Role of Radiotherapy in the Treatment of Nasoethmoidal Adenocarcinoma

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**Objective:** To assess the efficacy of radiotherapy in the treatment of nasoethmoidal adenocarcinoma.

**Design:** Multicenter, retrospective study.

**Setting:** Eleven French hospitals.

**Patients:** The medical records of 418 patients who presented with nasoethmoidal adenocarcinoma from January 1, 1976, through December 31, 2001, were evaluated. A total of 324 patients were treated with a combination of surgery and radiotherapy, and 55 were treated with surgery only.

**Main Outcome Measures:** Survival rates, disease recurrence, and postoperative complications.

**Results:** The 5-year Kaplan-Meier survey revealed survival rates of 64.5% for the surgery-only group and 70.8% for the combined-treatment group. In the surgery-only group, 28 patients (51%) had disease recurrence (24 local, 2 regional, and 2 distant). Of the 55 patients in the combined-treatment group, 31 patients (56%) had disease recurrence (29 local, 1 regional, and 1 distant). Immediate postoperative complications in the combined-treatment group were hemorrhages in 2 patients, meningitis in 3 patients, and cerebrospinal fluid leakage in 4 patients, but no deaths occurred. In the surgery-only group, 1 patient had meningitis, 2 had cerebrospinal fluid leaking but no hemorrhage, and 5 died postoperatively.

**Conclusion:** The results of this retrospective study suggest that radiotherapy can be used to treat nasoethmoidal adenocarcinoma, but its usefulness should be confirmed with further prospective studies.


**Nasoethmoidal adenocarcinomas are rare tumors, yet the risk factors for these tumors have been previously well defined.** The criterion standard treatment reported in the literature is the combination of surgery and radiotherapy, however, some authors have reported an alternative approach that does not include radiotherapy. The aims of this study were to evaluate and compare patients treated by surgery only with patients treated by a combination of methods (surgery and radiotherapy) and to assess the role of radiotherapy in this patient population.

**Methods**

Our retrospective study assessed a large patient population with nasoethmoidal adenocarcinoma. This series was previously published with general data reported elsewhere. All factors that influenced the survey of this population were presented in a previous article and have now been used in this more updated evaluation, with treatment specifically assessed. The treatment was not analyzed in the first article because of the numerous data analyzed in the initial study.

Eleven French hospitals (the University Hospitals of Caen, Clermont-Ferrand, Grenoble, Lyon, Montpellier, Nancy, Nantes, and Rouen and the Comprehensive Cancer Centers of Caen, Nancy, and Paris, collectively known as the Study Group for Tumors of the Head and Neck) participated in the study. The study spans a 25-year period from January 1, 1976, to December 31, 2001, during which 418 patients presented with an adenocarcinoma of the ethmoid bone. A total of 307 patients were men and 111 were women. The mean age at presentation was 62.8 years (range, 31-91 years).

Patients were divided into 2 groups. In the first group, 324 patients (77.5%) received combined treatment. In the second group, 55 patients (13.2%) were treated with surgery only. The other 39 patients (9.3%) treated by another protocol were excluded from the present...
study. These 2 groups were asymmetric, and more at-risk patients were present in the combined-treatment group. To eliminate this difference, a cross-matched population analysis was performed, and 55 patients treated by surgery and radiotherapy were selected to obtain 2 similar groups. Further analysis was performed to compare the surgery-only group to the cross-matched population of 55 patients treated with surgery and radiotherapy. The risk factors for prognosis were the size of the tumor (T4), the size of the lymph node, and intracranial involvement.1

Staging was performed according to the recommendations of the American Joint Committee on Cancer21 for the staging of tumors of the ethmoid sinuses. Both groups contained 7 patients with T1 tumors, 21 with T2 tumors, 11 with T3 tumors, and 16 with T4 tumors; all tumors were labelled N0 based on the American Joint Committee on Cancer classification. All centers included patients treated by surgery only. During this long period of analysis, combined treatment (surgery and radiotherapy) of these lesions experienced major advancements, but the distribution during this period in patients of the 2 groups subsequently permitted a more specific comparison.

Of the 55 patients in the surgery-only group, surgical resection was transfacial in 42 patients (76%), transcranial only in 3 patients (5%), combined (transfacial and transcranial) in 8 patients (15%), and endoscopic in 2 patients (4%). The 2 endoscopic procedures each revealed a poorly developed lesion in a unilaterial polyp discovered fortuitously. The transfacial approach was preferred when the lesion was extensive to the mediofacial area with no dura or brain extension. The extension to the cribiform plate was not a contraindication to a transfacial approach for some surgeons. The transcranial procedure was specifically performed for the lesion with intracra-

The epidemiologic data of the 2 groups were similar, with nasoethmoidal adenocarcinoma occurring mostly in men in the sixth decade with a long period (>20 years) of wood particle exposure. The only difference in the data was that more women were in the surgery-only group, but sex was not a prognostic factor in this patient population. Unilateral rhinologic symptoms were routinely found. All patients underwent computed tomography, whereas magnetic resonance imaging was used for more recent patients included in the study. The risk factors of each group are reported in Table 1.

The 5-year Kaplan-Meier survey revealed survival rates of 64.5% for the surgery-only group and 70.8% for the combined-treatment group. No statistical difference was found in the survival rate (Kaplan-Meier) between these 2 groups (P = .20), but the rates were asymmetric, and more at-risk patients were present in the combined-treatment group. To eliminate this difference, a cross-matched population was created, and 55 patients treated by surgery and radiotherapy were selected to obtain 2 similar groups with regard to risk factors and general data (Table 2). The 5-year Kaplan-Meier survey revealed a survival rate of 60.9% for the cross-matched group. No statistical difference was found with regard to the survival rate between these 2 comparative groups for risk factors of worse prognosis (P = .60) (Figure). All patients included in this analysis underwent a surgical procedure. The macroscopic and microscopic analyses of the tumor resection are given in Table 3.

### Table 1. Risk Factors of the Patients in the Surgery-Only and Combined-Treatment Groups

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Surgery Only (n=55)</th>
<th>Combined Treatment (n=324)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brain or dura involvement</td>
<td>7 (2.7)</td>
<td>75 (23.1)</td>
</tr>
<tr>
<td>Stage T4 tumor</td>
<td>16 (29.1)</td>
<td>120 (37.0)</td>
</tr>
<tr>
<td>Lymph node involvement</td>
<td>0 (0)</td>
<td>7 (2.2)</td>
</tr>
</tbody>
</table>

### Table 2. Characteristics of the Surgery-Only and Combined-Treatment Groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of Patientsa</th>
<th>Surgery-Only Group (n=55)</th>
<th>Combined-Treatment Group (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>6 (11)</td>
<td>6 (11)</td>
<td></td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>63.27 (9.75)</td>
<td>63.10 (9.75)</td>
<td></td>
</tr>
<tr>
<td>Wood particle exposure</td>
<td>47 (85)</td>
<td>43 (78)</td>
<td></td>
</tr>
<tr>
<td>Leather exposure</td>
<td>1 (2)</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>Duration of exposure, mean (SD), y</td>
<td>25.45 (13.9)</td>
<td>25.71 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Brain or dura involvement</td>
<td>7 (13)</td>
<td>7 (13)</td>
<td></td>
</tr>
<tr>
<td>Stage T4 tumor</td>
<td>16 (29)</td>
<td>16 (29)</td>
<td></td>
</tr>
<tr>
<td>Lymph node involvement</td>
<td>0</td>
<td>0</td>
<td></td>
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</table>

a Data are presented as number (percentage) of patients unless otherwise indicated.

### RESULTS

The epidemiologic data of the 2 groups were similar, with nasoethmoidal adenocarcinoma occurring mostly in men in the sixth decade with a long period (>20 years) of wood particle exposure. The only difference in the data was that more women were in the surgery-only group, but sex was not a prognostic factor in this patient population. Unilateral rhinologic symptoms were routinely found. All patients underwent computed tomography, whereas magnetic resonance imaging was used for more recent patients included in the study. The risk factors of each group are reported in Table 1.

The 5-year Kaplan-Meier survey revealed survival rates of 64.5% for the surgery-only group and 70.8% for the combined-treatment group. No statistical difference was found in the survival rate (Kaplan-Meier) between these 2 groups (P = .20), but the rates were asymmetric, and more at-risk patients were present in the combined-treatment group. To eliminate this difference, a cross-matched population was created, and 55 patients treated by surgery and radiotherapy were selected to obtain 2 similar groups with regard to risk factors and general data (Table 2). The 5-year Kaplan-Meier survey revealed a survival rate of 60.9% for the cross-matched group. No statistical difference was found with regard to the survival rate between these 2 comparative groups for risk factors of worse prognosis (P = .60) (Figure). All patients included in this analysis underwent a surgical procedure. The macroscopic and microscopic analyses of the tumor resection are given in Table 3.
In the surgery-only group, 28 patients (51%) had disease recurrence (24 local, 2 regional, and 2 distant). Of the 55 patients in the combined-treatment group, 31 (56%) had disease recurrence (29 local, 1 regional, and 1 distant). At the end point of this study, 32 patients in the surgery-only group and 31 in the combined-treatment group were disease free.

Immediate postoperative complications in the combined-treatment group were hemorrhages in 2 patients, meningitis in 3 patients, and cerebrospinal fluid leaking in 4 patients, but no deaths occurred. In the surgery-only group, 1 patient had meningitis, 2 had cerebrospinal fluid leaking but no hemorrhage, and 5 died postoperatively. Five patients had a T4 lesion and underwent a transcranial procedure.

### Table 3. Macroscopic and Microscopic Analysis of the Margins of Tumor Resection

<table>
<thead>
<tr>
<th>Tumor Margin</th>
<th>Surgery-Only Group (n=55)</th>
<th>Combined-Treatment Group (n=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroscopic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit</td>
<td>12 (22)</td>
<td>8 (15)</td>
</tr>
<tr>
<td>Large</td>
<td>43 (78)</td>
<td>47 (85)</td>
</tr>
<tr>
<td>Microscopic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient</td>
<td>39 (71)</td>
<td>40 (73)</td>
</tr>
<tr>
<td>Marginal</td>
<td>4 (7)</td>
<td>9 (16)</td>
</tr>
<tr>
<td>Insufficient</td>
<td>12 (22)</td>
<td>6 (11)</td>
</tr>
</tbody>
</table>

Although nasoethmoidal adenocarcinoma is rare, it is a well-defined condition. Epidemiologic, clinical, and radiologic findings have been reported in a number of articles. Risk factors are now well known, and the most important appear to be the size of the lesion (T4 in TNM classification), extension to the lymph node, and intracranial involvement. With regard to treatment, the criterion standard seems to be combined treatment (ie, combination of surgery and radiotherapy in most reported studies), which has a 5-year patient survival rate of 35% to 70%. The use of combination treatment is supported by the risk of local tumor recurrence. However, the effect of radiotherapy remains unclear. For some authors, adenocarcinoma of the sinuses and nasal cavities seems to be moderately radiosensitive, whereas other authors report radiotherapy as their treatment of choice.

Some authors reserved radiotherapy for lesions with a large diameter of the tumor. In conclusion, the criterion standard treatment of ethmoid nasal adenocarcinoma is a combination of surgery and postoperative radiotherapy. This study demonstrates that all patients do not require postoperative radiotherapy and selected patients can be treated by surgery only. Prospective studies will be useful to clarify the role of radiotherapy and develop a subsequent therapeutic strategy. New modalities of radiotherapy (eg, intensity-modulated radiotherapy) can perhaps improve the treatment of this condition. New molecules (eg, monoclonal antibody of epidermal growth factor receptor inhibitor) could be of interest in the treatment of these lesions, which are similar to intestinal adenocarcinomas. To our knowledge, no previous studies have examined the role of chemotherapy in the treatment of this condition. The results of this retrospective study suggest that radiotherapy can be used to treat nasoethmoidal adenocarcinoma, but its usefulness should be confirmed with further prospective studies.

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Author Contributions: Dr Choussy had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: De Raucourt and Dehesdin. Acquisition of data: Ferron, Védrine, Toussaint, Létin, Marandas, Babin, Rey, Cosmidis, and Makeiﬀ. Analysis and interpretation of data: Choussy. Drafting of the manuscript: Choussy. Critical revision of the manuscript for important intellectual content: Ferron, Védrine, Toussaint, Létin, Marandas, Babin, De Raucourt, Rey, Cosmidis, Makeiﬀ, and Dehesdin. Obtained funding: Cosmidis. Administrative, technical, and material support: Choussy, Ferron, Toussaint, Marandas, De Raucourt, Rey, and Makeiﬀ. Study supervision: Védrine, Babin, De Raucourt, and Dehesdin.

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REFERENCES