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Assessing tumor response to treatment in patients with lung cancer using Dynamic Contrast-Enhanced CT - A systematic review

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BACKGROUND

- Lung cancer is one of the leading causes of cancer death
- Anti-angiogenic drugs have shown great potential in treatment of lung cancer
- Anti-angiogenic drugs cytostatic effects change vascularity of tumor earlier than changes in size of the tumor.
- New ways of assessing treatment response in patients treated with anti-angiogenic drugs are required
- DCE-CT are already established as a tool to assess acute stokes

AIM

The aim of this study was to provide a complete summary of the literature available on whether DCE-CT may be a useful tool to evaluate treatment response, in patients diagnosed with lung cancer.

METHOD

- This systematic review was compiled according to PRISMA guidelines.
- The literature search was performed in PubMed, Embase, Web of Science and Cochrane Library.
- The search was limited to studies in English, which were published within the last 10 years to include the most recent research.
- Only original research articles concerning treatment response in patients with lung cancer measured with DCE-CT, were included.
- To assess the quality of each study we will implement Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool.

STUDY SELECTION

The initial search yielded 651 publications, of these 16 articles were included in this study. The articles were divided into four groups of treatment.

1. Eight studies included patients who were treated with chemotherapy with or without anti-angiogenic drug.
2. Three studies enrolled patients who were treated with radiotherapy.
3. In one study patients were treated with either chemotherapy, radiotherapy or concurrent chemoradiation.
4. Four studies included patients who were treated with various treatments such as target therapy or thermotherapy, these were categorized as others.

PRELIMINARY RESULTS & CONCLUSION

The included studies have a wide variety of scan protocols, scan parameters and time between treatment and DCE-CT scans.

Preliminary results indicates a trend of decrease in blood flow and permeability between baseline and follow-up scans in patients treated with chemotherapy with or without anti-angiogenic drugs.

Blood volume seems to increase in patients treated with radiotherapy.

DCE-CT may be a useful tool in assessing treatment response in patients with lung cancer. However the heterogeneity in scan protocols, scan parameters and time between treatment and DCE-CT scans complicates the comparison of the included studies. Further studies are needed to clarify DCE-CT ability to evaluate treatment response, in patients diagnosed with lung cancer.

Table 1: An example of data extraction of two studies from group 1 & 2

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Study design</th>
<th>Patients</th>
<th>Diagnosis</th>
<th>Scan parameters</th>
<th>Kinetic model</th>
<th>Treatment</th>
<th>Perfusion scan</th>
<th>DCE-CT factors</th>
<th>Gold standard</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prasad et al. 2011</td>
<td>Prospective</td>
<td>41</td>
<td>Lung adenocarcinoma</td>
<td>100 kVp</td>
<td>0.5 mm</td>
<td>Two-compartmental (Polyak)</td>
<td>Blood flow, BF; BV</td>
<td>BF, BV, TP</td>
<td>PS, RECIST</td>
<td>Significant decrease in blood flow and perfusion between baseline and post-treatment</td>
<td>DCE-CT may allow evaluation of angiogenesis change in tumor microenvironment following treatment; RECIST may allow evaluation of angiogenesis change in tumor microenvironment following treatment;</td>
</tr>
<tr>
<td>Ng et al. 2010</td>
<td>Prospective</td>
<td>33</td>
<td>NSCLC</td>
<td>80 kVp</td>
<td>10 mm</td>
<td>Two-compartmental (Polyak)</td>
<td>Positron emission tomography</td>
<td>BF, BV</td>
<td>N/A</td>
<td>BV increased significantly following chemotherapy using multivariate analysis but not within weight limit evaluation;</td>
<td></td>
</tr>
</tbody>
</table>


Figure 1: PRISMA 2009 flow diagram