Myxofibrosarcoma Mimicking Inflammatory Lesion of Temporomandibular Joint—Case Presentation

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Abstract: Treating oncologic patients remains a challenge for surgeons aiming to provide patients with safe margins of resection while maintaining the highest possible quality of life. The latter, in the case of malignancies, requires using sophisticated methods of reconstruction. Thus, we present a case of a 75-year-old patient treated in our department with a rare neoplasm in the region of the temporomandibular joint—a myxofibrosarcoma that was mimicking an inflammatory lesion. The patient underwent two surgeries—firstly alloplasty of the TMJ due to the suspicion of an inflammatory lesion, lately extended to the resection of glenoid fossa and subtemporal fossa contents when the mandible was reconstructed using UHMW-PE (ultra-high molecular weight polyethylene). The patient was also referred for adjuvant radiotherapy and has remained disease-free for over 96 months with very good aesthetics and function of the mandible. The presented case highlights not only the need for increased oncologic awareness but also the possible use of UHMW-PE as a reconstruction material in the broad resection of the maxillofacial region.

Keywords: myxofibrosarcoma; TMJ; TMJ neoplasm; TMJ reconstruction; UHMW-PE

Citation: Zagacki, D.; Sztychny, K.; Tyndorf, M.; Bibik, R.; Sygut, D.; Kozakiewicz, M. Myxofibrosarcoma Mimicking Inflammatory Lesion of Temporomandibular Joint—Case Presentation. *Appl. Sci.* **2021**, *11*, 4373. <https://doi.org/10.3390/app11104373>

Academic Editor: Gabriele Cervino

Received: 28 April 2021

Accepted: 10 May 2021

Published: 12 May 2021

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1. Introduction

Myxofibrosarcoma (MFS) is a rare soft tissue neoplasm presenting a high incidence of late recurrence (50–60%) and metastasis potential (33%) [1]. The most common location for the pathology is the soft tissues of the lower extremities followed by the trunk, retroperitoneum and mediastinum [2]. The head and neck as a primary site are extremely rare with only a few reports being present in literature. Previous cases reported in the region of head and neck included the cranial cavity, orbit, maxilla, parotid gland, hypopharynx, sinus piriformis, vocal folds or thyroid gland [3]. No cases in the region of the temporomandibular joint were found in the literature, to the best of our knowledge. The rareness of the disease entity in this region may lead to many initial misdiagnoses, or even to the classification as benign lesions at first. What also should be highlighted is that most of the MFS present as a painless and slow-growing mass [1] that is also very misleading during the primary examination of the patient. We present a case of a 75-year-old male patient with myxofibrosarcoma of the temporomandibular joint and symptoms similar to those of the rheumatoid inflammatory entity of the joint. The patient underwent a broad resection with mandible reconstruction using UHMW-PE, thus, we would like to discuss in this article the up-to-date challenges in maxillofacial surgery—the possibilities of reconstructions using allogenic materials on the example of UHMW-PE and titanium.

2. Materials and Methods

Retrospective analysis of the medical documentation of the patient was performed (the first admission of the patient was in 2013) and updated with the most recent follow-up examination.

3. Results

The 75-year-old male was referred to the Department of Maxillofacial Surgery Medical University of Łódź, Poland, due to weight loss caused by severe pain in the left temporomandibular joint and restricted mouth opening for four years. The patient was burdened with ischemic heart disease and benign prostatic hyperplasia.

In the intra- and extra-oral examination, a restriction of mouth opening to 10 mm was noted (Figure 1), also our patient presented with insufficient lateral movement of the mandible.

Figure 1. Patient presenting mouth restriction to 10 mm.

The MRI of TMJ was performed and described by the radiologist as chronic arthritis and inflammation of the surrounding tissue ($33 \times 18 \times 22$ mm). Lateral pterygoid muscle, temporal muscle and masseter were involved as well (Figure 2). A consultation with a rheumatologist was commissioned and scintigraphy was performed—it was described as a degenerative-inflammatory lesion, confirming the primary diagnosis as chronic arthritis.

The patient qualified for total temporomandibular joint replacement with an individual prosthesis. Before the surgery, CT with 3D reconstruction was performed to design a prosthesis. The mandibular fossa was made of UHMW-PE and the condylar part of titanium.

Under general anesthesia, alloplasty of the TMJ was performed (Figure 3). Glenoid fossa, discus, condyle process as well as part of the mandible ramus and part of pterygoid muscle were resected. Postoperatively, the improvement of mandible movement was seen. The patient presented slight facial nerve paresthesia—intense rehabilitation (massage, kinesitherapy, Kinesio Taping) was administered.

Figure 2. Imaging examination presenting the lesion (MRI on the left and scintigraphy on the right). Chronic arthritis and inflammation of surrounding tissue ($33 \times 18 \times 22$ mm). Lateral pterygoid muscle, temporalis muscle and masseter were involved.

Figure 3. First operation of the patient—alloplasty of the TMJ. An individual prosthesis was prefabricated (the mandibular fossa was made of UHMW-PE and the condylar part was made of titanium). Glenoid fossa, discus, condyle process as well as part of the mandible ramus and part of pterygoid muscle were resected.

Postoperative material was histopathologically examined and described as follows: “Two histological patterns are seen in that case. The dominating one is the low-grade myxofibrosarcoma component with uniformly myxoid matrix, moderate cellularity, mild cellular atypia and prominent, sometimes curvilinear, elongated vessels (Figure 4). High-grade-like areas are very cellular with bizarre, sometimes multinucleated giant cells with abundant eosinophilic cytoplasm resembling myoid cells (Figure 5). Many nuclei are irregularly shaped. There are not foci of necrosis. The mitoses are infrequent. The lack of these two last features do not allow to classify that tumor as high-grade. That is why the term intermediate-grade would be more appropriate. An immunohistochemical analysis for this case was nonspecific. It is positive for s100p, CD68 and CD34. Ki-67 index was low.”

Figure 4. Postoperative material. H+E staining. A high-grade solid component resembling undifferentiated pleomorphic sarcoma is seen [3] (bottom), juxtaposed to a myxoid matrix [1] area exhibiting typical features of myxofibrosarcoma (moderate cellularity, mild atypia, prominent elongated vessels [2]).

Figure 5. Postoperative material, H+E staining. High-grade-like areas are present with bizarre [1], multinucleated giant cells with abundant eosinophilic cytoplasm [2] (resembling myoid cells).

The patient was qualified for reoperation (Figure 6). Under general anesthesia extended resection of glenoid fossa and subtemporal fossa was performed. Supraomohyoid lymphadenectomy was also performed during the surgery and, in palpative examination, enlarged lymph nodes were found. The prosthesis was removed and a titanium part was sterilized intraoperatively. A new UHMW-PE part was designed before surgery. The procedure was performed without complication. The patient was then referred for adjuvant radiotherapy (Figure 7). After the course, PET-CT was performed. No metastasis or local

recurrence was noted. The patient remains under the control of the clinic and has stayed disease-free for over five years (Figure 8).

Figure 6. Reoperation procedure. A submandibular incision was performed (A) and an individual UHMW-PE implant was removed (B) and sterilized. Pre-auricular and temporal incision was performed to reach zygomatic arch and TMJ prosthesis (C). Acetabulum's prosthesis was removed. Extended resection of glenoid fossa and subtemporal fossa was performed (D). A sterilized implant was inserted and stabilized (E), new acetabulum was inserted (F).

Figure 7. Radiotherapy planning.

Figure 8. PET-CT of the patient during follow-up examination 5 years after the surgery. No increased ^{18}F -FDG uptake in the region of the operation is present.

4. Discussion

Malignant tumors of the temporomandibular joint are very rare disease entities. The first description of MFS was by Angervall et al. in 1977 [4]. The lesions, as were mentioned before, are a deceptively bland malignancy that presents high recurrence and metastasis potential. It most commonly appears in the deep soft tissues of the lower extremities [5] with occurrence in the head and neck site being extremely rare—only about ten reports were found in the literature to the best of our knowledge. In this region, MFS was found in the cranial cavity, orbit, maxilla, parotid gland, hypopharynx, sinus piriformis, vocal folds or thyroid gland [3]. MFS affects mostly elder patients with no specific sex predilections [6]. Our patient also was in the elder group. Symptoms and signs provided in TMJ neoplasm case reports are similar to those reported for the temporomandibular disorder (TMD) [7]. TMJ rheumatoid arthritis may present as a unilateral as well as symmetrical lesion [8]. The same situation was observed in our case, but the duration of the patient's complaint (4 years) seems to be very uncommon for such an aggressive tumor. The rarity of the MFS in the head and neck region may lead to the misdiagnosis of the benign tumor delaying the proper treatment of the patient. The history of our patient's complaint and general medical anamnesis, diagnostic tests, radiographs, consultations (rheumatologist) as well as extra- and intra-oral examinations indicated arthritis and made surgeons decide on a sophisticated method of treatment—total TMJ replacement with the individual prosthesis. The main goal for the maxillofacial surgeon is to restore the function of the stomatognathic system as well as to preserve the best aesthetics of the face. For this procedure, either stock prostheses or custom prostheses can be used. The former is produced in different sizes and shapes [9] while the latter are customized using the CAD/CAM technique. It should be taken into consideration that the human skull presents a very high variability thus it is challenging to replace TMJ with a prefabricated prostheses [10]. This is one of the main reasons why prostheses should be individually customized for the operation. A perfect autologous material used should have the following properties: it should be cheap, biocompatible, non-antigenic, easily manipulated during the procedure and easily visible during imaging examination. One of the materials gaining more and more prominence in reconstructions is ultrahigh molecular weight polyethylene (UHMW-PE). UHMW-PE is commonly used in orthopedic surgery—it is used as a liner of acetabular cups in total hip arthroplasties, tibial inserts in total knee arthroplasties as a patellar component, or

in intervertebral artificial disc replacement as a spacer [11]. The use of polyethylene implants in large bone defects (as in, e.g., hemimandibulectomy) is recommended by Ye et al. [12]. UHMW-PE presents several advantages such as being well-tolerated and non-antigenic [13]. According to Ram et al. another big advantage of the material is its porous structure, allowing fibrovascularization which not only prevents the migration of the implant but also decreases the possibility of complications due to an infection of the implant [14]. Even though UHMW-PE presents lots of advantages its imperfection remains significant—it is not visible on an X-ray examination [13]. Implants made of UHMW-PE are being modified—to decrease its wear rate and the formation of free radicals that lead to oxidative stress, vitamin E is added [15]. Vitamin E is described as an antioxidant in a human's body, reacting with free radicals in cell membrane and protecting from the degradation processes (due to oxidation) and polyunsaturated fatty acids [16]. According to the producer of UHMW-PE modified with vitamin E (Celanese), the use of irradiation to sterilize the manufactured prostheses leads to the production of free radicals on the surface of the prosthesis accelerating its wear. The presence of vitamin E eliminates free radicals from the surface of the prosthesis. The effect of that modification should be studied if it also has a positive impact on the condition of the prosthesis during radiation therapy.

MFS is described as challenging for diagnosing due to its very variable clinical and histologic presentation [17]. Histologically, MFS myxoid cells are mixed with spindle cells [3]. In the area of spindle cells, there are present large atypical cells and more mitotic features. Moreover, there are giant cells (multinuclear or mononuclear) present as well as curved blood vessels, spoke-like structures and inflammatory cells [18]. The histologic differential diagnosis includes myxoid spindle cell squamous cell carcinoma, myxoid dermatofibrosarcoma protuberans, spindle cell melanoma, pleomorphic dermal sarcoma, myxoid fat-free spindle cell lipomas and atypical fibroxanthoma [19]. To distinguish neoplasms, the immunohistochemistry panel should be performed. MFS shows consistent immunoreactivity for vimentin (VIM), smooth muscle actin (SMA), CD34, Ki-67 and remains negative for S-100 and glial fibrillary acidic protein (GFAP) [3]. The immunohistochemical analysis was, for our case, nonspecific as it was positive for S100p, CD68, CD34 and low positive for Ki-67. It highlights the importance of the immunohistochemistry examination of the material to distinguish the MFS from other spindle cell neoplasms occurring in this region.

The treatment of choice is surgical resection with safety margins in order to maintain long, disease-free survival of the patient. The role of adjuvant therapy in improving overall disease-free survival remains unclear [20]. According to the literature data, the distant metastases occurred in 23% of head and neck MFS [6]. The metastases were present in the lungs, lymph nodes and somatic soft tissues [21–23]. Due to the potential of distant metastases, the patient should remain under long-term follow-up.

5. Conclusions

Malignancies of the temporomandibular joint are extremely rare and often present similar symptoms to those of rheumatoid lesions of the site. We present the first case of MFS in the region of TMJ. The biggest challenge, in that case, remains the differentiation between non-malignant lesions and malignant tumors. The histological nature of MFS for the distinction requires immunohistochemistry.

Author Contributions: Conceptualization, M.K., K.S. and D.Z.; Methodology, M.K.; Validation, M.K., K.S. and M.T.; Investigation, M.K., M.T., K.S. and R.B.; Writing—original draft preparation D.Z.; writing—review and editing, M.K., K.S., M.T. and D.S.; Visualisation, D.Z. and M.T.; Supervision, M.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Medical University of Lodz Bioethical Committee approval 266/11/KB and 312/12/KB.

Informed Consent Statement: Informed consent was obtained from the patient involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Nishio, J.; Iwasaki, H.; Nabeshima, K.; Naito, M. Cytogenetics and Molecular Genetics of Myxoid Soft-Tissue Sarcomas. *Genet. Res. Int.* **2011**, *2011*, 497148. [\[CrossRef\]](#) [\[PubMed\]](#)
2. Dell'Aversana, O.G.; Iaconetta, G.; Abbate, V.; Piombino, P.; Romano, A.; Maglito, F.; Salzano, G.; Califano, L. Head and neck myxofibrosarcoma: A case report and review of the literature. *J. Med. Case Rep.* **2014**, *8*, 468. [\[CrossRef\]](#) [\[PubMed\]](#)
3. Ke, X.-T.; Yu, X.-F.; Liu, J.-Y.; Huang, F.; Chen, M.-G.; Lai, Q.-Q. Myxofibrosarcoma of the scalp with difficult preoperative diagnosis: A case report and review of the literature. *World J. Clin. Cases* **2020**, *8*, 2350–2358. [\[CrossRef\]](#)
4. Angervall, L.; Kindblom, L.G.; Merck, C. Myxofibrosarcoma. A study of 30 cases. *Acta Pathol. Microbiol. Scand. A* **1977**, *85*, 127–140.
5. Li, X.; Chen, X.; Shi, Z.-H.; Chen, Y.; Ye, J.; Qiao, L.; Qiu, J.-H. Primary myxofibrosarcoma of the parotid: Case report. *BMC Cancer* **2010**, *10*, 246. [\[CrossRef\]](#)
6. Srinivasan, B.; Ethunandan, M.; Hussain, K.; Ilankovan, V. Epitheloid Myxofibrosarcoma of the Parotid Gland. *Case Rep. Pathol.* **2011**, *2011*, 1–3. [\[CrossRef\]](#)
7. Poveda-Roda, R.; Bagan, J.; Sanchis, J.; Margaix, M. Pseudotumors and tumors of the temporomandibular joint. A review. *Medicina Oral Patología Oral y Cirugía Bucal* **2013**, *18*, e392–e402. [\[CrossRef\]](#) [\[PubMed\]](#)
8. Kent, J.N.; Carlton, D.M.; Zide, M.F. Rheumatoid Disease and Related Arthropathies: Surgical Rehabilitation of the Temporomandibular Joint. *Oral Surg. Oral Med. Oral Pathol.* **1988**, *61*, 423–439. [\[CrossRef\]](#)
9. Lee, S.-H.; Ryu, D.-J.; Kim, H.-S.; Kim, H.-G.; Huh, J.-K. Alloplastic total temporomandibular joint replacement using stock prosthesis: A one-year follow-up report of two cases. *J. Korean Assoc. Oral Maxillofac. Surg.* **2013**, *39*, 297–303. [\[CrossRef\]](#) [\[PubMed\]](#)
10. Chaware, S.M.; Bagaria, V.; Kuthe, A. Application of the rapid prototyping technique to design a customized temporomandibular joint used to treat temporomandibular ankylosis. *Indian J. Plast. Surg.* **2009**, *42*, 85–93. [\[CrossRef\]](#)
11. Navarro, M.; Michiardi, A.; Castaño, O.; Planell, J.A. Biomaterials in orthopaedics. *J. R. Soc. Interf.* **2008**, *5*, 1137–1158. [\[CrossRef\]](#) [\[PubMed\]](#)
12. Ye, J.; Kook, K.H.; Lee, S.Y. Evaluation of Computer-Based Volume Measurement and Porous Polyethylene Channel Implants in Reconstruction of Large Orbital Wall Fractures. *Investig. Ophthalmol. Vis. Sci.* **2006**, *47*, 509–513. [\[CrossRef\]](#)
13. Jazwiecka-Koscielniak, E.; Kozakiewicz, M. A new modification of the individually designed polymer implant visible in X-ray for orbital reconstruction. *J. Cranio-Maxillofac. Surg.* **2014**, *42*, 1520–1529. [\[CrossRef\]](#) [\[PubMed\]](#)
14. Ram, H.; Singh, R.K.; Mohammad, S.; Gupta, A.K. Efficacy of Iliac Crest vs. Medpor in Orbital Floor Reconstruction. *J. Maxillofac. Oral Surg.* **2010**, *9*, 134–141. [\[CrossRef\]](#)
15. Massaccesi, L.; Ragone, V.; Papini, N.; Goi, G.; Romanelli, M.M.C.; Galliera, E. Effects of Vitamin E-Stabilized Ultra High Molecular Weight Polyethylene on Oxidative Stress Response and Osteoimmunological Response in Human Osteoblast. *Front. Endocrinol.* **2019**, *10*, 203. [\[CrossRef\]](#) [\[PubMed\]](#)
16. Packer, L.; Suzuki, Y.J. Vitamin E and alpha-lipoate: Role in antioxidant recycling and activation of the NF-kappa B transcription factor. *Mol. Asp. Med.* **1993**, *14*, 229–239. [\[CrossRef\]](#)
17. Quimby, A.; Estelle, A.; Gopinath, A.; Fernandes, R. Myxofibrosarcoma in Head and Neck: Case Report of Unusually Aggressive Presentation. *J. Oral Maxillofac. Surg.* **2017**, *75*, 2709.e1–2709.e12. [\[CrossRef\]](#) [\[PubMed\]](#)
18. Razek, A.A.; Huang, B.Y. Soft Tissue Tumors of the Head and Neck: Imaging-based Review of the WHO Classification. *Radiography* **2011**, *31*, 1923–1954. [\[CrossRef\]](#) [\[PubMed\]](#)
19. Tjarks, B.J.; Ko, J.S.; Billings, S.D. Myxofibrosarcoma of unusual sites. *J. Cutan. Pathol.* **2017**, *45*, 104–110. [\[CrossRef\]](#) [\[PubMed\]](#)
20. Sanfilippo, R.; Miceli, R.; Grosso, F.; Fiore, M.; Puma, E.; Pennacchioli, E.; Barisella, M.; Sangalli, C.; Mariani, L.; Casali, P.G.; et al. Myxofibrosarcoma: Prognostic Factors and Survival in a Series of Patients Treated at a Single Institution. *Ann. Surg. Oncol.* **2010**, *18*, 720–725. [\[CrossRef\]](#)
21. Lin, C.-N.; Chou, S.-C.; Li, C.-F.; Tsai, K.-B.; Chen, W.-C.; Hsiung, C.-Y.; Yen, C.-F.; Huang, H.-Y. Prognostic factors of myxofibrosarcomas: Implications of margin status, tumor necrosis, and mitotic rate on survival. *J. Surg. Oncol.* **2006**, *93*, 294–303. [\[CrossRef\]](#) [\[PubMed\]](#)
22. Weiss, S.W.; Enzinger, F.M. Myxoid variant of malignant fibrous histiocytoma. *Cancer* **1977**, *39*, 1672–1685. [\[CrossRef\]](#)
23. Huang, H.Y.; Lal, P.; Qin, J.; Brennan, M.F.; Antonescu, C.R. Low-grade myxofibrosarcoma: A clinicopathologic analysis of 49 cases treated at a single institution with simultaneous assessment of the efficacy of 3-tier and 4-tier grading systems. *Hum. Pathol.* **2004**, *35*, 612–621. [\[CrossRef\]](#) [\[PubMed\]](#)