CT Pulmonary Angiogram (CTPA) is a widely used study for patients with symptoms suggestive of pulmonary embolism (PE) with approximately 1500 performed in our centre per year. The main diagnostic purpose of a CTPA is to diagnose a PE and this is the gold standard investigation for this particular clinical question. However, CTPA requires ionising radiation and we have a legislative duty to keep the radiation dose as low as reasonably practicable. This may be achieved in a number of different ways, from changing scanning equipment to altering scan parameters. Our project aims to reduce the radiation delivered to patients by changing the anatomical coverage of the scan. A standard protocol extends from the lung apices to the lung bases. We propose a reduced coverage scan from below the humeral heads down to the lung bases, excluding the lung apices. We hypothesise that this would reduce radiation dose to patients without compromising diagnostic accuracy.  

**Purpose**

1. To determine whether a reduced anatomical coverage scan would compromise diagnostic accuracy.
2. To quantify the potential reduction in radiation measured in dose length product (DLP).
3. To reduce the delivered radiation dose to patients.

**Background**

CT Pulmonary Angiogram (CTPA) is a widely used study for patients with symptoms suggestive of pulmonary embolism (PE) with approximately 1500 performed in our centre per year. The main diagnostic purpose of a CTPA is to diagnose a PE and this is the gold standard investigation for this particular clinical question. However, CTPA requires ionising radiation and we have a legislative duty to keep the radiation dose as low as reasonably practicable. This may be achieved in a number of different ways, from changing scanning equipment to altering scan parameters. Our project aims to reduce the radiation delivered to patients by changing the anatomical coverage of the scan. A standard protocol extends from the lung apices to the lung bases. We propose a reduced coverage scan from below the humeral heads down to the lung bases, excluding the lung apices. We hypothesise that this would reduce radiation dose to patients without compromising diagnostic accuracy.

**Methods and Materials**

**Phase 1**

Retrospective data collected from our Trust PACS for all CTPAs from 1st November 2018 to 30th November 2018. Data on the presence of a PE and an isolated apical PE were recorded based on the information on the radiology report. Data analysed with Microsoft Excel.

**Phase 2**

Prospective data collected on CTPAs on a single CT scanner from 6th December 2018 to 21st January 2019 for predicted DLP of a reduced anatomical coverage scan and a standard coverage scan. Data analysed with Microsoft Excel.

**Results**

**Phase 1**

153 patients underwent CTPA between 1st November 2018 and 30th November 2018. 29 patients (19%) had a PE, and of those 29 patients, none had an isolated PE within the lung apices which would have been missed on a reduced coverage CTPA (Figure 1).

**Phase 2**

23 patients had a CTPA between 6th December 2018 and 21st January 2019 in a single scanner with an average predicted DLP of 133.2mGycm for the standard protocol compared with 103.8mGycm for the reduced coverage CTPA. This represented an average DLP reduction of 21% (Figure 2).

**Discussion**

Our concern of a reduced coverage scan is the possibility of missing an isolated PE in the apical segments. We evaluated the diagnostic accuracy for a reduced coverage scan by identifying all patients who had a CTPA and determined whether any patients may have had a missed PE as a result. Our results suggest that there is no case within our timeframe where an isolated apical PE would have been missed.

We then quantified the potential radiation dose reduction by measuring the predicted DLP estimated from the CT scan and compared this for reduced coverage and standard coverage scan. This was found to be an average of 21%.

In summary, our study demonstrates that compared to a standard protocol, reducing the CTPA anatomical coverage reduces the delivered DLP to patients by an average of 21% without compromising the diagnostic accuracy for PE.

**Conclusion and Outcome**

The results of this study were presented to the Cardiacthoracic Radiology Department at our centre, and this has subsequently been introduced into clinical practice for a subgroup of patients:

- Patients with a normal chest radiograph and who are:
  - Aged less than 40 years
  - Pregnant

A new CRIS protocol 'CT Pulmonary Angiogram (Reduced Dose Scan)' is available to Radiologists at our centre. Patients meeting the above criteria will now have their radiation dose reduced by an average of 21%.