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Pediatric Soft Tissue Oral Lesions

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KEYWORDS
- Children • Oral lesions • Soft tissue • Color changes • Nodules

KEY POINTS
- Oral mucosal lesions in children may present as ulcers, color changes, and alterations in size and configuration of oral anatomy.
- Leukoedema is a benign white lesion found bilaterally or unilaterally on the buccal or labial mucosa.
- Pseudomembranous candidiasis, a common condition in children, is an opportunistic fungal infection caused by Candida albicans, more likely to occur in children who had a recent use of antibiotics, corticosteroids, or extended exposure to pacifier.
- Melanotic nevus is an alteration of mucosal color. Nevi may be congenital or develop over the life span and mostly represent deviations of normal anatomy.
- Nodular vascular anomalies are currently classified into either benign tumors or vascular malformations based on the clinical presentation and evolution of the lesion and its histopathologic features.

PEDIATRIC SOFT TISSUE ORAL LESIONS

Oral mucosal lesions in children may present as ulcers, color changes, alterations in size, and configuration of oral anatomy. This article presents a broad overview of oral conditions that affect children, focusing on abnormalities of color and nodular changes. Ulcerative disorders are covered extensively in other readily accessible literature.

MUCOSAL CHANGES (COLOR)

White Lesions

Frictional keratosis (Morsicatio buccarum)
The constant rubbing of the mucosa may cause white patches that can disappear if the causative agent habit is discontinued. Habits causing this finding include traumatic

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tooth brushing (toothbrush keratosis) and forcefully rubbing the tongue against the teeth (tongue thrust keratosis). The prevalence of frictional keratosis has been reported between 0.26% and 1.89% in children.\(^1,2\)

**Clinical presentation** The condition is observed as a corrugated, gray or white lesion that may be smooth or rough and occasionally irregular with small loose tags of epithelium on the surface. The site of appearance is mostly the buccal mucosa.

**Treatment** Removal of intraoral irritants and discontinuation of causative habits usually resolves this lesion.

**Leukoedema**
Leukoedema is a benign white lesion found bilaterally or unilaterally on the buccal or labial mucosa. The etiology is unknown but associations with tobacco smoking, local irritation, and malocclusion have been made. The prevalence differs in adults depending on the population examined and ranges between 0.96% and 58.00%,\(^3,4\) with the highest prevalence noted in African Americans.

**Clinical presentation** Leukoedema is characterized by a diffuse white opacification that resolves when the mucosa is stretched.

**Treatment** No treatment is needed, as this condition is benign.

**Linea alba**
This condition is a benign finding located on the buccal mucosa across the commissures and extending posteriorly toward the molars. The prevalence is 1.5% in children\(^5\) and up to 5.3% in adolescents.\(^6\)

**Clinical presentation** Linea alba presents as a distinct white linear area on the buccal mucosa opposing the plane of occlusion (Fig. 1). Occasionally, it has also been recognized on the lateral border of the tongue.

**Treatment** No treatment is needed, as this condition is benign.

**Hairy tongue**
Hairy tongue is a benign condition that arises from abnormal elongation of the filiform papillae of the tongue (1–12 mm) or the proliferation of bacteria that release pigments

![Fig. 1. Linea alba in an adolescent boy (arrow).](image)
on them. This condition may also be caused by intrinsic factors, such as antibiotics (erythromycin), antipsychotics (olanzapine), iron supplements, or radiation therapy. Extrinsic causative factors are primarily related to diet (coffee, tea), poor oral hygiene, mouth washes, or smoking, a concern in adolescent patients.\(^7,8\) The prevalence of hairy tongue in children is unknown.\(^1\)

**Clinical presentation** Papillary elongation gives the appearance of thick, hairylike surface on the dorsal tongue. The condition may present with superficial coating that blunts the hairy appearance (Fig. 2).

**Treatment** Good oral hygiene, diet restriction, smoking cessation, or tobacco counseling and brushing with 1% to 2% hydrogen peroxide solution or diluted sodium hypochloride has been suggested.\(^9\)

**Pseudomembranous candidiasis**
This common condition in children is an opportunistic fungal infection caused by *Candida albicans*, more likely to occur in children who had a recent use of antibiotics, corticosteroids, or extended exposure to pacifier.\(^10–13\) It is a hallmark oral finding in children with systemic conditions, such as endocrine disorders, leukemia, chemotherapy, radiation therapy, transplantation, prematurity, and malnutrition.\(^14–17\) The prevalence is 0.99% to 8.57% in children\(^2,11\) and 37.00% of infants.

**Clinical presentation** This condition is presented as superficial white plaques on the mucous membranes that can be wiped off.\(^18–20\) These white plaques can be seen on the buccal and labial mucosa, hard and soft palate, tongue, and oropharynx.

![Fig. 2. Dorsal tongue with heavy pigmentation.](image-url)
Treatment  Treatment usually includes gentian violet or topical nystatin for infants, and nystatin (topical) or topical clotrimazole for older children. Systemic fluconazole, ketoconazole, or itraconazole may be used for children who are at risk of developing systemic infection or are intolerant to topical therapy.\textsuperscript{21,22}

White sponge nevus
White sponge nevus is a benign asymptomatic condition due to an autosomal dominant inheritance. Lesions clinically present as bilateral white plaques that are thickened, spongy, and folded. The buccal mucosa is the most frequent site but the condition also may be seen on the labial mucosa, floor of the mouth, and gingiva. They are usually present at birth or in early childhood and may occasionally develop in adolescence. The prevalence is 1.54\%.\textsuperscript{11}

Clinical presentation White, raised, folded unilateral or bilateral tissue on tongue or buccal mucosa. The tissue cannot be removed. The differential diagnosis may include leukoplakia, chemical burns, trauma, tobacco, and \textit{Candida} infections.

Treatment No treatment is necessary unless masticatory function is compromised.

RED AND/OR WHITE LESIONS

\textit{Petechiae, Purpura, Ecchymosis}

These red lesions are commonly caused by trauma affecting the underlying vasculature. They are frequently a sign of bleeding disorders, such as thrombocytopenia or hemophilia, and may occasionally be associated with leukemia and anemia. The prevalence of vascular lesions is 1.89\% to 8.39\% in children\textsuperscript{1,2} and may be up to 42.8\% in children with systemic disease.\textsuperscript{11}

Clinical presentation The lesions are predominantly seen on the lips, tongue, hard palate, and gingiva and are classified as follows:

- \textit{Petechiae}: pinpoint hemorrhages
- \textit{Purpura}: 2-mm to 2-cm hemorrhages
- \textit{Ecchymosis}: >2 cm hemorrhages

Treatment Treatment includes the initial investigation of the source of the trauma to rule out child abuse. All other lesions associated with medical conditions or medications must be referred for further medical workup.

\textit{Erythematous Candidiasis}

The etiology of the symptomatic form is often linked to vitamin B12 and folate deficiency, as well as recent antibiotic or steroid therapy. The asymptomatic form is characterized by chronic erythema of tissues covered by prostheses, such as dentures and retainers. Lesions are commonly seen on the palate and occasionally on the mandibular tissue. The prevalence in children is unknown. It is presumed to be lower than the prevalence of pseudomembranous candidiasis.

Clinical presentation Red macular lesions that are usually asymptomatic or occasionally symptomatic with a burning sensation on the tongue or mouth and a bright red appearance.
Treatment
See pseudomembranous candidiasis.

Angular Chelitis
This disorder is a chronic inflammation of the skin and labial mucosa at the corners of the mouth. The etiology may be due to nutritional deficiencies (riboflavin, folate), anemia (iron deficiency) allergy, infections, physical irritation, low socioeconomic status,23 and bruxism.5,6,24,25 The prevalence is 3% in children5 and 9% in adolescents.6

Clinical presentation
Angular chelitis is characterized by the presence of painful cracking, fissuring, and erythema on bilateral commissures. Hemorrhage may be a concomitant finding.

Treatment
See pseudomembranous candidiasis.

Erythema Migrans (Benign Migratory Glossitis)
Also known as geographic tongue, erythema migrans is a benign condition affecting the dorsum of the tongue. The etiology is unknown, but studies have suggested an association with atopy, psoriasis, and fissured tongue and included a genetic linkage between the 2 conditions.26–29 Geographic tongue is also more prevalent in allergic patients.30,31 Prevalence ranges between 0.37% and 14.3%2,5 in pediatric patients depending on the populations examined and may be up to 40.6% in children with systemic disease.11

Clinical presentation
Clinically, benign migratory glossitis appears as a well-configured maplike appearance due to the well-defined depapillated erythematous regions that are surrounded by white borders (Fig. 3).

Treatment
No treatment is necessary, other than reassurance. In adults, zinc, topical anesthetics, steroid gels, and antihistamine mouth rinses have been suggested for symptomatic cases.32

Median Rhomboid Glossitis
This particular fungal infection has predisposing factors, such as Candida infections, and immunosuppressive diseases, such as diabetes. Other risk factors reported in the literature, but have inconsistent results include age, smoking, and removable prostheses.33,34 Prevalence in pediatric patients has been reported between 0% and 1.23%.1,35–37

Clinical presentation
The condition presents as a well-circumscribed central papillary atrophy of the tongue, typically located in the midline on the dorsum of the tongue anterior to the circumvallate papillae (Fig. 4). The surface of the lesion is smooth and glossy and is asymptomatic in most patients; however, pain, irritation, and pruritus have been reported. Tongue lesions may occasionally present with palatal inflammations or kissing lesions that are considered a marker for HIV infection.35

Treatment
Because this is an asymptomatic lesion, treatment is not indicated. However, the lesion often responds to antifungal treatment with nystatin, fluconazole, or clotrimazole as a suspension or oral troches.
BROWN-BLACK LESIONS

Physiologic Pigmentation

This pigmentation is the most common form of diffuse and bilateral pigmentation that arises from the increased production of melanin in dark-skinned populations (Middle Eastern, African American, and occasionally Asians). In general, conditions that increase the prevalence of this pigmentation are race/ethnicity, increased age, smoking, pregnancy, endocrine syndromes, and hormonal changes. Atypical cases have been reported in newborns. Peutz-Jeghers syndrome is an autosomal dominant trait.

Fig. 3. Geographic tongue in a 12-year-old girl. Note the white borders surrounding the lesions.

Fig. 4. Central papillary atrophy in an 8-year-old child.
that is associated with multiple intraoral and perioral pigmentations, most of which do not require treatment and involute after the first decade of life. However, the early establishment of a diagnosis is critical for a gastroenterology workup for intestinal polyps and hamartomas that have a 2% to 3% tendency for malignant transformation. Addison disease or adrenal insufficiency is an autoimmune disease resulting in insufficient secretion of glucocorticoids and mineralocorticoids. Initial symptoms include diffuse bronzing of the skin and mucous membranes. In the oral cavity, the pigmentation is commonly located on the gingiva, tongue, buccal mucosa, and hard palate. Occasionally, isolated macules maybe present. Oral surfaces frequently exposed to trauma may develop the pigmentation more frequently. The prevalence of oral pigmentation in children is 13.5% with an onset in the first/second decades.

**Clinical presentation**

The pigmentation is commonly found on the attached gingiva. Occasionally, the buccal mucosa, palate, and lips, as well as the dorsal surface of the tongue are affected.

**Treatment**

Treatment is not required. Intraoral pigments associated with Peutz-Jeghers syndrome require monitoring and evaluation by a gastroenterologist for the development of mucosal gastric malignancies.

**Amalgam Tattoo/Graphite**

This disorder occurs as sequelae of surgical oral interventions or removal of amalgam restorations. The prevalence in children is 1.3%.

**Clinical presentation**

Amalgam tattoo is a localized flat blue-gray solitary or multiple lesions of variable sizes and shapes (0.1–2.0 cm). It is commonly found on the attached and alveolar mucosa next to teeth restored with amalgam, and may be occasionally seen dispersed in the buccal mucosa or the floor of the mouth. Graphite pigmentation is a common finding in the anterior palatal area in children due to trauma. It appears clinically as an ill-defined flat gray/black pigmentation.

**Treatment**

No biopsy is indicated in most cases unless a confirmation of amalgam is needed when the patient’s medical history suggests susceptibility to dermatologic malignancy.

**Melanotic Nevus**

Melanotic nevus is an alteration of mucosal color. Nevi may be congenital or develop over the life span and mostly represent deviations of normal anatomy. It is important to mention the histologic classification of nevi, as it may impact lesion prognosis:

1. Junctional: proliferation of the nevus cells at the tips of the rete pegs that are close to the surface and are confined in the epithelium.
2. Compound: proliferation of nevus cell into the epithelium and connective tissue.
3. Intradermal/intramucosal: nevus cells are located in the lamina propria and do not contact the basement membrane. These lesions are dome shaped, typically light brown in color and are commonly seen on the gingiva, and labial and buccal mucosa.
4. Blue nevi: proliferation of spindle cells within the deep connective tissue and remotely from the surface epithelium. This lesion is commonly seen on the hard
palate. They are further classified into atypical blue nevus, locally aggressive blue nevus, and congenital giant melanotic nevus with nodular growth.59

5. Other melanotic nevi include the combined nevus and the Spitz nevus, which may be located on the palate or tongue.60–62

6. The congenital melanotic nevi with large nodules.63

The prevalence of oral nevi in children is unknown, and published figures include older patients.57

Clinical presentation
Melanotic nevi present as localized brown, blue, gray, black, or colorless macule or papule and rarely polypoid57,58 that range from 0.1 to 3.0 cm (Fig. 5).57,58 The nevi are commonly located on the hard palate, buccal mucosa, and gingiva at 41.0%, 12.0%, and 11.5% respectively.47,57,58

Treatment
Treatment includes excisional biopsy to rule out mucosal melanoma, especially if the lesion is located in the palate. Transformation of pigmented nevi to melanoma is not well documented in the literature.64–66

Soft Tissue Nodules
Most reports establish that 90% to 98% of soft tissue biopsies in children are diagnosed as benign.67–74 These benign lesions can be divided into 2 categories according to their etiology: inflammatory/reactive lesions and benign neoplasms. Malignancies are uncommon in children; however, because when they occur they cannot be clinically distinguished from benign lesions, these must be biopsied to establish a definitive diagnosis.

Inflammatory/reactive lesions
Mucocele (mucous extravasation phenomenon) A mucocele is a lesion that results from the extravasation of mucous into the connective tissue of the oral mucosa secondary to the rupture of a minor salivary gland duct. The prevalence of mucoceles in children has been reported between 0.04% and 1.00%.75

Clinical presentation Mucoceles appear most frequently as slightly bluish nodules measuring smaller than 1.5 cm, most of which have a history of increasing and decreasing in size.76 On palpation, they can be fluctuant or firm. If the extravasated
mucous is located in the deeper connective tissue, they may appear as pink nodules. The most common location is the lower labial mucosa, which is a site that is frequently traumatized by biting. Other common locations include the floor of the mouth, ventral tongue, and buccal mucosa (Fig. 6).

**Treatment** Occasionally mucoceles have been reported to rupture spontaneously. For those that persist, treatment consists of surgical excision with removal of the associated minor salivary glands to prevent recurrence. Other treatment modalities include cryosurgery, electrosurgery, CO2 laser removal, or laser vaporization. Mucoceles located on the floor of the mouth (ranulas) are treated by marsupialization or removal of the lesion and the associated salivary gland.

**Irritation fibroma** Irritation fibromas represent a fibrous connective tissue hyperplasia that occurs secondary to chronic trauma to the oral mucosa. Although they are the most common benign soft tissue lesion seen in adults, they can also be found in children. The prevalence of fibromas in children is unknown.

**Clinical presentation** Fibromas appear clinically as nodules with a smooth surface or sometimes an ulcerated surface. Their color is that of the surrounding mucosa and they feel firm on palpation. The most frequent locations are mucosal sites that are easily traumatized, such as the buccal mucosa, the labial mucosa, and the lateral tongue (Fig. 7).

**Treatment** Conservative excision is the treatment of choice if the lesion interferes with normal oral functions and to obtain a definitive diagnosis. If the source of chronic trauma is not eliminated, the lesion may recur.

**Peripheral ossifying fibroma** Peripheral ossifying fibromas are benign neoplasms thought to arise from cells in the periodontal ligament or periosteum; therefore, they are seen almost exclusively on the gingiva. They are reported to be the most common gingival lesion seen in children, comprising 9.6% of all gingival lesions, occurring in the second decade of life.

**Clinical presentation** This lesion presents as a sessile nodule on the gingiva, especially the anterior maxillary gingiva. Depending on the amount of calcification, it can be soft to palpation to firm or hard. Their color is usually that of the surrounding mucosa, but occasionally can appear red or with surface ulceration. It is more prevalent in younger patients and has a predilection for female patients (3:2).
Treatment Surgical excision of the lesion, including the periodontal ligament, is thought to reduce the possibility of recurrence, but can lead to gingival defects. The recurrence rate for this lesion is 16% to 20%. Use of laser excision has also been effective.85

Pyogenic granuloma Pyogenic granuloma is a benign soft tissue lesion that is thought to result from chronic irritation, trauma, and hormonal factors.86 Despite its name, it is a vascular proliferation and not a true granuloma.87 Recently, the International Society for the Study of Vascular Anomalies has classified pyogenic granulomas as vascular tumors, but this classification is still not widely used.88 The prevalence of pyogenic granulomas has been reported as high as 52% of reactive lesions, which are most of the oral lesions in children.87

Clinical presentation Oral pyogenic granulomas present as sessile or pedunculated nodules, ranging in size from a few millimeters to 2 cm, with a bright red color and a smooth or ulcerated surface (Fig. 8). In some cases, they can rapidly increase in size, mimicking a malignancy and causing increased concern to the patient or clinician. The most common site is the gingiva, especially the maxillary anterior labial gingiva. Other common sites are the lips, tongue, buccal mucosa, and palate.89
Treatment  Surgical excision of the lesion is recommended, but other modalities, such as cryosurgery, electrosurgery, and laser excision have been used. In gingival lesions, the excision should extend down to the periosteum. Intralesional steroid therapy has been used for recurrent lesions. A recurrence rate of up to 16% has been reported.86

Peripheral giant cell granuloma Peripheral giant cell granuloma is a benign lesion of unknown origin characterized by the presence of giant cells. It presents in patients of all ages, including children, and has a female predilection. Because it is thought to arise from the cells in the periodontal ligament or periosteum, it is seen exclusively in the gingiva secondary to local irritation or trauma.90,91

Clinical presentation  This lesion appears clinically as a soft tissue nodule with a pedunculated or sessile base and either a smooth or ulcerated surface. It is located usually in the interproximal dental papillae on the buccal or lingual aspect and measures approximately 2 cm. In some cases, it can surround a tooth and produce displacement of the adjacent teeth and even some saucerization of the underlying bone.92–94

Treatment  Complete surgical excision and curettage of underlying bone is the preferred treatment. A recurrence rate of 10% has been reported.95 Early diagnosis and treatment is important to minimize risk of bone or tooth loss.96

Benign neoplasms  Squamous papilloma  There are more than 100 human papilloma virus (HPV) types and they are known to cause lesions in human mucosal sites. In the oral cavity, the most frequent lesion induced by HPV types 6 and 11 is the squamous papilloma.97 In addition, squamous papillomas represent 8% of all soft tissue masses in children.71

Clinical presentation  Squamous papilloma presents as a small pedunculated or sometimes sessile papule with papillary “fronds” and may be the same color of mucosa or appear white.98 They usually appear as a single lesion measuring approximately 0.5 cm. Squamous papillomas can occur anywhere in the oral mucosa but are commonly seen on the soft palate and tongue. Oral condylomas, on the other hand, clinically appear larger in size (average of 3 cm), have a sessile base, and occur more commonly in labial mucosa, lingual frenum, or soft palate.99

Treatment  The treatment of choice is either conventional scalpel surgical excision or laser ablation, and recurrence has been rarely reported.100,101 The recent introduction of a vaccine against HPV types 6, 11, 16, and 18 could potentially impact the prevalence of squamous papillomas in children, preventing the occurrence of these lesions.102

Hemangioma/vascular malformations  Nodular vascular anomalies are currently classified into either benign tumors or vascular malformations based on the clinical presentation and evolution of the lesion and its histopathologic features.103 The prevalence of hemangiomas is 1% of newborns in the United States and the head and neck area accounts for 60% of these lesions.104,105 Hemangiomas can be a clinical feature of multiple syndromes.104 Alternatively, vascular malformations are considered congenital structural anomalies of blood vessels that are non-neoplastic.106 They do not proliferate or undergo involution; however, they may expand secondarily to stimuli, such as trauma, endocrine changes, or infection.103

Clinical presentation  Hemangiomas appear as either a red or purple/red macule or nodule with a smooth or lobulated surface. The more superficial lesions appear red in
color, whereas the deeper lesions appear purple. Approximately 90% of hemangiomas will resolve by age 9.\textsuperscript{103} Common locations in the head and neck area are the parotid and the orbit.\textsuperscript{107} Vascular malformations are present at birth and do not involute but persist and are classified according to the vessel type (capillary, venous, lymphatic, or arteriovenous). Port wine stains are a common capillary malformation that occurs in 0.3% to 1.0% of newborns. Other malformations can present initially as flat macules that blanch under pressure and slowly become more nodular or cobblestoned in appearance.\textsuperscript{103}

**Treatment** It is important to differentiate between a hemangioma and a vascular malformation because their treatment modalities differ.\textsuperscript{108} Because hemangiomas can spontaneously involute during infancy, treatment is deferred until the lesion has involuted. For any remaining lesion, corticosteroid injections have been used to decrease the size and surgical modalities include the use of lasers and scalpel excision.\textsuperscript{109,110}

In summary, color changes and soft tissue lesions are relevant findings in the pediatric population. Oral health practitioners should be aware of the clinical characteristics of these findings and the need for further workup or referral in select cases.

**REFERENCES**


