



Saliva Profile after Intensity-Modulated and Conventional Radiotherapy for Nasopharyngeal Carcinoma



E.H.N. POW*, A.S. McMILLAN, W.K. LEUNG, M.C.M. WONG, D.L.W. KWONG
Faculties of Dentistry and Medicine, The University of Hong Kong, Hong Kong SAR, CHINA

INTRODUCTION

Nasopharyngeal carcinoma (NPC) is a common head and neck tumour among Southern Chinese. The primary treatment of NPC is by radiotherapy because the tumour is highly radiosensitive. Salivary hypofunction is the major oral complication following treatment and causes discomfort and an increased risk of oral diseases like dental caries and fungal infections.¹ A novel technique - intensity-modulated radiotherapy has been introduced which can spare the salivary glands from radiation damage.² To our knowledge, no data are presently available comparing salivary gland changes in NPC patients after conventional and intensity-modulated radiotherapy.

OBJECTIVE

To compare short term quantitative and qualitative changes in saliva of nasopharyngeal carcinoma (NPC) patients receiving conventional radiotherapy (CT) and intensity-modulated radiotherapy (IMRT).

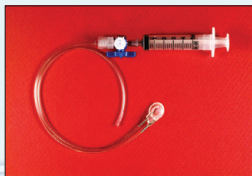
MATERIALS AND METHODS

Subjects

- Double-blinded randomized design.
- 25 consecutive patients newly diagnosed with NPC (T2) recruited from the Queen Mary Hospital, Hong Kong were randomized to either CT or IMRT limb.
- Patients who had history of chemotherapy or radiotherapy in head and neck region were excluded.

Saliva collection and analysis

- Stimulated whole saliva (SWS): chewing of a rubber ring for 5min
- Stimulated parotid saliva (SPS): chewing of a rubber ring and application of 0.1ml 2% citric acid at 3min intervals for 15min, collected using a Lashley cup (Fig. 1) secured over a parotid duct
- Saliva volume, pH and buffer capacity were measured.
- Evaluation points: prior to and 2- and 6-month after treatment performed by single examiner (EHNP).



Data analysis

- Paired sample T, Wilcoxon signed ranks tests to compare changes over time.
- Independent sample T, Mann-Whitney, Chi-square tests to compare differences between groups.
- 5% level of significance was used.

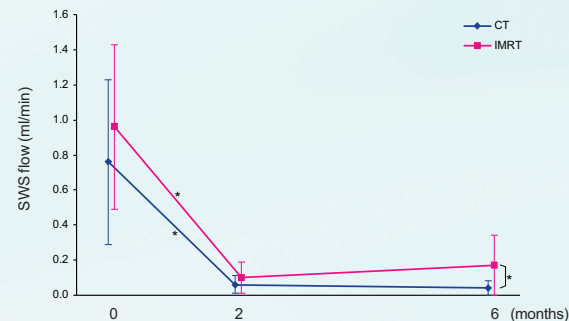
RESULTS

A total of 24 out of 25 patients completed the study. One subject withdrew.

Baseline data before treatment

	CT	IMRT
Number	15	9
Age (mean, SD)	53(9)	44(10)
Gender (M, F%)	87, 13	89, 11
RT dose (mean, SD cGy)	7600(414)	7178(696)
SWS (mean, SD ml/min)	0.76(0.47)	0.96(0.47)
SPS (mean, SD ml/min)	0.05(0.06)	0.06(0.05)
pH of SWS	7.2(0.3)	7.1(0.3)
pH of SPS	6.1(0.9)	6.1(0.8)
Buffer capacity of SWS (high, medium, low %)	93, 0, 7	89, 11, 0
Buffer capacity of SPS (high, medium, low %)	13, 7, 80	11, 0, 89

No significant differences for all variables tested



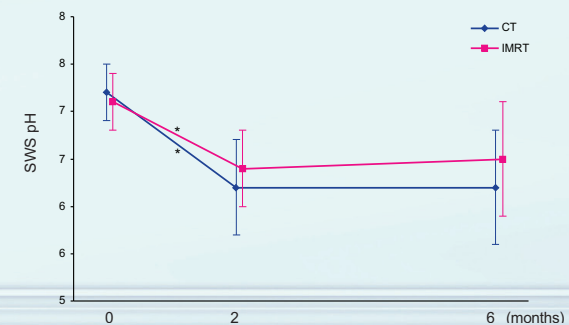
SWS flow (Fig. 2)

- Significant reduction in SWS was found in both groups between baseline and the 2-month evaluation point ($p < 0.01$).
- Significant reduction in SWS was found in the CT group between the 2-month and 6-month evaluation points ($p < 0.01$). No further reduction was observed in IMRT group.
- Significant difference in flow was found between groups at 6-month ($p < 0.05$), with greater flow in the IMRT group.



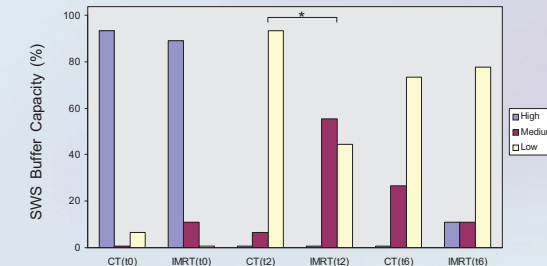
SPS flow (Fig. 3)

- Significant reduction in SPS was found in both groups between baseline and the 2-month evaluation point ($p < 0.01$).
- Significant recovery in SPS was found in IMRT group between the 2-month and 6-month evaluation points ($p < 0.01$). No improvement was observed in the CT group.
- Significant difference in flow was found between groups at 6-month point ($p < 0.01$), with greater flow in the IMRT group.



pH of SWS (Fig. 4)

- Significant drop in pH was found in both groups between baseline and the 2-month evaluation point ($p < 0.01$) and no change was observed afterwards. There was no difference in pH between groups.



Buffer capacity of SWS (Fig. 5)

- The buffer capacity was compromised in both groups between baseline and the 2-month evaluation point ($p < 0.01$). A significant difference was found between groups at the 2-month but not at the 6-month evaluation point.

DISCUSSION

- Both treatments resulted in significant impairment of saliva quantity and quality.
- There was less reduction in SWS flow in the IMRT group.
- The IMRT group demonstrated recovery in SPS flow while CT did not.
- No difference in pH changes between two groups.
- The rate of impairment in SWS buffer capacity was less rapid in the IMRT group, however, both groups were more or less the same as the 6-month evaluation.
- All observed differences in salivary parameters between the two treatment groups were most probably due to differences in radiation dose imposed on the parotid glands.

CONCLUSION

In this short term study, the results indicate that the salivary gland function was markedly less impaired after IMRT and hence the potential risk of xerostomia-induced oral and dental diseases may be minimized. This study is on-going and a parallel study investigating dental parameters is underway to reveal any beneficial effects in the longer term.

REFERENCES

- Schwarz E, Chiu GKC, Leung WK. Oral health status of southern Chinese following head and neck irradiation therapy for nasopharyngeal carcinoma J Dent 1999;27:21-28.
- Sternick S et al. Intensity-modulated radiotherapy. In: Treatment planning in radiation oncology. William & Wilkins, 1998.

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