ORIGINAL ARTICLE

Oral cancer: experiences and diagnostic abilities elicited by dentists in North-western Spain

J Seoane¹, S Warnakulasuriya², P Varela-Centelles³, G Esparza⁴, PD Dios⁵

¹Stomatology Department, School of Medicine and Dentistry, University of Santiago de Compostela, Santiago de Compostela, A Coruña, Spain; ²Department of Oral Medicine and Pathology, WHO Collaborating Centre for Oral Cancer and PreCancer, Guy's, King's & St Thomas' Dental Institute, Denmark Hill Campus, London, UK; ³Galician Health Service, Primary Care Clinics, Burela, Lugo; ⁴Department of Oral Medicine, School of Dentistry, Complutense University, Madrid; ⁵School of Medicine and Dentistry, University of Santiago de Compostela, Santiago de Compostela, A Coruña, Spain

BACKGROUND: Opinions, knowledge, behaviours and attitudes of general dental practitioners on oral cancer prevention and detection have been reported from many countries. However, experiences and skills of oral cancer detection have not been evaluated systematically.

OBJECTIVE: To obtain information on behaviours of screening and ability to correctly detect oral cancer and precancer among general dentists (GDP) in North-western Spain.

SUBJECTS AND METHODS: Thirty-two randomly selected GDPs completed questionnaires and then classified 50 projected images of clinical lesions, into cancer, precancer or benign lesions.

RESULTS: 87.5% reported conducting routine oral examinations, 84.4% provided routine advice to their subjects for risk modifications and 84.4% claimed to biopsy a suspected oral mucosal lesion that they detected in practice. In a quasi research setting using clinical slides, the sensitivity of visual diagnosis of a cancerous lesion was 61.4% and precancer 59.5%. The diagnostic accuracy reported here is lower than what is already reported by evaluation of published screening programmes by dentists.

CONCLUSIONS: Our data from Spain suggest a need for improving the diagnostic ability of GDPs in the visual detection of oral cancer/precancer by strengthening continuing professional education.

Oral Diseases (2006) 12, 487–492

Keywords: oral cancer; precancer; mucosal lesions; screening; calibration; sensitivity; specificity

Introduction

An increasing trend in oral cancer mortality has been observed in several countries of Western, Central and Eastern Europe (Hill *et al*, 1991; Macfarlane *et al*, 1994; Parkin *et al*, 1997; Moore *et al*, 2000). In Spain, death registers are available since the beginning of the Twentieth Century and show a substantial annual increase in oral cancer mortality for males (25% increase from 1975 to 1994) and a less marked increment for females (9% increase in the same period) (Nieto and Ruiz-Ramos, 2002; López-Abente *et al*, 1996; Izarzugaza *et al*, 2001). These figures make oral cancer in Spain a major public health issue.

Early diagnosis is a foremost step for reducing cancer mortality (Boyle *et al*, 2003), as identification of smaller lesions allows less aggressive and debilitating treatments. Unfortunately, diagnosis is often made in advanced stages (III or IV) of the disease and, thus the prognosis is poor and the morbidity and mortality high (Sankaranarayanan *et al*, 1990; Rubright *et al*, 1996; De Faria *et al*, 2003).

Despite the need for randomized controlled trials (RCTs) (Rodrigues et al, 1998; Kujan et al, 2003), casefinding studies suggest that oral screening results in improved survival and reduced morbidity (Smart, 1993). A recent RCT has shown a significant reduction in mortality following visual screening with a mortality ratio of 0.57 (95% CI 0.35-0.93) in male tobacco and alcohol users (Sankaranayanan, for the Trivandrum Oral Cancer Screening Study Group, 2005). However, screening programmes for oral cancer in the general population have a limited value because of the low compliance of the subject screened to attend screening or follow-up (Ikeda et al, 1995; Warnakulasuriya et al, 1998; Downer et al, 2004) and to the low prevalence of the disease in many European countries resulting in reduced detection rate of the disease. These shortcomings can be overcome by opportunistical screening during routine dental or medical check-ups (Smart,

Correspondence: Juan Seoane, Cantón Grande no. 5, apto. 1° E, E-15003 A Coruña, Spain. Tel: +34981223033, Fax: 0034 981562226, E-mail: jseoanel@usc.es

Received 21 September 2005; revised 3 November 2005; accepted 22 November 2005

1993; Jullien *et al*, 1995a; Warnakulasuriya and Johnson, 1996; Lim *et al*, 2003) or by industrial screening (Field *et al*, 1995; Nagao *et al*, 2002; Nagao and Warnakulasuriya, 2003). Dental professionals have an important role in both, primary prevention of oral cancer by inducing healthy life styles and secondary prevention by detecting oral cancer or its precursor lesions at early stages (Seoane *et al*, 1997a; Parkin *et al*, 1999; Gansky *et al*, 2002; Sanchez *et al*, 2003).

Information on Spanish dental students indicates their opinions, experience and knowledge on oral cancer is scarce (Jaber *et al*, 1997; Seoane *et al*, 1997b). Furthermore there are reports on the inconsistencies among dental practitioners' level of knowledge of oral cancer in North-western Spain (Seoane *et al*, 1999).

The aim of this study was to evaluate the experience, skills and the level of accuracy of the GDPs working for the National Health Service in North-western Spain as examiners for opportunistic screening of oral precancer and malignant lesions. This information serves as a baseline to ascertain educational needs among GDPs in this area.

Subjects and methods

To evaluate the clinical competence of GDPs as oral cancer examiners, a descriptive, cross-sectional study was designed that combined the study of attitudes and diagnostic accuracy. This was a mixed questionnaire (attitudes-clinical cases) that consisted of 12 items eliciting experience with, knowledge of, and opinions about oral cancer (Seoane et al, 1999; available on request from the author) and visual verification of 50 clinical cases including seven typical and early oral cancers (SCCs) and 12 oral precancers together with 31 benign lesions selected (Table 1) according to its prevalence among Spanish general population (leukoplakia 1.6%; oral lichen planus 3.2%; frictional lesions 7.5%; traumatic ulcer 7.1%, denture induced hyperplasia 5.2%; plicated tongue 3.9%; angular cheilitis 2.9%; fibrous hyperplasia 2.6%; recurrent aphtae 1.9%) (Garcia-Pola et al, 2002). The clinical cases were

Table 1 Categories of clinical cases (n = 50) included in the test package

Groups of pathologies	Clinical cases	Number (n)	(%)
I. Oral cancer	Squamous cell carcinoma	7	14
II. Oral precancers	Oral leukoplakia	2	4
, t	Oral erytroplakia	1	2
	Actinic cheilitis/keratosis	4	8
	Oral lichen planus	3	6
	Plumer-Vinson syndrome	1	2
	Epidermolysis bullosa	1	2
III. Benign lesions	Frictional lesion	7	14
	Traumatic ulcer	7	14
	Denture-induced hyperplasia	6	12
	Plicated tongue	3	6
	Angular cheilitis	3	6
	Fibrous hyperplasia	3	6
	Recurrent aphthous ulcer	2	4

pathologically verified and the information provided consisted of an image, and clinical notes of each case. This included age and sex of the patients, location, clinical symptoms, time of evolution and behaviour of the lesions, as well as, semiological data related to palpation. Along with an image of each lesion, the surrounding tissues were also included. Clinical photographs were obtained by means of a Yashica (Kyocera Corp. Denville, NJ, USA) dental eye II camera, numbered and each slide randomly projected for 30 s, by means of a Kodak Ektapro 5000 projector (Eastman Kodak Co., Rochester, NY, USA) on a 2×2 screen in a seminar room where the GDPS seated within an area of 30° considered from the projection axis. Evaluation was on an anonymous answer sheet where the GDP had to choose one of three possible responses: oral cancer, precancerous lesion/condition or benign lesion. Data for each parameter were determined on a two category bases (oral cancer vs other lesions) and (oral cancer and precancer vs other lesions).

In January 2004 this questionnaire and the image test was applied to 32 randomly selected general dentists (GDPs) out of the 70 GDPs working at the primary care network of the National Health System in Galicia (SERGAS).

The results were entered in a database (dBase IV) and analysed by means of a statistical package (SPSS/PC+, SPSS Inc. Chicago, Ills, USA). Sensitivity, specificity, percentage of total agreement (concordance) and index of wrong classifications for each GDP were obtained, as well as, statistical indices for position and spread. The Kappa coefficient of agreement was also obtained for each GDP considering their three responses. The significance level chosen for all test was 5%.

Results

The sample of GDPs (n = 32) had been in practice for 9.1 (±5.9) years and they claimed to have diagnosed on average about 5.1 (±6.3) oral cancers throughout their professional life. Most respondents (87.5%) had witnessed at least one oral cancer. The GDPs estimated as reasonable a delay of 6 (±6.5) days when referring a patient with a suspected oral cancer.

In terms of oral cancer prevention, 87.5% of the respondents reported performing routine examinations of oral soft tissues during clinical practice. Most of them (84.4%) claimed to inform their patients about the benefits of avoiding excess alcohol and cessation of tobacco consumption as a way to prevent oral cancer. Most of the respondents (84.4%) considered biopsy to be a procedure that should be undertaken on a routine basis in dental surgeries and 50% had undertaken at least one biopsy per year to confirm or rule out oral cancer. Biopsy performed with scalpel was the most frequently performed procedure for oral biopsy (96.9%) and only 9.4% of the respondents used toluidine blue as a screening method or as an ancillary procedure before taking a biopsy.

Diagnostic sensitivity of the GDPs for oral cancer detection was 61.4 and specificity of 86.5 (Table 2).

488

 Table 2
 Level of accuracy of GDPs in the diagnosis of malignant oral lesions

Variable	Mean	s.d.	Minimun	Maximun	n
Sensitivity	61.4	0.1	43.0	86.0	32
Specificity	86.5	6.7	74.0	95.0	32
Wrong classification	17.1	5.3	12.0	28.0	32

s.d., standard deviation.

 Table 3 Level of accuracy of GDPs in the diagnosis of oral cancer and precancer vs benign lesions

Variable	Mean	s.d.	Minimun	Maximun	п
Sensitivity	57.8	0.1	37.0	79.0	32
Specificity	53.0	0.1	29.0	74.0	32
Wrong classification	45.6	0.1	32.0	64.0	32

s.d., standard deviation.

 Table 4 Level of accuracy of GDPs in the diagnosis of premalignant oral lesions

Variable	Mean	s.d.	Minimun	Maximun	n
Sensitivity	59.5	0.1	16.0	83.0	32
Specificity	73.2	9.7	50.0	89.0	32

See Table 1 for categories of clinical cases included in the test package. s.d., standard deviation.

Diagnostic sensitivity for oral cancer and precancer vs benign lesions was 57.8 and specificity of 53.0 (Table 3). Diagnostic sensitivity for oral precancer alone was 59.5, specificity of 73.2 (Table 4). The mean concordance between GDPs' diagnoses and clinical cases was poor, yielding a Kappa statistic of $0.25 (\pm 0.14)$.

Discussion

The clinical and pathological stage at diagnosis is the most important prognostic indicator for oral squamous cell carcinoma (Jones, 1994; Greenlee et al, 2000; Warnakulasuriya and van der Waal, 2004). Unfortunately, almost half of intraoral cancers are diagnosed late (stage III or IV), with 5-year survival rates ranging from 20% to 50% depending on the location of the tumour (Holmes et al, 2003). In Northwest Spain, 51.1% of the oral cancers showed advanced disease at the time of diagnosis (Varela-Centelles et al, 2002). This might be due to an unawareness of the majority of the population regarding the potential malignancy of oral lesions (patients' delay), to an inaccurate diagnosis by the health professional and to delay in referral for treatment (Dimitroulis et al, 1992; Allison et al, 1998).

Some reports indicated that professional delay was longer for patients referred by dentists than by physicians (Scully *et al*, 1986; Kowalski *et al*, 1994). In this study, respondents estimated reasonable mean 6-day delay for referring patients with a suspected oral cancer. Large standard deviation noted (6 + 6.5) suggest marked variation among dentists, some referring immediately, others taking a week or two to do so. Paradoxically, other reports showed no significant association between the delay experienced by the patient and the type of professional involved in initial referral (Wildt *et al*, 1995). However, several reports support the emerging opinion that asymptomatic cancers are more likely to be detected in a dental setting, and a dental care provider is more likely to detect a lesion during a routine appointment than a medical provider (Gellrich *et al*, 2003; Holmes *et al*, 2003; Lim *et al*, 2003).

Screening by GDPs is a significant step forward in the efforts to decrease morbidity and mortality resulting from oral cancers (Schnetler, 1992; Zakrzewska *et al*, 1993; Warnakulasuriya and Johnson, 1996; Horowitz, 2003). This view is reinforced by the knowledge that regular dental care has been associated with earlier diagnosis of oral cancer (Elwood and Gallagher, 1985; Gellrich *et al*, 2003). The weakness of the opportunistic mucosal screen as part of a routine dental examination in general dental practices is that it would not include the population who do not regularly attend the dentist. This group is as high as 17% in Spain (Galluci and Tejerina-Diaz, 2003).

Previous reports have used survey type questionnaires to evaluate dentists' ability to diagnose and make proper referral for treatment of oral and oropharyngeal cancers (Horowitz et al, 2000b; Yellowitz et al, 2000). These reports provide data on perceptions and knowledge regarding oral cancer, but they do not inform on how skilled dentists were at screening and detecting these cancers (Holmes et al, 2003). The tests of knowledge are surely important, but they are also incomplete tools to evaluate competence in a professional task (Miller, 1992; Martín-Fernandez et al, 2001). In this study, a mixed questionnaire and an image detection approach was applied to assess attitudinal profiles and diagnostic ability of oral cancer. Previous reports have described the existence of a wide gap between opinions and knowledge vs attitudes and professional competence (Horowitz et al, 2000a; Yellowitz et al, 2000; Alonge and Narendran, 2003).

Most respondents (87.5%) declared to perform systematic reviews of oral soft tissues to rule out oral cancer, in agreement with most of their colleages in Europe and the USA (83–86%) (Yellowitz and Goodman, 1995; Warnakulasuriya and Johnson, 1999). The optimal frequency of routine examinations for oral cancer detection is unknown (Nagao and Warnakulasuriya, 2003). There is wide agreement on the need to provide oral cancer examinations annually for patients of 40 years of age and older (Horowitz *et al*, 2000b; Alonge and Narendran, 2003). Taking into account new aetiological agents, risk factors modifications and the results of the Spanish oral cancer mortality reports that concur increasing incidence and mortality in young persons (Martín-Granizo *et al*, 1997; Mackenzie *et al*, 2000), the range of ages for systematic oral examination should be broaden.

The GDPs are in a good position to advise patients of ways to prevent oral cancer (stop tobacco and moderate alcohol consumption) (La Vecchia and Boyle, 1993). Tobacco use is the most important risk factor for oral cancer in Spain (the odds ratio: 6-20 cigarettes day⁻¹ is 3.1) (Moreno-Lopez et al, 2000), and cessation of smoking habit eliminates the increased risk within 5-10 years (Johnson and Bain, 2000; Boyle et al, 2003). Despite these facts, tobacco cessation counselling is not a routine part of dental practice (Dolan et al, 1997; Warnakulasuriya and Johnson, 1999). It is worthy to note that this preventive attitude in north-west Spain seems to have increased since 1997 (69.9% vs 84.4%) (Seoane et al, 1999). Signs of improvement on tobacco cessation activities by UK dentists in primary care setting were also reported recently (Lowe et al, 2005).

The ability to reduce diagnostic delay and legal reasons support the concept that any observed suspicious mucosal lesions must be sampled and submitted to an oral and maxillofacial pathologist for evaluation (Sciubba, 2001; Lydiatt, 2002; Seoane et al, 2004). However, the number of primary care dentists who offer oral biopsy either on a routine or selective bases is scarce in Europe (Cowan et al, 1995; Warnakulasuriya and Johnson, 1999). In the north-west of Spain, after an intervention funded by the Regional Government, up to a 50% of the GDPs now perform diagnostic biopsies. This was a 2-year programme (2001–2003) that included a course on systematic oral examination, indications and technique of oral biopsy, alert and referral, counselling on diet and on alcohol and tobacco cessation. Furthermore 2-h diagnostic seminars were held where oral cancer was discussed, together with other lesions of similar clinical appearance that should be considered in differential diagnosis of oral cancer. A manual with images and numerous modules and diagnostic criteria for oral cancer and precancer detection was also supplied to the participants.

There is evidence that oral visual inspection by providers trained to detect oral cancer can improve stage at diagnosis. (Warnakulasuriya and Nanayakkara, 1991; Field et al, 1995; Jullien et al, 1995b; Rodrigues et al, 1998; Sankaranarayanan, et al 2002). It is generally accepted that a sensitivity of agreement higher than 80% is acceptable for systematic screening of oral cancer (Ikeda et al, 1994). However, adequate concordance values often hide low values especially as the derived sensitivity values ranged from 0.60 to 0.95 (Jullien et al, 1995b; Moles et al, 2002; Kujan et al, 2003). The weighted pooled value of sensitivity for oral cancer detection among seven studies was reported at 0.796 (95% CI 0.594–0.912) (Moles et al. 2002). Sensitivity reflects the ability of the examiner to make a correct positive detection. In this study, 61.4% of malignant lesions were classified as such by GDPs. For precancers shown the level of sensitivity was slightly lower (59.5%).

It is not surprising that larger oral cancers were diagnosed more easily than smaller lesions (Onizawa *et al*, 2003), diagnostic delays are linked to carcinomas

that appear to be seemingly innocent alterations, in the form of focal colour change without surface textural change or small and ulcerated lesions erroneously diagnosed as aphthae or traumatic ulcers (Sciubba, 2001; Onizawa *et al*, 2003). These determinants seem to explain the low sensitivity for the visual diagnosis of oral cancer/benign lesions. Given the enormous resource implications of seeing all patients with an urgent cancer referral preferably within 2 weeks by a hospital consultant as laid out by Nice guidelines in the UK (NICE 2005), our results raise a number of important points.

A wrong answer of mistaking precancerous lesion/ condition as oral cancer can be considered better than a wrong answer of mistaking precancerous lesion/condition as benign lesion. However, we have obtained a high number of wrong classifications when we grouped oral cancer and precancer vs benign lesions. This may indicate that the dentists may ignore high-risk lesions if they diagnose and consider these as benign. Further continuing professional training of GDPs on high-risk mucosal lesions is recommended.

Spanish GDPs have demonstrated difficulties in classifying white lesions correctly (leukoplakia and lichen planus *vs* frictional lesions). A further clarification of the WHO classification of oral white lesions and particularly on the correct use of the term leukoplakia is timely. Moreover Plummer–Vinson syndrome and epidermolysis bullosa are very rare disorders in Spain, so their inclusion in the visual evaluation tests may have induced a low sensitivity and diagnostic specificity, which may partially explain the better results obtained by the same sample of GDPs for the cancerous lesions in comparison with those achieved for precancerous lesions/conditions. One limitation in the slide set used (Table 1) was lack of candida-associated oral lesions in the testing set.

It is an educational objective related to secondary prevention of oral cancer to increase efficacy in screening for precancerous lesions/conditions (Seoane *et al*, 1997b). To achieve this goal, it is mandatory to train GDPs who are motivated and capable of performing a full mouth examination focused on neoplastic and precancerous pathologies.

The data reported highlight the need for increasing diagnostic sensitivity by establishing educational interventions that make GDPs 'experts in visual diagnosis' of oral cancer and precancer, and in undertaking incisional biopsies of suspected malignant lesions with atypical presentation. It also seems necessary to organize specific training that reinforces knowledge of GDPs and their preventive attitudes towards oral cancer.

References

- Allison P, Franco E, Feine J (1998). Predictors of professional diagnosis delays for upper aerodigestive tract carcinoma. *Oral Oncol* **34**: 127–132.
- Alonge OK, Narendran S (2003). Opinions about oral cancer prevention and early detection among dentists practising along the Texas–Mexico border. *Oral Dis* **9:** 41–45.

- Boyle P, Autier P, Bartelink H *et al* (2003). European code against cancer and scientific justification: third version. *Ann Oncol* **14**: 973–1005.
- Cowan CG, Gregg TA, Kee F (1995). Prevention and detection of oral cancer: the views of primary care dentists in Northern Ireland. *Br Dent J* **179**: 338–342.
- De Faria PR, Cardoso SV, Nishioka S *et al* (2003). Clinical presentation of patients with oral squamous cell carcinoma when first seen by dentist or physician in a teaching hospital in Brazil. *Clin Oral Invest* **7**: 46–51.
- Dimitroulis G, Reade P, Wiesenfeld D (1992). Referral patterns of patients with oral squamous cell carcinoma, Australia. *Oral Oncol* **28**: 23–27.
- Dolan TA, McGorray SP, Grinstead-Skigen CL et al (1997). Tobacco control activities in U.S. dental practices. J Am Dent Assoc 128: 1669–1679.
- Downer MC, Moles DR, Palmer S *et al* (2004). A systematic review of test performance in screening for oral cancer and precancer. *Oral Oncol* **40**: 264–273.
- Elwood JM, Gallagher RP (1985). Factors influencing early diagnosis of oral cancer of the oral cavity. *Can Med Assoc J* 133: 651–656.
- Field EA, Morrison T, Darling AE *et al* (1995). Oral mucosal screening as an integral part of routine dental care. *Br Dent J* **179:** 262–266.
- Galluci CM, Tejerina-Diaz L (2003). La demanda de los servicios dentales en España. Fundación Dental Española. Ediciones letra clara: Madrid-España.
- Gansky SA, Ellison JA, Kavanagh C *et al* (2002). Oral screening and brief spit tobacco cessation counselling: a review and findings. *J Dent Educ* **66**: 1088–1098.
- Garcia-Pola MJ, Martinez Diaz-Canel AI, Garcia-Martin JM *et al* (2002). Risk factors for oral soft tissue lesions in an adult Spanish population. *Community Dent Oral Epidemiol* **30**: 277–285.
- Gellrich NC, Suarez-Cunqueiro MM, Bremerich A *et al* (2003). Characteristics of oral cancer in a central European population. Defining the dentist's role. *J Am Dent Assoc* **134:** 307–314.
- Greenlee RT, Murray T, Bolden S et al (2000). Cancer statistics 2000. CA Cancer J Clin 50: 7–33.
- Hill C, Benhamou E, Doyon F (1991). Trends in cancer mortality, France 1950–1985. Br J Cancer 63: 587–590.
- Holmes JD, Dierks EJ, Homer LD *et al* (2003). Is detection of oral and oropharyngeal squamous cancer by dental health care provider associated with a lower stage at diagnosis? *J Oral Maxillofac Surg* **61**: 285–291.
- Horowitz AM (2003). Has the time come for opportunistic oral cancer screening? *Br Dent J* **194:** 493.
- Horowitz AM, Drury TF, Canto MT (2000a). Practices of Maryland dentists: oral cancer prevention and early detection-baseline from 1995. Oral Dis 6: 282–288.
- Horowitz AM, Drury TF, Goodman HS *et al* (2000b). Oral pharyngeal cancer prevention and early detection: dentist's opinions and practices. *J Am Dent Assoc* **131**: 453–462.
- Ikeda N, Ishi T, Kawai T (1994). Le despistage systematique des precancers et cancers de la cavite buccale au Japon. Un programme preventif pour la detection avancee des cancers de la cavite buccale. In: Bruguere J, Szpirglas H, eds. *Lesions precancereuses de muqueuses des voies aero-digestives superieures*. Masson: Paris, pp. 30–35.
- Ikeda N, Downer MC, Ozowa Y *et al* (1995). Characteristics of participants and non-participants in annual mass screening for oral cancer in 60-year-old residents in Tokoname city, Japan. *Community Dent Health* **12**: 83–88.

- Izarzugaza M, Esparza H, Aguirre JM (2001). Epidemiological aspects of oral and pharyngeal cancers in the Basque Country. *J Oral Pathol Med* **30:** 521–525.
- Jaber MA, Diz Dios P, Vazquez García E *et al* (1997). Spanish dental students knowledge of oral malignancy and premalignancy. *Eur J Dent Educ* **1**: 167–171.
- Johnson NW, Bain CA (2000). Tobacco and oral disease. EU-Working Group on Tobacco and Oral Health. *Br Dent J* 189: 200–206.
- Jones AS (1994). Prognosis in mouth cancer: tumour factors. *Eur J Cancer B Oral Oncol* **30B:** 8–15.
- Jullien JA, Zakrzewska JM, Downer MC *et al* (1995a). Attendance and compliance at an oral cancer screening programme in a general medical practice. *Oral Oncol* 31B: 202–206.
- Jullien JA, Downer MC, Zakrzewska JM *et al* (1995b). Evaluation of a screening test for early detection of oral cancer and precancer. *Community Dent Health* **12:** 3–7.
- Kowalski LP, Franco EL, Torloni H *et al* (1994). Lateness of diagnosis oral and oropharyngeal carcinoma: factors related to the tumor, the patient and health professionals. *Oral Oncol* **30B:** 167–173.
- Kujan O, Glenny AM, Duxbury AJ, Thakker N, Sloan P (2003). Screening programmes for the early detection and prevention of oral cancer (Cochrane Database)(4) CD007150.
- La Vecchia C, Boyle P (1993). Trends in the tobacco-related cancer epidemic in Europe. *Cancer Detect Prev* **17**: 495–506.
- Lim K, Moles DR, Downer MC *et al* (2003). Opportunistic screening for oral cancer and precancer in general dental practice: results of a demonstration study. *Br Dent J* **194**: 497–502.
- López-Abente G, Pollán M, Escolar A et al (1996). Atlas de mortalidad por cáncer y otras causas en España, 1978–1992. Fundación científica de la Asociación Española Contra el Cáncer: Madrid.
- Lowe JC, Johnson NW, Warnakulasuriya KAAS (2005). Tobacco cessation activities of UK dentists in primary care: signs of improvement. *Br Dent J* (in press).
- Lydiatt DD (2002). Cancer of the oral cavity and medical malpractice. *Laryngoscope* **112**: 816–819.
- Macfarlane GJ, Boyle P, Svstifeeva TV *et al* (1994). Rising trends of oral cancer mortality among males worldwide. The return of and old public health problem. *Cancer Causes and Control* **5:** 259–265.
- Mackenzie J, Ah-See K, Thakker N et al (2000). Increasing incidence of oral cancer amongst young persons; what is the aetiology? Oral Oncol 36: 387–389.
- Martín-Fernandez J, Martinez-Marcos M, Ferrándiz-Santos J (2001). Evaluación de la formación continuada: de la satisfacción al impacto. A propósito de un programa formativo en cirugía menor en un área de salud. *Aten Primaria* **27**: 497–502.
- Martín-Granizo R, Rodriguez-Campo F, Naval L *et al* (1997). Squamous cell carcinoma of the oral cavity in patient's younger than 40 years. *Otolaryngol Head Neck Surg* **117**: 268–275.
- Miller G (1992). The assessment of clinical skills/competence/ performance. Acad Med 65: 63–67.
- Moles DR, Downer MC, Speight PM (2002). Meta-analysis of measures of performance reported in oral cancer and precancer screening studies. *Br Dent J* **192**: 340–344.
- Moore SR, Johnson NW, Pierce AM *et al* (2000). The epidemiology of mouth cancer. A review of global incidence. *Oral Dis* **6**: 65–74.

- Moreno-Lopez LA, Esparza-Gomez GC, Gonzalez-Navarro A *et al* (2000). Risk of oral cancer associated with tobacco smoking, alcohol consumption and oral hygiene: a case-control study in Madrid, Spain. *Oral Oncol* **36**: 170–174.
- Nagao T, Warnakulasuriya S (2003). Annual screening for oral cancer detection. *Cancer Detect Prev* **27**: 333–337.
- Nagao T, Warnakulasuriya S, Gelbier S *et al* (2002). Oral precancer and the associate risk factors among industrial workers in Japan's overseas enterprises in the UK. *J Oral Pathol Med* **16**: 326–329.
- NICE (2005) http://www.nice.org.uk/pdf/2005_012_referral_ guidelines_for_suspected_cancer.pdf.
- Nieto A, Ruiz-Ramos M (2002). Rising trends in oral cancer mortality in Spain, 1975–94. *J Oral Pathol Med* **31:** 147– 152.
- Nuttal NM, Bradnock G, White D *et al* (2001). Dental attendance in 1998 and implications for the future. *Br Dent J* **190:** 177–182.
- Onizawa K, Nishihara K, Yamagata K *et al* (2003). Factors associated with diagnostic delay of oral squamous cell carcinoma. *Oral Oncol* **39**: 781–788.
- Parkin DM, Whelan SL, Ferlay J et al (1997). Cancer incidence in five continents. Volume VII. International Agency for Research on Cancer: Lyon. IARC Scientific Publication No.143.
- Parkin DM, Pisani P, Ferlay J (1999). Estimates of the worldwide incidence of 25 major cancers in 1990. Int J Cancer 80: 827–841.
- Rodrigues VC, Moss SM, Tuomainen H (1998). Oral cancer in the UK: to screen or not to screen. Oral Oncol 34: 454–465.
- Rubright WC, Hoffman HT, Lynch CF *et al* (1996). Risk factors for advanced-stage oral cavity cancer. *Arch Otolar-yngol Head Neck Surg* **122**: 621–626.
- Sanchez MJ, Martinez C, Nieto A *et al* (2003). Oral and oropharyngeal cancer in Spain: influence of dietary patterns. *Eur J Cancer Prev* 12: 49–56.
- Sankaranarayanan R (1990). Oral cancer in India. An epidemiologic and clinical review. *Oral Surg Oral Med Oral Pathol* **69:** 325–330.
- Sankaranarayanan R, Fernandez-Garrote L, Lence-anta J *et al* (2002). Visual inspection in oral cancer screening in Cuba: a case-control study. *Oral Oncol* **38**, 131–136.
- Sankaranayanan R, for the Trivandrum Oral Cancer Screening Study Group (2005). Effect of screening on oral cancer mortality in Kerala, India: a cluster-randomised controlled trial. *Lancet* 365: 1927–33.
- Schnetler JFC (1992). Oral cancer diagnosis and delays in referral. Br J Oral Maxillofac Surg 30: 210–213.
- Sciubba JJ (2001). Oral cancer and its detection. Historytaking and the diagnostic phase of management. *J Am Dent Assoc* 132: 12S–18S.

- Scully C, Malamos D, Levers BGH *et al* (1986). Sources and pattern of referrals of oral cancer: role of general practitioners. *Br Med J* 293: 599–601.
- Seoane J, Gonzalez-Reforma N, Aguado A *et al* (1997a). Assessment of dental student's diagnostic accuracy for oral cancer screening. J Dent Educ 61: 437–439.
- Seoane J, Varela-Centelles PI, Gonzalez-Reforma N et al (1997b). Assessment of dental student's ability to recognise precancerous lesions and conditions. Eur J Dent Educ 1: 172–175.
- Seoane J, Varela-Centelles PI, Diz-Dios P (1999). Experience and knowledge of oral cancer and precancer among dentists in northwestern Spain. *J Cancer Educ* **14**: 68–69.
- Seoane J, Varela-Centelles PI, Ramirez JR *et al* (2004). Artefacts in oral incisional biopsies in general dental practice: a pathology audit. *Oral Dis* **10**: 1–5.
- Smart CR (1993). Screening for cancer of the aerodigestive tract. *Cancer* **72**(Suppl.): 1061–1065.
- Varela-Centelles PI, Seoane J, Vazquez-Fernandez E *et al* (2002). Survival to oral cancer. A study of clinical risk markers with independent prognostic value. *Bull Group Int Rech Sci Stomatol Odontol* **44:** 46–51.
- Warnakulasuriya KAAS, Johnson NW (1996). Strengths and weaknesses of screening programmes for oral malignancies and potentially malignant lesions. *Eur J Cancer Prev* 5: 93–98.
- Warnakulasuriya KAAS, Johnson NW (1999). Dentist and oral cancer prevention in the UK: opinions, attitudes and practices to screening for mucosal lesions and to counselling patients on tobacco and alcohol use: baseline data from 1991. *Oral Dis* **5**: 10–14.
- Warnakulasuriya KAAS, Nanayakkara BG (1991). Reproducibility of an oral cancer and precancer detection program using a primary health care model in Sri Lanka. *Cancer Detect Prev* 15: 331–334.
- Warnakulasuriya S, van der Waal I (2004). *Oral cancer*. http:// www.eastman.ucl.ac.uk/~eaom/OM_Handbook/ oral_cancer.pdf.
- Warnakulasuriya KAAS, Ekanayake ANI, Stjernsward J *et al* (1998). Compliance following referral in the early detection of oral cancer and precancer in Sri Lanka. *Comm Dent Oral Epidemiol* **16**: 326–329.
- Wildt J, Bundgaard T, Bentzen SM (1995). Delay in diagnosis of oral squamous cell carcinoma. *Clin Otolaryngol* 20: 21–25.
- Yellowitz JA, Goodman HS (1995). Assessing physicians' and dentists' oral cancer knowledge, opinions and practices. *J Am Dent Assoc* **126**: 53–60.
- Yellowitz JA, Horowitz AM, Drury TF *et al* (2000). Survey of U.S. dentist's knowledge and opinions about oral pharyngeal cancer. *J Am Dent Assoc* **131:** 653–661.
- Zakrzewska JM, Hindle I, Speight PM (1993). Practical considerations for the establishment of an oral cancer screening programme. *Comm Dent Health* **10**: 79–85.

492

Copyright of Oral Diseases is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.