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A Oar  
*Western Sydney University*

Michael Jameson  
*University of Wollongong, [mj77@uowmail.edu.au](mailto:mj77@uowmail.edu.au)*


I. A Ho Shon  
*Liverpool Hospital*

Penny Phan  
*Liverpool and Macarthur Cancer Therapy Centres*

Lois C. Holloway  
*University of Wollongong, [loish@uow.edu.au](mailto:loish@uow.edu.au)*

*See next page for additional authors*

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## Relationship between CT-derived gross tumour volume (GTV) and the FDG-PET/CT-derived metabolic tumour volume (MTV): An exploratory study in non-small cell lung cancer patients treated with radical radiotherapy

### Abstract

Poster presentation from The Royal Australian and New Zealand College of Radiologists 65th Annual Scientific Meeting, 29 October-1 November 2015, Adelaide, Australia

### Keywords

study, exploratory, metabolic, volume, tumour, gross, between, relationship, treated, patients, radiotherapy, cancer, radical, lung, cell, (mtv);, (gtv), non-small, fdg-pet/ct-derived, ct-derived

### Disciplines

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### Authors

A Oar, Michael Jameson, I. A Ho Shon, Penny Phan, Lois C. Holloway, Danyang Wang, Joseph Descallar, A Pramana, Shalini K. Vinod, E Koh, and M Field

# Relationship between CT-derived gross tumour volume (GTV) and the FDG-PET/CT-derived metabolic tumour volume (MTV): An exploratory study in non-small cell lung cancer patients treated with radical radiotherapy

A Oar,<sup>1,2</sup> M Jameson,<sup>1,3,4</sup> I Ho-Shon,<sup>2,5,6</sup> P Phan,<sup>1</sup> L Holloway,<sup>1,3,4,5,7</sup> D Wang,<sup>5</sup> J Descallar,<sup>3,5</sup> A Pramana,<sup>8</sup> S Vinod,<sup>1,2,5</sup> E Koh<sup>1,2,3</sup> and M Field<sup>3,4</sup>

<sup>1</sup>Liverpool and Macarthur Cancer Therapy Centres, Sydney, New South Wales, Australia, <sup>2</sup>University of Western Sydney, Sydney, New South Wales, Australia, <sup>3</sup>Ingham Institute of Applied Medical Research, Liverpool Hospital, Sydney, New South Wales, Australia, <sup>4</sup>Institute of Medical Physics, School of Physics, University of Sydney, Sydney, New South Wales, Australia, <sup>5</sup>University of New South Wales, Sydney, New South Wales, Australia, <sup>6</sup>Department of Nuclear Medicine and PET, Liverpool Hospital, Wollongong, New South Wales, Australia, <sup>7</sup>Centre for Medical Radiation Physics, University of Wollongong, Wollongong, New South Wales, Australia, <sup>8</sup>St George Cancer Care Centre, Sydney, New South Wales, Australia

**Purpose:** Fluorodeoxyglucose positron emission tomography/computed tomography (FDG-PET/CT) is routinely used in staging and radiotherapy (RT) planning for non-small cell lung cancer (NSCLC). Over and above established clinical factors, emerging literature has proposed the novel PET/CT-derived metabolic tumour volume (MTV) as a potential prognostic factor. This study aims to firstly describe the spatial overlap between CT-derived Gross Tumour Volume (GTV) and MTV and secondly, to investigate the impact of this overlap on progression-free survival (PFS).

**Methods and Materials:** To date, medical records of twenty Stage I-III NSCLC patients diagnosed over 2006–2011 who underwent staging and/or planning FDG-PET/CT were reviewed for tumour and treatment characteristics, site of relapse (locoregional and/or distant), and PFS. Metabolically active regions of primary tumour and nodal disease on FDG-PET/CT studies were manually contoured using Osirix<sup>®</sup> (v5.1.12) by consensus between two experienced observers (nuclear medicine physician and radiation oncologist) to derive the MTV. Both observers were blinded to all other clinical and imaging information. CT-derived GTVs used for actual RT were contoured with concurrent PET fusion in the Focal<sup>®</sup> planning system. Osirix<sup>®</sup>-based MTVs were then transferred to Focal<sup>®</sup> for comparison with GTVs. Agreement between GTV and MTV was assessed using the Dice similarity coefficient (DSC), a score from 0 to 1 which measures spatial overlap of two volumes, with 1 indicating perfect agreement. Univariate cox regression was conducted to assess the impact of Stage, histology and DSC on PFS.

**Results:** There were 14 males and 6 females with median age 69 years (range 56–89). Six patients had Stage I, 3/20(15%) Stage II and 11/20(55%) Stage III disease, with n = 7 adenocarcinoma, n = 4 large cell and n = 9 squamous cell tumours. Median RT dose was 66 Gy (range 60–70 Gy). Nine patients received chemotherapy, given concurrently in n = 8. With median follow-up of 19 months (5–73 months), n = 9 experienced isolated locoregional and n = 4 had distant relapse. The DSC between GTV and MTV contours was moderate at 0.58 +/- 0.18. There was no association found between Stage (p = 0.37) and tumour histology (p = 0.69) with PFS. Furthermore, given the moderate degree of overlap, small sample size and number/sites of relapse, the DSC was not associated with PFS (p = 0.86).

**Conclusions:** Preliminary results in a small cohort show a moderate overlap between GTV and MTV, as represented by the DSC. Further investigation in a larger sample will aid in clarifying the relationship between known clinical prognostic factors, novel metabolic parameters and the end-points of locoregional failure and progression-free survival.