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Spindle Cell Lesions Complex Diagnostic Entites-A Case Series

[1]Dr.Alekya, Post Graduate, St. Joseph Dental College, Dugirala, Eluru

[2]Dr. A. Anuradha, HOD & Professor, St. Joseph Dental College, Dugirala, Eluru

[3]Dr. K. Vedapriya, Reader, MDS, St. Joseph Dental College, Dugirala, Eluru

[4]Dr B. Rajasekhar, Sr. Lecturer, MDS, St. Joseph Dental College, Dugirala, Eluru

[5]Dr. B. Sudhershan, Sr. Lecturer, MDS, St. Joseph Dental College, Dugirala, Eluru

[6]Dr. T. Varsha, Post Graduate, St. Joseph Dental College, Dugirala, Eluru

Corresponding Author: Dr.Alekya, Post Graduate, St. Joseph Dental College, Dugirala, Eluru

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Abstract

Spindle cell lesions of the oral cavity are rare, present considerable diagnostic challenges due to overlapping clinical, radiological, and histopathological features. These lesions ranges from benign proliferations to aggressive sarcomas, making accurate diagnosis critical as treatment and prognosis differ significantly. This paper presents a case series of four patients with spindle cell lesions reported to the Department of Oral Pathology. Detailed history, clinical examination, imaging (CBCT, MRI), histopathology, and immunohistochemistry with markers such as Desmin, S-100, Myogenin, and SMA were used for evaluation. All patients were managed surgically with favorable short-term outcomes. These cases highlight the heterogeneity of spindle cell lesions, where morphology provides important clues but immunohistochemistry is essential for distinguishing mimicking entities such as rhabdomyoma, leiomyoma, schwannoma, and sarcomas. Special stains and molecular correlations may provide additional diagnostic support. Management strategies vary from conservative excision in benign cases to aggressive resection with possible adjuvant therapy in malignant cases. In conclusion, spindle cell lesions of the oral cavity are complex diagnostic entities that demand a multimodal approach integrating clinical, radiological, histological, and immunohistochemical findings to ensure early, precise diagnosis and optimal patient outcomes.

Keywords: Spindle cell lesions, Oral cavity, Rhabdomyoma, Schwannoma, Leiomyoma, Fibrosarcoma, Immunohistochemistry.

Summary

Spindle cell lesions of the oral cavity are rare but diagnostically challenging entities arising from epithelial or mesenchymal tissues, influenced by factors such as trauma, inflammation, genetic mutations, and epithelial–mesenchymal transition. They often present as slow-growing swellings with overlapping clinical and histological features, making differentiation between benign and malignant forms difficult. Imaging provides supportive information, but definitive diagnosis relies on microscopic evaluation and immunohistochemistry using markers like S-100, SMA, Desmin, and Myogenin. The reported cases illustrate the broad spectrum of spindle cell lesions, including rhabdomyoma, schwannoma, leiomyoma, and fibrosarcoma. Accurate classification is essential for appropriate treatment, which ranges from simple excision to radical management in aggressive tumors.

Introduction

Spindle cell lesions are generally very oftenly seen in the mouth, accounting for less than 1% of all oral tumors, though they are relatively more common at other sites in the body.[1] They may arise in various regions of the head and neck, including the soft tissues of the scalp, orbit, neck, and upper aerodigestive tract.[2] Within the oral cavity, their origin can be traced to epithelial, mesenchymal, or odontogenic components.[3] The etiological factors associated in their development include genetic predisposition, chromosomal alterations, exposure to radiation or certain chemical agents, as well as trauma and chronic inflammation.[4,5] In spindle cell lesion the tumor cells typically display mesenchymal features and may also represent epithelial–mesenchymal transition in certain epithelial neoplasms.[6] Nuclei are characteristically elongated, often serpiginous, cigar-shaped, or fusiform in appearance. Cytoplasm is fibrillary or vacuolated, and may exhibit cross-striations, granular texture, and a distinctly eosinophilic staining quality.[7]

Case Report 1

A 40-year-old female patient reported to the Outpatient Department with the chief complaint of a slow-growing swelling on the right side of the face, which had been present for the past two years. Her habit history revealed betel nut chewing twice daily for the past 20 years.

On clinical examination, a distinct facial asymmetry was noted on the right side. On extra-oral inspection, a solitary swelling measuring approximately 5×5 cm was noted on the right side of the face(Fig:1). It extended anteroposteriorly from 1 cm away from the right corner of the mouth to about 1.5 cm away from the tragus, and superoinferiorly from the ala-tragus line to the lower border of the mandible. The skin over the swelling appeared stretched. On palpation, all the inspectory findings were confirmed. The swelling was non-tender, mobile, smooth in texture, soft to firm in consistency, and non-pulsatile, with no localized rise in temperature or fixation to the overlying skin.

Intra-oral examination revealed a diffuse swelling of approximately 3×2 cm involving the right buccal mucosa, extending from 1 cm away from the corner of the mouth to the right maxillary tuberosity, and vertically at the level of occlusion (Fig:2). The overlying mucosa appeared erythematous, with an ulcer along the line of occlusion in relation to 17, covered with yellowish slough.

Radiological investigations such as CBCT revealed an ill-defined, non-enhancing hypodense lesion measuring 6.7×3.7 cm involving the right infratemporal fossa, with scalloping of the lateral wall of the maxillary sinus and maxilla (Fig.3). MRI showed a large heterogeneous T2 hyperintense mass lesion, 6.6×4.1×3 cm in size, involving the right infratemporal fossa with extension

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into the buccal region (Fig: 4). The lesion abutted the periosteum of the mandible and maxilla, with adjacent subcutaneous fat edema but no definite intraosseous extension.

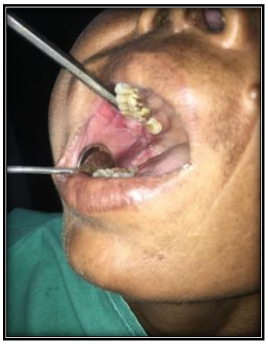
Based on the clinical and radiological findings, a differential diagnosis of Neuroma, Neurofibroma, Leiomyoma, Rhabdomyoma, and Benign Salivary Gland Tumor arising from the accessory parotid gland was considered.

Microscopic examination showed bland elongated spindle-shaped cells with blunt ends, eccentrically placed vesicular nuclei, and dense eosinophilic cytoplasm arranged in short fascicles. (Fig: 5-7)

Histologically considered differential diagnosis included Leiomyoma and Rhabdomyoma.

Immunohistochemistry with a panel of markers including Desmin, S-100, Myogenin, and SMA (FIG: 8-14) confirmed the final diagnosis as an intermediate type of rhabdomyoma. The patient was treated successfully with surgical excision.

Fig.1:



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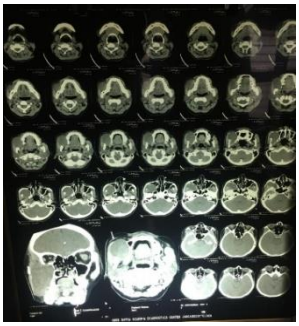

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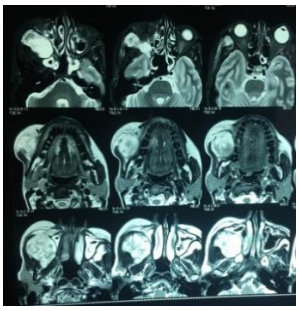

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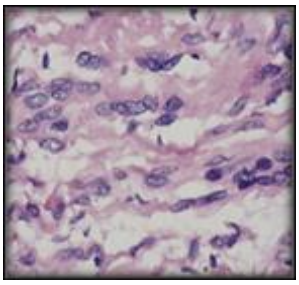

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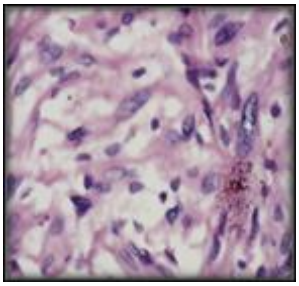

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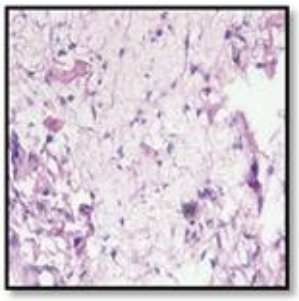

Fig.7:

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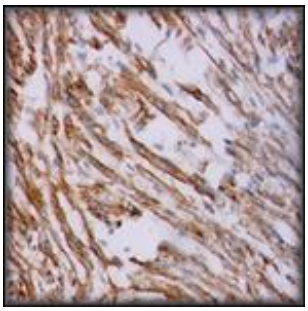
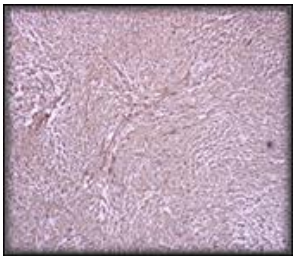


Fig.8:

Fig.9:



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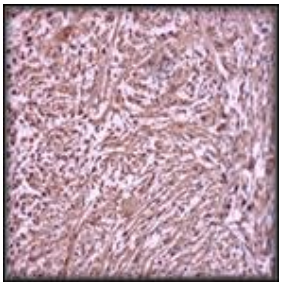

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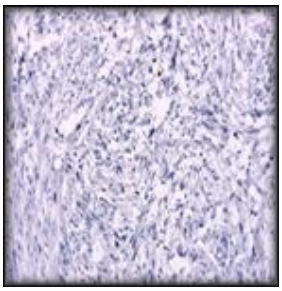

Fig.12:

Fig.13:

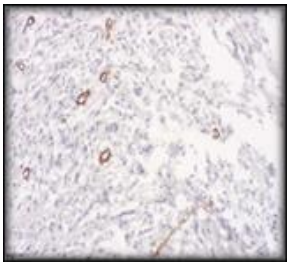

Fig.14:

Fig. 5 & 6. Bland elongated blunt-ended spindle-shaped cells with eccentrically placed, vesicular nuclei and dense eosinophilic cytoplasm arranged in short fascicles. Fig.7. myxoid areas were seen intervening with the fascicles. Fig. 8 & 9. Diffuse positivity for desmin under 20x magnification. Fig10 &11 Diffuse positivity for S-100 under 4x & 10x magnification Fig.12. Negative expression of

Case Report 2

A 60-year-old male patient reported to the Outpatient Department with a chief complaint of pain in the right upper back tooth region for the past one month. The patient gave a history of an intraoral growth present for the same duration, associated with pain of gradual onset, moderate intensity, intermittent and throbbing in nature, non-radiating, aggravated while chewing food, and relieved on taking medication. His habit history revealed cigarette smoking twice daily for the past 10 years. On bilateral examination of the lymph nodes in the head and neck region, no tenderness or palpable nodes were detected.

Intra-oral examination revealed a solitary, round-shaped growth located on the soft palate, measuring

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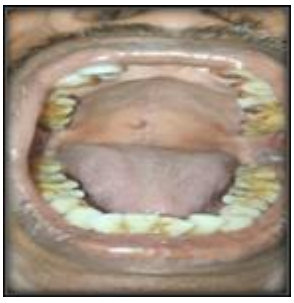
approximately 5×5 mm. The swelling extended anteroposteriorly from 5 mm away from the junction of the hard and soft palate to about 1 cm from the uvula, and mediolaterally from the midline up to 3 cm away from the palatal marginal gingiva in relation to 18. The growth was the same color as the adjacent mucosa, non-tender, soft to firm in consistency, palpable, and smooth in texture. (Fig:15)

An excisional biopsy was performed, and a Provisional Diagnosis of Irritational Fibroma was made. The Differential Diagnosis included Fibroma, Schwannoma, Peripheral Nerve Sheath Tumor, and Pleomorphic Adenoma.

Histopathological examination showed parakeratinized stratified squamous epithelium overlying connective tissue stroma. The lesional tissue was unencapsulated and consisted of eosinophilic areas surrounded by cells with round nuclei and indistinct cell borders resembling Antoni A areas. The lesional cells exhibited mild nuclear pleomorphism with prominent nucleoli. (Fig:16-18)

Immunohistochemistry showed diffuse nuclear and cytoplasmic positivity for S-100. Based on clinical, histopathological, and immunohistochemical findings, a final diagnosis of Schwannoma was established. The patient was treated successfully with Surgical Excision. (Fig:19)



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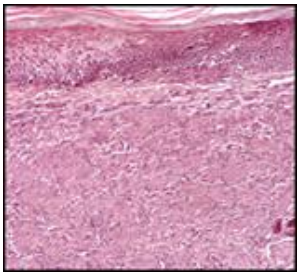

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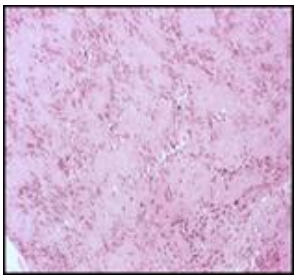
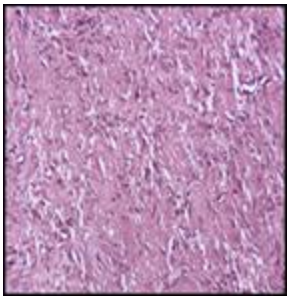


Fig.17:



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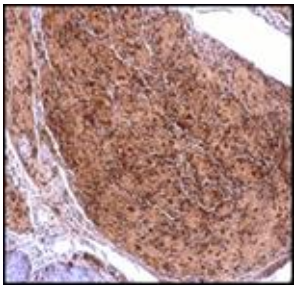

Fig.19:

Fig.16.Overlying para keratinized stratified squamous epithelium with alternating Antoni A and B areas in connective tissue Fig.17 Antoni A areas with ill defined fascicles without distinct nuclear palisading Fig18. Antoni B areas with less orderly arranged spindle

Case Report 3

A 32-year-old female patient reported to the Outpatient Department of St. Joseph Dental College with a chief complaint of swelling in the right cheek region. The

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history of present illness revealed a slow-growing, painless swelling in the same region for the past two months. Her habit history was significant for betel nut chewing twice daily for the past 10 years.

On intraoral soft-tissue examination, the gingiva appeared pale pink in color and firm in consistency. The labial mucosa, palate, tongue, and floor of the mouth showed no abnormalities. A solitary swelling was observed on the right buccal mucosa in the molar region.

Microscopic examination of the lesion demonstrated interlacing fascicles of spindle-shaped cells with elongated nuclei and eosinophilic cytoplasm (Fig: 20-23). Immunohistochemistry showed strong cytoplasmic positivity of tumor cells for SMA (Fig: 24, 25). Based on the histopathological findings, a final diagnosis of Leiomyoma was made. The patient was managed by surgical intervention.

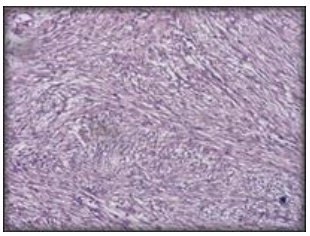


Fig.20:

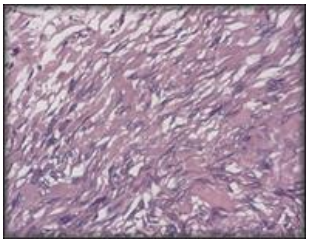
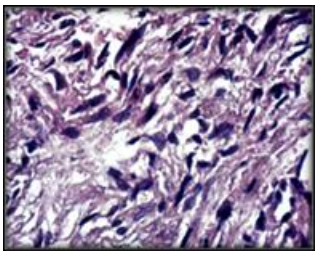


Fig.21:



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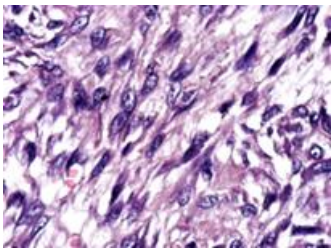

Fig.23:

Fig.24:

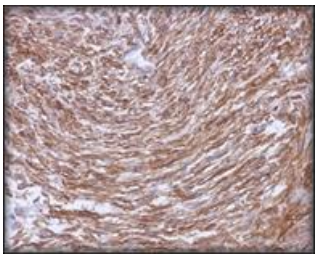

Fig.25:

Fig 20&21 Interlacing fascicles of spindle-shaped cells with elongated nuclei and eosinophilic cytoplasm. Fig 24&25. Cytoplasm of the tumor cells is strongly positive for SMA under 4x,20x magnification

Case Report 4

A 21-year-old female patient reported to the Out-patient Department of St. Joseph Dental College with the chief complaint of swelling in the lower right front tooth region. The history of present illness revealed that the patient had been experiencing spontaneous bleeding, mild pain, and a gradual increase in the size of the swelling for the past two months.

On intraoral soft-tissue examination, a solitary erythematous growth measuring approximately 1×1 cm was observed over the attached gingiva in relation to 41 to 43. The lesion extended superoinferiorly from the marginal gingiva of 41 to 43 up to 0.5 mm away from the lower labial vestibule. (Fig:26) The swelling was tender

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on palpation, soft in consistency, smooth in texture, and showed evidence of blood discharge. Bilateral examination of the head and neck lymph nodes revealed no tenderness or palpable enlargement.

Based on the clinical features, a Provisional Differential Diagnosis of Peripheral Giant Cell Fibroma, Peripheral Ossifying Fibroma, and Pyogenic Granuloma was considered. An excisional biopsy was performed, and microscopic examination showed connective tissue with uniform fasciculate growth patterns consisting of fusiform spindle-shaped cells (Fig: 27). Immunohistochemistry shows diffuse cytoplasmic positivity for vimentin (Fig: 28, 29). These findings established a final diagnosis of Fibrosarcoma**.** The patient was managed by surgical excision of the lesion.

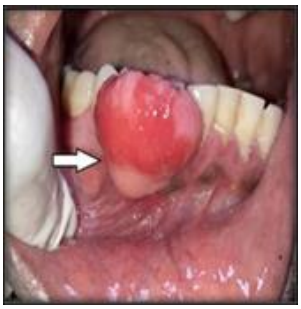

Fig.26:

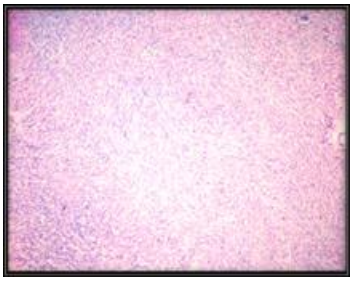

Fig.27:

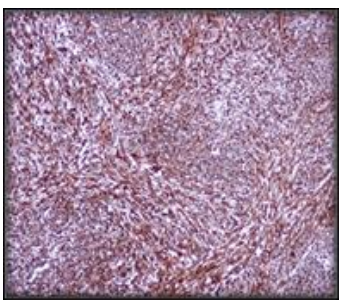

Fig.28:

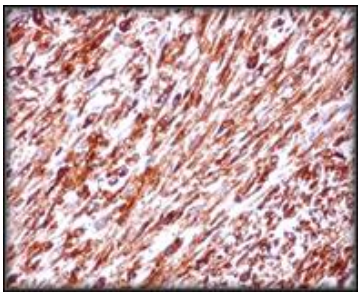

Fig.29:

Fig.27. Connective tissue shows uniform fasciculate growth patterns consisting of fusiform/spindle shaped cells.Fig.28. Diffuse cytoplasmic positivity for vimentin under 10 x magnification Fig.29. Diffuse cytoplasmic staining for vimentin under 40x magnification

Discussion

Spindle cell lesions are a heterogeneous group of pathological conditions characterized by proliferation of spindle-shaped cells with elongated nuclei and tapering cytoplasm.[1] These lesions occur in multiple anatomical sites, including oral cavity, breast, thyroid, skin, and soft tissues. The spectrum encompasses benign, reactive, and malignant neoplasms, many of which share overlapping morphological features.

The etiopathogenesis of spindle cell lesions varies widely according to the specific entity. Benign lesions such as nodular fasciitis may result from reactive proliferation secondary to trauma or inflammation, whereas fibromatosis is associated with aberrant Wnt/β-catenin signaling (CTNNB1 or APC mutations).[5] Neoplastic spindle cell tumors such as Leiomyosarcoma, Fibrosarcoma, and Solitary Fibrous Tumor arise from mesenchymal cells, while Spindle Cell Metaplastic Carcinoma develops from Epithelial cells undergoing mesenchymal transdifferentiation.[4] Inflammatory myofibroblastic tumors often harbor ALK, ROS1, or RET gene rearrangements, driving abnormal myofibroblastic proliferation.[8,9] Thus, molecular

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alterations play a pivotal role in distinguishing true neoplasms from Reactive Spindle Proliferations.

Spindle cell lesions generally present as painless, slow-growing masses, though rapid enlargement may occur in aggressive Sarcomas or Nodular Fasciitis. Symptoms depend on anatomical site: oral lesions may cause ulceration, bleeding, or tooth mobility; Breast lesions typically present as firm, irregular masses that may mimic carcinoma; thyroid spindle lesions can cause compressive symptoms such as Dysphagia and Dyspnea. Age distribution varies: Fibromatosis is common in young adults, Spindle Cell Sarcomas in middle-aged individuals, and spindle cell carcinoma typically in older patient.[6]

Radiographic and imaging findings are non-specific but provide important clues. In oral cavity lesions, radiographs may reveal ill-defined osteolytic areas in Aggressive Fibrosarcoma, whereas Fibromatosis appears as infiltrative soft tissue mass.[10] Breast imaging shows Spindle Cell lesions as irregular, hypoechoic, spiculated masses on ultrasound, often mimicking Invasive Ductal Carcinoma. On MRI, spindle lesions may appear isointense to muscle with heterogeneous enhancement. CT and PET scans aid in staging of sarcomas and assessing recurrence.[11]

Histologically, spindle cell lesions are characterized by elongated nuclei with tapered ends, arranged in fascicles, storiform, or herringbone patterns. Benign lesions (Fibroma, Neurofibroma) show low cellularity, absence of atypia, and abundant stroma, while malignant lesions (Fibrosarcoma, Leiomyosarcoma, Spindle Cell Carcinoma) demonstrate hyper cellularity, nuclear pleomorphism, high mitotic activity, and necrosis. Specific morphologies aid diagnosis: Storiform in Dermatofibrosarcoma protuberans, Herringbone in Fibrosarcoma, and Staghorn vessels in solitary fibrous tumor.[12]

Special stains are used to highlight matrix components or specific cell types. Some special stains used are:

- Masson's Trichrome: Differentiates collagen from muscle fibers, useful in fibromatosis vs leiomyosarcoma.
- Reticulin stain: highlights reticulin framework, altered in sarcomas.
- Verhoeff–Van Gieson: highlights elastic tissue in vascular spindle lesions.
- Toluidine blue: metachromasia helps in mast cell-rich spindle proliferations.

Although helpful, special stains are largely supplanted by Immunohistochemistry and molecular tests.

Immunohistochemistry (IHC) plays a pivotal role in the diagnosis of spindle cell lesions because of the significant morphological overlap among benign, reactive, and malignant entities. A carefully selected antibody panel allows pathologists to delineate lineage differentiation and narrow the differential diagnosis.[13]

Cytokeratins such as AE1/AE3, CK5/6, and p63 are invaluable in establishing epithelial differentiation, thereby supporting the diagnosis of spindle cell carcinoma or metaplastic carcinoma, which can otherwise mimic Sarcomas. Smooth muscle markers including SMA, Desmin, and h-Caldesmon are used to confirm smooth muscle lineage, characteristic of Leiomyosarcoma. Neural differentiation is suggested by positivity for S100 and SOX10, which are typically expressed in Schwannoma and Malignant Peripheral Nerve Sheath Tumor (MPNST). CD34 and nuclear STAT6 expression are highly characteristic of solitary fibrous tumor, while nuclear β-catenin positivity is considered diagnostic of esmoid-type fibromatosis.[9,4,15] Furthermore, Anaplastic Lymphoma Kinase (ALK) and

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ROS1(Receptor Tyrosine Kinase) expression confirm inflammatory myofibroblastic tumor, highlighting the expanding role of molecularly correlated Immunohistochemistry markers.

Although immunohistochemical markers are useful, it is essential to recognize that many markers, such as vimentin and SMA, are nonspecific and expressed across multiple spindle cell entities; therefore, results must be interpreted in conjunction with histological patterns, radiological findings, and clinical context. This emphasizes the importance of using broad yet targeted Immunohistochemistry panels guided by initial histomorphology to achieve an accurate diagnosis.[15]

Management depends on the lesion type and biological behavior.[16]

Benign spindle lesions such as Fibroma, Schwannoma are treated with simple excision and have excellent prognosis. Fibromatosis requires wide excision due to high recurrence.

Malignant spindle lesions, including sarcomas and metaplastic carcinomas, necessitate radical resection, sometimes with chemotherapy and radiotherapy. Targeted therapies are emerging. Long-term follow-up is essential due to risk of recurrence and metastasis.[13]

Accurate diagnosis is critical because management and prognosis vary widely — ranging from conservative excision in benign proliferations to radical surgery or systemic therapy for Aggressive Sarcomas or Carcinomas.

Conclusion

Spindle cell lesions of the oral cavity encompass a wide spectrum ranging from benign tumors like Leiomyoma and Schwannoma to Malignant neoplasms such as Fibrosarcoma, often presenting with overlapping clinical features like slow-growing swellings or erythematous growths. While histopathology is crucial for diagnosis, the morphological mimicry among these entities necessitates the use of immunohistochemistry with specific markers (e.g., S-100, SMA, Desmin, Myogenin) to confirm tissue origin. Thus, spindle cell lesions represent complex diagnostic entities requiring integration of clinical, radiological, histopathological, and immunohistochemical findings to ensure accurate diagnosis and appropriate management.

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