
Synovial Sarcomas of the Head and Neck: CT and MR Findings

Robert Sigal,^{1,5} Marie-Dominique Chancelier,¹ Bernard Luboinski,² Lorraine G. Shapeero,^{1,3} Jacques Bosq,⁴ and Daniel Vanel¹

Summary: The authors present three cases of histologically proved synovial sarcoma. CT is useful in assessing erosive or destructive changes in bone, and in demonstrating calcifications. MR characteristics are nonspecific; calcifications within these tumors can be missed on MR. MR can help to assess tumor extension, vascular invasion, and hemorrhage within the tumor.

Index terms: Neck, neoplasms; Sarcoma; Neck, magnetic resonance; Neck, computed tomography

Synovial sarcoma, a malignant soft-tissue tumor that occurs primarily in the extremities of young adults, is rare in the head and neck. About 50 cases have been reported since the lesion was first described by Jernstrom in 1954 (1, 2). Magnetic resonance imaging (MR) characteristics of these tumors have been reported in the extremities (3). We present three cases of histologically proven synovial sarcoma of the head and neck and discuss the CT and MR findings of this lesion.

Case Reports

Between 1985 and 1991 three patients with head and neck synovial sarcoma were admitted to our institution. All patients underwent two or three MR examinations. MR scans were performed on a 1.5-T unit (Signa; General Electric, Milwaukee, WI). Images were obtained using the dual spin-echo multisection multiplane imaging technique. Short sequences (600/20) and long sequences (2000/20–90) were used in all cases. An injection of gadolinium-DTPA (dose = 0.1 mmol/kg) was done in all patients. Section thickness was 5 mm with an intersection gap of 1 mm. The acquisition matrix was either 256 × 256 or 192 × 256. All studies comprised at least two perpendicular imaging planes. Contrast computed tomography (CT) was done in all cases.

Case 1

An 18-year old woman presented in 1984 with a painless mass in the right cheek. Examination disclosed palsies of the right V, VII, X, and XII nerves. Initial contrast CT showed a large enhancing mass in the infratemporal fossa that destroyed the greater wing of the sphenoid bone, the ascending ramus of the mandible, and the posterior wall of the maxillary sinus. A biopsy was performed, disclosing a highly cellular synovial sarcoma. The patient was treated with chemotherapy and radiotherapy. Regression of the X, XII, and VII nerve palsies and reduction of the tumor size were noticed. Between 1985 and 1991, the patient was followed with sequential CT and MR examinations. CT showed a large mass with regular margins. The bony structures were remodeled outward rather than destroyed by the tumor (Fig. 1A). On T1- and T2-weighted MR sequences, the tumor appeared hypointense in comparison to muscles (Figs. 1B and 1C). After gadolinium injection, minimal and inhomogeneous enhancement was noted (Fig. 1D). There was no evidence of intracranial extension.

Case 2

A 23-year-old woman was referred for treatment of a recurrent mass in the posterior part of the neck. Clinical findings were not specific for tumor and were compatible with post-therapeutic changes. However, MR disclosed a small, rounded lesion with low signal intensity on T1-weighted images, and high signal intensity on T2-weighted images. After injection of gadolinium-DTPA, moderate and inhomogeneous enhancement was noted in the tumor (Figs. 2A–2C). The mass was removed and was proved to be a synovial sarcoma at histopathology, including immunohistochemical studies (Fig. 2D).

Case 3

A 61-year old woman noted a slowly growing mass of the left external temporal fossa associated with intermittent pain in the temporomandibular joint. CT showed a tumor

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¹ Department of Radiology, Institut Gustave Roussy, Villejuif, France.

² Department of Head and Neck Surgery, Institut Gustave Roussy, Villejuif, France.

³ Department of Radiology, University of California Medical Center, San Francisco, CA 94143.

⁴ Department of Pathology, Institut Gustave Roussy, Villejuif, France.

⁵ Address reprint requests to Robert Sigal, MD, Department of Radiology, Institut Gustave Roussy, F-94805 Villejuif Cedex, France.

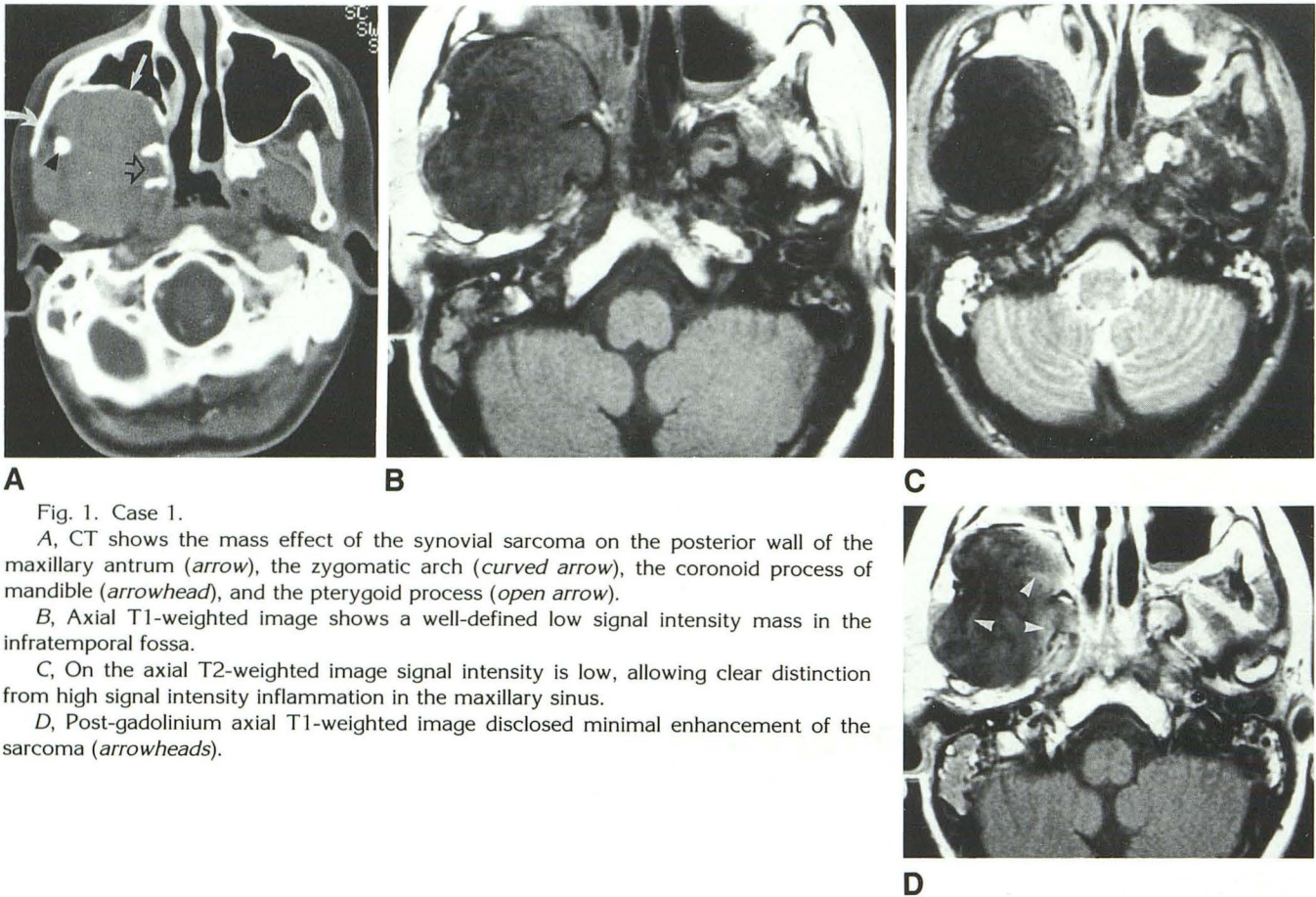


Fig. 1. Case 1.

A, CT shows the mass effect of the synovial sarcoma on the posterior wall of the maxillary antrum (*arrow*), the zygomatic arch (*curved arrow*), the coronoid process of mandible (*arrowhead*), and the pterygoid process (*open arrow*).

B, Axial T1-weighted image shows a well-defined low signal intensity mass in the infratemporal fossa.

C, On the axial T2-weighted image signal intensity is low, allowing clear distinction from high signal intensity inflammation in the maxillary sinus.

D, Post-gadolinium axial T1-weighted image disclosed minimal enhancement of the sarcoma (*arrowheads*).

in the left infratemporal fossa, enhancing with contrast with small intratumoral calcifications (Fig. 3A). At MR, the lesion appeared markedly heterogeneous on both T1- and T2-weighted images (Figs. 3B and 3C). Enhancement was noted after gadolinium injection (Fig. 3D). The lesion was totally removed and a synovial sarcoma, with interspersed calcifications, was diagnosed at histopathology (Fig. 3E).

Discussion

Synovial sarcomas comprise between 8% and 10% of all soft-tissue malignancies (4). Patients present between ages 15 to 35 years, with a male/female ratio of 3:2 (2). Approximately 85% of synovial sarcomas occur in the extremities, especially the knees (5). Other sites are rare and comprise soft tissues of the head and neck, lower back, chest, and abdominal wall. In the head and neck, most of the tumors have been described in the cervical and parapharyngeal sites, the orofacial region being more rarely involved (5, 6). Synovial sarcomas seldom arise from formed synovial tissue. In the neck, synovial tissue is found in the tendinous portions of the cervical

muscles and in the anterior portion of the larynx and pharynx (bursa subhyoidea, bursa laryngea subcutanea) (4). Because most synovial sarcomas have been found in the retropharyngeal region where synovial tissue is not normally present, it has been hypothesized that these tumors represent synovioblastic differentiation of mesenchymal tissues (4, 6, 7). Classically, biphasic synovial sarcomas with both spindle cells and epithelial cells are characteristic, but monophasic forms, consisting of only one cell type, have also been described (2, 8). Hemorrhage and necrosis may be present (4). Calcification are found in up to 30% of adult cases and extensive calcification may indicate a more favorable prognosis (9). Regional lymph nodes are found in 12.5% of cases (2). Synovial sarcomas are equally aggressive in the head and neck as in the extremities, with local recurrence and pulmonary metastases. Survival is 40% at 5 years and 25% at 10 years (2, 5-7).

CT and MR findings in synovial sarcomas are nonspecific and resemble those associated with

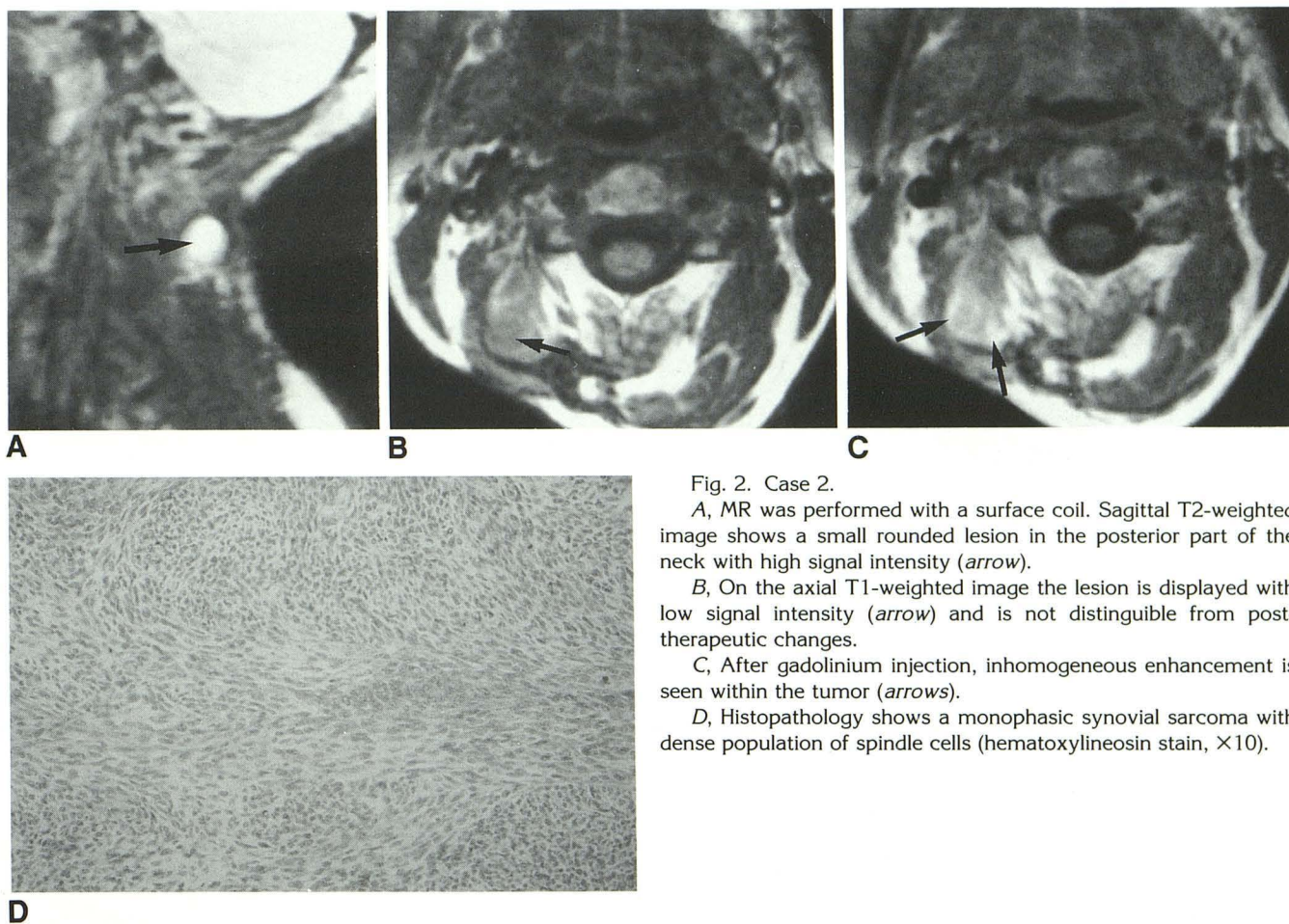


Fig. 2. Case 2.

A, MR was performed with a surface coil. Sagittal T2-weighted image shows a small rounded lesion in the posterior part of the neck with high signal intensity (*arrow*).

B, On the axial T1-weighted image the lesion is displayed with low signal intensity (*arrow*) and is not distinguishable from post-therapeutic changes.

C, After gadolinium injection, inhomogeneous enhancement is seen within the tumor (*arrows*).

D, Histopathology shows a monophasic synovial sarcoma with dense population of spindle cells (hematoxylineosin stain, $\times 10$).

other soft-tissue tumors (3, 10–13). Mahajan reported the MR findings in a series of 10 patients with lower limb synovial sarcoma. The lesions showed intermediate signal intensity on the T1-weighted images, and heterogeneous high signal intensity on the T2-weighted images. One of our patients had similar MR findings, but the two others had different signal intensity appearance: one had low signal intensity on both T1- and T2-weighted sequences, consistent with dense cellularity; the other showed an area of high signal intensity on both sequences due to chronic hemorrhage. All lesions enhanced after gadolinium injection, but to different degrees. Thus, our results confirm the fact that MR findings are non-specific for a particular soft-tissue neoplasm (14), and underscore the need for biopsy to ensure histopathologic diagnosis. The other limitation of MR is its inability to demonstrate calcification, as seen in one of our patients; occasionally, cortical bone involvement can be missed (13). CT should be performed to assess erosive or destructive

bony changes, particularly in the orofacial region, and to demonstrate calcifications—a good prognostic sign (15). However, the multiplanar capabilities of MR are key in therapeutic planning (radical surgery, radiation therapy) and MR should be used to assess tumor extension (3), in particular skull base and intracranial involvement, to demonstrate vascular invasion, and to identify hemorrhage within the tumor.

References

1. Jernstrom P. Synovial sarcoma of the pharynx: report of a case. *Am J Clin Pathol* 1954;24:957–961
2. Moore MM, Berke GS. Synovial sarcoma in the head and neck. *Arch Otolaryngol Head Neck Surg* 1987;113:311–313
3. Mahajan H, Lorigan JG, Shirkhoda A. Synovial sarcoma: MR imaging. *Magn Reson Imaging* 1989;7:211–216
4. Batsakis JG. Synovial sarcoma (malignant synovioma). In: Batsakis JG, ed. *Tumors of the head and neck: clinical and pathological considerations*. 2nd ed. Baltimore: Williams & Wilkins, 1979: 356–359

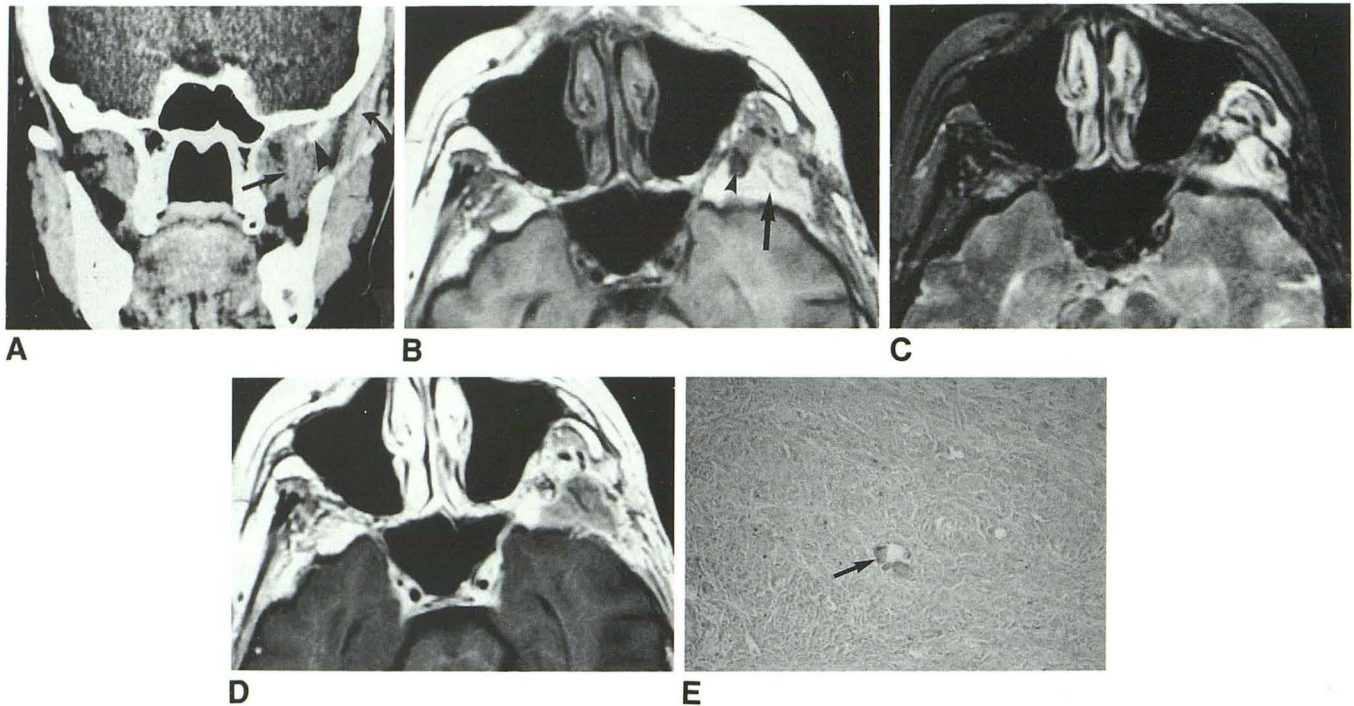


Fig. 3. Case 3.

A, Coronal CT shows a lesion in the infratemporal fossa (arrow), with extension to the external temporal fossa (curved arrow). A calcification is visible within the tumor (arrowhead).

B, Axial T1-weighted image shows an heterogeneous lesion with a posterior high signal intensity area corresponding to hemorrhage (arrow). The calcification is also seen (arrowhead).

C, On the axial T2-weighted image the lesion has mixed signal intensities.

D, Post-gadolinium axial T1-weighted image displays enhancement of the anterior part of the sarcoma.

E, Photomicrograph of the specimen shows a monophasic synovial sarcoma. Tumor cells are stained brown with monoclonal antibody (vimentine). A microcalcification is also seen (arrow) ($\times 10$).

5. Shmookler BM, Enzinger FM, Brannon RB. Orofacial synovial sarcoma: a clinicopathologic study of 11 new cases and review of the literature. *Cancer* 1982;50:269-276
6. Roth JA, Einzinger FM, Tannebaum M. Synovial sarcoma of the neck: a follow-up study of 24 cases. *Cancer* 1975;35:1243-1253
7. Hajdu SI, Shiu MH, Fortner JG. Tendosynovial sarcoma: a clinicopathological study of 136 cases. *Cancer* 1977;39:1201-1217
8. Harisson EG. Synovial sarcoma primary in the neck. *Arch Pathol* 1961;71:137-141
9. Varela-Duran J, Enzinger FM. Calcifying synovial sarcoma. *Cancer* 1982;50:345-352
10. Pulpeiro JR, Cruz R, Arenas A, Perez-Espejo G. Para-oesophageal synovial sarcoma. *Eur J Radiol* 1988;8:120-121
11. Israels SJ, Chan HSL, Daneman A, Weitzman SS. Synovial sarcoma in childhood. *AJR* 1984;142:803-806
12. Kester NL. Synovial sarcoma in the neck of an eleven month old girl. *Pediatr Radiol* 1990;20:487
13. Vanel D, Di Paola R, Contesso G. Magnetic resonance imaging in musculoskeletal primary malignant tumors. In: Kressel HY, ed. *Magnetic resonance annual*. New York: Raven Press, 1987:237-261
14. Pettersson H, Slone RM, Spanier S, Gillespy T, III, Fitzsimmons JR, Scott KN. Musculoskeletal tumors: T1 and T2 relaxation times. *Radiology* 1988;167:783-785
15. Fanney D, Castillo M, Lerner HH. Computed tomography of calcified synovial sarcoma of the hypopharynx. *J Comput Assist Tomogr* 1988;12:687-689