Objective: The aim of this in vivo study was to compare the performance of light-emitting diode (LED)- and laser fluorescence (LF)-based devices with that of visual inspection (VI) in the diagnosis of occlusal caries. Methods: A total of 156 occlusal surfaces were investigated. Each occlusal surface was assessed with LED- and LF-based devices after a VI was performed. Pit and fissure opening was applied to the occlusal surfaces in which opacity or discoloration was distinctly visible after air drying. The inter-examiner reliability of caries examination was assessed using the weighted $\kappa$ statistics. The sensitivity, specificity, and accuracy of occlusal caries diagnosis using these methods were calculated according to the appropriate thresholds. Results: Acceptable inter-examiner agreement was found for the LED- and LF-based devices and VI ($\kappa=0.61$, $\kappa=0.76$, and $\kappa=0.87$, respectively). Higher specificity values were achieved at a T2 threshold for the LF-based device (0.76 and 0.80) and at a T1 threshold for the LED-based readings (0.60 and 0.62) and VI (0.90 and 0.93) for both observers. With regard to VI, higher sensitivity values were found at both thresholds for the two observers in comparing the three caries detection methods (0.98 at T1 and 0.96 at T2). The accuracy values for T1 were higher than those for the T2 values, for all three caries detection methods. Conclusions: Caries lesions may be detected more accurately than clinically sound areas by both caries detection devices.