The Role of Radiation Therapy in the Management of Sinonasal and Ventral Skull Base Malignancies

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KEYWORDS

• Nasal cavity • Sinonasal • Paranasal • Sinus • Skull base • Radiation

KEY POINTS

- Sinonasal and ventral skull base cancers encompass a variety of rare "orphan" tumors. Existing evidence is predominantly from retrospective single-institution series.
- Multimodality treatment with surgery and postoperative radiation therapy is the standard paradigm.
- Advances including intensity-modulated radiation therapy and charged particle therapy have allowed for improved oncologic outcomes and reduced toxicity.
- Radiation oncologists must balance target coverage and critical structure dose to maximize tumor control while minimizing severe toxicity.
- Specific radiotherapy considerations vary by histology and location and are important for optimal management.

INTRODUCTION

Sinonasal and ventral skull base malignancies are rare tumors; therefore, evidence for optimal management is limited primarily to single-institution retrospective series and population-based registry studies. Initial management is usually maximal surgical resection. Although no randomized trials exist, high rates of local failure have led to the wide adoption of postoperative radiation therapy for all except early-stage tumors without adverse pathologic risk factors. Numerous institutions published their

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Table 1
Select large institutional series using RT for sinonasal cancer

Series	Years Treated	n	% Surgery	Results	Conclusions/Toxicity
Blanco et al,[1] 2004 (WashU)	1960–1998	106	65	5-y OS 27%, DFS 33%, LC 58%	Better outcomes in those who had surgery
Hoppe et al,[2] 2007 (MSKCC)	1987–2005	85	100	5-y OS 67%, DFS 55%, LC 62%	Only 1 G3+ ocular toxicity using mostly modern techniques (3DCRT, IMRT)
Dulguerov et al,[3] 2001 (UCLA, Switzerland)	1975–1994	220	71	5-y OS 40%, LC 57%	Better outcomes in those who had surgery
Chen et al,[4] 2007 (UCSF)	1960–2005	127	84	5-y OS 52%, DFS 62%, LC 54%	Decreased toxicity across decade treated due to advances in RT technique
Dirix et al,[5] 2007 (Belgium)	1976–2003	127	88	5-y OS 54%, DFS 37%, LC 53%	15 patients with RT retinopathy, 2 patients with severe optic neuropathy
Bristol et al,[6] 2007 (MDACC)	1969–2002	146	100	5-y OS 55%, DFS 53%, LC 74%	34% G3+ toxicity if treated before 1991 vs 8% if treated after 1991
Mendenhall et al,[7] 2009 (UF)	1964–2005	109	49	(Excluded maxillary tumors) 5-y OS 55%, LC 63%	20% severe complications, including 19 patients with at least ipsilateral blindness
Duprez et al,[8] 2012 (Belgium)	1998–2009	130	78	5-y OS 52%, DFS 39%, LC 59%	G3+ ocular toxicity in 11 patients, but no blindness in patients who had IMRT
Al-Mamgani et al,[9] 2012 (Netherlands)	1999–2010	82	78	5-y OS 54%, DFS 56%, LC 74%	Decreased late toxicity and increased vision preservation with IMRT vs 3DCRT

Abbreviations: DFS, disease-free survival; IMRT, intensity-modulated radiation therapy; LC, local control; MDACC, MD Anderson Cancer Center; MSKCC, Memorial Sloan Kettering Cancer Center; RT, radiation therapy; UCLA, University of California, Los Angeles; UCSF, University of California, San Francisco; UF, University of Florida; WashU, Washington University in St. Louis.

experiences with this approach (Table 1), with most reports spanning at least several decades and encompassing a mix of tumor stages and histologies. These series report 5-year overall survival (OS) rates of roughly 50% and local control (LC) of 50% to 70%.[1–9] When patients present with unresectable disease or comorbidities