A new radiation dose-reduction protocol in monitoring early interim chemotherapy response in lymphoma using $^{18}$F-FDG-PET-CT

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Introduction: There is ever-increasing evidence of $^{18}$F-FDG-PET-CT being useful in monitoring early interim response to chemotherapy in lymphoma. With a concern of radiation burden this study aimed to assess if PET-CT acquisition area could be minimised in order to reduce radiation dose and acquisition time.

Materials and methods: Retrospective 1000 consecutive lymphoma patients (553 male, mean 42.4 years old, 421 Hodgkin’s Lymphoma (HL), 579 Non-HL) was performed to record sites of disease on pre-chemotherapy PET-CT and the first interim post-chemotherapy PET-CT. The body is divided into four conventional parts (head-and-neck, thorax, abdomen and pelvis) for recording sites of disease. The potential reduction in radiation dose and time-saving achieved by limiting to the sites of known disease identified on pre-chemotherapy PET-CT was calculated.

Results: No FDG-uptake was seen in 744/1000 first post-chemotherapy PET-CT. FDG-uptake at known disease sites was seen in 256/1000 cases. 902/1000 of the patients had disease confined to only one or two body parts out of four. Incidental synchronous non-lymphomatous malignancy identified in 48/1000 cases in pre-chemotherapy PET-CT. Post-chemotherapy PET-CT did not reveal any unexpected sites of lymphoma or incidental interval malignancy. Limiting PET-CT to the sites of known disease would have reduced a mean radiation dose by 3.6 mSv (24.3 %), with a mean time-saving of 16 minutes (66.6%).

Conclusion: In order to assess early response to chemotherapy it may be sufficient to scan the sites of known disease. This leads to reduce the incidence of secondary cancers, particularly in the young patients experiencing multiple radiation exposure.
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Introduction

Lymphoma management

Lifetime dose of PET CT is high

Induction of fatal cancer: 5% per Sv

$25\text{mSv}$ will induce fatal cancer in 1 in 800

Early response monitoring, post-chemotherapy follow-up

Aim

Dose minimisation PETCT

Materials & Methods

Retrospective analysis

1000 consecutive lymphoma patients

553 male, 447 female

age 9 - 86, mean 42.4

421 HL, 579 NHL

Pre-chemo PET-CT: sites of disease

Post-chemo PET-CT: estimate of dose and time reduction if confined to sites of disease

Results: PETCT

FDG Uptake

Site

Incidental Synchronous Malignancy

Dose Reduction
Conclusion

Average dose reduction: 3.6 mSv (24.3%)
Average time reduction: 16 minutes (66.6%)

For assessing early response to chemotherapy, a limited PET-CT to the site of the known disease may be sufficient.

This contributes to reduce the lifetime radiation dose & to prevent secondary cancers, particularly in young patients.