Maximum Intensity Projection (MIP) versus Computer-Aided-Detection (CAD) in CT Lung Cancer Screening

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Objectives: Evaluate the influence of standard-dose and micro-dose chest CT and three different reconstruction kernels (i30, i50, i70) on the nodule detection rate of two different CAD-systems and the maximum intensity projections (MIP).
Materials/Methods: A total of 226 lung nodules (5, 8, 10, 12 mm, 113 solid and 113 ground glass nodules) were randomly distributed into 55 anthropomorphic lung phantoms. All scans were performed on a 128-row multi-detector CT scanner (Somatom Definition Flash, Siemens, Germany) with a standard dose (100 kVp/100 ref.-mAs) and a microdose level (80 kVp, 6 mAs). The nodule sensitivity of two CAD-softwares (Siemens sygoCT-CAD and Philips Intelli-Space CAD) and two radiologists reading MIP-images (8mm slap / 2 mm slice-thickness) was calculated for standard- and microdose-CT for three different edge enhancing image reconstruction kernels (I30, I50, I70).
Results: The MIP-sensitivity at standard dose level was 97% for all 3 kernels. At microdose level sensitivity for I30, I50 and I70 was 97.6%, 95% and 85.1% (each loss of sensitivity was significant $p<0.05$). SygoCT-CAD at standard dose reached sensitivities of 96.5%, 97.3% and 96% and dropped at microdose level to 96%, 95.6% and 88.9%. Intelli-Space CAD detected significantly less nodules in all dose/kernel combination, best performance of 73.9% and 69% was reached at I70 for standard and I30 for microdose CT.
Conclusions: MIP can detect as much nodules as a CAD at standard and microdose levels, as long as a soft kernel is used. CAD at microdose-CT works best with softer reconstruction kernels.
Clinical Relevance: MIP as stand-alone device is sufficient compared to CAD for lung cancer screening at microdose levels, but the use of a soft reconstruction kernel (I30) is mandatory.

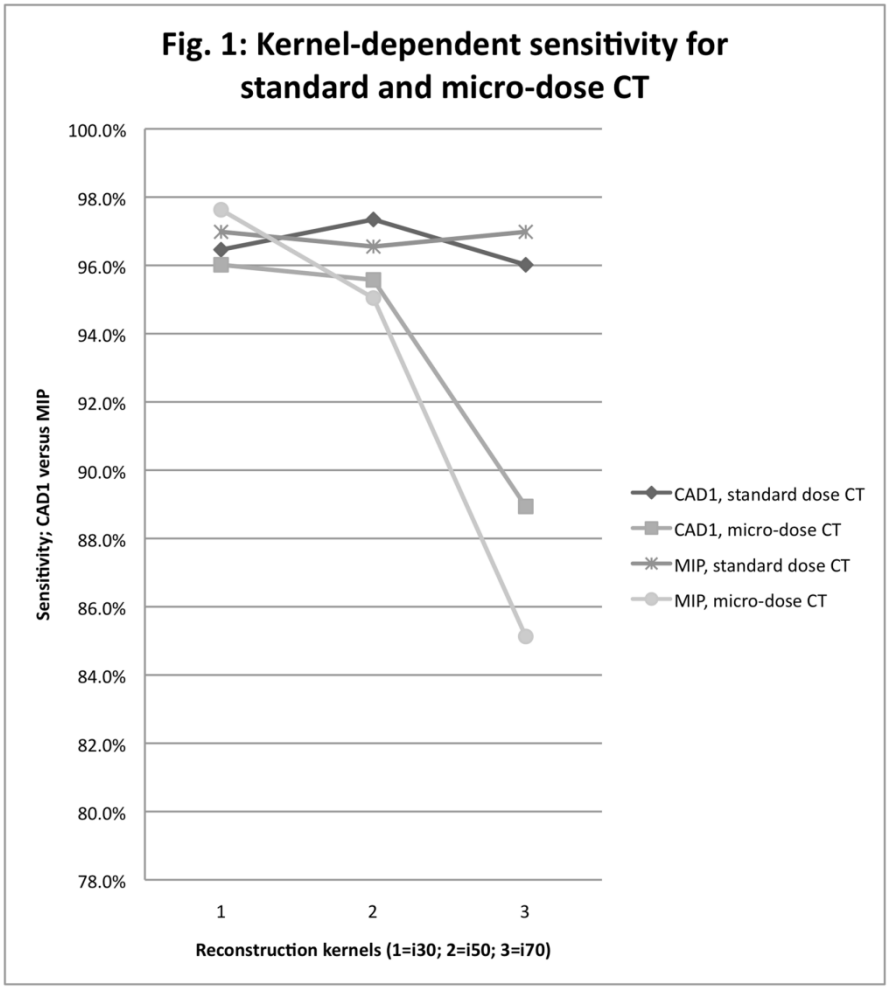
Fig. 1: Kernel-dependent sensitivity for standard and micro-dose CT
100.0%
98.0%
96.0%
94.0%
92.0%
90.0%
88.0%
86.0%
84.0%
82.0%
80.0%
78.0%
Sensitivity; CAD1 versus MIP
1
2
3
Reconstruction kernels (1=i30; 2=i50; 3=i70)
CAD1, standard dose CT
CAD1, micro-dose CT
MIP, standard dose CT
MIP, micro-dose CT