

CASE REPORT

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Histopathological specialized staining of oral lichen planus-induced fibrotic changes and surgical treatment of associated restricted mouth opening: a case report

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Abstract

Background: Oral lichen planus is a chronic inflammatory and immune-mediated disease that affects the oral mucosa. Recent findings have suggested that oral lichen planus is often associated with submucosal fibrotic changes. Fibrotic changes in the buccal submucosa may cause restricted mouth opening. This report discusses the histopathological examination (including specialized staining) and surgical treatment for oral lichen planus-induced fibrotic changes.

Case presentation: Here, we describe a 63-year-old woman who had oral lichen planus with fibrotic changes. Her maximum mouth opening distance was approximately 30 mm due to submucosal fibrotic changes, and she exhibited gradual fibrosis progression. Histological examinations were performed to assess the oral lichen planus-induced fibrotic changes. Then, double Z-plasty were performed as treatment for restricted mouth opening. The immunohistochemical staining results were negative for cytokeratin 13 and positive in some layers for cytokeratin 17 and Ki-67/MIB-1. Masson's trichrome staining showed enhanced collagen formation. Postoperative mouth opening training enabled the patient to achieve a mouth opening distance of > 50 mm.

Conclusion: Our findings suggest that histopathological examination with specialized staining can aid in the evaluation of oral lichen planus-induced fibrotic changes, and that Z-plasty is effective for the treatment of restricted mouth opening due to oral lichen planus.

Keywords: Oral lichen planus, Submucosal fibrotic changes, Restricted mouth opening, Z-plasty, Case report

Background

Oral lichen planus (OLP) is a relatively common disease of the squamous epithelia and is regarded as a T-cell-mediated chronic inflammatory disease of unknown etiology (Scully and Carrozzo 2008). OLP is characterized by white striations (Wickham's striae), white papules, white plaques, mucosal erythema, and atrophic erosions, all of which predominantly affect the buccal

mucosa (Nogueira et al. 2015). Except in patients with the pathognomonic appearance of reticular OLP (i.e., bilateral white striae on the buccal mucosa), histopathologic evaluation of lesional tissue is generally required to obtain a definitive diagnosis (Edwards and Kelsch 2002). Common histopathological features of OLP are hydropic degeneration of the basal layer and band-like chronic lymphocytic inflammatory infiltrate in the subepithelial layer (Anitua et al. 2019).

Recently, it has been suggested that some types of OLP may be associated with submucosal fibrotic changes, which are regarded as OLP-induced fibrotic changes

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(OLPFCs). In previous reports, the term "submucosal fibrotic bands in OLP" has been used (Shteiner et al. 2020), potentially to distinguish from a similar lesion, oral submucosal fibrosis (OSF). The causes of these two lesions are different, but they are similar in that they are associated with fibrotic change-induced restricted mouth opening (RMO). Patients with severe RMO (<35 mm) have lower quality of life (Scott et al. 2008); therefore, treatment may be needed.

There have been some studies regarding treatment for OSF-induced RMO (Mehrotra et al. 2009); to the best of our knowledge, there have been no reports of treatment for OLPFC-induced RMO. In addition, there have been no reports of histopathological examinations that include specialized staining for OLPFCs. This report describes histopathological examination including immunostaining and collagen staining for OLPFCs; it also discusses Z-plasty as a surgical treatment. Importantly, the term "trismus" is generally used to indicate radiation-induced fibrosis of masticatory muscles and should not be used as a general term for patients with RMO (Satheeshkumar et al. 2014). Therefore, in this report, the term RMO is used consistently.

Case presentation

This article demonstrates a typical OLPFC and OLPFC-induced RMO. A 63-year-old woman was referred to our outpatient clinic for further evaluation of RMO due to OLP. Her lesion had been diagnosed as OLP based on the results of a biopsy performed at another hospital, 4 years prior to her first visit to our department. At that time, the OLP was not associated with RMO. Beginning at 6 months before the first visit to our clinic, the patient experienced gradual mucosal induration, which resulted in RMO. At the time of presentation, the patient was a nonsmoker, had no exposure to areca nuts, and had no remarkable prior medical history and family medical history.

Initial clinical examination revealed a scar-like white lesion on the right buccal mucosa, which contained white plaques and mucosal erythema (Fig. 1). The lesion exhibited strong induration and had led to RMO; the patient's maximum mouth opening distance was approximately 30 mm (Fig. 2). Magnetic resonance imaging showed no neoplastic lesions and was suggestive of a scar-like lesion due to inflammation. The masseter muscle had been separated from the lesion; it had become hypertrophic, but remained intact (Fig. 3).

The histological diagnosis of OLP had been made prior to the initial presentation to our clinic. However, considering the possibility of lesion progression, another histological examination was performed. Hematoxylin–eosin staining revealed the following histopathological features,



Fig. 1 Clinical presentation, intraoral view. The lesion had been diagnosed as oral lichen planus following biopsy at another hospital, 4 years before the patient's first visit to my department



Fig. 2 Preoperative measurement photograph. The patient's maximum mouth opening distance was approximately 30 mm

which were typical of OLP: hydropic degeneration of the basal layer, band-like chronic lymphocytic inflammatory infiltrate in the subepithelial layer, hyperkeratosis, sharp serrated ridges of epithelial processes, and Civatte bodies (Fig. 4). Enhanced fibrotic changes were also indicated by hematoxylin–eosin staining. Therefore, collagen fiber staining (Masson's trichrome staining) was performed, which revealed the progression of distinct fibrosis, especially around infiltrated lymphocytes in the subepithelial layer (Fig. 5). Elastica van Gieson staining did not reveal any proliferation of elastic fibers. Immunohistochemical staining (based on the characteristics of "oral potentially malignant disorders" in OLPs) showed negative cytokeratin 13 (CK13) findings, as well as positive cytokeratin 17 (CK17) findings in the epithelium layer and positive Ki-67/MIB-1 findings primarily in the basal layer (Fig. 6).

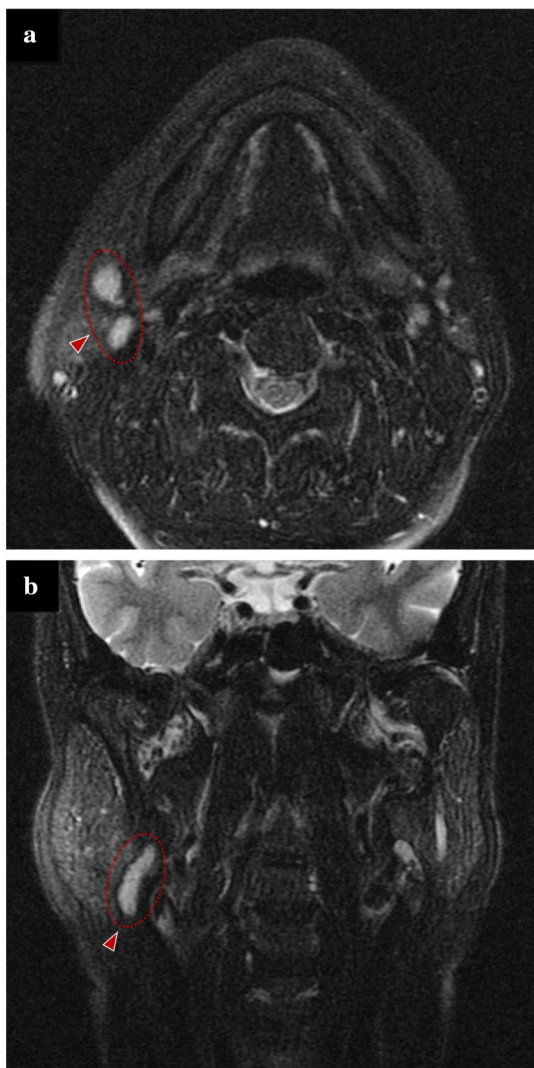


Fig. 3 Magnetic resonance imaging results were suggestive of a scar-like lesion due to inflammation. The masseter muscle had been separated from the lesion and remained intact. **a** Axial plane (short T1 inversion recovery). **b** Coronal plane

The lesion was not associated with pain or discomfort unique to OLP; however, treatment of RMO was needed. Band-shaped indurated mucosal excision and Z-plasty were performed with the patient under local anesthesia. Basic Z-plasty, in which two triangular flaps of equal dimension are transposed, was presumed to interfere with the maxillary–mandibular gingiva and parotid papilla due to the larger incision line. Therefore, a double Z-plasty technique was applied (Fig. 7). No induration was observed in the muscular layer; thus, surgery was performed only in the mucosal epithelium and lamina propria. Immediately after surgery,

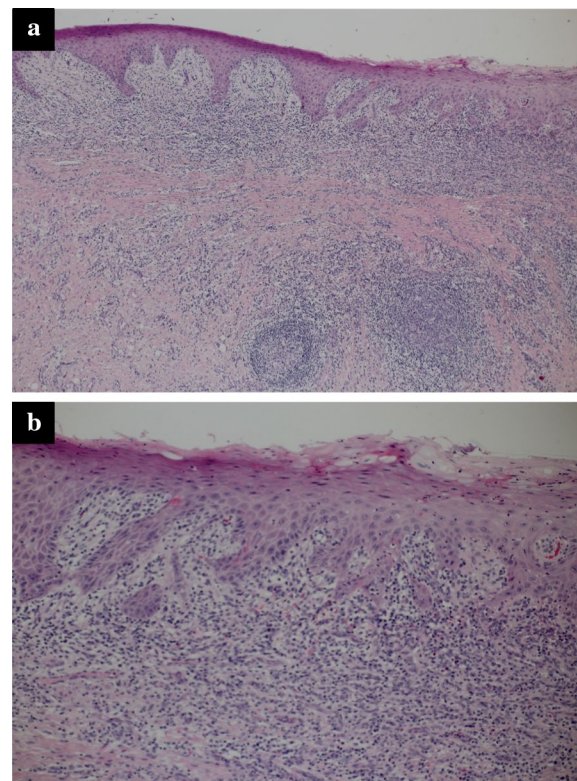


Fig. 4 Hematoxylin–eosin staining revealed histopathological features typical of oral lichen planus. **a** Magnification, $\times 20$. **b** Magnification, $\times 100$

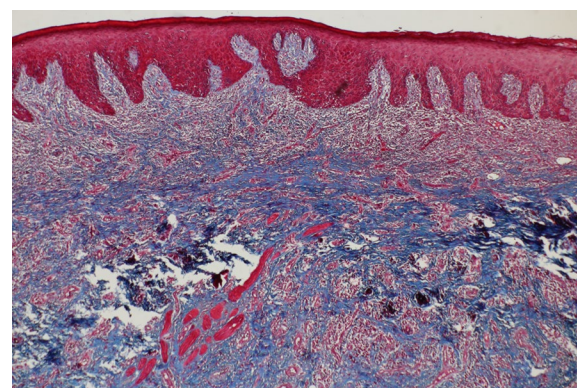


Fig. 5 Masson's trichrome staining revealed distinct fibrosis, especially around infiltrated lymphocytes in the subepithelial layer ($\times 20$)

the patient's mouth opening distance improved to 38 mm (Fig. 8). In addition to conducting our professional opening training, continuous self-training was instructed. Eight months after the surgery, the mouth opening distance improved to > 50 mm (Fig. 9).

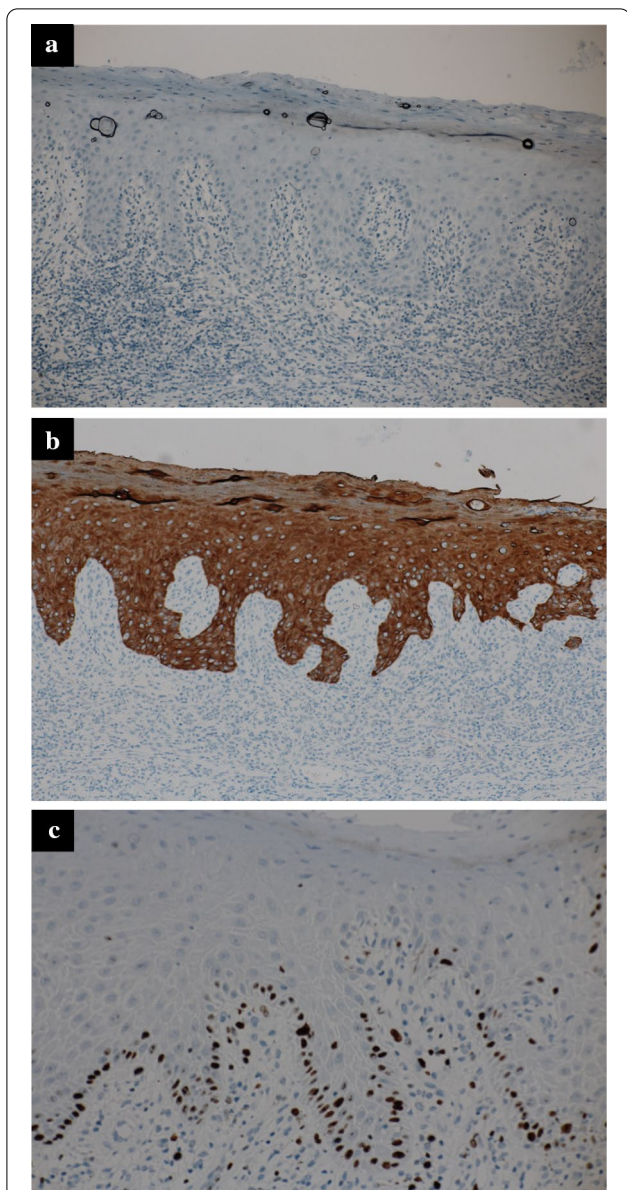


Fig. 6 Immunohistochemical staining results were negative for cytokeratin 13 ($\times 100$) (a), positive for cytokeratin 17 within the epithelium layer ($\times 100$) (b), and positive for Ki-67/MIB-1 primarily in the basal layer ($\times 200$) (c)

The subsequent clinical course was uneventful and the patient did not exhibit evidence of recurrent RMO (Fig. 10). The patient was pleased with the outcome.

Discussion

Various clinical pathological features of OLP have been reported. Considering the diversity of OLP manifestations, OLPFCs may be not uncommon clinical features; however, there is the minimal clinical literature regarding OLPFCs. Severe OLPFCs that cause RMO may be

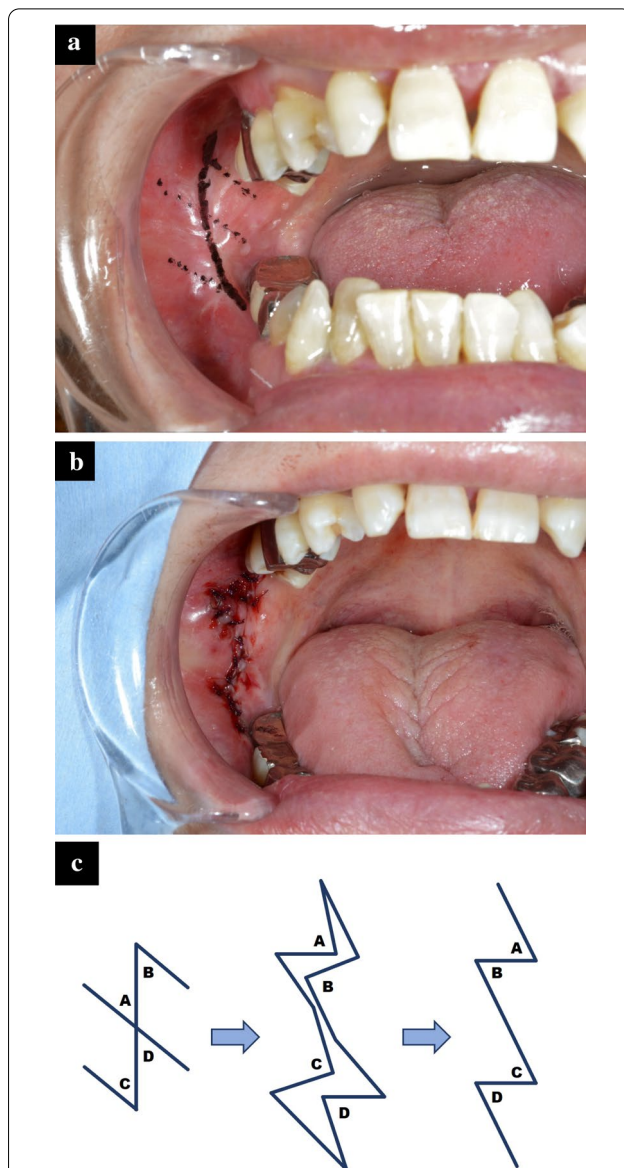


Fig. 7 Intraoperative view. a Designated incision line (solid line: band-shaped indurated mucosal excisional area; dotted line: incision line for double Z-plasty flaps). b Results after Z-plasty. c Diagram of the double Z-plasty procedure

difficult to diagnose and treat; therefore, information regarding the histopathological features and treatment strategies of OLPFCs may be useful for clinicians.

OLP is considered a precancerous lesion and was classified as an oral potentially malignant disorder by the 2017 World Health Organization guidelines (Speight et al. 2018). OSF is also considered an oral potentially malignant disorder. OLP that has progressed to the stage of OLPFCs is similar to exacerbated OSF in that it causes RMO; however, there are some differences



Fig. 8 Postoperative measurement photograph. Immediately after surgery, the patient's mouth opening distance improved to 38 mm



Fig. 9 Following mouth opening training, the maximum mouth opening distance improved to > 50 mm

in etiology and histological features between OLDFCs and OSF.

Histopathologically, the pathogenesis of OLP is mainly centered on the epithelial lamina propria boundary (subepithelial layer to basal layer). In contrast, pathological alteration in OSF begins in the lamina propria and secondarily involves the epithelium (Rajendran 1994). Given these characteristics, the central locations of fibrotic changes may differ between OLDFCs and OSF, such that OLDFCs occur mainly in the subepithelium, while OSF



Fig. 10 Intraoral examination at 9 months postoperatively

may occur throughout the connective tissue. Masson's trichrome staining is effective for diagnosis because the site of collagen formation can be clarified.

In the present patient, the immunohistochemical staining results were negative for CK13, positive for CK17 within the epithelium layer, and positive for Ki-67/MIB-1 primarily in the basal layer. In patients with OSF, the expression of CK13 in the epithelium tends to decrease (Kuo et al. 2006), while the expression of CK17 in the suprabasal layer increases (Lalli et al. 2008) and Ki-67/MIB-1 exhibits basal layer expression and intense nuclear staining (Humayun and Prasad 2011). These immunohistochemical staining findings may be similar between OLDFCs and OSF. Previous reports suggest that the severity of OSF is associated with the degree of CK17 or Ki-67/MIB-1 staining; a similar assessment may be possible for OLDFCs.

With respect to treatment methods, patients with early OSF can be treated by local injection of triamcinolone acetone, while patients with advanced OSF require surgical intervention (Khanna and Andrade 1995). OSF surgery may require deep excision and reconstruction, presumably because severe OSF can infiltrate the muscular layer (Rooban et al. 2005). In contrast, OLDFCs in our patient could be treated simply by band-shaped indurated mucosal excision and Z-plasty, without excision of the muscular layer. The center of fibrotic changes is more superficial in OLDFCs than in OSF; therefore, the muscular layer may be mostly intact and not require resection.

It is uncommon to routinely perform biopsies of OLP lesions unless potential malignant changes are suspected, or to confirm a differential diagnosis. However, considering the potential for progression to OLDFCs, excision or biopsy for histopathological evaluation (including specialized staining) may be warranted. There have been no research reports regarding histopathological specialized staining and surgical treatment for OLDFCs; hence, there

is a need for additional case reports regarding patients with OLDFCs.

Conclusion

OLP is a relatively common oral disease, whereas OLDFCs have rarely been discussed. This report has suggested the effectiveness of specialized staining and Z-plasty for assessment and treatment of OLDFCs. In the future, there is a need to collect records of additional patients with OLDFCs, along with more evidence regarding detailed analysis procedures and treatment strategies.

Abbreviations

CK13: Cytokeratin 13; CK17: Cytokeratin 17; OLP: Oral lichen planus; OLDFCs: OLP-induced fibrotic changes; OSF: Oral submucosal fibrosis; RMO: Restricted mouth opening.

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Authors' contributions

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Availability of data and materials

All data used for this report are included in the text.

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Competing interests

The author declares no competing interests.

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