

# Metastasis of a Solitary Fibrous Tumor in the Mandible: A Case Report

FLORIAN DUDDE, MANFRED GIESE and KAI-OLAF HENKEL

*Department of Oral and Maxillofacial Surgery, Army Hospital Hamburg, Hamburg, Germany*

**Abstract.** *Background/Aim: The solitary fibrous tumor (SFT) is a mesenchymal neoplasm and belongs to the group of soft tissue sarcomas. The SFT is characterized by indolent, slowly progressive growth and manifests itself clinically by compression of neighboring structures. The treatment of choice is surgical removal of the tumor. In advanced stages, there is also the possibility of chemotherapy, systemic therapy, or immunotherapy, as well as radiotherapy. Depending on their location and severity, SFTs show different recurrence rates and survival functions. Case Report: The present case report shows an extremely rare localization of a low-risk SFT in the floor of the mouth. Despite complete surgical removal of the SFT, the patient showed a metastasis of the SFT in the mandible two years postoperatively. Therefore, this case report shows that even a low-risk SFT in the localized stage can metastasize despite of total surgical removal. Consequently, SFTs of the head and neck region require close clinical and imaging follow-up. Conclusion: Although the localization of the SFT in the oral cavity is a rarity, this entity should be included in the differential diagnosis in the case of long-term space-occupying processes in the head and neck region. This report is the first regarding metastasis of a SFT to the mandible.*

*Correspondence to:* Dr. Florian Dudde, Department of Oral and Maxillofacial Surgery, Army Hospital Hamburg, Lesserstraße 180, 22049 Hamburg, Germany. Tel: +49 40694717111, e-mail: floriandudde@gmx.de

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Solitary fibrous tumors (SFTs) belong to the group of soft tissue sarcomas with a pronounced heterogeneity. In the literature, SFTs have been described using a variety of synonyms (localized mesothelioma, benign mesothelioma, pleural fibroma) (1). This form of mesenchymal neoplasm belongs to the group of orphan diseases and is usually the result of interdisciplinary differential diagnostics (2). The group of SFTs is a rarity as space-occupying processes in the mouth, jaw, and face (3). The most common localization is in the area of the visceral pleura (4). Initial investigations into SFTs postulated that it was a variant of mesothelioma (5). However, recent studies have shown that SFTs can also be localized extrathoracically, including intraorally. The occurrence in the head and neck area is mainly described in the orbital cavity, the paranasal sinuses, as well as intraorally and accounts for about 6% of all SFTs (6, 7). However, only individual case reports of SFTs have been published in the jaw or in the area of the floor of the mouth (2, 8). There is no report of metastasis to the mandible so far.

## Case Report

The following case report describes a 53-year-old woman who attended the Department of Oral and Maxillofacial Surgery of the Army Hospital Hamburg suffering from a swelling in her left floor of the mouth. The swelling was initially noticed about a year ago and showed rapid progression in size within the last weeks according to the patient. The patient had no relevant previous illnesses at the time of the first presentation. The extraoral examination showed a soft indolent swelling of the left submandibular area. The intraoral examination showed a palpable swelling with a marginal erosion in the lingual mucosa close to the left jaw angle. An ultrasound of the head and jaw region was performed showing questionably suspicious lymph nodes. The magnetic resonance imaging (MRI) of the head and neck area showed a suspect tumor within the left anterior floor of the mouth (Figure 1). However, the tumor could not be assigned to a specific group of tumors through MRI. An

incisional biopsy of the tumor was performed. The histological findings showed mesenchymal neoplasia of spindle cells. Immunohistochemical stainings for S100, desmin, cytokeratin, and CD34 were negative. A few vessels within the tumor showed a positive staining for alpha-actin. Ki67 as a marker for proliferation was slightly increased. A high nuclear expression of STAT6 was found as well as the pathognomonic NAB2/STAT6 fusion. This led to the diagnosis of a low-risk SFT of the mandible. A computed tomography (CT) scan of the head and neck region as well as a chest x-ray were negative for metastases. Total excision of the SFT in the mandible through a submandibular approach was performed after interdisciplinary case discussion. The SFT was of firm structure and easy to extract from the soft tissue (Figure 2). Histological examination showed a completely surgically removed low-risk SFT. The patient's postoperative course was uncomplicated. The case was discussed in an interdisciplinary manner in the tumor board and clinical follow-up and a MRI check-up in six months were agreed. In the first two years of follow-up, there was no evidence of recurrence or metastasis. However, two and a half years postoperatively, the patient presented a progressive dysesthesia in the supply area of the left inferior alveolar nerve, firstly noticed one month earlier. Further clinical examination revealed no abnormalities. Due to the patient's pronounced symptoms, an orthopantomogram as well as a cone beam scan of the mandible was first performed. A low-density mass in the edentulous mandibular bone in the region of the former second premolar was found with subsequent displacement of the inferior alveolar nerve in a lingual-caudal direction (Figure 3). The lingual cortex was internally thinned by the tumor with a smooth surface, while the outer cortex appeared irregularly infiltrated.

The cone beam scan was supplemented by an MRI. Here, a strictly intraosseous mass with increased contrast agent enhancement was shown (Figure 4). The surgical removal of the intraosseous neoplasm in the lower jaw was performed from enoral. The tumor revealed a strong adherence to the inferior alveolar nerve, thus a continuity resection of the nerve had to be performed as well. The intraosseous neoplasm resulted in the histopathological finding of a metastasis of the known SFT, with osseous and perineural infiltration and a high rate of nuclear pleomorphisms. After further discussion of the case, a mandibular continuity resection was carried out together with an accompanying mandibular reconstruction using a reconstruction plate (Figure 5). Here, tumor-free resection margins were histologically proven again. In addition, a control positron emission tomography-CT examination of the head-neck-thorax region was carried out three months postoperatively, in which a local recurrence as well as another metastasis of the SFT in the head-neck region could be ruled out. In a second intervention, the definitive lower jaw reconstruction

was carried out using avascular bone from the iliac crest (Figure 6). In the case of a metastasis of the SFT, the recommendation for clinical follow-up using MRI after three to six months postoperatively was made in the interdisciplinary tumor conference.

## Discussion

SFTs in general show no sex predisposition with a mean age of onset of 60 years (9). Clinically, the tumors are characterized by variable symptoms. They usually show indolent, slow growth and are expressed by the compression of neighboring structures (10). The progression of the symptoms depends on the histological subtype of the SFT. In addition, some works describe an association with paraneoplastic syndromes such as Doege-Potter syndrome and Pierre-Marie-Bamberger syndrome (11). The Doege-Potter syndrome results from an increased production of the IGF-II hormone from the SFT and consequently leads to a tendency towards hypoglycaemia in the patient. Up to 5% of patients with SFTs have this symptom. Likewise, IGF-II-mediated symptoms of acromegaly are described (12). The Pierre-Marie-Bamberger syndrome describes a paraneoplastic hypertrophic pulmonary osteoarthropathy, especially in the area of the phalanges, and has also been associated with SFTs (13). There are currently no known key symptoms of SFT in the head and neck region. Consequently, this results in the need for comprehensive imaging measures and the confirmation of findings through a biopsy including histological examination in order to be able to diagnose SFT (14, 15). A sonographic examination of the findings is initially suitable as imaging. However, SFTs can show variable signals with clear differentiation from the environment (2). Both CT and MRI are used for advanced imaging. The SFTs show a heterogeneous contrast agent enhancement with usually isodense or isointense signal behavior in relation to the muscles (6). However, there are also different presentations with regard to histopathologically benign or malignant SFTs. For example, benign SFTs with a cystic structure are described as a lobulated mass with aspects of displacement of the surrounding tissue in the case of intralesional hypodensity in CT (6).

The definitive diagnosis of SFT is made by histopathological processing of the tissue. This mesenchymal neoplasia consists of spindle-shaped tumor cells, some of which are arranged in a net-like or "herringbone" pattern, and are traversed by multiple microvessels (14, 10). Immunohistochemical examinations provide crucial information when differentiating other tumors from the group of soft tissue sarcomas (1, 16). Characteristically, the transmembrane protein CD34 and an increased nuclear concentration of STAT6 in SFTs can be stained immunohistochemically (10).

Other immunohistochemical markers include CD99, Bcl-2, and vimentin. In addition, histopathological processing can be

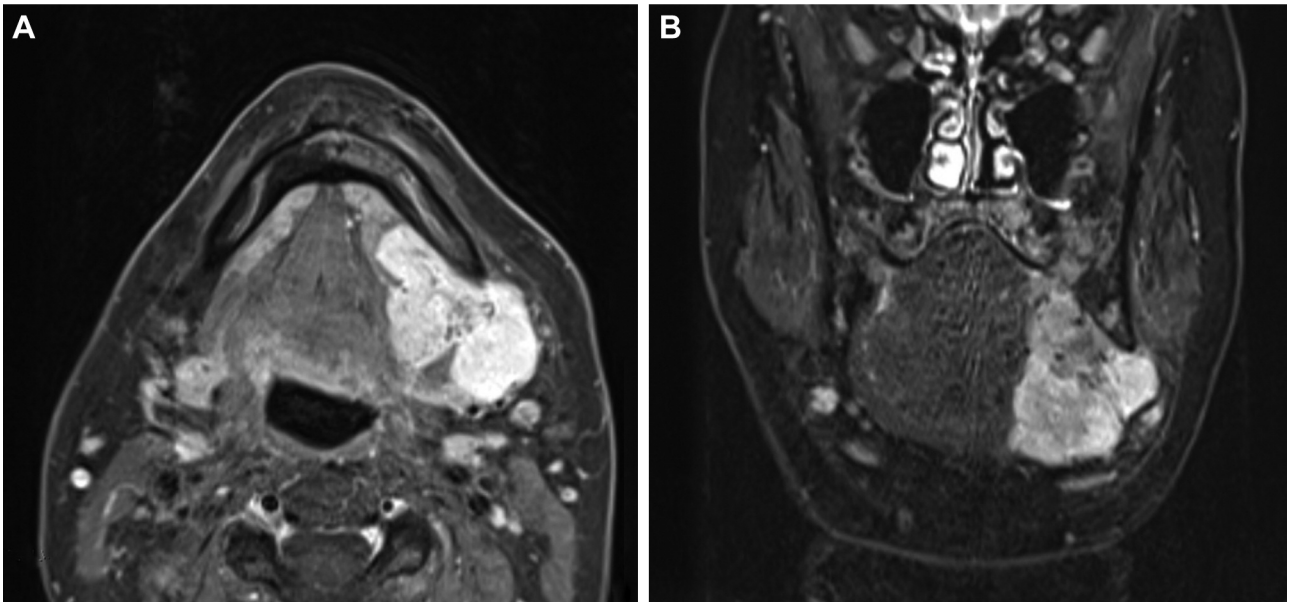


Figure 1. MRI of the head of a 53-year-old woman showing: A) a suspect tumor within the left anterior floor of the mouth in a T1-weighted sequence on the axial view and B) on the coronal view.

used to differentiate between benign and malignant SFTs. Known malignancy criteria are marginal infiltration, an increased mitotic index, an increased number of necrosis, and nuclear and cellular polymorphisms (2, 10). If 3/5 of these malignancy criteria are present, a malignant SFT is assumed histopathologically (17). In addition, benign and malignant SFTs differ by a disproportionately high expression of STAT6 in benign SFTs (18). This differentiation is supplemented by the proliferation marker Ki67, which most likely indicates a malignant SFT with a proliferation index >10% (19). Due to the variable localization of SFTs, there are different therapy concepts depending on the dignity and severity of the tumors (15). Because of the rarity of this form of sarcoma, the different therapy recommendations are based on little evidence. The treatment of choice for clearly definable SFTs is surgical removal of the tumor (20). In patients with malignant SFT, it is also possible to combine surgical therapy with adjuvant or neoadjuvant radiotherapy of the tumor (21). Despite limited data, studies have shown that some SFTs tend to metastasize regardless of the location of the primary tumor. Metastases have been found in particular in the lungs, liver, and bones (22). The literature describes a metastasis rate of between 5-25% in patients with SFTs (16). Patients who have SFT in the metastatic stage can be treated with anthracyclines in accordance with the guidelines, despite the fact that they are generally considered insensitive to classic chemotherapeutic agents (2, 15). However, current data show that the survival rate without disease progression in patients with advanced SFT is relatively short at an



Figure 2. The surgical specimen was knobby and of elastic structure.

average of 4 months (23). In view of the histopathologically traceable hypervascularization of this mesenchymal neoplasia, angiogenesis inhibitors and immunotherapies, in particular tyrosine-kinase-inhibitors, are increasingly being used in these patients (24, 25). This resulted in a doubling of the progression-free survival period. Although the case numbers of SFTs are marginal, studies show a sufficient

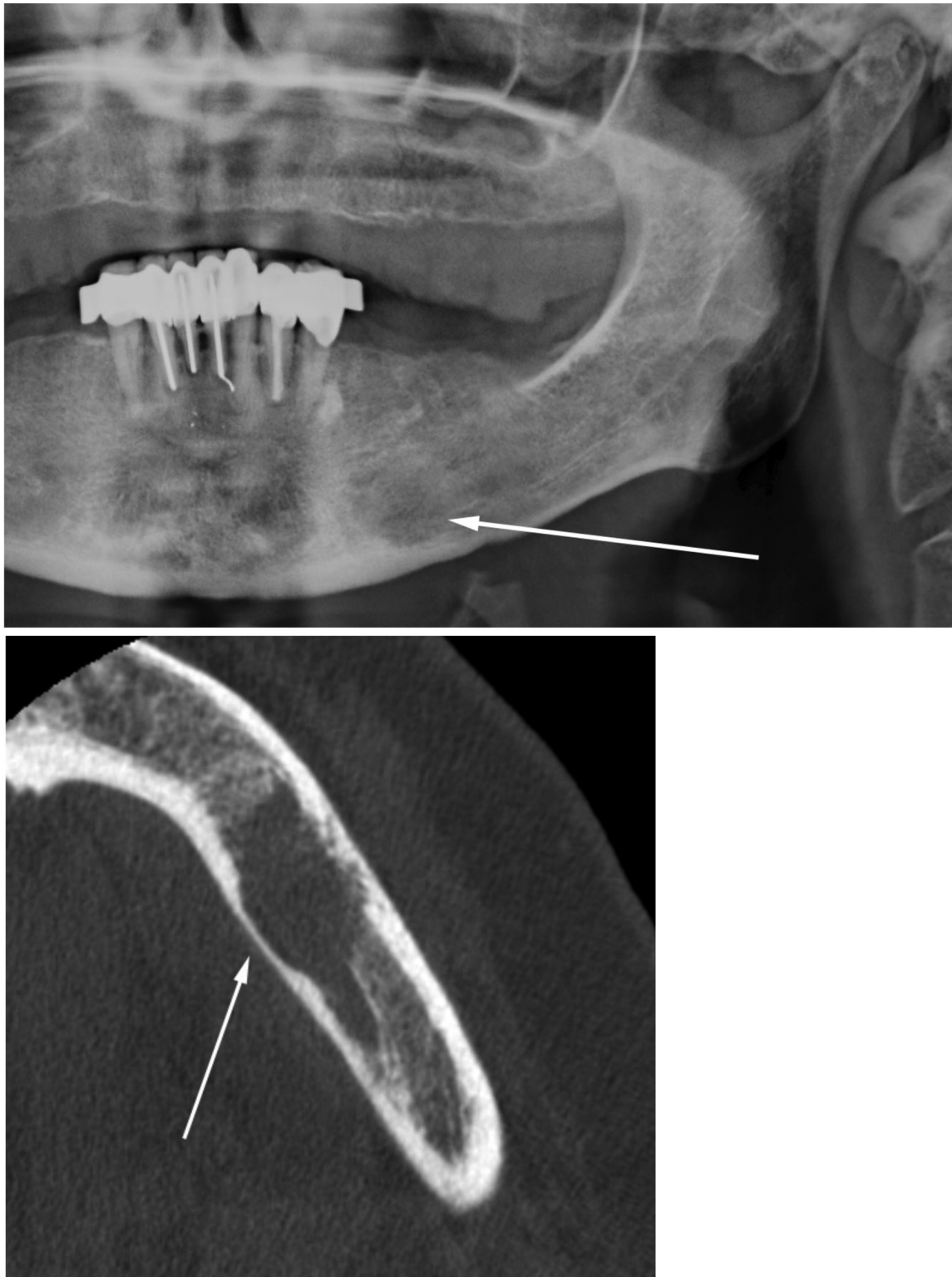


Figure 3. The orthopantomogram 2 years postoperatively showing a low-density mass in region (rg) 035/036 (arrow). Cone beam scan 2 years postoperatively shows a low-density mass (arrow) in region (rg) 035/036 with subsequent displacement of the inferior alveolar nerve in a lingual-caudal direction (axial view). The lingual cortex was internally thinned by the tumor with a smooth surface, while the outer cortex appeared irregularly infiltrated. However, there was no connection between the metastasis in the vestibular edentulous mandibular bone and the solitary fibrous tumor in the floor of the mouth.

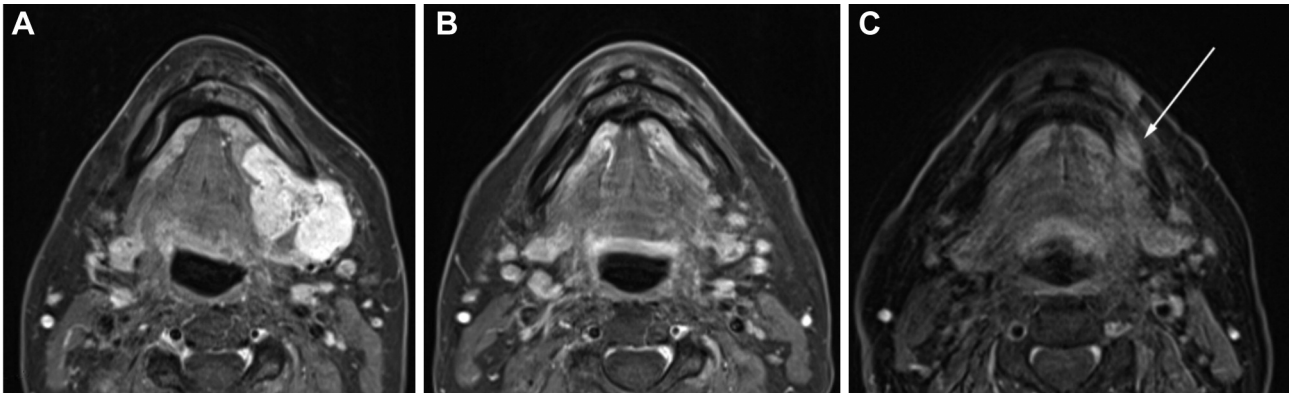


Figure 4. MRI of the head shows A) on the axial view, a suspect tumor within the left anterior floor of the mouth in a T1-weighted sequence as part of the initial diagnostics. B) Six months postoperatively no evidence of a metastasis or recurrence of the solitary fibrous tumor was found in a T1-weighted sequence. C) Two years postoperatively, a strict intraosseous mass (arrow) in the corpus mandibulae was identified.



Figure 5. The orthopantomogram shows the postoperative result after mandibular continuity resection and reconstruction using a reconstruction plate.

prognosis with a 5-year survival rate of 88% and a 10-year survival rate of 76% after tumor resection (16). This study referred to SFTs in different localizations and additionally differentiated the endpoints of metastasis and survival function based on the histopathological dignity. Malignant (high-risk) SFTs show an increased rate of metastasis and a lower survival rate than benign (low-risk) SFTs. Recent studies support these results and describe a reduction in the 5-year survival rate of up to 50% in patients with high-risk or malignant SFTs (15).

Some differences can be observed with regard to the recurrence rates of SFTs.

In a retrospective analysis with a small study collective, an 83% recurrence rate of an SFT of the orbit was found with a median follow-up period of about 6 years (26). However, larger studies describe significantly lower recurrence rates of 12% (27). An increased age of the patient as well as a visceral localization, could be determined as prognostically relevant factors with regard to recurrence rates. Histopathological risk factors include mitotic rates (>4/10 High Power Field) as well as CD34 negativity in immunohistochemistry (28). In patients with high-risk or malignant SFT, adjuvant irradiation of the tumor could lead to a significantly lower recurrence rate. The recurrences mainly occur in the first two postoperative years

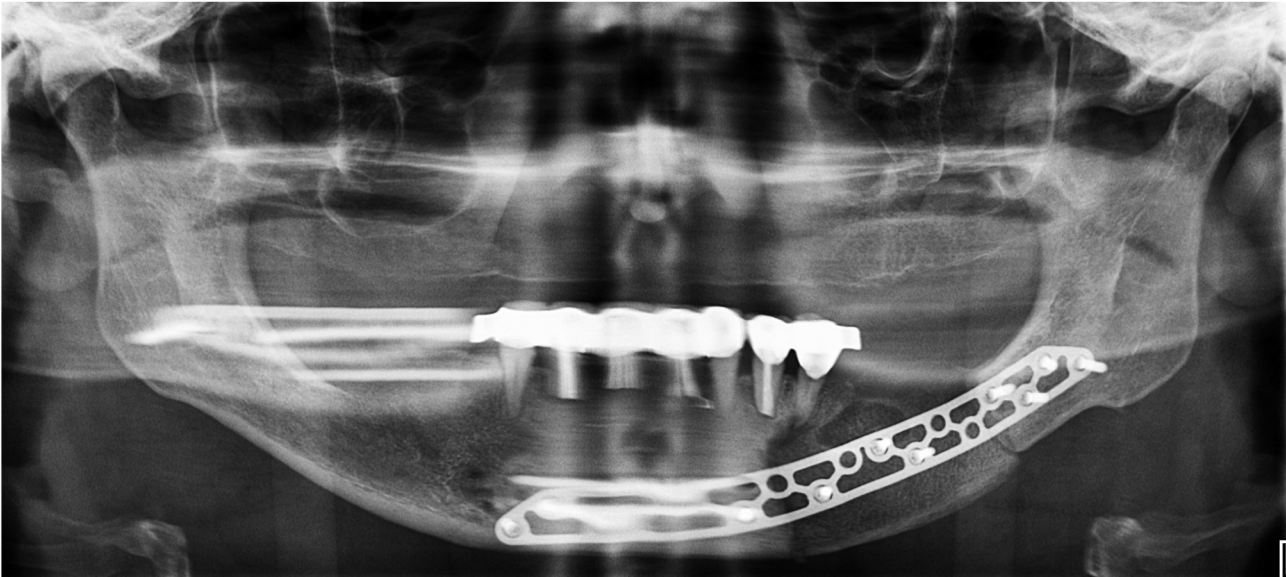


Figure 6. The orthopantomogram shows the postoperative result after lower jaw reconstruction was carried out using avascular bone from the iliac crest.

(28, 29). Due to the relatively low occurrence of SFTs in the head and neck region, there are only a few case reports regarding the recurrence rates in this area (8). However, patients with an SFT can also suffer recurrences years to decades later, therefore short-term and in particular long-term follow-up care is indicated (15, 30). In contrast to most solid tumors, this form of neoplasm requires follow-up monitoring accompanied by imaging (sonography, MRI, CT) over a period of >5 years (31). If a recurrence is detected, further therapy should be coordinated in an interdisciplinary manner. In the case of recurrence, the primary therapy of choice is surgical removal of the tumor. This can be supplemented by adjuvant therapy (radiation therapy, chemotherapy, immunotherapy). However, the current case report is too limited to make clear, evidence-based therapy recommendations for recurrent SFTs (31).

## Conclusion

The SFT of the head and neck region is an absolute rarity, especially in the anterior floor of the mouth. Nevertheless, it should be included in the differential diagnostic considerations in the case of long-term space-occupying processes in the head and neck region. Considering the slow growth of the SFT, the correct diagnosis can be made by means of appropriate imaging and histopathological findings in order to be able to offer the patient an individual therapy. This case report shows a local metastasis two and a half years postoperatively, despite the complete tumor resection with immunohistochemically proven low-risk variant of an

SFT. This underlines the need for clinical follow-up for this rare entity and also reveals the need for further clinical studies in order to be able to define the therapy concepts and prognosis of this disease in an evidence-based manner.

## Conflicts of Interest

The Authors have no conflicts of interest with regard to the work presented.

## Authors' Contributions

KOH and MG treated the patient and revised the article. FD researched the scientific literature, provided radiological findings and wrote the article. All Authors gave final approval for publication.

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