Abstract. The goal of our cross-sectional study is to determine the efficiency of using an optical coherence tomography (OCT) and a new method for evaluating recorded images for detecting and differentiating middle ear effusions (MEEs). 52 OCT data subset of MEE and healthy ears volunteers were included in a blinded reader quiz via specially designed viewer program AnalysEar. It was conducted using 24 readers from 3 groups of tiered medical expertise. The primary outcome assessed was reader ability to detect presence/absence of MEE. A secondary outcome assessed was reader ability to differentiate serous vs nonserous MEE. Blinded reader analysis of an OCT data subset for detection of MEE resulted in 95.7% accuracy, 98.1% sensitivity, 90.3% specificity, Differentiating MEE type, reader identification of nonserous MEE had 90.6% accuracy, 85.7% sensitivity, 94% specificity, and interreader agreement of 93.4%. We especially want to highlight the OCT-experienced group that has showed accuracy, sensitivity and specificity of detection of MEE at the level of 99%, 99%, and 100%, respectively.

Motivation
Otitis media with effusion (OME) is a non-purulent disease of the middle ear, which is characterized by the accumulation of fluid (exudate) in the tympanic cavity, accompanied by a restriction of the mobility of the tympanic membrane. The clinical picture of OME is characterized by the absence of pain and signs of active inflammation, most often by moderate hearing loss and noise in the ear. The lack of timely correct diagnosis and adequate treatment can lead to the development of complications, including chronic sensorineural hearing loss and reconstructive interventions. The currently existing techniques for determining the presence of liquid in the tympanic cavity have low sensitivity and specificity indicators: standard otoscopy - 74%-87% and 60%-74%, tympanometry - 85.5% and 72%, respectively.

Subjects and Methods
Sixteen adults patients undergoing tympanostomy tube placement were preoperatively imaged using an OCT device. Eighteen OCT data subset of MEE from these patients and eight of healthy volunteers were included in a blinded reader quiz via specially designed viewer program AnalysEar. These 28 images were combined with their duplicate mirror images to get the level of interreader agreement. A total of 52 images participated in this study.

Three reader groups consisted of (1) specialists of a non-clinical profile with prior experience with ear-specific OCT (n=5), (2) otolaryngologists with no previous experience (n=7), and (3) nonmedical professionals as a control group to evaluate for clinical experience dependence.

The experts were explained the purpose of the study, what otitis media is, what OCT is, what the liquid-free cavity looks like, which artifacts can interfere with the assessment, how to distinguish between serous and nonserous exudate, how to see an air bubble in the tympanic cavity, which also indicates the presence of liquid in the tympanic cavity. The program’s capabilities were demonstrated.

The primary outcome assessed was reader ability to detect presence/absence of MEE. A secondary outcome assessed was reader ability to differentiate serous vs nonserous MEE.

Results
Blinded reader analysis of an OCT data subset for detection of MEE resulted in 95.7% accuracy, 98.1% sensitivity, 90.3% specificity, and interreader agreement of 93.4%. Differentiating MEE type, reader identification of nonserous MEE had 90.6% accuracy, 85.7% sensitivity, 94% specificity, and interreader agreement of 91%. We especially want to highlight the OCT-experienced group that has showed accuracy, sensitivity and specificity of detection of MEE at the level of 99.6%, 99.4%, and 100%, respectively.

Conclusion
OCTotoscopy shows promise for facilitating accurate MEE detection. The imageability of using viewer program AnalysEar displays significant results not only with detection of MEE but also with identification of nonserous MEE.