Coronavirus Disease 2019 and Chest CT

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Letters to the Editor

Coronavirus Disease 2019 and Chest CT: Do Not Put the Sensitivity Value in the Isolation Room and Look Beyond the Numbers

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Editor:

With interest we read the systematic review and meta-analysis by Dr Kim and colleagues (1) published online in April in *Radiology* regarding the value of chest CT in diagnosing coronavirus disease 2019 (COVID-19) infection. Kim et al reported chest CT to have a high pooled sensitivity of 94% (95% confidence interval [CI]: 91%, 96%), but a low specificity of 37% (95% CI: 26%, 50%). However, we believe that there is no convincing evidence yet that chest CT achieves such a high sensitivity in diagnosing COVID-19 in clinical practice. Note that the majority of studies that were included in the meta-analysis by Kim et al (1) (58 of 63 studies) only enrolled patients with proven COVID-19 infection whereas patients without the disease were lacking. Strikingly, this is not in line with their exclusion criterion number 3: "lack of extractable data for a two-by-two contingency table." As a result, these 58 studies only allowed for the calculation of sensitivity, and not specificity. However, the diagnostic value of a test depends on its ability to discriminate between patients with and without disease (2). Sensitivity and specificity are intertwined entities and are both dependent on the threshold value that is applied to discriminate between patients with the disease and those without (2). Generally, creating a high sensitivity by applying a low threshold is at the expense of specificity (2). Multiple studies in the meta-analysis by Dr Kim and colleagues did not report which criteria were used as threshold value (1). The possibility that a low threshold was used remains a realistic scenario. Applying a low threshold in cohorts of patients suspected of having the disease (both with and without an actual COVID-19 infection) may result in virtually all patients classified as having the disease. As a result, sensitivity values in these individual studies and the pooled estimate that was calculated by Dr Kim and colleagues (1) may have been overestimated. It should also be noted that the five studies that did provide a 2 × 2 diagnostic contingency table had numerous methodologic flaws. The lack of high-quality evidence, rather than the mathematical numbers, should have been the main conclusion in the otherwise excellent work by Dr Kim and colleagues (1).

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Response

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We thank the authors for their interest in our study (1). We admit that the third exclusion criterion was described insufficiently. To be exact, studies with a lack of extractable data for true-positive cases and disease-positive cases to calculate the sensitivity or true-negative cases and disease-negative cases to calculate the specificity were excluded.

We understand the concern about the potential of overestimation of the sensitivity for chest CT. The sensitivity and specificity are interdependent measures, and thus higher sensitivity may result in lower specificity of a diagnostic test. Given the circumstance that the majority of studies we analyzed reported only the sensitivity, the threshold effect could not be identified. Nevertheless, we performed a subgroup analysis for the five articles that reported both sensitivity and specificity of chest CT (2–6). In these studies, the pooled sensitivity was 96% (95% CI: 94%, 97%; I^2 = 0%), which was similar to that of the primary analysis (94%; 95% CI: 91%, 96%; I^2 = 95%). For the five studies, the reported sensitivity ranged from 94% to 100%, and the specificity ranged from 25% to 56%. On the basis of the visual evaluation of the coupled forest plot, there was no decrease in sensitivities according to increase in specificities.

Furthermore, we conducted an additional subgroup analysis for the studies with a low risk of bias for the CT interpretation, which clarified that the image readers were blinded to the clinical information or used radiology reports obtained from the routine clinical practice (2,7–29). Again, the pooled sensitivity (93%; 95% CI: 86%, 96%; I^2 = 96%) was comparable to that of the primary analysis. Although there was a huge heterogeneity in the included

studies, we believe our findings would help guide the radiology practice during the outbreak of COVID-19.

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