



Evaluation of Dental Health and the Need for Dental Treatment prior to Radiotherapy in Eighty-three Patients with Head and Neck Cancer

Eva M. Martinez^a, José V. Bagan^a, Yolanda Jiménez^a, Crispian Scully^b

^a*Stomatology Department, Faculty of Medicine and Dentistry, University of Valencia, Valencia, Spain.*

^b*International Centres for Excellence in Dentistry, and Eastman Dental Institute for Oral Health Care Sciences, University College London, London, UK.*

Purpose: A study was made to investigate the possible differences in dental health between patients scheduled for head and neck radiotherapy and healthy subjects of similar age and sex, with an evaluation of the need for dental treatment prior to radiotherapy.

Material and Methods: The dental and periodontal health of 83 head and neck cancer patients and 34 healthy controls of similar age and sex was evaluated, based on the Silness-Löe plaque index, DMF index and modified CPI index, and attachment loss. Each patient was also evaluated in terms of the need for treatment before radiotherapy, based on the Bruins Model for Pretherapy Dental Decision Support.

Results: Dental health was found to be poorer among the oncological patients versus the controls, with statistically significant differences in terms of the Silness-Löe index ($t=3.64$; $p<0.01$), mean number of decayed teeth ($t=2.51$; $p=0.01$), mean number of filled teeth ($t=-4.24$; $p<0.01$), periodontal pockets ($t=2.93$; $p<0.01$), and attachment loss ($t=4.84$; $p<0.01$). On applying the Bruins decision-taking protocol, the extraction of an average of 8.34 ± 0.90 teeth/individual was found to be advisable among the patients scheduled for radiotherapy.

Conclusions: Patients scheduled for head and neck radiotherapy presented poorer dental and periodontal health than the healthy subjects of similar age and sex. As a result, a considerable number of teeth required extraction prior to radiotherapy among the oncological patients.

Key words: oral cancer, radiotherapy, dental health

Oral Biosci Med 2004; 1: 181-185

Submitted for publication 22 January 2004; accepted for publication 13 July 2004.

INTRODUCTION

Radiotherapy can be applied to head and neck cancer either alone or (more frequently) as a coadjuvant to surgery and/or chemotherapy (Lockhart and Clark, 1994; Silvestre et al, 1998).

In addition to the desired antineoplastic effects, radiotherapy exerts a series of undesirable actions upon the irradiated tissues. At oral cavity level, such effects include dry mouth (xerostomia), increased sus-

ceptibility to candidiasis, rapidly progressing dental neck caries and osteoradionecrosis (Scully and Epstein, 1996).

Pre-irradiation preparation of the oral cavity to ensure the best possible health conditions is essential in order to minimize the deleterious effects of head and neck radiotherapy. Accordingly, different dental management protocols have been developed for application in such patients (Epstein et al, 1996). One of the most recent and complete proposals has been pro-

Table 1 Risk classification according to the dental and clinical characteristics of the patient, based on the study of Bruins et al (1998)

Dental Risk Factors	Risk
Periodontal disease	
Periodontal pockets 3-6 mm	Medium
Pockets >6 mm	High
Gingival recession 3-6 mm	Medium
Gingival recession >6 mm	High
Bleeding upon probing	Medium
Spontaneous bleeding	High
Root furcations	High
Lateral mobility 1-2 mm	Medium
Lateral mobility >2 mm or vertical mobility 1 mm	High
Pulp involvement and periapical lesions	
Negative vitality; no previous endodontic treatment; no radiolucency	Medium
Negative vitality; no previous endodontic treatment; radiolucency	High
Swelling and/or fistula	High
Radiolucency <3 mm, with good condensation root canal filling material, without pain upon percussion	Low/medium
Radiolucency <3 mm, inadequate condensation root canal filling material, pain upon percussion	High
Radiolucency >3 mm	High
Condensing osteitis, hypercementosis, vital tooth	Low
Condensing osteitis, non-vital tooth	Medium
External/internal root resorption	High
Extensive caries	
Caries occupying <2/3 of crown	Medium
Caries occupying >2/3 of crown with pulp involvement	High
Defective obturations with secondary caries, no pulp alterations	Medium
Root caries <1/2 of root circumference, no pulp alterations	Medium
Root caries >1/2 root circumference	High
Non-functional teeth	
Semierupted teeth or mucosal root fragments	High
Root fragments not totally covered by bone or with radiolucent areas	High
Fully impacted teeth, without follicular cysts, totally embedded within bone	Low
Impacted teeth, not totally covered by bone or with follicular cyst	High
Malignancy Associated Risk Factors	
Radiotherapy	
Total dose <55 Gy, field including >50% of the major salivary glands	Medium
Total dose <55 Gy, field including maxillary/mandibular tooth	Medium
Total dose >55 Gy, field including maxillary/mandibular tooth	High
Interstitial radiotherapy, field including teeth adjacent to implantation zone	High
Chemotherapy	High
Teeth very close to tumour	High
Time to start of treatment <14 days	High

posed by Bruins et al (1998), who base dental therapeutic planning on a series of dental risk factors and parameters inherent to the neoplastic process and radiotherapeutic management involved (Table 1).

The present study evaluates dental health and the need for dental treatment prior to radiotherapy in a series of patients with head and neck malignancies.

MATERIAL AND METHODS

The study comprised 83 patients with a mean age of 55.2 ± 12.0 years. There were 64 males and 19 females (77.1% and 22.9%, respectively).

Tumour location was as follows: pharyngeal tumours (n=37; 44.5%), tongue (n=26; 31.3%), floor of the

mouth (n=10; 12.04%), palate (n=4; 4.8%), upper maxilla (n=3; 3.6%), buccal mucosa (n=3; 3.6%).

All patients were scheduled for radiotherapy. In addition, and prior to radiotherapy, 60 patients (73.2%) underwent surgery, and 29 (34.9%) received systemic chemotherapy.

The control group in turn consisted of 34 individuals without medical antecedents of interest who did not use medication on a regular basis and gave their informed consent to participation in the different oral diagnostic evaluations. The mean age was 54.4 ± 5.04 years. There were 22 males and 12 females (64.7% and 35.3%, respectively). Both groups showed similar age ($t=0.70$; $p=0.48$) and sex distributions ($\chi^2=1.16$; $p=0.28$).

Evaluations were made for both groups using the Silness-Löe index (1964), DMF index, the modified Community Periodontal Index (CPI) (Ainamo and Bay, 1976), and periodontal attachment loss. The latter two measurements were applied to the following teeth: upper right first molar, upper right canine, upper left central incisor, upper left second premolar, lower left first molar, lower left canine, lower right central incisor and lower right second premolar.

The Model for Pretherapy Dental Decision Support proposed by Bruins et al (1998) was subsequently used to evaluate the need for tooth extractions, periodontal care and restorative treatment in the patients, prior to radiotherapy.

The chi-square test was used to contrast the association or independence between qualitative variables, while the Student t-test was performed to analyze differences between the means of two quantitative variables. Statistical significance was considered for $p \leq 0.05$.

RESULTS

The comparative analysis of the two groups generally reflected poorer dental health among the head and neck cancer patients versus the controls (Table 2), with statistically significant intergroup differences observed in terms of plaque index and the number of decayed and filled teeth. Periodontal condition as assessed by the modified CPI index, and attachment loss, were likewise found to be much worse among the oncological patients.

As to the need for dental treatment prior to radiotherapy, 7 of the 83 patients (8.4%) were edentulous. Among the remaining 76 patients, the average number of teeth requiring extraction was 8.34 ± 8.20 per individual. Forty-one (53.9%) and 28 patients (36.8%) required periodontal and restorative treatment, respectively (Table 3).

Table 2 Results of the different indices used to evaluate dental and periodontal health among oncological patients and healthy controls

	Patient group	Controls	
Plaque index	1.71 ± 0.85	1.11 ± 0.63	$t=3.64^*$ $p < 0.01$
Decayed teeth	6.03 ± 5.92	3.32 ± 3.22	$t=2.51^*$ $p=0.01$
Missing teeth	10.74 ± 8.40	8.14 ± 7.94	$t=1.54$ $p=0.12$
Filled teeth	1.42 ± 3.55	4.64 ± 4.14	$t=-4.24^*$ $p < 0.01$
DMF index	18.37 ± 7.30	16.14 ± 7.79	$t=1.46$ $p=0.14$
Mean periodontal pockets (CPI index)	4.53 ± 1.31	3.74 ± 1.17	$t=2.93^*$ $p < 0.01$
Mean attachment loss	7.25 ± 2.23	5.12 ± 1.68	$t=4.84$ $p < 0.01$

* statistically significant results

Table 3 Conservative dental management advised in oncological patients prior to head and neck radiotherapy

Dental treatments before radiotherapy	No. of patients	%
Fluoriation	41	53.9
Calculus removal	41	53.9
Restorative treatments	28	36.8

DISCUSSION

The average Silness-Löe index recorded in our dentate patients was 1.71 ± 0.85 , and far greater than the value observed in the control group. No studies similar to our own have been found in the literature, with the exception of the paper by Lockhart and Clark (1994), who assessed dental health in 131 patients scheduled for head and neck radiotherapy. This study evaluated patient hygiene, classifying the subjects into four categories according to the amount of plaque and calculus present. The authors found that plaque and calculus was present in 94% of the patients at the time of the exploration. Of these, 66% and 16% presented moderate and large deposits, respectively. Our own observations demonstrate the association between oral cancer and pre-carious oral hygiene – in coincidence with the findings of earlier studies (Velly et al, 1998; Zheng and Boyle, 1990; Maier et al. 1993).

As regards dental condition, of the 83 patients included in the present study, only 7 were edentulous (8.4%), while the remaining 76 patients presented at least one tooth in the mouth at the time of the exploration. Nevertheless, most of these individuals had dental and/or periodontal problems. Although patient age in the series published by Lockhart and Clark (1994) was very similar to our own, the proportion of edentulous patients was much greater in the former study (43% of the global sample).

The average DMF index in our patients was 18.37 ± 7.30 . While this value is high, it is not attributable to the number of filled teeth (with a mean value of only 1.42 ± 3.55) but to the number of decayed teeth (6.03 ± 5.92 per patient on average) and teeth missing because of caries (10.74 ± 8.40 per patient). Very similar results have been published by Martínez et al (2000), in a series of 60 oncological patients. This finding again points to the existence of deficient oral hygiene and a lack of motivation among these individuals (Lockhart and Clark, 1994; Scully and Epstein, 1996; Martínez et al, 2000). As has been mentioned

above, the average number of decayed teeth in our patients was 6.03 ± 5.92 .

Lockhart and Clark (1994) likewise found that 71% of the dentulous patients in their study had at least one caries lesion, identified at preliminary exploration. The authors pointed out that this percentage probably would have been greater if a more meticulous dental exploration had been conducted at the time. On comparing the dental characteristics of the oncological patients with those of the controls, the average number of caries lesions was found to be much greater among the former – the difference being statistically significant ($t=2.51$; $p=0.01$). In turn, the average number of fillings was significantly higher among the controls than in the patient group ($t=-4.24$; $p<0.01$). However, on comparing the average number of teeth missing as a consequence of caries, together with the DMF index, no statistically significant intergroup differences were observed.

Additional evidence suggesting that patients with head and neck tumours tend to show pre-carious oral hygiene and important dental problems (Lockhart and Clark, 1994; Martínez et al, 2000) is provided by evaluation of the periodontal pockets and attachment loss. The mean depth of the pockets among the dentate patients in our series was 4.53 ± 1.31 mm, with an attachment loss of 7.25 ± 2.23 mm – demonstrating the existence of dental support tissue problems in these individuals. In the study published by Lockhart and Clark (1994), 66% of the dentate patients presented a generalized alveolar bone loss of about 40% at preliminary clinical evaluation, and only 7% of the individuals examined appeared to have good periodontal health. In the study by Martínez et al (2000), 90% of the subjects showed periodontal pocket depths of more than 4 mm, and over 60% of these subjects also presented attachment losses in excess of 9 mm.

On individually evaluating the teeth of each patient based on the protocol developed by Bruins et al (1998), we concluded that of the 76 dentate patients, only 16 (21%) required no teeth extractions prior to radiotherapy – the average number of advised extractions being 8.34 ± 3.42 per patient. In another study, Bruins et al (1999) proposed that various dental professionals working with irradiated cases should assess the need for dental extractions. In the extreme cases (teeth with large furcations and dental mobility, severe crown destruction, etc.) the decisions coincided among all dental professionals. However, in patients with only moderate dental risk factors, the opinions regarding the need for extraction differed considerably. The number

of teeth requiring extraction for periodontal reasons was slightly higher than the number of teeth requiring extraction because of caries (4.39 ± 0.70 versus 3.42 ± 0.49 teeth per patient). In turn, far fewer teeth required extraction on the grounds that they were located close to the tumour zone (0.77 ± 0.24 teeth per patient on average). On the other hand, there were cases in which despite no major dental problems, extraction was decided in view of the scant patient motivation (0.12 ± 0.10 teeth per patient on average).

To summarize, it can be concluded that head and neck cancer patients scheduled for radiotherapy present poorer dental health than the healthy controls of similar age and sex. Consequently, on applying the protocol developed by Bruins et al (1998), a considerable number of teeth are seen to require extraction prior to radiotherapy.

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Reprint requests:

Prof. José V. Bagan
C/ Jativa 6 pta. 9
46002 Valencia
Spain
E-mail: bagan@uv.es