Audit of High Resolution Computed Tomography (HRCT) Chest Imaging Quality and Protocol Compliance

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Background

High Resolution Computed Tomography (HRCT) chest imaging must be of good diagnostic quality. If a clinical question cannot be answered by a standard protocol, additional images may be required, e.g. prone or expiratory images. In addition, patients should not be exposed to increased radiation from unnecessary additional scans.

Standard

100% of HRCTs should have sufficient images to adequately answer the clinical question. Our standard protocol is to perform a supine inspiratory study unless otherwise specified (e.g., patient recalled for prone imaging, scans determined in advance by radiologist). Additional scans are then only performed if the radiographer alerts the radiologist to review. As there are no national guidelines nor agreed standard in the literature, the standard used for this audit was a locally agreed guidance list of protocol indications based on best clinical practice (Table 1). Examples of when prone and supine images are required are illustrated in Figures 1-3.

Methodology

Retrospective analysis of 100 consecutive HRCTs from a two month period. All HRCTs were unenhanced images with 1cm slice interval and collimation of 0.625mm for lung parenchymal reconstructions. Data was collected on a proforma detailing demographic information and scan protocols performed. Each examination was judged to be appropriate or inappropriate. Reasons for inappropriate scans were documented.

Results of First Round

100 examinations were included of 52 male and 48 female patients with an age range of 22-85 years. 37/100 (37%) examinations were deemed to have an inappropriate protocol. Reasons were omission of expiratory (22/100), prone (9/100), inspiratory (15/100) or both expiratory and prone (2/100) images, unnecessary prone images (3/100) and, in one instance, HRCT was not indicated and a volume CT was required (Chart 1). As unnecessary images did not hinder diagnosis, 34/100 (34%) scans were inadequate for diagnosis.

Action Plan

Audit results were presented to the radiology department. Educational sessions were held for radiologists and CT radiographers. Protocol indications, shown in Table 1, were added to the CT protocol folder for reference and displayed in CT reporting areas.

Results of Second Round

105 consecutive HRCTs were retrospectively audited following an interval of 4 months after first round completion. All 105 studies were included from 46 males and 59 females with an age range of 21-93 years. 14/105 (12%) had inappropriate protocols. Reasons were omission of expiratory (22/100), prone (9/100), inspiratory (15/100) or both expiratory and prone (2/100) images, unnecessary prone images (3/100) and, in one instance, HRCT was not indicated and a volume CT was required. Only 9/105 (8%) were inadequate for diagnosis. Comparison of first and second round results are shown in Chart 3.

Second Action Plan

A marked improvement in HRCT quality was observed. Results were fed back to the department by means of departmental presentation and e-mail. Vigilance for the presence of mosaicism and basal changes that may require expiratory or prone images respectively was emphasized. Follow-up audit in 6-12 months was recommended.

INDICATIONS FOR PROTOCOLS

**PRONE**

To exclude dependent changes on supine scan

**EXPIRATORY**

>100 days post allograft bone marrow transplant

Rheumatoid arthritis and/or bronchiolitis obliterans

Chronic pulmonary emboli

Extrinsic allergic alveolitis (hypersensitivity pneumonitis)

Suspected or diagnosed sickle cell lung disease

Suspected or diagnosed relapsing polychondritis

Repeat expiratory scan due to previous inadequate scan

Expiratory scan requested by radiologist or clinician

**INSPIRATORY**

If initial scan appears to be acquired in expiration

**RESULTS OF FIRST AND SECOND ROUNDS**

![Chart 3](chart3.png)

**REASONS FOR INADEQUATE SCAN (FIRST ROUND)**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Inadequate expiratory</td>
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<tr>
<td>Inadequate prone</td>
<td>4%</td>
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<tr>
<td>Inadequate inspiratory</td>
<td>22%</td>
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<tr>
<td>Inadequate expiratory and prone</td>
<td>2%</td>
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<tr>
<td>Inadequate prone and expiratory</td>
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**REASONS FOR INADEQUATE SCAN (SECOND ROUND)**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
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</thead>
<tbody>
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**REFERENCES**

