# Multi-scale analysis of apparent diffusion coefficient (ADC) predicts cervical nodal status in patients with head and neck squamous cell carcinoma

Shonit Punwani[1], Pierpaolo Purpura[1], Nikolaos Dikaios[1], Heather Fitzke[1], Alan Bainbridge[2], David Price[2], Scott Rice[1], Simon Morley[3], Timothy Beale[3], Ruheena Mendes[4], Martin Forster[4], Dawn Carnell[4], Thayalini Vaitilingam[3], Nina Newton[1], David Atkinson[1], Steve Halligan[1], and Stuart Taylor[1]

[1]*Centre for Medical Imaging, University College London, London, UK, United Kingdom,* [2]*Medical Physics and Bioengineering, University College London Hospital, London, United Kingdom,* [3]*Radiology, University College London Hospital, London, United Kingdom,* [4]*Head and Neck Oncology, University College London Hospital, London, United Kingdom*

The study assess multi-scale diffusion parameters (median volumetric nodal region of interest values, inter-voxel histogram distributions, and intra-voxel diffusion heterogeneity as assessed by the stretched exponential model) as classifiers of nodal status in patients with head and neck squamous cell carcinoma (SCC). Low b value (0, 50, 100) derived nodal ADC (perfusion sensitive) was the key parameter facilitating discrimination of metastatic from benign nodes in patients with head and neck SCC. The stretched exponential derived α value together with histogram features of ADC provide an accurate decision tree model for classification of nodal disease.