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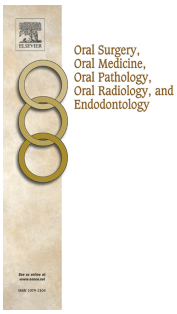

Pre-radiotherapy dental extractions and health related quality of life

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Title

Pre-radiotherapy dental extractions and health related quality of life

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None.

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Abstract

Background: Health-related quality of life (HRQoL) is a valuable outcome measurement of treatment, particularly in patients undergoing therapy for malignancy. Due to the effects of both disease and treatment, it is important for clinicians to understand the holistic experience of the patient, not just the direct physical effect on morbidity and mortality. Oropharyngeal cancers are often treated with radiation to the head and neck, which presents a number of issues that will affect quality of life, including difficult to manage sequelae such as osteoradionecrosis. Dental extractions performed under any circumstances have an impact on quality of life, and those performed pre and post-radiotherapy are no exception. **Aim:** The aim of this study was to investigate the connection between pre-radiotherapy dental extractions and self-reported health related quality of life. **Methods:** Retrospective data on patients treated with radiotherapy for oropharyngeal cancer were pooled with a cross-sectional survey. **Results:** greater than 8 pre-radiotherapy dental extractions, p16 negative status, female gender and positive smoking status were associated with statistically significant reduced quality of life. **Conclusion:** pre-radiotherapy dental extractions do not result in improved quality of life, and may in fact worsen it.

Introduction

Radiotherapy (RT) is widely utilised for the management of head and neck cancer (HNC) and is associated with significant morbidity, manifest during treatment and often persisting permanently. One of the most feared late sequelae is osteoradionecrosis of the jaws (ORN), a condition of impaired wound healing characterised by non-vital bone in radiation fields not related to tumour recurrence[1]. Many risk factors for ORN exist including radiation dose, field and fractionation, tumour location, smoking and alcohol use, general health and nutrition status, oral health and oral hygiene. There also exist triggers that increase the likelihood of ORN developing, such as dental extractions, dental implants, surgery or poor fitting prostheses [2] as well as any residual foci of infection[3].

To minimise the risk of ORN and other radiation-related negative effects on the oral cavity, it is recommended that all patients are seen by a dental clinician prior to the commencement of treatment. At this visit, the oral status is assessed and appropriate dental treatments are completed. The dental needs of patients diagnosed with HNC are often quite high, and patients frequently present with periodontal disease and caries [4]. Initial screening and elimination of oral foci of infection has been shown to reduce post-radiotherapy complications such as osteoradionecrosis [5]. Dental extractions prior to radiotherapy have been advocated as a method of reducing such foci and therefore reducing osteoradionecrosis risk. In addition, they are advocated to reduce the need for post-radiotherapy extractions which are more technically challenging and can lead to osteoradionecrosis. However, in some studies, the group that underwent pre-radiotherapy dental extractions had a higher rate of ORN[6].

An important factor when understanding treatment effects of neoplastic disease is the patient's quality of life. A cancer diagnosis is often traumatic, and the treatment received has significant morbidity. In the case of head and neck cancer treated with RT, there can be significant effects on aesthetics, speech, eating and pain, as well as general effects on emotional state, social state and a general functional level [7]. There are numerous quality of life instruments available for the clinician or researcher to use, with a recent review finding 57 separate head and neck specific instruments published [8]. Quality of life instruments attempt to measure the human experience in order to produce a meaningful, thorough and comparable quantity that can be used to ascertain treatment effectiveness beyond the purely biological. This is obviously not an easy task.

It has been reflected in the literature that fewer teeth are associated with reduced quality of life [9], however there are no studies published to date on the impact of RT related dental extractions on quality of life. As teeth are often extracted in the pre-RT period, it is hypothesised that dental extractions in this population result in a reduced oral health related quality of life. The competing theory is that pre-RT dental extractions provide a protective effect against outcomes that stand to impair quality of life, such as ORN, in such a significant way as to overpower the quality of life effect of tooth loss and provide a net benefit. In this study we aim to understand the effect that dental extractions had on quality of life for patients receiving RT for oropharyngeal cancer (OPC).

Materials and Methods

Participant selection

Patients over the age of 18 with OPC treated with curative intent definitive and/ or postoperative RT at two tertiary hospitals in an Australian state capital from 2005-2011 were invited to participate in the study. Patients underwent treatment planning through a multidisciplinary head and neck clinic and all received dental assessment, primary dental treatment and oral hygiene instruction before being discharged back to community dental clinics The dates chosen allowed sufficient post-treatment time to capture late complications, specifically ORN with a minimum time of 3 years. 190 participants completed the study, and 47 declined to participate. Data was collected between July and December 2014. Ethics approval was obtained to complete the study.

Data collection

Consenting participants had their demographic and treatment data retrieved from hospital databases. Age, gender and smoking status were recorded. Diagnostic data included tumour location, tissue diagnosis, TNM staging and p16 status. Treatment data included radiation dose and site as well as the use and synchronicity of chemotherapy.

Participants were given questionnaires requesting further information regarding their dental health and treatment in the preceding months before, during and following RT. Specifically, the location, timing and number of dental extractions were recorded. Subjective dental hygiene was recorded for pre- and post-treatment and participants were asked to disclose dental habits, denture use and service utilisation. The questionnaire gathered information regarding exposed bone after radiation treatment including duration, quadrant location and treatment with either surgical intervention and/or hyperbaric oxygen. Location site was confirmed with medical records and radiographs.

Participants were given two self-reported quality of life instruments, the Oral Health Impact Profile 14 (OHIP-14)[10], and the Functional Assessment of Cancer Therapy – Head and Neck (FACT Head and Neck)[11] which they completed and returned.

All data was de-identified, tabulated and stored in a secure database.

The quality of life instruments were administered according to their guidelines.

OHIP-14 scores were individually calculated based on additive measures.

FACT Head and Neck scores were individually calculated according to the weighted method. Subset scores were recorded according to the Functional Assessment of Chronic Illness Therapy (FACIT) guidelines and recorded as physical well-being, social well-being, emotional well-being, functional well-being and head and neck specific. Derived scores were also calculated according to the guidelines and recorded as FACT-G, FACT-HN Total and Fact-HN Trial Outcome Index. FACT-G scores represent a general endpoint utilising the subsets of Physical, Social, Emotion and Functional Well Being are comparable with other FACIT family scores. FACT- Trial Outcome Index represents a physical and functional endpoint, which is calculated from Physical and Functional Well Being, and the Head and Neck specific score. The FACT total score encompasses all the subsets.

Data underwent statistical analysis provided by an independent external statistician using Stata statistical software v12.0 (Statacorp, College Station, TX, USA).

Results

190 participants met the criteria and were included in the study, of which 132 (69.5%) were from hospital 1, and 58 (30.5%) were from hospital 2. 157 (82.6) were males and 33 (17.3%)

were females. The mean age was 64.9 (34.1-89.0, SD 8.3) with mean female age 61.2 and mean male age 65.7.

Approximately half of the cases were tonsillar primary tumours (53.7%) followed by base of tongue (35.8%). Of known p16 status cases the great majority were positive (87.2%). Smoking status was divided into current smokers, ex-smokers and lifelong non-smokers, and respectively represented 16.9%, 54.9% and 28.2%, indicating over three-quarters were current or ex-smokers. The majority of histopathological diagnoses were SCC (95.3%) (Table 1). Participants with a negative p16 status were more likely to be current smokers (26.7% compared with 12.7%) and ex smokers (60% compared with 52%).

Treatment Modality

All participants underwent RT as required by the study protocol. 167 (87.9%) underwent concurrent chemotherapy and RT. 21 (11.1%) underwent RT alone, and 2 (1.1%) underwent sequential chemotherapy and RT. The mean RT dose administered was 68 Gray (30-77, SD 5.9).

Pre-Radiotherapy Dental Extractions

4 participants (2.1%) were edentulous prior to treatment. 129 (67.9%) of participants underwent dental extractions as part of their pre-RT treatment. 13 of this group underwent full clearances. Of the 129 cases who had pre-RT extractions, 20 (15.5%) went on to have post-RT extractions, leaving 109 having only pre-RT extractions. The mean number of teeth extracted for all cases was 5.1 (Range 0-24, SD 5.4). Teeth were extracted prior to RT at a total of 364 quadrant-extractions. More extractions were performed in the mandible at a ratio of 1:1.7. Quadrants 1 to 4 had 77, 72, 102 and 113 quadrant-extractions respectively. 83.3% of current smokers, 54% of ex smokers and 70% of non-smokers underwent pre-radiotherapy extractions. Of those who had more than 8 teeth extracted prior to radiotherapy, 19.5% were current smokers, 41.5% were ex-smokers and 39% were non-smokers. Of those who had 1-7 extractions26.7%, 48.9% and 26.7% were current, ex and non-smokers respectively.

Extractions during radiotherapy

No participants had dental extractions during RT treatment.

Post-Radiotherapy Dental Extractions

30 participants underwent post-radiotherapy extractions, with 10 cases having them alone. The mean number of teeth extracted after RT for all cases was 0.85 (Range 0-20, SD 3.0). Teeth extracted post RT were balanced across the mouth, with extractions from quadrant 1 to quadrant 4 as 16, 15, 15 and 16 respectively (Table 2).

Osteoradionecrosis

29 participants (15.3%) had developed ORN at the time of the study. ORN was 5.8 times more common in the mandible than the maxilla.

25 of the 29 cases of ORN (86.2%) occurred in participants who underwent pre-RT extractions, and 22 of the 29 cases of ORN (75.9%) were in sites of pre-RT extraction. Of the 25, 2 cases of ORN developed in participants who had full clearances, and 5 developed in participants who had both pre- and post-RT extractions.

4 cases of ORN (13.8%) developed in the site of post-RT extraction, and 3 (10.3%) were in the same quadrant that had undergone both pre- and post-RT extractions. 2 dentate participants developed ORN without undergoing pre- or post-RT extractions. No participants who were edentulous at the beginning of treatment developed ORN.

Oral Hygiene Status

Oral hygiene status was self reported, with an overall status, brushing times per day and dental visits per year recorded. Participants gave scores for their hygiene both prior to treatment and at the time of questionnaire, reported as poor, fair, good or excellent. Post-treatment the results polarised and the excellent and poor groups made net gains (Table 3).

Quality of Life Measures

The range of values representing quality of life was broad, with the OHIP-14 scores ranging from the lowest possible score to 3 points below the highest possible score. A similar range was found for the FACT-Head and Neck subsets, with the results occupying a large proportion of the available options.

It must be noted that the values for the OHIP-14 and the FACT-H&N measures have different meanings of their sign, ie a higher score for the OHIP-14 represents a poorer quality of life, whereas a higher score for the FACT-Head and Neck represents a richer quality of life. To derive the OHIP-14 mean as a percentage of the theoretical maximum, the inverse was used as to be more comparable (Table 4).

OHIP-14

Female gender was associated with a significantly worse quality of life (6.8 points). Other outcomes that negatively affected the quality of life according to the OHIP-14 score at the 5% level were p16 status and smoking status. p16 negative cases had poorer quality of life, as did current and ex-smokers, with current smokers faring worse.

Pre-RT dental extractions by number revealed that >8 were associated with a significantly worse quality of life than those who had no extractions. While 1-7 pre-RT extractions and post-RT extractions were associated with a reduced quality of life, this was not found to be significant at levels applied. When pre-RT dental extractions were taken as a binary yes or no, the effect on the quality of life was negative but not statistically significant.

Other measures associated with a significantly reduced quality of life included pre-RT full clearance (14.05, p=0.046), and development of ORN (4.74, p=0.036). Current excellent dental hygiene was associated with a slightly improved quality of life (-1.92 points, p=0.004).

There was not a great range of RT doses received to determine a significant effect on quality of life. When the doses are separated into the groups ‘less than 70 Gray’ and ‘greater than or equal to 70 Gray’ there is a negative but not significant effect on quality of life (3.38, p=0.54). Treatment received ie synchronised chemoradiotherapy and other intervention groups did not produce significant results, but again there was a great degree of homogeneity in the data (Table 5).

FACT Head and Neck Subset Scores

The FACT- Head and Neck subset scores were analysed to further understand if associations could be made between particular domains of quality of life and interventions received. Here it can be seen that there is a significant association across all domains between reduced quality of life and smoking status as either current and or ex compared with lifelong non-smokers. p16 negative cases are associated with reduced quality of life in the Social and HNCS domains. Female gender was significantly associated with reduced quality of life in the Emotional Well Being domain (Table 6, Table 7).

Discussion

Comparison of Quality of Life Instruments

Murphy et al reports that Quality of Life instruments can be categorised as either site-specific (in this case, Head and Neck), symptom-specific or treatment-specific[12]. The selected instruments have been taken from different groups, namely the FACT- Head and Neck is a site-specific instrument, and the OHIP-14 is a symptom-specific instrument[8]. It was hypothesised that using instruments from differing paradigms would produce meaningful results. Additionally, data gained can introduce a comparison between the two instruments, as our literature review did not reveal any study comparing data from the OHIP-14 and the FACT- Head and Neck instruments. There was however, one study found which compared OHIP-14 to another member of the FACIT family, namely the FACT- Bone Marrow Transplant [13].

The studies have differing strengths and weaknesses. The OHIP-14 is derived from data collected from Australians and focuses on oral health symptoms [10]. This is important in order to capture any effect from oral hygiene as well as oral health interventions, such as dental extractions, as well as resulting in a high level of applicability as the current study population are Australian as well. The OHIP-14 is also short, and easy to use. However the OHIP-14 relates questions back to teeth, mouth or dentures, whereas the FACT-Head and Neck is more general, which may cause some answers to be different between the two. An example of this is the OHIP-14 question “Have you had painful aching in your mouth” and the FACT-Head and Neck statement “I have pain”. The FACT- Head and Neck instrument is utilised for breadth in that it captures general health data, and specificity in that the Head and Neck Specific questions have been determined especially for patients with head and neck cancer[11].

In this study, the mean of QoL outcomes is similar. The mean score expressed as a percentage of the theoretical maximum quality of life is 71.1% for OHIP-14 and 77% for FACT- Head and Neck. The OHIP-14 values ranged from the minimum theoretical (ie best possible quality of life) score of 0, to a maximum of 53 from the theoretical 56 (worst possible OHIP-14 score). Increased values for the two instruments have opposite meaning, and it can be seen that the FACT-Head and Neck ranges from a score of 147 of theoretical 148 (best possible score) and to a score of 44 from 0 (worst possible score). So while the means are comparable, it can be seen that the OHIP-14 reports a wider range, and the FACT-Head and Neck has a lesser range of negative quality of life scores.

Demographics

The participants were derived from two major and similar hospitals of within the same city, 69.5% from one and 30.5% from the other. The mean age was 64.9 (SD 8.3) and range 34.1 to 89, which is higher than that of diagnosis in HPV-associated (53 years) and non-HPV associated (57 years)[14], but when follow up time of 3 to 9 years is included then this number approaches that in the literature.

Extractions

A large number of participants (67.9%) underwent extractions (mean 5.1 teeth) as part of their pre-RT work-up. This is in keeping with the literature showing head and neck cancer patients present with high dental needs and unmanaged risk factors, poor oral health literacy and low engagement with the dental profession, often persisting post-treatment [4, 15, 16]. 15.5% (20) of those having pre-RT dental extractions went on to have post-RT dental extractions, with only 10 participants having post-RT extractions alone.

Oral Hygiene

Poor pre-RT dental hygiene habits have been published in the literature to persist following treatment [15], despite high adherence to oral hygiene methods leading to reduced complications [17, 18]. This must be seen as a joint responsibility of the patient and the head and neck oncology team, including the dental practitioner. In this study, we found that oral hygiene polarised following treatment, whereby the excellent and poor groups increased in number, and in fact the excellent group doubled from 20% to 39.7%. This was a subjective record, however it shows that despite morbid treatment there is chance of improving oral hygiene. All the participants in this study underwent dental consultation and oral hygiene information prior to RT, and it is hypothesised that such oral health education and intervention can have a positive impact on hygiene practises.

Quality of Life Outcomes

Much of the literature regarding quality of life for head and neck oncologic patients focuses on the difference between transoral robotic surgery and chemoradiotherary, or between HPV positive and negative tumours. Some comparable data does exist for this study in the form of OHIP-14 and FACT H&N results but due to the large number of different instruments used by various institutions, much opportunity for direct comparison is lost, and it is only possible to compare trends, with unclear inter-instrument reliability.

The mean additive OHIP-14 score was 16.1, which is comparable to the score of 18.9 from a study of oral and oropharyngeal cancer survivors at least 6 months post-treatment, and contrasted to the mean of 5.9 from their control group[19]. Factors significantly reducing the quality of life per the OHIP-14 score were found to be female gender, p16 negative status, current vs never smoking status, current vs ex-smoking status, pre-RT dental extractions >8 and pre-RT full clearance. Development of ORN was associated with a worse quality of life. Excellent dental hygiene was found to improve quality of life.

In regards to the FACT- Head and Neck scores, similar results were found. Smoking status resulted in worse quality of life outcomes in the domains of physical, social, emotional and functional well-being. P16 negative status worsened social well-being, head and neck specific scores and FACT-G (general) scores. Female gender worsened quality of life in the emotional well-being domain.

Importantly, dental extractions both pre- and post-RT did not have a significant positive effect on quality of life post-treatment. While extractions did not have a significant

relationship (beyond >8 extractions and OHIP-14 score), both groups were associated with negative effects on quality of life.

Smoking status has been found to be a predictor of not only post-treatment oral health related quality of life, but general health related quality of life in head and neck cancer survivors[20], and the current study confirms this relationship extends to a tiered system where current smokers, ex-smokers and non-smokers have improving quality of life. Additionally, our study confirms the previous findings that p16 positive cases have better quality of life over their counterparts [21], often attributed to improved survival, younger age and lack of smoking, although other studies have found no difference [22].

It is interesting but not surprising that excellent dental hygiene was associated with an improved quality of life score. Improved oral hygiene should lead to improved oral function, and then translate into measurable quality of life differences.

Clinical Implications

The clinical implications are broad. Firstly, the dental needs of head and neck cancer patients are high, and clinicians should make the management of this a priority, as oral hygiene can improve, and is associated with the development of post-treatment complications. Secondly, dental extractions prior to RT do not improve post-treatment quality of life, and may worsen it. Such extractions therefore require great consideration. Thirdly, there are modifiable risk factors that can improve quality of life, namely smoking status, as well as non-modifiable risk factors such as female gender and HPV status that clinicians should identify as requiring greater support from a quality of life perspective.

Further Research

The domains covered by quality of life instruments in the head and neck population have a large amount of consistency. However, with more than 57 instruments to choose from, there is a great need that the advocates for various quality of life instruments in produce or choose a standard instrument, available freely and in multiple languages, so that the international community may benefit from improved communication of collected data and enable higher powered statistical comparison. A higher powered and prospective study investigating dental extractions and quality of life would add great weight to this discussion.

Limitations

It is prudent to address the limitations of a study before discussing the merits of the results so as to ensure the outcomes are viewed in the correct light, and, more importantly, that future studies may be planned accordingly to account for such limitations and produce higher quality data.

In this study, there are number of limitations. There is no true control, nor is there a pre-treatment quality of life baseline, and there is evidence to suggest that longer term quality of life relates to baseline[12, 23]. Due to the nature of the study design, there are opportunities for bias to occur with participants selecting into and out of the study due to personal reasons, for example, developing ORN and desiring to express their concerns. Additionally there is survivorship bias, as all participants have been able to complete the requirements of the study, which selects for p16 positive malignancies and the inherent prognostic factors [24, 25].

Conclusion

Pre-radiotherapy dental extractions may impact health-related quality of life.

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References

1. Schwartz, H.C. and A.R. Kagan, *Osteoradionecrosis of the mandible: scientific basis for clinical staging.* Am J Clin Oncol, 2002. **25**(2): p. 168-71.
2. Curi, M.M. and L.L. Dib, *Osteoradionecrosis of the jaws: a retrospective study of the background factors and treatment in 104 cases.* J Oral Maxillofac Surg, 1997. **55**(6): p. 540-4; discussion 545-6.
3. Schuurhuis, J.M., et al., *Evidence supporting pre-radiation elimination of oral foci of infection in head and neck cancer patients to prevent oral sequelae. A systematic review.* Oral Oncol, 2015. **51**(3): p. 212-20.
4. Jham, B.C., et al., *Oral health status of 207 head and neck cancer patients before, during and after radiotherapy.* Clin Oral Investig, 2008. **12**(1): p. 19-24.
5. Schuurhuis, J.M., et al., *Efficacy of routine pre-radiation dental screening and dental follow-up in head and neck oncology patients on intermediate and late radiation effects. A retrospective evaluation.* Radiother Oncol, 2011. **101**(3): p. 403-9.
6. Chang, D.T., et al., *Do pre-irradiation dental extractions reduce the risk of osteoradionecrosis of the mandible?* Head Neck, 2007. **29**(6): p. 528-36.
7. Kamstra, J.I., et al., *Oral symptoms and functional outcome related to oral and oropharyngeal cancer.* Support Care Cancer, 2011. **19**(9): p. 1327-33.
8. Ojo, B., et al., *A systematic review of head and neck cancer quality of life assessment instruments.* Oral Oncol, 2012. **48**(10): p. 923-37.
9. Gerritsen, A.E., et al., *Tooth loss and oral health-related quality of life: a systematic review and meta-analysis.* Health Qual Life Outcomes, 2010. **8**: p. 126.
10. Slade, G.D., *Derivation and validation of a short-form oral health impact profile.* Community Dent Oral Epidemiol, 1997. **25**(4): p. 284-90.
11. List, M.A., et al., *The Performance Status Scale for Head and Neck Cancer Patients and the Functional Assessment of Cancer Therapy-Head and Neck Scale. A study of utility and validity.* Cancer, 1996. **77**(11): p. 2294-301.
12. Murphy, B.A., et al., *Quality of life research in head and neck cancer: a review of the current state of the science.* Crit Rev Oncol Hematol, 2007. **62**(3): p. 251-67.
13. Silva, L.C., et al., *The Impact of Low-Level Laser Therapy on Oral Mucositis and Quality of Life in Patients Undergoing Hematopoietic Stem Cell Transplantation Using the Oral Health Impact Profile and the Functional Assessment of Cancer Therapy-Bone Marrow Transplantation Questionnaires.* Photomed Laser Surg, 2015. **33**(7): p. 357-63.
14. Vigneswaran, N. and M.D. Williams, *Epidemiologic trends in head and neck cancer and aids in diagnosis.* Oral Maxillofac Surg Clin North Am, 2014. **26**(2): p. 123-41.

15. Bertl, K., et al., *Oral health status and dental care behaviours of head and neck cancer patients: a cross-sectional study in an Austrian tertiary hospital.* Clin Oral Investig, 2015.
16. Rosales, A.C., et al., *Dental needs in Brazilian patients subjected to head and neck radiotherapy.* Braz Dent J, 2009. **20**(1): p. 74-7.
17. Morais, M.O., et al., *The effect of preventive oral care on treatment outcomes of a cohort of oral cancer patients.* Support Care Cancer, 2015.
18. Ben-David, M.A., et al., *Lack of osteoradionecrosis of the mandible after intensity-modulated radiotherapy for head and neck cancer: likely contributions of both dental care and improved dose distributions.* Int J Radiat Oncol Biol Phys, 2007. **68**(2): p. 396-402.
19. Barrios, R., et al., *Oral and general health-related quality of life in patients treated for oral cancer compared to control group.* Health Qual Life Outcomes, 2015. **13**: p. 9.
20. Wells, M., et al., *Predictors of quality of life in head and neck cancer survivors up to 5 years after end of treatment: a cross-sectional survey.* Support Care Cancer, 2015.
21. Maxwell, J.H., et al., *Quality of life in head and neck cancer patients: impact of HPV and primary treatment modality.* Laryngoscope, 2014. **124**(7): p. 1592-7.
22. Sharma, A., et al., *Human papillomavirus-positive oral cavity and oropharyngeal cancer patients do not have better quality-of-life trajectories.* Otolaryngol Head Neck Surg, 2012. **146**(5): p. 739-45.
23. Psoter, W.J. and M.L. Aguilar, *Head and neck cancer radiation therapy with and without chemotherapy may result in decreased health-related quality of life followed by a return to baseline over a 1-year period.* J Evid Based Dent Pract, 2015. **15**(1): p. 25-7.
24. Ringash, J., *Survivorship and Quality of Life in Head and Neck Cancer.* J Clin Oncol, 2015. **33**(29): p. 3322-7.
25. Vainshtein, J.M., et al., *Long-term quality of life after swallowing and salivary-sparing chemo-intensity modulated radiation therapy in survivors of human papillomavirus-related oropharyngeal cancer.* Int J Radiat Oncol Biol Phys, 2015. **91**(5): p. 925-33.

Table 1: Participant Demographics

Tumour Site	**Cases**	**T Stage**	**Cases**	**Prog Stage**	**Cases**
Tonsil	102	TX	2	Stage I	5
Base of Tongue	68	T0	3	Stage II	8
Soft Palate	3	T1	44	Stage III	31
Oropharynx Other or Unspecified	17	T2	66	Stage IVA	134
P16 status	**Cases**	T3	43	Stage IVB	7
Positive	102	T4a	27	Not recorded	5
Negative	15	T4b	1		
Unknown	73	T Not recorded	4		
Smoking status	**Count**	**N Stage**			
Current smoker	24	N0	22		
Ex-smoker	78	N1	32		
Non-smoker	40	N2a	19		
Unknown	48	N2b	74		
Morphology	**Count**	**N2c**	**24**		
Squamous cell carcinoma	181	N3	6		
Other	9	N Not recorded	4		

Table 2: Dental extractions

Extractions	**Count**
Pre-RT extractions	129
Pre-RT full clearance	13
Pre-RT extractions only	109
Edentulous prior to treatment	4
Post RT extractions	30
Post RT extractions only	10
Pre- and Post-RT	20
Pre- and/or Post-RT	139
No extractions (Dentate)	47

Table 3: Oral Hygiene Status

Oral Hygiene	**Poor**	**Fair**	**Good**	**Excellent**
Pre-RT	2.6%	19.6%	57.7%	20.1%
Post-RT	5.8%	11.6%	42.9%	39.7%
Net change	+3.2%	-7.9%	-14.8%	+19.6%

Table 4: Quality of life outcomes

Instrument	**Mean**	**Min (Actual)**	**Max (Actual)**	**St Dev**
OHIP 14	16.1	0	53	12.7
PWB	23.5	3	28	4.7
SWB	21.6	0	28	6.6
EWB	20.0	5	24	4.3
FWB	22.0	4	28	5.7
HNCS	27.1	8	40	7.6
FACT TOI	72.6	19	96	15.7
FACT G	87.1	36	108	17.1
FACT H&N	114.2	44	147	22.9

Table 5: Linear regression for OHIP-14

OHIP-14				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	-0.15	0.119	-0.33	0.04
Gender (M)	-6.84	0.005*	-11.53	-2.14
Morphology	-3.33	0.44	-11.87	5.22
p16 (+ve)	-8.21	0.025*	-15.38	-1.03
Smoking Ex vs C	-6.14	0.039*	-11.96	-0.31
Smoking N vs C	-6.24	0.058*	-12.69	0.20
Pre RT exo 1-7 vs 0	3.82	0.090	-0.59	8.23
Pre RT exo >8 vs 0	4.82	0.033*	0.40	9.23
Post-RT exo	3.56	0.16	-1.40	8.52

Table 6: Linear regression for FACT Head and Neck

Physical Well Being				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.031	0.38	-0.038	0.099
Gender (M)	0.78	0.38	-0.98	2.55
Morphology	1.31	0.41	-1.84	4.47
p16 (+ve)	.66	0.64	-2.15	3.47
Smoking Ex vs C	2.27	0.037*	0.14	4.40
Smoking N vs C	2.78	0.021*	0.42	5.13
Pre RT exo 1-7 vs 0	-0.52	0.53	-2.17	1.12
Pre RT exo >8 vs 0	-0.07	0.93	-1.72	1.58
Post-RT exo	-0.27	0.77	-2.11	1.57
Social Well Being				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	-0.01	0.80	-0.11	0.09
Gender (M)	0.65	0.51	-1.87	3.16
Morphology	1.50	0.66	-2.98	5.98
p16 (+ve)	3.80	0.047*	0.06	7.55
Smoking Ex vs C	2.87	0.06	-0.12	5.86
Smoking N vs C	5.23	0.002*	1.93	8.54
Pre RT exo 1-7 vs 0	-1.66	0.16	-4.00	0.67
Pre RT exo >8 vs 0	-0.71	0.55	-3.05	1.62
Post RT exo	-0.26	0.84	-2.87	2.35
Emotional Well Being				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.04	0.17	-0.19	0.10
Gender (M)	2.06	0.01*	0.47	3.66
Morphology	1.33	0.36	-1.55	4.22
p16 (+ve)	1.07	0.40	-1.44	3.58
Smoking Ex vs C	0.97	0.33	-1.01	2.95
Smoking N vs C	2.53	0.02*	0.34	4.73
Pre RT exo 1-7 vs 0	-0.75	0.92	-1.59	1.43
Pre RT exo >8 vs 0	0.21	0.79	-1.31	1.71
Post RT exo	0.14	0.87	1.54	1.83
Functional Well Being				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.03	0.54	-0.06	0.11
Gender (M)	0.52	0.63	-1.63	2.70

Morphology	1.57	0.42	-2.27	5.41
p16 (+ve)	3.15	0.064	-0.19	6.48
Smoking Ex vs C	3.75	0.005*	1.13	6.36
Smoking N vs C	5.13	0.001*	2.24	8.03
Pre RT exo 1-7 vs 0	-1.09	0.29	-3.10	0.92
Pre RT exo >8 vs 0	-0.22	0.83	-2.22	1.79
Post RT exo	-1.16	0.31	-3.40	1.07
HNCS				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.03	0.65	-0.09	0.14
Gender (M)	0.76	0.60	-2.11	3.63
Morphology	1.43	0.58	-3.70	6.55
p16 (+ve)	4.55	0.035*	0.33	8.77
Smoking Ex vs C	4.17	0.017*	0.75	7.60
Smoking N vs C	3.66	0.058	-0.13	7.44
Pre RT exo 1-7 vs 0	-2.26	0.096	-4.93	0.40
Pre RT exo >8 vs 0	-1.150	0.28	-4.13	1.20
Post RT exo	-1.68	0.27	-4.66	1.30

Table 7: Factor Head and Neck Derived Scores

FACT TOI				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.08	0.48	-0.15	0.31
Gender (M)	2.07	0.49	-3.85	7.98
Morphology	4.31	0.42	-6.23	14.86
p16 (+ve)	8.36	0.069	0.66	17.38
Smoking Ex vs C	10.19	0.005*	3.11	17.26
Smoking N vs C	11.57	0.004*	3.74	19.39
Pre RT exo 1-7 vs 0	-3.87	0.17	-9.37	1.62
Pre RT exo >8 vs 0	-1.75	0.53	-7.24	3.75
Post RT exo	-3.12	0.32	-9.25	3.02
FACT G				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.09	0.49	-0.16	0.33
Gender (M)	4.01	0.22	-2.43	10.46
Morphology	5.72	0.33	-5.79	17.23
p16 (+ve)	8.68	0.09*	-1.40	18.74
Smoking Ex vs C	9.86	0.014*	2.06	17.66
Smoking N vs C	15.68	<0.0001*	7.05	24.31
Pre RT exo 1-7 vs 0	-3.35	0.27	-9.36	2.67
Pre RT exo >8 vs 0	-0.80	0.80	-6.81	5.22
Post RT exo	-1.55	0.65	-8.27	5.17
FACT TOTAL				
Variable	**Coefficient**	**P value**	**95% Confidence Interval**	
Age	0.11	0.51	-0.22	0.45
Gender (M)	4.78	0.28	-3.87	13.42
Morphology	7.15	0.36	-8.29	22.59
p16 (+ve)	13.23	0.051	-0.09	26.54
Smoking Ex vs C	14.03	0.009*	3.62	24.44
Smoking N vs C	19.33	0.001*	7.82	30.85
Pre RT exo 1-7 vs 0	-5.61	0.17	-13.67	2.44
Pre RT exo >8 vs 0	-2.26	0.58	-10.31	5.80
Post RT exo	-3.23	0.48	-12.23	5.77

Statement of Clinical Relevance

Title

Pre-radiotherapy dental extractions and health related quality of life

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Statement

Pre-radiotherapy dental extractions do not improve post-treatment quality of life, and may in fact worsen it.