Paranasal Sinus and Nasal Cavity

Claus Andrup Kristensen

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Key Points

- Sinonasal carcinoma occurs more frequently in wood dust-exposed individuals and occupational history is particularly important for this patient group.
- CT scans and MRI are complementary and both are necessary for diagnosis, staging, and planning of surgery and radiotherapy. 18F-FDG-PET/CT can be used as a supplement to other diagnostic and treatment planning procedures.
- Multidisciplinary conferences are essential for optimal diagnosis and treatment planning.
- Surgery is the primary treatment of sinonasal cancer. Postoperative radiotherapy is recommended in cases of incomplete surgery, advanced stage disease, or adenoid cystic carcinoma. Most studies report 5-year overall survival rates on the order of 50–60%.
- In selected cases, radical surgery is feasible with endoscopic techniques with excellent cosmetic result.
- Increasing radiation dose conformality leads to increased functional preservation of organs at risk (OARs). IMRT and proton therapy reduce mean dose to OARs significantly. Doses of 60–70 Gy should be applied.
- Induction and concomitant chemotherapy should be considered in sinonasal undifferentiated carcinoma. For other histologies, the indication is not clear-cut and should be decided in each individual case.
- Follow-up with MRI and/or PET/CT at regular intervals is recommended.
- Local recurrences should be evaluated for reirradiation and surgery before palliative chemotherapy is offered.

Claus Andrup Kristensen, MD, PhD
Department of Oncology 5073, The Finsen Centre, Rigshospitalet, Blegdamsvej 9, 2100 Copenhagen, Denmark
6.1 Epidemiology

Carcinoma of the paranasal sinuses and nasal cavity is relatively rare with an incidence of ~1/100,000 inhabitants; 60–80% of patients are males. The most common histologic subtype is squamous cell carcinoma (40–80%) followed by adenocarcinoma (10–20%) \(^{(\text{Barnes et al. 2005})}\). Less frequently occurring are salivary gland tumors (mainly adenoid cystic carcinoma), sinonasal undifferentiated carcinoma (SNUC), and neuroendocrine carcinomas (small cell carcinoma and esthesioneuroblastoma).

Smoking increases the risk of squamous cell carcinoma with a factor of 1.7–3.1 \(^{(\text{t'Mannetje et al. 1999; Hayes et al. 1987})}\), whereas the main etiological factor for development of adenocarcinoma is occupational wood dust exposure. There is a clear correlation between cancer risk and prolonged exposure to high concentrations of wood dust \(^{(\text{t'Mannetje et al. 1999})}\). The role of inhalation of formaldehyde and dust from the preparation of leather and textiles is more controversial, but these agents may increase the risk of sinonasal adenocarcinoma \(^{(\text{Luce et al. 2002; Coggon et al. 2003})}\).

6.2 Diagnosis and Staging

Due to the anatomy of the area with large mucosa-lined cavities, the tumor may grow for a very long time without causing any symptoms. Patients often ignore the initial unspecific symptoms, e.g., anosmia, nasal obstruction, discharge, and epistaxis; but eventually the tumor will invade the osseous walls of the cavities leading to local pain, headache, facial swelling, and orbital symptoms (proptosis, vision loss, diplopia) after invasion of the orbit and/or the skull base \(^{(\text{Jiang et al. 1998; Dias et al. 2003})}\). Consequently, most patients are diagnosed in advanced stages \(^{(\text{Myers and Oxford 2004})}\).

Carcinomas should be staged according to the UICC/AJCC classification (Table 6.1). The first clinical staging system for esthesioneuroblastomas was developed by Kadish et al. (1976) (Table 6.2) and later modified by Morita et al. (1993). The Kadish classification was criticized for distributing a population of patients unevenly in stages A–C with very few patients in stage A and a large inhomogeneous group of patients in stage C. In a recent comparison of different classification systems, the Kadish classification was the only staging system able to show a statistically significant discrimination between stages regarding relapse-free survival \(^{(\text{Dias et al. 2003})}\).

The diagnosis and staging is based on physical examination, imaging, and biopsy. Fiberoptic nasal endoscopy may provide important information about local tumor extension. Since large areas of the nose and paranasal sinuses are inaccessible for visualization even by nasal endoscopy, the use of imaging modalities is particularly important for staging and assessment of exact tumor extension. Combined CT scanning and MRI is recommended for determination of tumor stage and tumor extension before surgery and/or radiotherapy \(^{(\text{Raghavan and Phillips 2007})}\). Most comparative studies of imaging modalities are of patients with nasopharyngeal carcinoma; but due to the close proximity of nasopharyngeal and sinonasal tumors and the propensity for both tumor types to invade the skull base and intracranial space, extrapolations from one tumor type to the other seem acceptable. CT is excellent for assessment of cortical bone destruction, whereas MR provides more information than CT regarding soft tissue involvement, skull base erosion/invasion along cranial nerve foramina, dural and orbital invasion (Fig. 6.1) \(^{(\text{Ng et al. 1997; Raghavan and Phillips 2007})}\). The exact role of PET and PET/CT in diagnosis, treatment planning, and evaluation has not been determined, but uptake of \(^{18}\text{F-FDG}\) seems to be particularly high in squamous cell carcinomas and undifferentiated carcinomas \(^{(\text{Ninomiya et al. 2004; Wild et al. 2006})}\).

Lymph node metastases are generally not frequent; they are present in 2–10% of patients at the time of diagnosis and lymph node recurrences occur in 7–12% \(^{(\text{Cantù et al. 2008; Dulguerov et al. 2001; Grau et al. 2001; Le et al. 2000; Logue and Slevin 1991; Myers et al. 2002})}\), approximately half of these recurrences occur in lymph nodes only \(^{(\text{Dulguerov et al. 2001})}\). Elective lymph node irradiation was not given consistently in these studies, but in a study of 49 T\(_{3,4}\)-N\(_{0,1}\)-M\(_{0}\) tumors, two patients (4.5%) had lymph node recurrences after elective radiotherapy \(^{(\text{Jeremic et al. 2000})}\).

6.3 Treatment

The location of sinonasal tumors in close proximity to high-priority organs at risk (OAR) such as the eye(s), the optic nerve(s), the optic chiasm, and the