean that the bacterial inoculum capable of seeding the operating site is small. However, this

inoculum finds at the operating site a medium conducive to its proliferation. In fact, surgical break-in leads to local tissue ischemia and the presence of hematoma disrupting the action of the host's immune system [1] In the United States and Europe 2% of procedures are complicated by an infection. In Africa, there is a

frequency of 8.6% in Côte d'Ivoire and 13.4% in Dakar [2].

Post-operative infections have a financial impact because they increase the length of hospital stay and force the purchase of antibiotics, which are sometimes very expensive.

The objective of this work was to analyze the epidemiological, bacteriological and therapeutic profile of post-operative infections in patients operated on for ENT cancer in the ENT department of Fann Hospital Center, in Dakar.

**MATERIALS AND METHODS**

This is a retrospective study from the period from January 2015 to December 2017, 3 years. It took place at Fann University Hospital Center, in Dakar, Senegal.

The study included all patients who underwent surgery for ENT cancer and who had an infection of the operating site or another site during the duration of their hospital stay. Data sources were medical records.

Post-operative management consisted of local dressings, the use of mouthwash in case of oral pharyngeal surgery, the use of antibiotics and analgesics.

The dressings were performed daily the day after the intervention but could be twice daily when the suppuration was profuse.

Operative site infection (OSI) had been suspected of local suppuration or the presence of shady secretions. A sample was taken in these cases and the product packaged for a bacteriological examination with antibiogram.

The first-line antibiotic therapy consisted of the combination of amoxicillin and clavulanic acid and was secondarily adapted to the results of the antibiogram.

The bacteriological examination could reveal cases of co-infection, that is to say the presence of at least 2 germs in a sample.

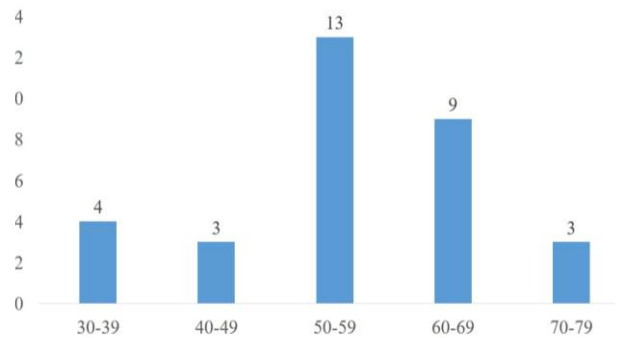
The risk of infection had been assessed using the Altmeier classification [3].

**RESULTS**

Among the 138 patients operated on for ENT cancer, 33 had a post-operative infection, or 23.9%. Among them, 32 had developed an OSI while the remaining patient had presented a pulmonary infection.

The average age of operated patients was 54 years (16-87 years). Figure 1 shows the age distribution of infections.

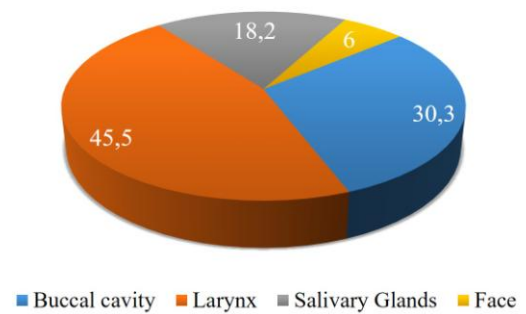
Men represented 66.7% (n = 22) while women were represented in 33.3% of cases (n = 11).



**Figure 1 :** age (years) distribution of infections

A definite medical history of alcohol or tobacco poisoning was found in 44 patients; of these, 12 had post-operative infection (p = 0.593). Three patients were hypertensive and all had an infection. The 3 HIV-positive patients and the 3 diabetics in the series had no infection. Preoperative radio-chemotherapy had been a history of therapy in a patient who had not developed a post-operative infection.

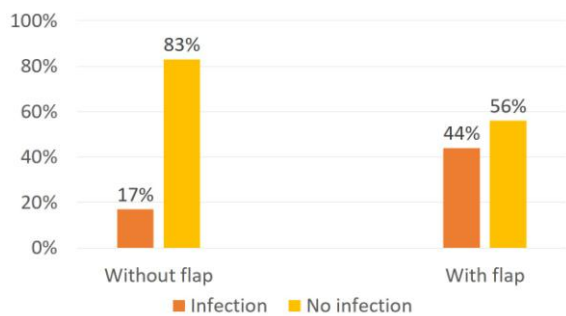
With regard to the distribution according to the site of the cancer, the infection complicated laryngeal surgery in 15 cases, oral surgery in 10 cases, salivary gland surgery in 6 cases as well as facial surgery in 2 cases ; p = 0.154. The distribution by cancer site is summarized in Figure 2.



**Figure 2 :** Distribution by cancer site

Depending on the TNM stage, 18.9% of the infection cases concerned the T2 stage, 22.5% (T3), 51.1% (T4); p = 0.048.

Forty-four percent (44%) of patients with a simple type of surgical closure had an infection compared to 17.9% for types of flap closure (Figure 3); p = 0.001.



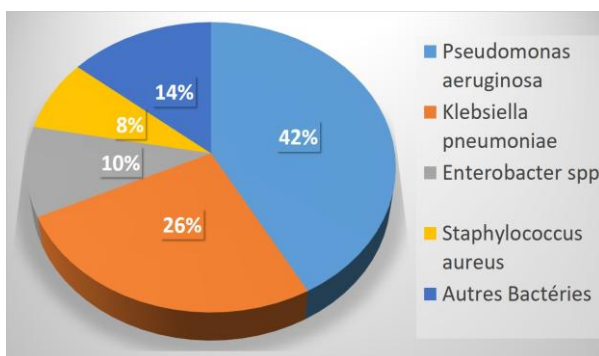
**Figure 3 :** Distribution according to the type of closure of the operating wound

Among seven patients transfused in per or post operative four developed an infection (57.1% of the transfused patients).

Depending on the contamination class, 6/20 class 1 patients had developed a post-operative infection as well as the 27/118 class 2 patients; ( $p = 0.346$ ).

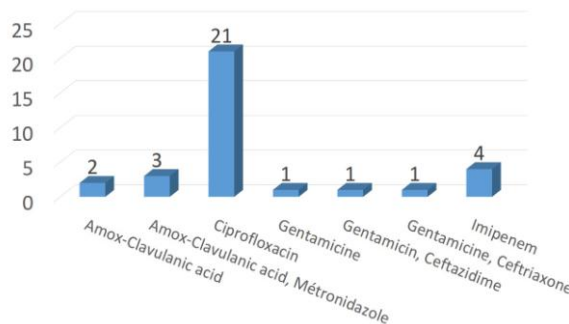
The incidence of infection in patients with a tracheostomy tube was 27.7% compared to 20.5% in the others ( $p = 0.828$ ).

On the bacteriological level, the antibiogram results were obtained for 28 patients; the remaining 5 patients were not removed. The most frequently found germs were *Pseudomonas aeruginosa* (16 cases), *Enterobacter spp* (4 cases), *Staphylococcus aureus* (3 cases) (Figure 4). Eight (8) cases of co-infection had been identified.



**Figure 4:** Different types of germs isolated

After adaptation to the antibiogram, the most used molecule was ciprofloxacin (21 cases). Figure 5 summarizes the antibiotics suitable for the antibiogram used.



**Figure 5:** Different types of antibiotics suitable for the antibiogram

**DISCUSSION**

As in the majority of retrospective studies, selection bias is noted in our study due to incomplete records. Other situations are also limitations to our study. In our structure, the bacteriological laboratory is not open on weekends, some bacteriological samples have been delayed until the following week. We also point out that the bacteriological examination may not find germs when the patient has already received antibiotic prophylaxis.

From our observations, it seems that the occurrence of postoperative infections is correlated with the use of flaps in the closure of operative wounds.

Flap repair gave more infections than simple closure repair in our study ( $p = 0.001$ ) as in the study by Bourget [4] and Suh [5]. Other authors have also had the same observations [6-8].

This higher incidence of OSI in patients with flap closure is the product of several risk factors for infection. In fact, tumors requiring flap closure are locally more advanced (high T) and the duration of the surgical procedure aimed at removing them is higher. As a result, the tissues are exposed to the environment of the operating room for a longer time, but also to saliva if it is a tumor of the oral cavity, the oropharynx and the pharyngolarynx. Several authors support this hypothesis and report that cases of OSI would be 1.5 to 4 times more frequent in case of flap closure [8-10]. It should also be noted that these tumors are very hemorrhagic; hence the frequency of transfusions constituting an additional risk factor for OSI because leading to a state of transient immunosuppression [11, 12].

Statistical analysis of the other parameters studied in our study did not establish a link with the occurrence of OSI, although their presence influences it. In contrast, many authors have reported correlations in their series.

**Events prior to surgery**

These are alcohol-tobacco exposure and radio-chemotherapy. The latter have long been considered as being able to favor the occurrence of a postoperative infection.

Lotfi's study [8] had found a relationship between the occurrence of infection and alcohol consumption. Indeed excessive consumption of alcohol increases post-operative stress and leads to a decrease in tissue

perfusion. Likewise, tobacco decreases the production of collagen and tissue oxygenation [13].

In our study we had only one case of preoperative radio-chemotherapy; this patient subsequently developed an OSI. Thus, our data were not sufficient to establish a link between preoperative radio-chemotherapy and the occurrence of postoperative infection. However, several studies such as that of Dassonville [14] and Benatar [15] have reported a correlation between the occurrence of postoperative infection in ENT oncology and preoperative radio-chemotherapy. This trend in the development of OSI is linked to the fact that radio-chemotherapy weakens the immune system.

#### The size of the tumor

In our series, the tumor was classified as T4 in more than half of the post-operative infection cases. The same is true of the studies of Ogihara [18] and Belusic-Gobic [19]. The increase of OSI in this scenario would be linked to the need for a large incision aimed at better exposing the tumor [20].

In addition, advanced tumors have a longer duration of evolution; this increases the risk of secondary infection

#### The contamination class

Lee's study [16] showed that clean contaminated surgery (Altemeier class 2) increased the risk of post op infection. Indeed, it is a surgery with opening of the pharynx causing an invasion of the operating wound by the germs of the ENT sphere.

#### Tracheostomy

Regarding the tracheostomy, half of our infected patients were cannula carriers even if we did not find any significant difference between the 2 groups.

Lee had shown that tracheostomy significantly increased the risk of developing post-operative infections [16]. Indeed, the communication of the respiratory tract with the external environment is a situation favoring bacterial colonization [17]. In addition, the secretions which accumulate at the level of the cannula favor the occurrence of infections.

#### Germs found

*Pseudomonas aeruginosa* was the germ most involved in SSIs in our series (n = 16), followed by *Klebsiella pneumoniae*.

Breda [23] made the same observations with *Pseudomonas*, *Escherichia coli* and *Klebsiella* as the main germs.

In patients with ENT tumors, the bacterial flora is greatly modified. The most common germs being Gram negative including *Pseudomonas* and enterobacteria [1]. Liu had found a higher frequency of *Pseudomonas* (69%), followed by enterobacteria and enterococcus [6].

#### Antibiotic prophylaxis

Becker and Parell [21] found that antibiotic prophylaxis reduced the occurrence of postoperative infection. In our work, all patients received treatment with amoxicillin-clavulanic acid; despite this, we found a 29.3% frequency of antibiotic prophylaxis failure. Thus, in our context, the notion of bacterial resistance to the combination of amoxicillin and clavulanic acid cannot be

ruled out [22]. Preoperative antibiotic prophylaxis restricted to the first 24 hours seems sufficient to prevent OSI [1].

#### CONCLUSION

The occurrence of post-operative infection was strongly attributable to the use of a closure flap, hence the need to observe strict hygiene for these patients who should benefit from it.

In view of our observations, the role of antibiotic prophylaxis using the combination of amoxicillin and clavulanic acid seems to be minimal. Their use should be prohibited for the benefit of patients' financial savings.

The place of ciprofloxacin in antibiotic prophylaxis should be the subject of a randomized study.

#### Authors contribution

All authors were involved either in patient care or in the correction of the manuscript.

#### Statement of grant

None

#### Conflict of interest

None

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