

# CT textures may predict post-treatment radiation-related fibrosis in Head-and-Neck cancer patients

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## INNOVATION

This study introduces a novel approach for improving the life quality after radiation treatment of patients with head and neck cancer. It aims to predict post-treatment fibrosis which develops in the neck area. Identifying patients at risk before treatment will result in better planning, exploring alternative treatment options or mitigation strategies.

## INTRODUCTION

Radiation therapy can induce skin and muscle changes that result in fibrosis formation which reduces the quality of life after treatment. Our hypothesis is that CT textures on radiotherapy planning CT may serve as a predictor for radiation-induced fibrosis in the neck.

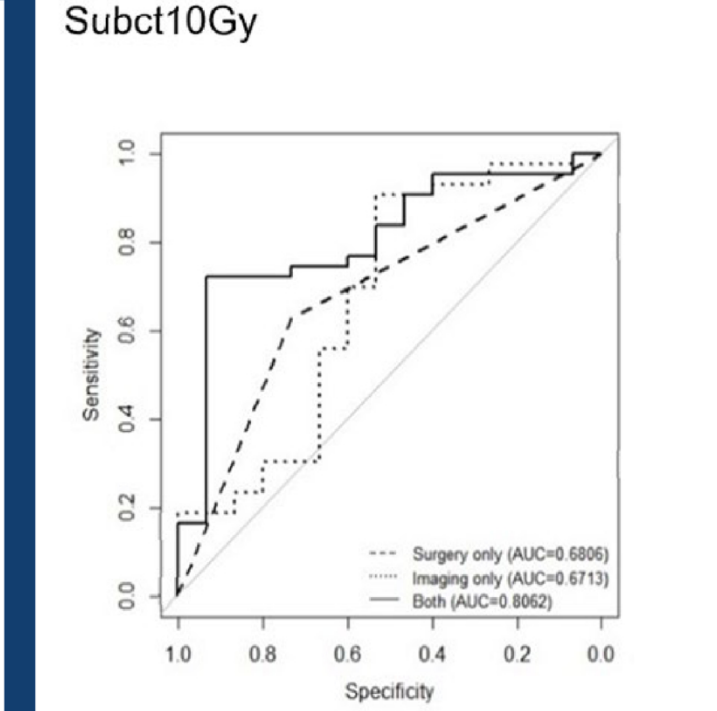
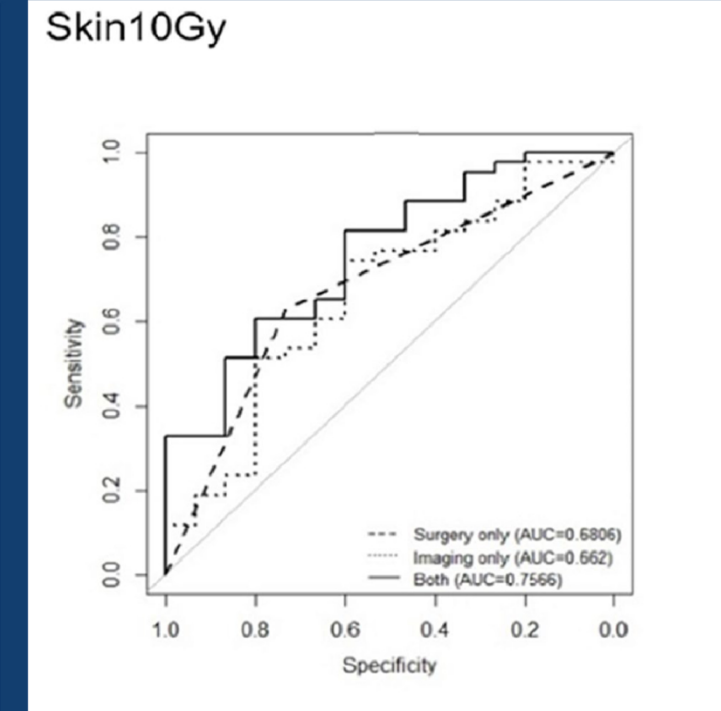
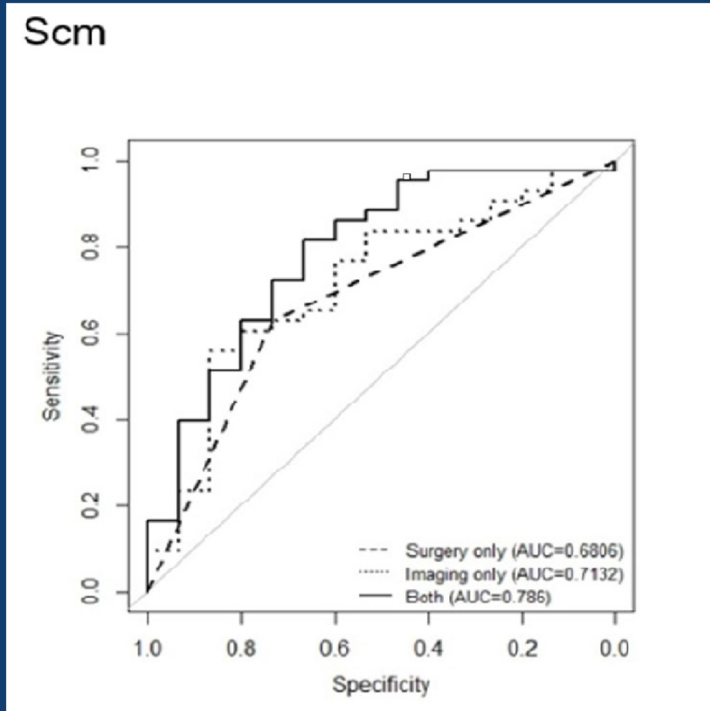
## METHOD

Sixty head-and-neck patients who underwent radiation treatment alone or chemo-radiation were reviewed. Delineation of skin, subcutaneous tissue (SCT) and sternomastoid (SCM) muscle was performed. Skin and SCT volumes were cropped at the 10 Gy isodose line. Approximately 90 textures were extracted using our in-house developed software. Radiation-induced fibrosis (RIF) grade was dichotomized according to validated scleroderma (SSPRO) survey into mild [score 0-25], and severe [score 26-100]. Odds ratio (OR) along with the corresponding 95% confidence interval, and  $p$ -value for each imaging feature were estimated using a univariate logistic regression model. In addition, the predictive value of the features were determined by random forest histogram-based area under the curve (AUC). Some of the patients had prior surgery and therefore it was used as co-variate in the model.

## RESULTS

The statistical analysis shows only 3 skin, 1 SCT and 3 SCM features indicate significant associations with the dichotomized RIF grade (two-tailed  $p$ -values  $< 0.05$ ), showing substantial effect with AUC of 0.757 skin, 0.806 SCT, and 0.786 SCM.

Figures below represent the Receiver Operating Characteristic curves (ROC) for sternomastoid (SCM), skin and subcutaneous tissue (SCT) along with values for area under the curve (AUC). All the values are high (above 0.7) which indicates better accuracy.



## CONCLUSIONS

The presented results suggest that the pre-treatment CT textures can provide a valuable prediction of the development of RIF in head and neck cancer patients undergoing RT. Future work includes expansion of the database and validation through multivariate analyses.

## CONTACT INFORMATION

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