

## Tutorial

### Orofacial myofunctional deficits in elderly individuals

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#### Suggested Citation

Ray, J. (2006). Orofacial myofunctional deficits in elderly individuals. *International Journal of Orofacial Myology*, 32(1), 22-31.

DOI: <https://doi.org/10.52010/ijom.2006.32.1.2>



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## **OROFACIAL MYOFUNCTIONAL DEFICITS IN ELDERLY INDIVIDUALS**

**Jayanti Ray, Ph.D.**

### **ABSTRACT**

Orofacial myofunctional deficits in elderly individuals impact nutrition, swallowing, speech, quality of life, and other aesthetic functions. This paper explores briefly the common orofacial myofunctional disorders (OMD) due to various etiologies. Ideally, the available evidence suggests that an interdisciplinary team should be able to diagnose and document effectively the OMD and provide evidence-based services to the clientele.

**Key words:** *Orofacial Myofunctional Disorders; Elderly Population; Speech; Swallowing*

### **INTRODUCTION**

Orofacial Myofunctional Disorders (OMD) refer to abnormal resting posture of the orofacial musculature, atypical chewing, swallowing patterns, dental malocclusions, blocked nasal airways, and speech problems (Hanson, 1988). OMD are patterns involving oral and/orofacial musculature that interfere with normal growth, development, or function of structures, or calls attention to itself or creates a cosmetic problem (ASHA, 1993). Tongue thrust and anterior tongue posture are two commonly noted OMDs. Variables that can encourage an anterior tongue posture include posterior airway obstruction, which may involve tonsils, enlarged adenoids, nasal blockage, high posterior tongue position with a short mandibular ramus, or a long soft palate (ASHA, 1989).

The purpose of this article is to review information on various symptoms of organic, neurological, and functional impairments in the geriatric population which are evidence based, and to identify which of those symptoms may be considered within the realm of orofacial myofunctional disorders. With increased knowledge about the relationships between OMD and vital functions, such as speech, chewing, and swallowing, interdisciplinary team members can provide information on selected characteristics that may be observed in the elderly population.

### **REVIEW**

#### **OMD in the elderly**

In the elderly population, OMD may be associated with various conditions such as aging, Parkinson's disease, stroke, dementia, and other neuromuscular conditions (Adams, 1997; deSwart, Verheij, & Beurskens, 2003; Duffy, 1995; Freed, 2000, Langmore & Lehman, 1994).

In elderly individuals, various types of OMD may be observed. For example, the elderly often experience an overall reduction in lip tone. In many elderly individuals, a predominating oral mode of breathing may accompany this reduction in lip tone. Some elderly individuals above the age of 65 experience painful orofacial symptoms.

The most common orofacial symptoms that require specialized medical services are tooth pain, facial pain, jaw joint pain, and burning mouth (Riley, Gilbert, & Heft, 1999). See Tables 1 and 2 for details.

OMD in the elderly may also lead to speech and swallowing problems. OMD may increase in the elderly as concomitant symptoms of the aging process. In rest of this article, various OMD will be discussed along with their possible etiologies.

**Table 1. Common oral pathologies leading to speech and swallowing deficits in the elderly** (Limeback, 1998; Tyldesley, 1991)

<b>Facial swellings</b>	swelling of the masseter muscle; parotid swelling; inflammatory/neoplastic swelling; swelling due to dental infections; swellings in the sinuses; swelling due to facial trauma and bleeding
<b>Oral disease</b>	hypertrophied or swollen lower lip; tuberculoid granulomas in the buccal region; lymph node obstructions
<b>Submandibular duct obstructions</b>	due to papillary stenosis/strictures of ducts; fistula post trauma/ fistula post abscess drainage or developmental cysts; carcinomas
<b>Parotid swelling</b>	obstructive, degenerative, and inflammatory changes in the parotid glands; inflamed and swollen parotid duct papillae; parotid gland tumors
<b>Bell's palsy</b>	acute unilateral paralysis of the facial muscles of unknown origin; lower motor neuron lesion; lack of taste sensation; poor mastication/swallowing
<b>Oral thrush</b>	common form of oropharyngeal candidiasis; white patches on the buccal mucosa, throat, tongue, and gum linings; commonly found in individuals wearing dentures; may be due to side effects of antibiotics and chemotherapy; also caused by diabetes, drug abuse, malnutrition, old age, AIDS, etc.
<b>Denture granuloma</b>	denture-induced changes in the oral mucosa; possible alveolar hyperplasia; oral mucosal hyperplasia
<b>Hemangioma</b>	abnormally dense collections of dilated small blood vessels on the skin or in the viscera; occur in the oral cavity, facial muscles, and facial bones; large hemangiomas impact airway, swallowing, and speech functions

**Table 1. Common oral pathologies cont.**

<b>Glossitis</b>	acute or chronic inflammation of the tongue; change in color of the tongue; swelling of the tongue; secondary to viral/bacterial infections, mechanical injury, abnormal edges of the teeth, use of dental/oral appliances, oral trauma, and chemical irritants
<b>Caries</b>	loss of tooth substance; may occur with xerostomia
<b>Torus palatinus</b>	a benign tumor on the hard palate; can take up the tongue space thus causing swallowing, speech, and breathing problems; may be accompanied by a high narrow nose, which can easily collapse and obstruct the airflow
<b>Atrophy of tongue</b>	wastage of muscles in the tongue secondary to lower motor neuron lesions (e.g., hypoglossal nerve involvement)
<b>Atrophy of alveolar bone</b>	very common problem involving wasting of alveolar processes; secondary to wearing of dentures
<b>Hypertrophy of Masseter muscles</b>	swelling on the face resembles parotid swelling; unknown cause; malocclusions
<b>Condylar hyperplasia/hypoplasia</b>	mandibular distortion
<b>Teeth attritions and abrasions</b>	attrition caused by tooth to tooth contact; abrasion caused by tooth substance loss; tooth erosion from emesis and stomach acids
<b>Extreme oral neglect</b>	deposition of calculus and plaque; periodontal disease; marked distortion of the normal gingival architecture

**Table 2. Swallowing Dysfunctions Which May be Associated With OMD In The Elderly**

- Difficulty with self-feeding
  - Difficulty with chewing
  - Difficulty with biting
  - Difficulty with bolus manipulation
  - Aspiration
  - Drooling
  - Facial dyskinesia during swallowing
  - Excessive contraction of the facial muscles
  - Difficulty with straw drinking
  - TMJ pain during mastication
  - Xerostomia
  - Weak cough reflex
  - Weak swallow reflex
  - Pocketing of food in the oral vestibule
  - Lack/loss of laryngeal/pharyngeal sensation
  - Decreased nutritional intake
  - Reduced tongue activity during deglutition
  - Difficulties in coordination of respiration and swallowing
  - Odynophagia (pain during swallowing)
  - Inadequate lip seal during drinking from cup
  - Abnormal contractions of the TMJ joint during eating/drinking
  - Difficulty swallowing saliva
  - Nasal regurgitation
- 

#### **Orofacial Myofunctional Dysfunctions**

Oral motor dysfunctions may be seen in aged individuals regardless of health status. Reduced masticatory effectiveness is common in the elderly. Difficulty in manipulating larger bite sizes can lead to swallowing impairments. Reduced chewing frequency and precision has been noted in individuals with missing teeth, or partial or complete dentures (Akeel, Nilner, & Nilner, 1992).

Reduced oral motor function may be seen in elderly people secondary to reduced muscle bulk (Newton, Yemm, Abel, & Menhinick, 1993). Walls and Steele (2004) stated that limited nutritional intake in the elderly is likely to be more related to food choice than the direct mechanical effects of impaired chewing in individuals with compromised oral function.

#### **Tongue Thrusting and OMD**

In elderly clients the stability of orthodontic corrections may not be maintained. In some patients, the development of tongue thrusting behaviors following denture placement contributes to difficulties in the retention of the dentures. Elderly clients may develop significant weak lip seal with habitual tongue thrusting. In addition, problems can also develop involving chewing and swallowing

difficulties, especially during the bolus preparation stage. Temporomandibular joint problems may also occur in conjunction with tongue thrust.

#### **Myofascial Pain and OMD**

Myofascial pain is a persistent feeling of pain, which may occur intraorally and over the face. The pain typically originates from the temporomandibular joint region. The symptoms include pain in the temporomandibular joint (TMJ); feeling of fatigue in the TMJ area; cracking of TMJ during speaking, swallowing, and chewing; lack of mobility of TMJ; reduced range of motion of TMJ; a persistent headache; feeling of dizziness, hearing loss; tinnitus; burning sensation in the oral cavity; xerostomia, bruxism (clenching or grinding teeth while asleep or awake); tenderness of TMJ; tenderness of the muscles of back and neck.

Myofascial pain may be related to bruxism, daytime teeth clenching habits, pipe smoking with clenched teeth, abnormal swallowing patterns, dental malocclusions, emotional stress, and habits. Orofacial pain due to trigeminal neuralgia and glossopharyngeal neuralgia are also commonly found in adults (Horowitz, Horowitz, Ochs, Carrau, & Kassam, 2004).

### **Speech Problems and OMD**

Tongue thrusting and speech problems may co-occur. Due to unconventional postures of the tongue and other speech articulators, interdental and frontal lisping are common. The alveolar sounds /s/ and /z/ are produced more anteriorly thus leading to interdental fricative like sounds, /θ/ and /ð/. Frontal lisping is also seen for affricative sounds like /tʃ/ in “church” and /dʒ/ in “joy”. Certain alveolar sounds like /t/, /d/, /s/, and /l/ may also be affected. The /r/, which is known as the most challenging phoneme in English may also be distorted.

Bigenzahn, Fischman, and Mayrhofer-Krammel in 1992 studied articulation disorders secondary to OMD. They found that tongue thrusting, swallowing variations, mouth breathing, abnormal mandibular development, and malocclusion could affect articulation. The authors also found that orofacial myofunctional therapy had a significantly positive impact on dental occlusion, 66% of the patients attained normal articulation following orofacial myofunctional therapy.

A confounding factor for the above complications is the possible dysfunction of the salivary glands which may cause discomfort in clients. Saliva is an essential component for everyday functions. Saliva enhances taste, speech, and swallowing; facilitates irrigation and lubrication; and protects the mucous membranes of the upper digestive tract. The dental complications of radiation-induced xerostomia often lead to teeth extractions. When patients choose to use prosthetic and other dental appliances, persistent xerostomia hinders the progress.

### **Down Syndrome in Adults and OMD**

During childhood, children with Down syndrome evidence problems in breathing, suckling, swallowing, and chewing. In adults with Down syndrome, many of these problems are alleviated due to use of various management strategies. Often, difficulties in coordination of respiration and swallowing are demonstrated. These difficulties may lead to aspiration of liquids and swallowing of air, followed by coughing or belching respectively. Orofacial dysmorphology also

decreases the stability of mandible and thus the rotary lingual pattern of mastication may be affected. Due to this orofacial dysmorphology, clients may adopt an abnormally anterior mandibular position. They also tend to position the tongue between the dental arches. Due to lack of occlusal stability, biting and chewing functions are also affected (Allison, Peyron, Faye, & Hennequin, 2004). These functions continue to be affected even in older clients with Down syndrome. Hence persistence of immature oral behaviors, hypotonocity, and dysmorphology mark the adult/older population with Down syndrome.

Adults with Down syndrome may also show dental impairments. The facial mid-third is underdeveloped, leading to maxillary endognathism and partial dental agenesis (Borea, Magi, Mingarelli, & Zamboni, 1990). These orofacial manifestations may compromise general health conditions and create problems regarding ability to manipulate food and/or mastication (Hennequin, Fauks, Veyrone, & Bourdiol, 1999).

### **Bruxism and OMD**

Bruxism is defined as the habitual, nonfunctional, forceful contact between occlusal tooth surfaces. It can occur while awake or asleep. This condition is often related to emotional stress, parasomnias, traumatic brain injury, neurologic disabilities, and morphologic factors (e.g. malocclusion). Complications of bruxism include dental attrition, headaches, temporomandibular joint dysfunction, and soreness of the masticatory muscles. The aging process can serve to exacerbate such symptoms and behaviors.

### **Sleep apnea and OMD**

OMD and sleep apnea are often closely related. Apnea may give rise to OMD and existing OMD may lead to apnea. Abnormal activities of genioglossus muscle and pharyngeal dilator muscles have been noted in sleep disorders (Kuna & Smickley, 1997). Factors that can contribute to sleep apnea include a small retruded mandible, elongated uvula, hypotonic soft palate, and obstruction of the posterior nasal choanae by hypertrophied inferior turbinates. The measures for understanding the nature of

sleep apnea include palatal height, maxillary intermolar distance, mandibular intermolar distance, overjet, neck circumference, size of the base of the tongue, and body mass index. Anyone with the aforementioned features could be at risk for sleep apnea. The elderly are especially at risk for sleep apnea with any morphologic changes that diminish posterior airway dimensions.

### **Aging of the face**

With age, orofacial posture also changes. Due to decreased tone, the lower face and lips may be droopy. Reduced alveolar bone support in edentulous persons may also lead to orofacial posture changes. This droopiness may lead to swallowing problems as well as sialorrhoea. It is difficult for some elderly persons to maintain lip competency for bolus manipulation, mastication, swallowing, and speech. The masticatory muscles also show some amount of atrophy and loss of X-ray density (McComas, 1998). Other neurological disorders (e.g., paralysis) may cause significant reduction in muscle tone of the lips. There are many significant challenges in the elderly in achieving adequate dietary intake. In general, a variety of oral functions in older individuals can be significantly compromised due to loss of natural teeth (Catovic, Jerolimov, & Catic, 2000), and the quality and quantity of saliva, and other factors.

### **Psychiatric Disorders and OMD**

Elderly patients with psychiatric disorders often demonstrate bizarre behaviors like lip licking, lip pulling, and lip biting. These habits have an effect on the dentition (Council on Clinical Affairs, 2004). Some of the severe lip and tongue biting habits may also be associated with profound neurological disability due to severe brain damage (Millwood & Fiske, 2001).

Oral habits can also be related to dentoalveolar and skeletal deformations. Changes in the dentoalveolar structures may result in anterior or posterior open bite, and cross bites, requiring appropriate dental treatment, often with appliance therapy. In addition, many patients will require appropriate patient counseling, behavior modification techniques, and/or myofunctional therapy.

### **Craniomandibular disorders**

The signs and symptoms of OMD in clients with craniomandibular disorders (CMD) are variable. These include hyperactivity of masticatory and perioral muscles that cause pain and muscle dysfunctions. A forward head posture is also known to trigger facial pain. With a lack of stable mandibular positions, clients may not be able to demonstrate adequate mastication of food. Bruxism can also cause CMD, and due to lack of knowledge of signs and symptoms of OMD, clients may demonstrate a considerable level of anxiety. Many elderly patients with temporomandibular joint disorders are seen to swallow with a teeth-apart posture.

In 2004, Gesch, Bernhardt, Alte, Kocher, John, and Hensel examined associations between malocclusions and temporomandibular dysfunctions (TMD) in adults. They investigated signs of TMD including TMJ tenderness on palpation/compression (lateral palpation and dorsocranial compression). Masticatory muscle tenderness of the masseter, temporal, medial pterygoid, and lateral pterygoid were observed, along with clicking sounds of the TMJ. In some adults mandibular motility is compromised, which leads to limited maximum mouth opening; limited lateral movement of the mandible; and pain on maximum mouth opening. Deviation of the mandible (+/- 2 mm) on opening and closing was another symptom. Pain in the facial muscles was also observed. According to Gesch et al. (2004) independent variables related to malocclusion included the following:

- crowding of upper incisors
- labial/lingual position of one canine
- labial/lingual position of two canines
- labial/lingual position of three canines
- labial/lingual position of all canines
- posterior crowding
- spacing
- overjet
- retroclined maxillary incisors
- edge-to-edge bite
- anterior crossbite
- negative overjet
- distocclusion
- mesiocclusion
- mixed occlusion

Results of the multivariate regression analysis showed that the signs or symptoms of TMD were significantly associated with unilateral open bite, less than or equal to 3 mm. Associations were also found with negative overjet and unilateral scissors-bite. In both genders normal occlusal relationships were not significantly correlated with signs and symptoms of OMD.

### Drugs and OMD

Profound age related changes are found in the salivary glands (Baum, Ship, & Wu, 1992; Bergdahl, 2000). There are also a plethora of drugs that may influence salivary secretion and tissue hydration (Smith & Burtner, 1994; Sreebny and Swartz, 1997). Clients with altered tissue hydration and lack of salivation undergo dry mouth conditions (Chambers, Garden, Kies, & Martin, 2004, Narhi, 1994), and as a result chewing, swallowing, taste, speech, tolerance of dentures, and overall general oral health may be affected (Narhi et al., 1992). Many causes of orofacial dysfunctions may be related to drugs (anticholinergic or diuretic drugs). Radiation therapy may also lead to impaired salivary gland dysfunctions (Kuten, Ben-Aryeh, & Berdicevsky, 1986). Phenothiazines are known to cause tardive dyskinesia, which is characterized by involuntary, stereotyped, and repetitive lip, tongue, and jaw movements.

### **Table 3. Assessment of OMD in the Elderly** (ASHA, 1989; ASHA, 1991; ASHA, 1993 World Health Organization, 2001)

- case history; medical history; educational history; vocational background
- auditory, visual, motor, and cognitive status
- structural /physiological status
- cultural and linguistic backgrounds of the clients
- structural assessment of orofacial structures, including face, jaw, lips, tongue, teeth, hard palate, soft palate, and pharynx
- oral and nasal airways
- articulation disorders secondary to OMD
- swallowing disorders (endoscopic or videofluoroscopic methods)

### CONCLUSIONS

In conclusion, this review indicates that there are a variety of OMD, which may affect the elderly. An interdisciplinary team approach is recommended for evaluation (see Table 3) and treatment of OMD. An orthodontist, dentist, family physician, otolaryngologist, neurologist, oral maxillofacial surgeon, prosthodontist, speech-language pathologist, orofacial myofunctional therapist, dental hygienist, and allergist may variably contribute on an interdisciplinary team to achieve treatment outcomes for patients with OMD (ASHA, 1991; Korbmacher & Kahl-Neike, 2001).

Treatment goals for the elderly with OMD should be tailored to individual needs and should be geared toward retaining labial and lingual resting and functional patterns (including speech) (ASHA, 1989). According to Riley et al. 1989, painful orofacial symptoms like tooth pain, jaw joint pain, and burning mouth often lead to seeking medical services.

An interdisciplinary assessment is important in diagnosing OMD in the elderly. Evaluation of the structure and function of the orofacial complex is considered the first step in treatment planning and follow-up. The team members not only emphasize the lingual and labial resting postures, but also train the muscles for handling swallowing of foods, liquids, and saliva effectively. Sometimes speech/swallowing therapy needs to be initiated to change the pattern of production of speech sounds and to facilitate safe and effective ingestion respectively. Behavioral modification principles and maintenance therapies are of utmost importance along with motivational considerations.

Collaboration and coordination with medical professionals is desirable to achieve effective identification of OMD and for planning treatments. Follow up services are essential for checking the status of the client.

Additional quantitative and qualitative research is required to collect data from elderly clients who have undergone successful interdisciplinary rehabilitation. Unfortunately, to date, many evidence based



standardized measures of OMD are lacking. Further research must be conducted to fill this void in order to provide the elderly with the highest level of care based on evidence derived from clinical trials.

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