Aim: The aim of this in vivo study was to assess the performance of the light-emitting diode (LED) and laser fluorescence-based (LF) devices in comparing visual examinations for diagnosing occlusal caries.

Methods: A total of 153 occlusal surfaces were investigated. Each occlusal surface was assessed with the LED- and LF-based devices after the visual examination was performed. Pit and fissure openings were applied to the occlusal surfaces in which opacity or discoloration was distinctly visible after air-drying. Inter-examiner reliability of the caries examination was assessed using Cohen’s Kappa statistics. The sensitivity, specificity, and accuracy in diagnosing occlusal caries using these methods were calculated according to appropriate thresholds.

Results: An acceptable inter-examiner agreement was found for the LED- and LF-based devices and visual examinations ($\kappa$: 0.56, 0.61, and 0.81, respectively). Higher specificity values were achieved at a T2 threshold on the laser-based device (0.76 and 0.80), and at a T1 threshold on the LED-based readings (0.60 and 0.62) and visual examination (0.90 and 0.93) for both observers. On the visual examination, higher sensitivity values were found at both thresholds for the two observers in comparing the three caries detection methods (0.98 at T1, 0.96 at T2). Accuracy values for the T1 were higher than the T2 values for the three caries detection methods.

Conclusion: The caries lesion may be detected more accurately than sound areas by both caries detection devices. It was also suggested that the T2 threshold may be more appropriate for determination of sound areas on laser-based devices, and the values of T1 were found as an acceptable threshold for the detection of caries lesion on both devices.