



Otoscope vs head mirror: a comparison of commonly used diagnostic tools

Otoskop u odnosu na čeonu ogledalo: poređenje često korišćenih dijagnostičkih alata

To the Editor:

The head mirror might be considered a relict of the past but it is still widely used even in developed countries^{1–3}. A paper published in 1996 analyzed rural hospitals without otorhinolaryngologists in Japan and found that about 70% of the 326 analyzed hospitals had a basic otorhinolaryngology kit (aural speculum, head mirror and nasal speculum)⁴. Due to the relatively low costs, almost no necessary maintenance and the versatility the head mirror remains a very popular choice among primary practice and even otorhinolaryngologists especially in the developing countries. Our research tries to quantify the time needed for examination with the head mirror and the otoscope, the accuracy of both methods in identifying tympanic membrane lesions and colour, the user confidence in results obtained from both methods and the perceived ease of use. The purpose of this study was to find the preferred method for ear examination in the primary health care practice.

This research was done on a group of students who performed exams on a model of the external auditory canal. The model consisted of 1) cardboard box (80 mm × 60 mm × 30 mm) with a 8 mm hole in one side; 2) one polyvinyl chloride (PVC) tube (aperture diameter 27 mm) which was bent to resemble the external auditory canal and had a 5mm process on the opening that was bent towards the opening so to imitate a tragus, and the end opposite to the tragus had a perpendicular cut in it; 3) Several red and orange circular papers that had different three digit numbers on them and served as a substitute for a tympanic membrane. The size of each individual digit was 2.7 mm. One paper was put at the end of the tube (through the perpendicular cut) with the digits facing the opening with the tragus. The tube was put inside the hole of the cardboard box with the tragus side of the tube protruding from the box.

Students were given a short course on the use of the otoscope (Heine mini 3000, 4 mm speculum) and head mirror (Riester Ziegler 90 mm and 4 mm aural speculum) and everyone was allowed to try the method before the timed

exam. All of the students have previously used the head mirror at least once and at most two times in their otorhinolaryngology rotations; only one of the students has previously used the otoscope.

Students were asked to examine the tube with both the head mirror and the otoscope and write down the numbers and the colour of the paper. Papers were changed between exams so no students would look at the same paper twice or influence their colleagues. Of the 51 students that completed the test 26 performed the exam with the otoscope first and 25 completed the exam with the head mirror first. For the otoscope exam, we measured the time needed for the exam from turning on to turning off the otoscope. For the head mirror exam, we measured two times: head mirror setup time and head mirror exam. Head mirror setup time was measured from the point the student took the head mirror until the student said he found a focus, and head mirror exam time was measured from the point the student took the aural speculum and the model in his hands and the end was marked when the student put down either one.

At the end of both exams the students were asked how they were confident that they correctly identified the number and paper colour with the respected method and how easy to use was that method. Confidence was graded on a 1–10 scale where 10 had the highest confidence. Ease of use was also graded on a 1–10 scale where 10 meant easiest.

All results were analyzed using the SPSS 19 software package. The difference between mean exam times for both methods and the differences between perceived confidence and ease of use were analyzed using the Mann-Whitney test. The statistical significance in misidentification frequency for both colour and numbers between the two methods was analyzed using the Fisher's exact test.

The average time needed for the otoscope exam was significantly lower than the time needed for the head mirror exam (15.033 s vs 32.929 s, respectively; $p < 0.05$, Mann-Whitney test) and by logic was lower than the total time needed for the head mirror setup and exam (15.033 s vs 61.582 s; $p < 0.001$, Mann-Whitney test) (Table 1).

Table 1
Otoscope vs head mirror average times, confidence, ease of use values and significance testing

Parameter	Otoscope	Head mirror
Setup time (s), mean (95% CI)	15.03 (12.65–17.41)	27.64 (23.31–33.97) ^a
Exam time (s), mean (95% CI)		32.93 (22.88–42.79) ^b
Setup + exam time (s), mean (95% CI)		61.57 (49.17–73.97) ^a
Confidence*	8.67 (8.08–9.25)	9.14 (8.69–9.58) ^c
Ease of use*	9.14 (8.69–9.58)	7.04 (6.26–7.14) ^a

*Determined using a 0–10 scale where 10 was marked as highest confidence and easiest of use.

^a $p < 0.000$; ^b $p < 0.001$; ^c $p = 0.181$ (Mann Whitney test).

Totally 25.5% and 31.4% of the students misidentified numbers by using otoscope and head mirror, respectively.

The colour identifying accuracy was found to be significantly different between the two groups as the otoscope was found to be more accurate than the head mirror (7.8% vs. 33.3% misidentified, respectively; $p < 0.05$, Fisher's exact test).

Perceived confidence in identified numbers and colour was not significantly different between otoscope and head mirror exams (average grade: 8.667 vs 7.980, respectively; $p = 0.181$, Mann-Whitney test) but the otoscope was found to be significantly easier to use than the head mirror (average grade: 9.136 vs. 7.039, respectively; $p < 0.001$, Mann-Whitney test) (Table 1).

Ear examination is a part of everyday's practice in almost any clinical setting and especially family medicine but family physicians are not usually as skilled at ear examination as otorhinolaryngologists are. Our test group consisted of final year medical students because, we believe, they most accurately represent inexperienced and young general practitioners.

This research clearly showed that the otoscope is a lot faster tool for performing ear exams than the head mirror. The versatility of the otoscope surpasses the head mirror, as it is a lot smaller, easier to fit in a pocket and it is self-illuminating so there is no need to search for an external light source.

The otoscope can also be used for: nose examination, sinus transillumination, diagnosing hereditary teleangiectasia^{5–8}, throat examination and eliciting pupillary reflexes. When it comes to the ease of use the students found the otoscope to be a lot easier to use^{7–9}.

We believe that reading the numbers from the piece of paper, as used in this study, accurately depicts identifying lesions on the tympanic membrane (e.g. perforations) and both methods showed similar accuracy. Although authors^{6–9} don't agree on the colour change of the tympanic membrane as a predictive sign for *otitis media* our study showed that correct colour identifications was superior with the otoscope than with the head mirror.

It is our opinion that the otoscope is a superior tool and that every physician should keep one close at hand.

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R E F E R E N C E S

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