

# The Oral Effects of Smokeless Tobacco

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## A b s t r a c t

*Smokeless tobacco use has increased rapidly in North America. This form of tobacco use has many oral effects including leukoplakia, oral cancer, loss of periodontal support (recession), and staining of teeth and composite restorations. Systemic effects such as nicotine dependence, transient hypertension and cardiovascular disease may also result from smokeless tobacco use. This paper aims to guide dental practitioners in identifying oral lesions that occur due to the use of smokeless tobacco and also offer guidelines on how to counsel patients who express a desire to stop using smokeless tobacco products.*

**MeSH Key Words:** leukoplakia, oral; mouth neoplasms; tobacco, smokeless

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The extent of smokeless tobacco use in Canada has been reported in several studies. A study based on the results of the 1986 Canadian Labour Force Survey reported that smokeless tobacco use was mainly confined to the male population.<sup>1</sup> It further reported that 0.7% of males aged 15 and over used chewing tobacco, and 0.4% used snuff. In 1986, the Canadian Labour Force Survey found that most snuff use was in Western Canada, whereas tobacco chewing was not prevalent in Western and Atlantic Canada.<sup>2</sup> A New Brunswick survey found that 5.4% of children in grades 7 to 12 were regular users (more than once a day) of smokeless tobacco.<sup>3</sup> Hoover and others<sup>4</sup> reported on a survey of 1,170 Canadian Native children in northern Saskatchewan. Thirty per cent of these children used smokeless tobacco, and half of them had started before the age of 12.<sup>4</sup> A longitudinal study<sup>5</sup> in Calgary found that the use of smokeless tobacco by students in the 6th, 7th and 8th grades increased from 1.1% in 1988 to 4.2% in 1990.<sup>5</sup>

The deleterious effects of smokeless tobacco use are perhaps not as well known as those produced by smoking.<sup>6</sup> Smokeless tobacco use has been recognized as a cause of cancer.<sup>7</sup> Other oral effects of smokeless tobacco include leukoplakia, periodontal disease, delayed wound healing and dental caries.<sup>8-12</sup> Dental professionals are ideally placed for early detection of oral lesions associated with smokeless tobacco use, not only because the primary focus of the dental examination is intra-oral but also because patients are seen on a regular basis. This paper reviews the forms of smokeless tobacco and the mucosal, periodontal and dental changes that may occur as a result of its

use. The relationship between oral lesions and oral cancer is examined, and recommendations to the dental profession on the management of smokeless tobacco users are provided.

### Smokeless Tobacco Products

Smokeless tobacco exists in two major forms: snuff and chewing tobacco.

Snuff may be moist or dry. Moist snuff is usually taken orally. This product is sold in small round cans, in which the snuff is loosely packed, or in small, tea-bag-like sachets. Dry snuff, which is less commonly used, is usually inhaled through the nose.

Chewing tobacco is coarser than snuff and exists in three forms: looseleaf (sold in a soft package or pouch), plug (sold in a small block) and twist (dried tobacco leaves that are twisted into strands). Chewing tobacco is usually placed in the buccal vestibule. It is referred to as a "chaw" or "quid" of chewing tobacco. The quid may be retained in the mouth for hours, and the user expectorates the saliva that mixes with the tobacco extract.

The chemical carcinogens in smokeless tobacco include polynuclear aromatic hydrocarbons (usually benzo[a]pyrene), polonium 210, and N-nitrosamines. Other chemicals include radium-226 and lead-210.<sup>2</sup> Studies in experimental animals showed that benzo[a]pyrene and one of its metabolites induced oral and perioral skin cancer.<sup>13</sup> There is an association between the tobacco-specific N-nitrosamines in smokeless tobacco and cancers of the upper digestive tract (esophagus and stomach) and mouth.<sup>14-16</sup>

## Effects of Smokeless Tobacco

### *Oral Mucosa*

The oral effects of smokeless tobacco are typically seen on the mucosal surfaces where the product is placed, as well as on the adjacent periodontium. Clinically, the lesion is usually clearly demarcated from the normal tissues. The affected site or lesion can be a white or yellow-brown colour and it may develop a thickened and wrinkled appearance with increased use of the tobacco product.<sup>17</sup> The best clinical diagnosis that should be assigned to these white lesions is tobacco-associated leukoplakia. By definition, leukoplakia is a white patch or plaque that cannot be characterized clinically or pathologically as any other disease.<sup>18</sup> The relationship between leukoplakia and malignant transformation is discussed below.

Histologically, the changes range from hyperparakeratosis to epithelial dysplasia.<sup>13</sup> Studies have found a correlation between low vitamin C intake and the presence of an oral lesion.<sup>13</sup> The prevalence and severity of lesions demonstrate a dose-response relationship, which is best predicted by the amount, frequency and duration of smokeless tobacco use.<sup>9</sup>

### *Relationship Between Oral Lesions and Oral Cancer*

Leukoplakia is a premalignant lesion.<sup>19</sup> Based on numerous studies, the consensus is that smokeless tobacco use can cause oral cancer.<sup>14-16,20-22</sup> What is of importance to the dental practitioner is whether and when a tobacco-associated leukoplakia will transform into a malignancy. A review of the literature reveals two different opinions. In one view, the development of a carcinoma from smokeless tobacco use is definite but slow — typically, 20 to 50 years of use is required to cause the malignant changes in the oral lesions.<sup>23</sup> In the other view, the relationship between leukoplakia in smokeless tobacco users and oral cancer is not clear.<sup>24</sup> Numerous studies have examined the transformation rates of oral leukoplakias — that is, the time that elapses before a leukoplakic lesion shows malignant change. Pindborg and others<sup>25</sup> followed 248 patients for a mean observation period of 3.7 years; during this time, the period prevalence of malignant transformation in leukoplakia was 4.4%. Silverman and others<sup>26</sup> examined 257 patients over an average period of 7.2 years and found squamous cell carcinomas in 17.5% of patients. Banocz and Csiba<sup>27</sup> reported a 6% malignant transformation in 670 patients who were observed over a period ranging from 1 to 30 years. In addition, a study by Roed-Petersen and others<sup>19</sup> found that the transformation rate for malignancy or epithelial dysplasia of oral leukoplakia was greater than 6%.

When cancer is found in association with smokeless tobacco use, the two most common forms of cancer are verrucous carcinoma and squamous cell carcinoma.<sup>28</sup> It has been observed that the oral cancers due to smokeless tobacco use may occur in sites that are different from the cancers caused by other factors. Users of smokeless tobacco exhibit oral cancer where the quid is held, that is, the buccal or alveolar surfaces. Oral cancer that has developed due to other causes is more commonly found on the tongue, the tonsil or retromolar area and the floor of the

mouth; infrequently, it is found on the alveolar surface or buccal mucosa. Despite the location, the clinical course of the cancer is similar. This course includes local tissue destruction in verrucous carcinoma and a high metastatic rate in squamous cell carcinoma.<sup>20</sup>

Studies have shown that the presence of dysplastic changes cannot be predicted by the habit or by the clinical grading of the lesion.<sup>28,29</sup> The most definitive method of determining if a lesion has progressed to cancer is to biopsy the most suspicious site.

A study conducted by Wray and McGuirt<sup>20</sup> reviewed the records of 128 patients, of whom 78% had used smokeless tobacco for 40 or more years. Of these patients, the three-year survival rate was 47%, and the five-year survival rate was 37%. Clinically, 40% of the patients had leukoplakia, erythroplakia or both at the time of presentation. This study concluded that there is a link between oral cancer and smokeless tobacco use and that, because of the cancer risk, it is important to implement early intervention to help people quit the habit.

### *Other Oral Effects*

In addition to the risk of oral cancer, a relationship exists between various forms of periodontal disease and smokeless tobacco use. Individual cases of ANUG, gingivitis and periodontitis have been reported,<sup>30</sup> but a clear relationship does not exist between a generalized periodontal condition and smokeless tobacco use.<sup>8,31</sup> Gingival recession and attachment loss have been shown to occur in the area adjacent to where the smokeless tobacco is held,<sup>31-34</sup> but some authors believe that gingival recession occurs only in smokeless tobacco users who exhibit co-existing gingivitis.<sup>30</sup> The prevalence of dental caries, gingivitis and plaque were not shown to be different in smokeless tobacco users and non-users.<sup>30,32,34</sup>

Other oral effects include staining of composite restorations and teeth, halitosis, and reduction of taste and smell acuity.<sup>35</sup> One author has reported abrasion of the incisal and occlusal surfaces of teeth as an effect produced by smokeless tobacco use.<sup>33</sup>

Smokeless tobacco has also been studied for its effects in preventing aphthous stomatitis; it was concluded that the systemically absorbed nicotine was the product that was probably responsible for the reduction of aphthous ulcers.<sup>36</sup>

### *Systemic Effects*

The systemic effects of smokeless tobacco use may not be of direct concern to dentists. Nonetheless, knowledge of these effects may assist in patient counselling. Systemic effects include nicotine dependence or addiction, transient increases in blood pressure and cardiovascular disease.<sup>9,34,37,38</sup> Withdrawal symptoms such as drowsiness, nervousness, headache, irritability, and cravings have been reported.<sup>37</sup> Smokeless tobacco may contain high levels of sodium, which may contribute to elevated blood pressure. The nicotine can also contribute to transient increases in blood pressure and heart rate.<sup>2</sup> These systemic effects are of increasing concern with continuous years of smokeless tobacco use.

## Role of the Practitioner

When dental personnel are actively involved in counselling patients on the harmful effects of smokeless tobacco, a greater proportion of patients stop using these products.<sup>27,39-42</sup> Therefore, both dentists and dental hygienists should make the proactive effort to identify oral lesions and conduct subsequent counselling. Dental health personnel should ask specific health questions about smokeless tobacco use and, where possible, teach patients the signs of breakdown of the hard and soft tissues and the initial stages of an oral lesion.<sup>33</sup> If a patient has been using smokeless tobacco frequently and for an extended period of time, a biopsy of the mucosal lesion should be performed to eliminate the possibility of dysplasia or carcinoma. If the dentist is unable to obtain a biopsy with adequate margins or is limited by the anatomical structures, then the patient should be referred to a specialist in oral medicine/pathology, oral and maxillofacial surgery or periodontology for diagnosis and treatment.<sup>28</sup>

When benign lesions occur, changing the location of the smokeless tobacco placement may also be recommended if the patient will not discontinue use.<sup>8</sup> Nicotine gum or transdermal nicotine patches should be considered as a substitute for patients who are addicted to the tobacco and its extracts. The use of nicotine gum has been shown to facilitate tobacco use cessation.<sup>43,44</sup> Finally, dentists and hygienists should provide the patient with accurate information on the negative factors of smokeless tobacco. Fortunately, research has shown that, if lesions are identified early, the involved mucosa can revert back to normal upon cessation of smokeless tobacco use.<sup>45</sup>

The Tobacco and Cancer Program of the National Cancer Institute (NCI) recommends that oral health professionals follow these guidelines<sup>46</sup> (the four As):

- Ask questions about tobacco use.
- Advise patients to stop using tobacco.
- Assist them in stopping.
- Arrange appropriate follow-up.

The NCI suggests using simple, brief, effective messages for education, prevention and cessation services, to reinforce the non-user and to prevent a return to use for those who have stopped.

Because many patients are on a regular recall schedule, dentists are in a position to effectively perform oral examinations and counsel their patients on a regular basis. The target population should be the younger generation (as young as patients in grade 4).<sup>1,4,5,8,47</sup> If the health risks and periodontal risks are explained to patients, the result may be many long-term benefits and a prevention of future oral carcinomas.<sup>20</sup> ♦

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