CASE REPORT

Oral cancer after using Swedish snus (smokeless tobacco) for 70 years – a case report

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Whereas the smoking habit has declined significantly in Sweden in recent decades, there has been a marked increase in the consumption of 'snus' (oral moist snuff). The use of this smokeless tobacco, exposing the user locally to carcinogenic nitrosamines, raises the question – will the increasing use of snuff eventually lead to a greater incidence of oral cancer? We report the case of a 90-yearold man who developed a localized squamous cell carcinoma in the gingival fold under the upper lip, at the exact place where he had regularly placed loose oral snuff for 70 years. Although this is a reminder of a prevailing cancer risk, the time frame indicates that the risk is slight. This is consistent with recent epidemiological reports regarding the minor risk of snuff-associated cancer in the Scandinavian countries.

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Introduction

The prevalence of moist snuff consumption in Sweden is high. Approximately 900 000 of a population of 8.9 million are daily users of snuff and the number of 'snuff dippers' has been increasing steadily since the 1970s (Bolinder, 1997). The high prevalence is due primarily to the growing popularity of this habit among young and middle-aged men. More recently, the trend has been boosted by the marketing of snuff as a harmless alternative to smoking cigarettes. From epidemiological studies it is clear that the risk of cancer to snuff dippers is nothing like as great as that in cigarette smokers (Lewin *et al*, 1998; Schildt *et al*, 1998). It is important, however, not to ignore the possible risk of cancer thereby hampering the prospect of early detection.

A pinch of moist Swedish snuff (approx. 20 g) is usually placed in the gingival fold under the upper lip – and frequently replaced. Total daily snuff exposure can vary from less than an hour to 20 h (Hirsch, Heyden and Thilander, 1982). All habitual 'snuff dippers' develop a characteristic lesion at the site of application, having a wrinkled swollen texture (Figure 1). The extent of the lesion depends on how much snuff is used and for how long (Hirsch *et al*, 1982; Frithiof *et al*, 1983; Andersson, Axell and Larsson, 1991; Ghosh *et al*, 1996).

In the mucosa, snuff exposure causes parakeratinization, with vacuolated cells in the superficial cell layers, and in the deeper parts of the epithelium a sublethal chemical cell injury. In the basal cell layers, varying degrees of dysplasia may occur. Stromal inflammation follows, with sialoadenitis and other degenerative changes of the minor salivary glands and ducts (Roed-Petersen and Pindborg, 1973; Axell, Momstad and Sundstrom, 1976; Christen, Armstrong and McDaniel, 1979; Pindborg *et al*, 1980; Hirsch *et al*, 1982; Frithiof *et al*, 1983; Hirsch and Johansson, 1983; Andersson, Axell and Larsson, 1989). Apart from epithelial thickening, the degree of morphological change is not invariably correlated with the lesion's clinical appearance (Axell *et al*, 1976; Frithiof *et al*, 1983).

There is a continuing public discussion regarding the possible carcinogenic risk associated with the use of oral snuff. In previous reports it was established that snuff dipping is common among patients diagnosed as having oral cancer (Ahlbom, 1937; Winn *et al*, 1981; Sundstrom, Momstad and Axell, 1982; Larsson, Axell and Andersson, 1991; Wray and McGuirt, 1993; Rodu and Cole, 2002). Yet, two recent Swedish investigations conclude that the risk of oral cancer among snuff users is remarkably low (Lewin *et al*, 1998; Schildt *et al*, 1998).

The present paper illustrates the existing cancer risk associated with the use of snuff. It describes a case of oral cancer in a patient who had used smokeless tobacco for more than 70 years. We wish to draw attention to

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Figure 1 A typical snuff lesion in the mucosa of the upper lip

the fact that the risk of oral cancer in snuff users is likely to increase with exposure time (Ghosh *et al*, 1996). Judging from the time frame of our case the risk is low. However, as snuff dipping is becoming more popular in the Scandinavian countries it can be anticipated that an increasing number of patients will be at risk of developing such lesions in the future.

Case report

A 90-year-old male remarkably fit for his age and free from any other disease, presented with a mucosal lesion in the gingival fold of the upper lip (Figure 2). The patient had used removable dentures for many years after losing his teeth when young. He had been a habitual snuff-dipper for 70 years, with an approximate daily consumption of 15–20 g. Alcohol consumption had always been very modest. He had no history of smoking apart from a short period in his early twenties when he smoked cigarettes for a few years.

Two years before admittance he started to note a distinct soreness under his upper lip. The sore spot coincided with the precise location where he regularly placed the pinch of snuff. As the soreness gradually worsened, he started to place the snuff on the contra-



Figure 2 Squamous cell carcinoma in the mucosa under the upper lip at the site of the placing of the snuff

Oral cancer and smokeless tobacco UK Zatterstrom *et al*



Figure 3 Histological section of the well differentiated squamous cell carcinoma in the mucosa under the upper lip

lateral side of the frenulum. He also changed from 'loose weight' to 'portion-bagged' snuff which caused less local irritation. But as the soreness at the initial site persisted, he consulted his general dental practitioner.

On clinical examination, a 6 cm^2 exophytic and ulcerated lesion was noted 1 cm to the left of the medial maxillary frenulum (Figure 2). A rim of typical whitish mucosa, frequently seen in snuff users, surrounded the lesion. No enlarged lymph nodes were found.

On computerized tomography (CT) scans the superficial lesion caused no detectable enhancement of contrast in the tumor area. Moreover, the alveolar process of the maxilla underlying the lesion showed no evidence of bone destruction. Nor was there any sign of regional metastases on the CT scan. Chest X-ray was normal.

A diagnostic biopsy revealed a well differentiated infiltrating squamous cell carcinoma (Figure 3). Possible association with Human Papilloma Virus (HPV) was considered but the biopsy was negative for HPV using *in situ* hybridization, although positive with the Polymerase Chain Reaction (PCR).

The patient was treated with radical laser excision of the lesion, leaving an approximately 1-cm macroscopic margin. The periosteum was removed but the bone of the alveolar process was left intact. The defect was covered with a 2×5 cm mucosal graft, attached with fibrin glue (Tisseel®, DuoQuick, Baxter, Deerfield, IL,

51

USA). Histology confirmed that the excision was complete.

Postoperatively the upper lip was swollen and painful for about 10 days, after which the patient returned home. The case has since been reviewed continuously for 21 months and there has been no evidence of local or regional recurrence of disease.

Discussion

The use of oral snuff has a long tradition in the Nordic countries. This is a moist form of snuff that consists of fermented tobacco with added salt and blending ingredients. The pinch of snuff is placed in the gingival fold under the upper lip, close to the midline frenulum, where it is kept in place for varying period of time.

In recent years the snuff habit has become increasingly popular, owing both to extensive marketing and to increasing awareness of the detrimental effects of cigarette smoking. In Sweden (population 8.9 million) the proportion of smokers has decreased and is now less than 20%. Sales of cigarettes have decreased by a third during the past decade, while sales of oral snuff increased by 45% (http://www.tobaksfakta.org). The increase in snuff consumption is due primarily to the growing popularity of this habit among young and middle-aged men.

It can be speculated that the common use of smokeless tobacco among athletes in our countries has given snuff dipping an image of a 'healthy' tobacco habit. Snuff is considered a safe alternative to smoking and is socially widely accepted. Its popularity was farther promoted by the introduction of the portion-bag pack, which makes the habit more discreet and easier to handle, than the earlier form of loose weight tobacco.

Previous studies have shown that snuff causes typical lesions in the oral mucosa (Axell *et al*, 1976; Christen *et al*, 1979; Pindborg *et al*, 1980; Hirsch *et al*, 1982; Frithiof *et al*, 1983; Hirsch and Johansson, 1983; Andersson *et al*, 1989; Wray and McGuirt, 1993). To what extent these lesions pose a risk of becoming carcinomas is a subject still under debate (Rodu and Cole, 2002). In general the development of snuff induced lesions (Figure 1) is reversible if the snuff habit is discontinued (Larsson *et al*, 1991).

Snuff contains the same carcinogens as all tobacco, i.e., N'-Nitrosonornicotine (NNN), N'-nitrosoanatabine (NNT), 4-(metylnitrosoamino)-l-(3-pyridyl)-l-butamine (NNK) and N'-nitrosoanabasine (NAB).

The risk of oral cancer from smokeless tobacco varies in different parts of the world. One possible explanation for this is the qualitative differences in the production of smokeless tobacco and differing contents of carcinogenic tobacco-specific N-nitrosamines (Hoffmann *et al*, 1975; Altuwairgi, Papageorge and Doku, 1995).

In conclusion, from the aspect of cancer prevention it would seem clear that snuff carries a lower cancer risk than smoking. In our opinion, however, the risk level for snuff remains to be conclusively determined. Whether snuff dipping alone can lead to malignant transformation or simply pave the way for other carcinogenic factors remains to be elucidated.

In our case there seems to be little doubt that the cancer was associated with the patient's snuff-taking. The typical site of the lesion was exactly where he had allegedly placed the snuff since he was 20-years-old.

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52

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