COVID-19: Making sense of the literature

Chest X-ray Scoring for Quantifying and Monitoring Disease Progression in COVID-19

Journal Article, Retrospective study

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PICO question: In adult hospitalized patients with COVID-19 pneumonia, can serial x rays measure the disease severity and its progression thus obviating need for serial CT scans.

Background:
- Serial chest radiographs are routinely used in ICU setting in hospitals to monitor the disease progression broadly, to establish position of lines, tubes and oversee overt complications.
- CT is considered most sensitive to detect lung changes, as also in early course of covid-19 pneumonia and can be used to serially monitor the disease progress and outcomes.
- Routine use of CT scan especially in ICU setting is cumbersome and logistically unfeasible, especially with regard to the volume of scans needed in wake of current pandemic, making it unsustainable.
- This study was done to validate the use of chest x rays for lung change quantification and monitoring the progress in covid-19 pneumonia, thus obviating the need for serial CT scans.

Summary

Methods:

Chest X Ray Scoring System
- On the premise that COVID-19 pneumonia presents as ground glass changes with or without consolidation, using RT-PCR confirmed hospitalized patients, scoring system was devised named Brixia score including two steps of image analysis
- Each lung was divided into three zones, named from A to F, upper (A/D) above aortic arch, middle (B/E) below aortic arch to hilum and Lower zones (C/F) below hilum to bases, on both posteroanterior or anteroposterior projections.
- Each zone was given a score of 0 to 3 based on lung abnormalities detected:
  - Score 0 no abnormality, Score 1 interstitial infiltrates, Score 2 interstitial and alveolar infiltrates with interstitial predominance, Score 3 interstitial and alveolar infiltrates with alveolar predominance.
  - Scores were added to form a cumulative CXR SCORE ranging from 0 – 18, with partial score of each zone entered as well. Other additional findings like pleural effusion were mentioned separately.

Validation Study
- Cohort of 100 hospitalized covid-19 confirmed pneumonia patients with available outcome as recovery / death were retrospectively selected.
- All CXRs with new scoring system were retrieved, with the CXR report having highest score in each patient selected.
- All 100 CXR reports were independently assessed by an experienced thoracic radiologist who reassigned new score for each of them.
- To assess agreement between the two scores, weighted Kappa was calculated, and to compare CXR with final outcome, Mann-Whitney U test was used in selected patients. P values of less than 0.05 were considered significant.

Results:
- Score entered in CXR reports ranged from 0 to 16 (median 6.5, interquartile range 2-11).
- Score reassigned by thoracic radiologist ranged from 0 to 16 (median 7, interquartile range 3 - 10)
- CXR scoring agreement was very good, kappa weighted 0.82, CI95% .79 - .86
- Semi-quantitative analysis of both reports(retrieved reports and reassigned by thoracic radiologist),
score was higher in patients who died than with those recovered (p<0.002)

**Conclusion:**
- This scoring system devised exclusively for grading COVID-19 pneumonia in terms of severity and progression in hospitalized patients is simple and can be easily replicated, obviating the need for serial CT scans in these patients.

**Appraisal**
- Only 100 subjects validation cohort included: will impact significance and validity, thus further larger studies needed.
- No comparison available with chest CT scans, which is a sensitive and efficient gold standard, would have added a direct comparison, validity and ruled out associated conditions.
- These patients are at risk of other superadded conditions of critical illnesses / nosocomial infections, which may have confounded the findings.
- Exact localisation not possible with radiographic evaluation.
- Mild illness may go undetected on chest radiographs.
- Quality of evidence C

**Opinion**
This validation cohort preliminary study had a very good inter observer agreement between the reading radiologists, and the overall CXR score was a good parameter to evaluate severity and outcomes, however there is need for larger study for validation. In the current times of pandemic, with the great strain on resources and logistics, the need for serial CT scans can be obviated with use of serial bedside radiographs for semi-quantitative assessment of severity and monitoring the COVID-19 pneumonia especially in ICU setting.

**Appraisers**
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