Assessment of Tympanic Membrane
A study of children with otitis media in general practice

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av filosofie/medicine doktorsexamen framläggs till offentligt förvar i Sal 135, byggnad 9, Norrlands Universitetssjukhus Fredagen den 4 april, kl. 09:00.
Avhandlingen kommer att försvaras på svenska.

Fakultetsopponent: Professor, Magnus von Unge, Clinical medicine, Universitet i Oslo, Norge.
Abstract
Background Acute otitis media (AOM) is a common disease in children and is causing great discomfort and disability worldwide but many areas are underserved regarding skilled professional. Tele-otology offers a promising technique to provide ear health globally. Diagnostic accuracy of AOM has regardless of method been found to be low. Grading the severity of AOM may offer a guide in decision on antibiotic treatment, however grading systems need improvement.

Aim To describe and evaluate imaging of the tympanic membrane (TM), develop an image based grading scale for AOM and to study the characteristics and the course of acute otitis media (AOM) episodes in children with the use of telemedicine techniques.

Method This thesis is based on two study populations, 63 children attending with othalgia at four primary health care centers in rural Sweden (papers I, II, IV) and 140 children attending a health clinic from a township in Johannesburg, South Africa, (paper III).

Paper I: Image quality of endoscopic imaging of TM’s, from the Swedish study was assessed by an otologist and two general practitioners together with an evaluation of important characteristics of assessing TM appearance.

Paper II: In development and validation of an image-based grading scale of AOM two expert panels of otologist’s evaluated the proposed grading scale stepwise and in a test and retest validation process.

Paper III: A test of the scale in a clinical situation was set up, an otologist otomicroscopically examined children and used the grading scale, and his diagnoses were set as gold standard. A specially trained ear and hearing facilitator then recorded videos of the TM using video-otoscopy. Videos were remotely assessed by the same otologist and by a general practitioner twice; 4 and 8 weeks after the otologist’s on-site grading.

Paper IV: Children with othalgia were followed with assessments of their symptoms and signs over a period of 3 months. An assessment group of two general practitioners and one otologist evaluated TM images, tympanograms and recorded symptoms and make a diagnose.

Results The results from paper I show that image quality was good and the position and transparency of the TM was found to be the most important characteristics when assessing TM. In paper II the new grading scale (OMGRADE) was developed and validated. The image-based scale focuses on the position and transparency of the TM. The results from paper III showed that the OMGRADE scale could discriminate the normal ear as well as ears with otitis media with effusion (OME) in an unselected pediatric population. Paper IV showed that the bilateral AOM had more severe symptoms. The children with chagrinated TM’s took the longest time to resolve regarding TM appearance and tympanograms. Furthermore, symptoms resolved quicker than TM changes and tympanograms during the first week.

Conclusions TM images or video recordings taken by a trained nurse or facilitator are sufficient for remote evaluation. The new grading scale of TM appearance is valid and reliable and may function as a diagnostic guide together with evaluation of middle ear effusion. TM appearance may be of importance in grading the severity of an AOM episode.

Keywords
Otitis media, acute otitis media, otitis media with effusion, chronic suppurative otitis media, bullous myringitis, tympanic membrane, grading system, scoring system, natural course, telemedicine, video-otoscopy, video-endoscopy, imaging, general practice