Classification Systems for Oral Submucous Fibrosis

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Contents

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6.1 Introduction

There are many classification systems, reported for OSF. The classifications are based on clinical signs (mouth opening, tongue protrusion and cheek flexibility), clinical symptoms (vesicle, burning sensation, dry mouth and dysphagia) and histopathological features (epithelial morphology, connective tissue changes, epithelial-connective tissue interface) alone or in combination. The different classification systems used from 1957 to 2018 are presented here.

Properties of a Good Classification

A good medical classification system should help clinicians stratify the patients to enable appropriate clinical management of the patient and aid in follow-up and prognostication. It should be

- Stable: Based on specific premise or criterion
- Suitable: Relevant to the subject of interest
- Unambiguous: The various groups/classes should be clearly defined
- Complete and mutually exclusive: All terms in each group or class should be distinct without overlap
- Flexible: It should be able to accommodate new entities as our understanding of the subject evolves
- Reproducible and communicable

Learning Goals

To familiarise the reader to the published classification systems on OSF to allow the best use of them in future epidemiological surveys and in clinical studies

6.2 Oral Submucous Fibrosis (OSF): Classification Systems

All classifications use clinical signs, clinical symptoms and histopathology of OSF either separately or in combination:

- Clinical signs:
  - Restriction in mouth opening (measured in mm/cm/finger width)
  - Limitation of tongue protrusion (measured in mm/cm)
  - Reduced cheek flexibility (measured in mm/cm)
  - Restricted soft palate movement
  - Deformity of uvula
  - Palpable fibrous bands
  - Pallor
  - Xerostomia (measured as salivary flow rate-stimulated/unstimulated saliva)
  - Lingual papillary atrophy
  - Leukoplakia
  - Erythroplakia
- Clinical symptoms:
  - Vesicles
  - Burning sensation
  - Restricted mouth opening
  - Inability to swallow
  - Dry mouth (perception of dryness by the patient)
- Histopathology:
  - Hyperkeratosis
  - Atrophy
  - Dysplasia
- Connective tissue changes:
  - Juxta-epithelial hyalinisation
  - Reduction in vascularity
  - Inflammatory cell infiltrate
  - Fibrosis
  - Muscle degeneration
- Epithelial connective tissue interface:
  - Flattened epithelial-connective tissue interface

The published classification systems are presented below in their chronological order.

6.2.1 Desa (1957)

In one of the earliest reports, an otolaryngologist, reported from the King Edward VII Memorial Hospital, Mumbai, India, the clinical presentation, history and the haematological and histological findings in 64 patients with OSF. In their classification system, the patients were divided into three stages, depending on the clinical features as [1]

- Stage I: Stomatitis and vesiculation

  Oral mucosa shows areas of redness on either the entire soft palate, the anterior faucial pillar or the buccal mucous membrane. It is in these areas the vesicles appear first; these vesicles are tender and rupture, leaving small superficial ulcers. Cultures of the vesicular fluid failed to reveal any specific organism.
- Stage 2: Stage of fibrosis

  Characterised by pallor of the mucous membrane together with small "spider-like" areas, due to the fibrosis, at the junction of the faucial pillars with the soft palate.
- Stage 3: Stage of sequelae

  The patients seek relief for the disabling effects produced by the increasing deposition of fibrous tissue in the submucosa. The fibrosis was described as being palatal, faucial or buccal. The mouth opening varied from 0.75 to 4.0 cm, depending on the severity of fibrosis (normal mouth opening was 4.05 cm).

6.2.2 Pindborg and Sirsat (1966)

Classified OSF, based on histology, into four stages based on the connective tissue changes, in haematoxylin and eosin-stained sections as follows [2]:

- Very early stage: Fine, fibrillar, dispersed collagen, marked oedema and connective tissue with plump young fibroblasts containing abundant cytoplasm. Blood vessels are normal or dilated and congested. Inflammatory cells seen are mainly polymorphonuclear leukocytes with occasional eosinophils.
- Early stage: There is juxta-epithelial hyalinisation. Collagen is in separate thick bundles. Moderate numbers of plump young fibroblasts are present, the blood vessels are dilated and congested. Inflammatory cells are primarily lymphocytes, eosinophils and occasional plasma cells.
- Moderately advanced stage: Collagen is moderately hyalinised, and this extends from the juxta-epithelial hyalinisation seen in the early stage. Collagen bundles are thick and separated by tissue oedema. Fibroblastic response is less marked, and the cells are predominantly spindle fibrocytes. Blood vessels are either normal or compressed, depending on the tissue fibrosis. Inflammatory exudate consists of lymphocytes and plasma cells.
- Advanced stage: Collagen is completely hyalinised and presents as a smooth sheet with loss of the bundle morphology of collagen. Oedema is absent. The hyalinised areas are devoid of fibroblasts. Blood vessels are completely obliterated or narrowed. Inflammatory cells are lymphocytes and plasma cells.

6.2.3 Wahi and Kapur et al. (1966)

Classified OSF based on the clinical features, severity and extent of involvement into three groups as follows [3]:

- Group I: Asymptomatic, focal fibrosis of one or more sites of oral mucosa with pallor or whitish coloration and wrinkling of mucosa with minimal induration.
- Group II: Soreness of mucosa or increased sensitivity to chillies. Oral mucosa is white, and the changes are diffuse and extensive and show induration, involving one or more anatomical sites.
- Group III: Restricted mobility due to trismus, stretching at angles of the mouth, and inability to protrude the tongue. Pronunciation is altered. Firm submucosal bands are palpable. Surface may be fissured or ulcerated.

6.2.4 Ahuja and Agarwal (1971)

This classification is discussed by Passi and colleagues in their review of classification systems and is based on the extent and type of clinical fibrosis [4, 5].

- Class I: Localised fibrous bands in the cheek extending from the superior to the inferior fornix on one or both sides. The bands are most commonly found on the lips followed by the premolar region or the second molar region.
- Class II: Generalised diffuse hardening of the subepithelial tissues extending from the cheek and hard palate to the soft palate, uvula and faucial pillars. Occasionally, the hardening might extend to the lining mucosa of the pharynx.
- Class III: Combination of the above two types, where the fibrous bands are associated with a generalised diffuse form of submucous fibrosis.

6.2.5 Bhatt and Dholakia (1977)

Clinically grouped OSF patients into three grades based on the subjective assessment of mouth opening and clinical fibrosis as follows [6]:

- Grade I: Mild and early cases with very slight fibrous bands and little difficulty in opening of the mouth.
- Grade II: Moderately pronounced symptoms with fibrous bands extending from the cheek to the palate.
- Grade III: Excessive amount of fibrosis involving the cheek, palate, uvula, tongue and lips with narrow opening of the mouth.

6.2.6 Gupta and Golhar (1980)

Classified OSF into four stages based primarily on the severity of trismus as follows [7]:

- Very early stage: No difficulty in mouth opening; the patients have burning sensation in the mouth or ulceration.
- Early stage: Along with burning sensation, the patients complain of slight difficulty in opening the mouth.
- Moderately advanced stage: Trismus is marked to such an extent that the patient cannot open his/her mouth more than two fingers width and has difficulty in mastication.
- Advanced stage: Patient has a marked degree of trismus and is undernourished and anaemic.

6.2.7 Warnakulasuriya (1987)

Provided a semi-quantitative grading of the severity of OSF based on mouth opening, fibrous banding and fixation of the tongue. Assessment was based on (a) three groups of mouth opening <20 mm, 20–35 mm and >35 mm; (b) fibrous bands of buccal mucosa grouped as broad single band >2 cm, multiple bands and a single, thin fibrous band; (c) ability to protrude the tongue beyond mucocutaneous (MC) junction: beyond lower incisors but unable to touch MC junction and only up to lower incisors [8].

6.2.8 Pindborg (1989)

Divided OSF into three stages based on clinical signs and symptoms. This classification is discussed by Gupta and colleagues in their review of classification systems [9, 10].

- Stage I: Stomatitis - includes erythematous mucosa, vesicles, mucosal ulcers, melanotic mucosal pigmentations and mucosal petechiae.
- Stage II: Fibrosis occurring in the healing vesicles and ulcers is the hallmark of this stage. Early lesions demonstrate blanching of the oral mucosa. Older lesions include vertical and circular palpable fibrous bands in the buccal mucosa and around the mouth opening or lips resulting in mottled marble-like appearance of the mucosa, because of the vertical thick fibrous bands in association with blanched mucosa. Specific findings include reduction of mouth opening, stiff and small tongue, blanched and leathery floor of the mouth, fibrotic and depigmented gingiva, rubbery soft palate with decreased mobility, blanched and atrophic tonsils, shrunken bud-like uvula and sunken cheeks, not commensurate with age or nutritional status.
- Stage III: Sequelae of OSF: Leukoplakia is found in more than 25% of the individuals with OSF. Speech and hearing defects may occur due to involvement of the tongue and Eustachian tubes.

6.2.9 Katharia et al. (1992)

In their study on the effects of placenta extract in the management of OSF described a scoring system [11] based on (a) the mouth opening, (b) tongue protrusion measured as the distance between incisal edges of lower anterior teeth and tongue tip protruded to its maximum, (c) colour of oral mucosa, (d) fibrous band and (e) burning sensation.

a. Mouth opening: Measured in mm between upper and lower central incisor edges:
   - Score 0: Mouth opening is greater than 41 mm.
   - Score 1: Mouth opening between 37 and 40 mm.
   - Score 2: Mouth opening between 33 and 36 mm.
   - Score 3: Mouth opening between 29 and 32 mm.
   - Score 4: Mouth opening between 25 and 28 mm.
   - Score 5: Mouth opening between 21 and 24 mm.
   - Score 6: Mouth opening between 17 and 20 mm.
   - Score 7: Mouth opening between 13 and 16 mm.
   - Score 8: Mouth opening between 9 and 12 mm.
   - Score 9: Mouth opening between 5 and 8 mm.
   - Score 10: Mouth opening between 0 and 4 mm.
b. Tongue protrusion: measured in mm as the distance between incisal edges of lower anterior teeth and tip of tongue, protruded to its maximum:
   - Score 0: ≥33 mm
   - Score 1: 30-32 mm
   - Score 2: 27-29 mm
   - Score 3: 24-26 mm
   - Score 4: 21-23 mm
   - Score 5: 18-20 mm
   - Score 6: 15-17 mm
   - Score 7: 12-14 mm
   - Score 8: 9-11 mm
   - Score 9: 5-8 mm
   - Score 10: 0-4 mm
c. Colour of oral mucosa:
   - Score 0: normal pink
   - Score 1: red or deep pink
   - Score 2: pale white
   - Score 3: blanched white
d. Fibrous band:
   - Score 0: no fibrous bands
   - Score 1: one or two solitary fibrous bands
   - Score 2: bands felt nearly in the entire surface
   - Score 3: adherent fibrous band producing binding and rigidity of mucosa
e. Burning sensation:
   - Score 0: no burning sensation
   - Score 1: mild
   - Score 2: moderate
   - Score 3: severe

6.2.10 Bailoor (1993)

This classification is discussed by Passi and colleagues in their review of classification systems and is based on a combination of clinical features as follows [5, 12]:

- Stage I: Early OSF:
  Mild blanching. No restriction in mouth opening (normal distance between central incisor tips: males

35–45 mm, females 30–42 mm). No restriction in tongue protrusion (normal mesio-incisal angle of the upper central incisor to the tip of the tongue when maximally extended with the mouth wide open: males 5–6 cm, females 4.5–5.5 cm). Cheek flexibility was measured from a reference point one-third the distance from the angle of the mouth on a line joining the tragus of the ear to the angle of the mouth. The patient is asked to blow his or her cheeks fully, and the distance between the points marked on the cheek indicates cheek flexibility. Mean values for cheek flexibility: males 1.2 cm and females 1.08 cm. Burning sensation on taking spicy or hot foods only.

- Stage II: Moderate OSF

  Moderate-to-severe blanching. Mouth opening reduced by 33%. Cheek flexibility also demonstrably reduced. Burning sensation in the absence of stimuli. Palpable bands felt. Lymphadenopathy either unilateral or bilateral. Demonstrable anaemia on haematological examination.
- Stage III: Severe OSF

  More than 66% reduction in the mouth opening, cheek flexibility and tongue protrusion. Tongue may appear fixed. Severe burning sensation; patient is unable to do day-to-day work. Ulcerative lesions may appear on the cheek. Thick palpable bands. Bilateral lymphadenopathy.

6.2.11 Racher (1993)

Classified OSF into three stages based on clinical features. This classification is discussed by Passi and colleagues in their review of classification systems [5].

- Stage I: Stage of stomatitis and vesiculation. Characterised by recurrent stomatitis and vesiculation. Patient complains of burning sensation in the mouth and inability to eat pungent food. The examination reveals vesicles on the palate that may rupture, and superficial ulceration may be seen. Some amount of fibrosis can be seen.
- Stage II: Stage of fibrosis. There is inability to open the mouth completely and stiffness in mastication. As disease advances, there is difficulty in blowing the cheeks and protruding the tongue. On examination, there is increasing fibrosis in the submucosal tissue. Mucosa is blanched and white. Lips and cheeks are stiff. Dorsum of the tongue may show atrophy of papillae. Blanching and stiffness of the mucosa of the floor of the mouth are less marked than those seen in the lips, cheeks and palate. Larynx is free from disease, and respiration is not affected.
- Stage III: Stage of sequelae and complications. Leukoplakia changes in the mucosa. An ulcerating malignant lesion may be seen involving the cheeks, oropharynx or tongue. Patients are predisposed to develop oral cancer under the influence of carcinogens.

6.2.12 Khanna and Andrade (1995)

Studied a series of 100 patients prospectively and proposed a group classification system based on both clinical and histopathological features to aid in the surgical management of OSF. OSF was staged into four categories [13]:

- Group I: Very early cases:
  - Clinically: Burning sensation in the mouth, acute ulceration and recurrent stomatitis; not associated with mouth opening limitation.
  - Histology: Fine fibrillar collagen network, oedema, dilated and congested blood vessels, large aggregates of plump young fibroblasts with abundant cytoplasm. Inflammatory cells consist of polymorphonuclear leukocytes with few eosinophils. The epithelium is normal.
- Group II: Early cases
  - Clinically: Limitation of mouth opening; the buccal mucosa is mottled and marble-like; there is palpable fibrosis predominantly involving soft palate and faucial pillars.
  - Histology: Juxta-epithelial hyalinisation; thick bundles of collagen are present that are in separate bundles; dilated and congested blood vessels; and moderate number of young fibroblasts. Inflammatory cells are mainly polymorphonuclear leukocytes with few eosinophils and occasional plasma cell. Epithelial rete pegs are short and flat with varying degrees of keratinisation.
- Group III: Moderately advanced cases
  - Clinically: Trismus with interincisal distance of 15–25 mm. Pale buccal mucosa firmly adherent to underlying tissues with palpable, fibrous bands in the premolar region, the soft palate anterior faucial pillar and the pterygomandibular raphe. The fibrosis has a scar-like appearance. Some cases exhibit atrophy of vermilion border of the lip.
  - Histology: Juxta-epithelial hyalinisation with faintly visible collagen bundles. There is mild oedema, constricted blood vessels and mature fibroblasts with scanty cytoplasm and spindle-shaped nuclei. The inflammatory cells present are lymphocytes and plasma cells. The surface epithelium is markedly atrophic with loss of rete pegs. Muscle fibres exhibit fibrosis and early signs of degeneration such as loss of striae.

- Group IV is subdivided into IVA and IVB.
- Group IVA: Advanced cases:
  - Clinically: Severe trismus with interincisal distance of 2–15 mm; fibrosed faucial pillars compressing the tonsil, shrunken and deformed uvula and restricted tongue movement. There may be diffuse papillary atrophy of the tongue. Fibrosis of the lip occurs leading to constriction of the rima oris and vermilion border atrophy.
- Group IVB: Advanced cases with "premalignant/malignant changes":
  - Clinically: OSF features with potentially malignant lesions such as leukoplakia and/or squamous cell carcinoma.
  - Histology: Hyalinised connective tissue in which the collagen bundles cannot be discerned. Blood vessels are obliterated. Fibroblasts are absent or scanty. The surface epithelium exhibits loss of melanocytes and epithelial rete ridges. Epithelium may show mild-to-moderate atypia or malignant changes in Group IVB. There is extensive degeneration of muscle fibres.

The authors recommend that patients in group I and group II be managed by symptomatic treatment, whereas those in group III and group IV by surgical management.

6.2.13 Lai et al. (1995)

Examined a series of 150 patients and divided their cohort of 150 OSF patients into six groups for management: medical (groups A, B, C) and surgical (groups D, E, F). Their classification was based on the interincisal distance as follows [14]:

- Group A: Interincisal distance greater than 35 mm
- Group B: Interincisal distance 30–35 mm
- Group C: Interincisal distance 20–30 mm
- Groups D, E, F: Interincisal distance less than 20 mm

6.2.14 Maher et al. (1996)

Their classification of OSF was based on the extent of the clinical disease based on the overall clinical impression. They subdivided intra-oral regions into seven areas: palate, posterior one-third of the buccal mucosa, middle one-third of the buccal mucosa, anterior one-third of the buccal mucosa, upper labial mucosa, tongue and floor of the mouth. These areas were further grouped into three categories [15]:

- Involvement of one-third or less of the oral cavity (three or less of the above zones involved)
- Involvement of one-third to two-thirds of the oral cavity (if four to six intra-oral sites are involved)
- Involvement of more than two-thirds of the oral cavity (if more than six intra-oral sites are involved)

6.2.15 Haider et al. (2000)

Their criteria for diagnosis of OSF was the presence of mucosal blanching, mucosal hardness, and palpable intra-oral bands. Following diagnosis, the patients were clinically and functionally staged [16]:

- Clinical staging:
  - Stage 1: Faucial bands only
  - Stage 2: Faucial and buccal bands
  - Stage 3: Faucial, buccal and labial bands
- Functional staging:
  - Stage A: Mouth opening greater than 20 mm
  - Stage B: Mouth opening between 11 and 19 mm
  - Stage C: Mouth opening less than or equal to 10 mm

6.2.16 Ranganathan et al. (2001)

Reported normal mouth opening, tongue protrusion and cheek flexibility in 800 patients and proposed the classification for OSF based on mouth opening as follows [17]:

- Group I: Only symptoms with no demonstrable restriction of mouth opening
- Group II: Limited mouth opening 20 mm and above
- Group III: Mouth opening less than 20 mm
- Group IV: OSF advanced with limited mouth opening and precancerous or cancerous changes

6.2.17 Rajendran (2003)

Classified OSF based on the clinical features as follows [18]:

- Early OSF: Burning sensation in the mouth on consuming spicy food, blisters especially on the palate, ulceration or recurrent generalised inflammation of oral mucosa, petechiae, excessive salivation, defective gustatory sensation, dryness of mouth and pain on palpation of the fibrous bands.
- Advanced OSF: Blanched and slightly opaque mucosa, fibrous bands in the buccal mucosa running in vertical direction. Palate and faucial pillars are the areas first involved with gradual impairment of tongue movement and difficulty in mouth opening due to the fibrosis of the pterygomandibular raphe.

6.2.18 Utsonumiya et al. (2005)

Classified OSF based on histological features as follows [19]:

- Early stage: Myxedematous changes in the area corresponding to lamina propria, diffuse lymphocytic infiltration and no fibrosis.
- Intermediate stage: Hyalinisation in sub-epithelial zone, fibrotic changes extending close to the muscles. Blood vessels are compressed by fibrous bundles. Reduced inflammatory cells in sub-epithelial layer are seen.
- Advanced stage: Marked fibrous areas with hyaline changes extending from sub-epithelial to superficial muscle layers are seen. Atrophic, degenerative changes start in muscle fibres. Inflammatory cell infiltrates are hardly seen. Number of blood vessels is dramatically less in the sub-epithelial zone.

6.2.19 Bose and Balan (2007)

Classified OSF based on clinical features as follows [20]:

- Group A: Mild cases with occasional symptoms, pallor, vesicles, one or two solitary palpable bands, loss of mucosal elasticity, variable tongue fibrosis with tongue protrusion beyond vermillion border. Mouth opening is greater than 3 cm.
- Group B: Moderate cases with soreness of oral mucosa, increased sensitivity to chillies, diffuse involvement of the mucosa with blanched appearance, buccal mucosa is tough and inelastic with fibrous bands palpable, considerable restriction of mouth opening (1.5–3 cm) and variable tongue movement.
- Group C: Severe cases with symptoms being more severe, broad fibrous bands palpable, blanched opaque mucosa, rigid oral mucosa, severe restriction of mouth opening (less than 1.5 cm), tongue is depapillated with restricted tongue protrusion.

6.2.20 Kumar et al. (2007)

Clinical stage of the disease in terms of the ability to open mouth was correlated with histopathological grading. Clinical criteria for the diagnosis of OSF were difficulty in opening the mouth and associated blanched oral mucosa with palpable fibrous bands. The distance between the interincisal edges was measured in mm for assessing the ability to open the mouth [21].

OSF cases were clinically categorised into three clinical stages according to their ability to open mouth as follows:

- Stage I: Mouth opening greater than 45 mm
- Stage II: Mouth opening between 20 and 44 mm
- Stage III: Mouth opening less than 20 mm

The histopathological grading followed in the study is as follows:

- Grade I: Loose connective tissue thick and thin fibres
- Grade II: Loose connective tissue with thick fibres and partial hyalinisation
- Grade III: Complete connective tissue hyalinisation

6.2.21 Mehrotra et al. (2009)

The patients were divided into four groups based on their clinical presentations as [22]:

- Grade I: Stomatitis, burning sensation in the buccal mucosa and with no palpable fibrous bands.
- Grade II: Symptoms of grade I, palpable fibrous bands, involvement of soft palate and maximal mouth opening of 26–35 mm.
- Grade III: Symptoms of grade II, blanched oral mucosa, involvement of tongue and maximal mouth opening of 6–25 mm.
- Grade IV: Symptoms of grade III, lip fibrosis and mouth opening of less than or equal to 5 mm. Suggested treatment is abstinence from habit and surgical management.

6.2.22 More et al. (2011)

Their classification was based on the common site of occurrence, symptoms, other affected sites and associated lesions as follows [23]:

I. Clinical staging:
   - S1: Stomatitis and/or blanching of oral mucosa
   - S2: Presence of palpable fibrous bands in buccal mucosa and/or oropharynx, with/without stomatitis
   - S3: Presence of palpable fibrous bands in buccal mucosa and/or oropharynx, and in any other parts of oral cavity, with/without stomatitis
   - S4: A: Any one of the above stages along with other potentially malignant disorders, e.g. oral leukoplakia and oral erythroplakia. B: Any one of the above stages along with oral carcinoma

II. Functional staging:
   - M1: Interincisal mouth opening up to or greater than 35 mm
   - M2: Interincisal mouth opening between 25 and 35 mm

- M3: Interincisal mouth opening between 15 and 25 mm
- M4: Interincisal mouth opening less than 15 mm

A combination of the clinical and functional staging was used to stratify patients for management. For example, the final staging may be S1M1, S2M3, S2M4 and so on.

6.2.23 Kerr et al. (2011)

Proposed the following grading system for OSF, following the World Workshop on Oral Medicine (WWOM V) as a recommendation for future studies on the various aspects of OSF, based on clinical severity as follows [24]:

- Grade 1: Mild: Any features of the disease triad for OSF (burning, depapillation, blanching or leathery mucosa) may be reported. Interincisal opening greater than 35 mm
- Grade 2: Moderate: Above features of OSF and interincisal limitation of opening between 20 and 35 mm
- Grade 3: Severe: Above features of OSF and interincisal opening less than 20 mm
- Grade 4A: Above features of OSF with other potentially malignant disorders on clinical examination. Grade 4B: Above features of OSF with any grade of oral epithelial dysplasia on biopsy
- Grade 5: Above features of OSF with oral squamous cell carcinoma

6.2.24 Patil and Maheshwari (2014)

Diagnosis of OSF was made on clinical symptoms and fibrosis. They proposed that patients with OSF can be further classified based on cheek flexibility, which was measured as "distance in millimetres, from maxillary incisal midline to the cheek retractor during retraction". Their proposed values for normal cheek flexibility were males 35 to 45 mm and females 30 to 40 mm [25]:

- Grade 1 (early): Cheek flexibility of 30 mm and above
- Grade 2 (mild): Cheek flexibility between 20 and 30 mm
- Grade 3 (moderate): Cheek flexibility less than 20 mm
- Grade 4 (severe): Any of the above condition without concurrent presence of potential malignant lesions
- Grade 5 (advanced): Any of the above condition with concurrent presence of oral carcinoma

6.2.25 Arakeri et al. (2018)

They proposed a classification based on trismus, fibrosis and presence or absence of malignant changes in the epithelium, which they called TFM classification [26], with recommendations for therapy based on their staging.

Parameters of TFM classification
Trismus (T)
TX: Trismus cannot be assessed due to the presence of confounding factors such as tooth impingement, temporomandibular join disorders (TMDs) and infection
T0: Interincisal distance of more than 36 mm
T1: Interincisal distance of 26–35 mm
T2: Interincisal distance of 15–25 mm
T3: Interincisal distance of less than 15 mm
TE: Edentulous (E) state due to either complete or partial loss of anterior teeth
TE0: Anterior free space after maximum mouth opening more than 41 mm
TE1: Anterior free space after maximum mouth opening of 36–40 mm
TE2: Anterior free space after maximum mouth opening of 25–35 mm
TE3: Anterior free space after maximum mouth opening of less than 25 mm
Fibrosis (F)
F0: No signs of fibrosis
FX: Fibrosis cannot be assessed due to severe trismus
F1: Burning sensation in the mouth and/or blanching of oral mucosa and/or acute ulceration and/or recurrent stomatitis
F2: Mottled and marble-like oral mucosa, dense, pale, depigmented fibrosed areas alternated with pink normal mucosa, widespread sheets of fibrosis (palpable fibrous bands) involving labial and/or buccal mucosa and/or oropharynx
F3: Pale oral mucosa firmly attached to underlying tissues, palpable vertical fibrous bands at the buccal mucosa and in the soft palate-radiating fibrous bands from the pterygomandibular raphe or the anterior faucial pillar in a scar-like appearance, atrophy of the vermilion border, patient unable to blow out cheeks and whistle
F4: Thickened faucial pillars, shrunken fibrous bud-like small uvula, narrowed isthmus, restricted tongue movement, diffuse papillary atrophy, palpable circular fibrous band around the entire mouth, obliquity of rima oris, vermilion border atrophy

Malignant transformation (M)
M0: No signs of malignant transformation
MX: Malignant transformation cannot be assessed due to severe trismus
MQ: Lesion in question
MP: Associated potentially malignant disorder
M1: Histopathological evidence of dysplasia
M1a: Low grade
M1b: High grade
M2: Histopathological evidence of malignant transformation

TFM staging of oral submucous fibrosis	
Stages	**TFM classification**
Stage 1 (medical therapy):	$T_{0\text{-}2/\ E0\text{-}E2}$ or $F_{1\text{-}2}$, $M_{0,1a}$
Stage 2 (surgical therapy):	$T_{2\text{-}3/E2\text{-}E3}$ or $F_{3\text{-}4}$, $M_{0,1b}$
Stage 3 (neoplastic disease therapy):	Any T, $F_{1\text{-}4}$, M_2

Summary

As discussed, vide supra, each classification is based on a premise which is unique to the aspect being studied in OSF. The features are summarised in Table 6.1

Table 6.1 Summary of features used by authors in their classification systems

Authors	Clinical signs	Clinical symptoms	Histopathological features
1. Desa (1957)	✓	✓	✕
2. Pindborg and Sirsat (1966)	✕	✕	✓
3. Wahi and Kapur et al. (1966)	✓	✓	✕
4. Ahuja and Agarwal (1971)	✓	✕	✕
5. Bhatt and Dholakia (1977)	✓	✓	✕
6. Gupta and Golhar (1980)	✓	✓	✕
7. Warnakulasuriya (1987)	✓	✓	✕
8. Pindborg (1989)	✓	✓	✕
9. Katharia et al. (1992)	✓	✓	✕
10. Bailoor (1993)	✓	✓	✕
11. Racher (1993)	✓	✓	✕
12. Khanna and Andrade (1995)	✓	✓	✓
13. Lai et al (1995)	✓	✕	✕
14. Maher et al. (1996)	✓	✕	✕
15. Haider (2000)	✓	✕	✕
16. Ranganathan et al. (2001)	✓	✓	✕
17. Rajendran (2003)	✓	✓	✕
18.Utsonumiya et al. (2005)	✕	✕	✓
19. Bose and Balan (2007)	✓	✓	✕
20. Kumar et al. (2007)	✓	✕	✓
21. Mehrotra et al. (2009)	✓	✓	✕
22. More et al. (2011)	✓	✓	✕
23. Kerr et al. (2011)	✓	✓	✓
24. Patil and Maheshwari (2014)	✓	✕	✕
25. Arakeri et al. (2018)	✓	✓	✓

6.3 Conclusion and Recommendations

There are many classification systems that have been suggested [5, 10, 23, 26–29]. Four of the systems recommend using both clinical and histopathological features to classify the disease [13, 21, 24, 26]. The classification by Pindborg and Sirsat [2] is the widely accepted histopathological classification. Khanna and Andrade's [14] classification system includes both clinical and histopathological features and is often used by clinicians. The Fifth World Workshop on Oral Medicine discussed the published studies and emphasised the need for a system that could assess the clinical severity and be used in clinical trials. OSF has a spectrum of features that segue without distinct demarcation as the disease progresses. This makes it difficult to have a classification system that is unambiguous and mutually exclusive. Consequently, the classification system chosen will depend on the variables being studied.

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