Original research

Video observation of procedural skills for assessment of trabeculectomy performed by residents

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Abstract

Purpose: The efficacy and sufficiency of a healthcare system is directly related to the knowledge and skills of graduates working in the system. In this regard, many different assessment methods have been proposed to evaluate various skills of the learners. Video Observation of Procedural Skills (VOPS) is one newly-proposed method. In this study we aimed to compare the results of the VOPS method with the more commonly used Direct Observation of Procedural Skills (DOPS).

Methods: In this prospective study conducted in 2012, all 10 ophthalmology residents of post graduate year 4 were selected for participation. Three months into training in the glaucoma ward, these residents performed trabeculectomy surgery on patients, and their procedural skills were assessed in real time by an expert via the DOPS method. All surgeries were also recorded and later evaluated via the VOPS method by an expert. Bland–Altman plot also was used to compare the two methods and calculating the mean and 95% limit of agreement.

Results: Residents have been done a mean of 14.9 ± 3.5 (range 10–20) independent trabeculectomy before the assessments. DOPS grade was positively associated with number of independent trabeculectomy during glaucoma rotation ($\beta=0.227$, $p = 0.004$). The intra-observer reproducibility of VOPS measurements was 0.847 (95% CI: 0.634, 0.961). The mean VOPS grade was significantly lower than the mean DOPS grade (8.4 vs. 8.9, $p = 0.02$). However, a good correlation was observed between the grades of VOPS and DOPS ($r = 0.89$, $p = 0.001$). Bland–Altman analysis demonstrated that all data points fell within the 95% limits of agreement (-1.46, 0.46).

Conclusion: The present study showed that VOPS might be considered a feasible, valid, and reliable assessment method for procedural skills of medical students and residents that can be used as an alternative to the DOPS method. However, VOPS might underestimate DOPS in evaluating surgical skills of residents.

Introduction

Medical education has progressed significantly and is going through major changes all around the world.[1] In response to different challenges from society, patients, students, and physicians, medical schools are developing new methods of teaching and assessment.[2,3] The efficacy and sufficiency of a healthcare system is directly related to the skills and abilities of graduates working in the system, which includes not only knowledge and technical skills but also analytical abilities and communication skills.[4] Accordingly, assessment systems must be comprehensive, logical and precise enough to be able to evaluate the required attributes along with assessment of necessary knowledge and skills.[5,6]

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Many different assessment methods have been proposed to evaluate various skills of the trainees, particularly procedural skills. Direct Observation of Procedural Skills (DOPS) is the most commonly used assessment method for evaluating these abilities.[7] In this method, an advanced trainee performs a procedure on a patient, and an experienced and knowledgeable assessor observes the trainee's performance.[7] This method provides high face validity, and the setting of the test closely resembles clinical practice.[8] The most important shortcoming of this approach is that multiple trainees cannot be accurately assessed at the same time. Due to the growing number of residents, the DOPS method will require significant time investment.[9] Another problem is that since residents are aware they are being observed, they might not perform the procedure as they usually do.[9]

Another assessment method recently proposed is Video Observation of Procedural Skills (VOPS), in which the trainee's performance is recorded and later evaluated by the assessor.[10] This method provides the assessor with adequate time and a proper setting for precise step by step assessment of the procedure. This method is more systematic and can be blinded. It also allows the residents to participate in the assessment process and compare their procedural skills with other trainees. The problem with this method is its lower face validity compared to the DOPS method.[10]

One of the important procedures that ophthalmology residents should be able to perform at the end of their training period is trabeculectomy.[11] Since the VOPS method has been proposed recently, few studies are present that have evaluated it validity and feasibility. Accordingly, we aimed to compare the results of VOPS and DOTS assessment methods in evaluating the procedural skills of ophthalmology residents in performing trabeculectomy.

Methods

In this prospective study conducted in 2012, all 10 ophthalmology residents of post graduate year 4 were selected for participation. After three months training in the glaucoma ward of Farabi Eye Hospital and performing trabeculectomy surgery on patients, their procedural skills were evaluated. Trabeculectomy procedure was divided into seven miniskills including: a) peritomy, b) conjunctival dissection, c) Mitomycin application, d) scleal flap creation, e) sclerotomy, f) closing sclera flap with releasable suture, and e) closing conjunctiva and resident's procedural skills were assessed by an expert via the DOPS method based on a 1 to 10 Likert scale for each mini skill. All the surgeries were also recorded and later evaluated via the VOPS method by an expert based on the same grading scale. Finally these grades were compared to each other, and the correlation between VOPS and DOPS grades was analyzed.

In order to minimize the inter-observer error, all VOPS and DOPS assessments were done by a single ophthalmology professor. To evaluate the intra-observer reproducibility of the VOPS assessment, all the videos were re-evaluated by the same observers within two weeks.

The absolute agreement of the grades was analyzed by one-way mixed effect model. The absolute agreement of a single observer's measurements was calculated with the intraclass correlation coefficient (ICC) from a 2-way mixed effect model. Comparisons between two groups were performed using Mann−Whitney U test. Measurements between the two methods were also compared using Bland−Altman analysis, which calculates the mean and 95% limit of agreement. Data were analyzed using SPSS software (version 18 for Windows; SPSS Inc., Chicago, IL, USA).

Results

There were 3 female and 7 male residents in our study group. Residents have been done a mean of 14.9 ± 3.5 (range 10−20) independent trabeculectomy before the assessments. DOPS grade was positively associated with number of independent trabeculectomy during glaucoma rotation ($\beta=0.227$, $p = 0.004$) However, DOPS grade was not correlated with the gender of residents ($\beta = -0.143$, $p = 0.85$). The intra-observer reproducibility of VOPS grades was 0.847 (95% CI: 0.634, 0.961).

We observed a linear relationship between VOPS and DOPS scores (Fig. 1). VOPS scores were consistently lower than DOPS scores (8.4 ± 1.08 vs. 8.9 ± 0.99, $p = 0.02$), as demonstrated by most points falling below the line of equality. The regression coefficient ($\beta = 0.970$, 95% CI: 0.57, 1.37) was not statistically different from the line of equality (slope of 1). There was a bias in which VOPS underestimates the score by 0.20 points compared to DOPS.

In Bland−Altman analysis, all data points fell within the 95% limits of agreement (−1.46, 0.46) (Fig. 2). The mean difference between VOPS and DOPS methods was −0.5 points across the range of mean scores (7.3−10 points), without variation of score difference at different mean score values. Fig. 2 illustrates the mean difference, 95% limits of
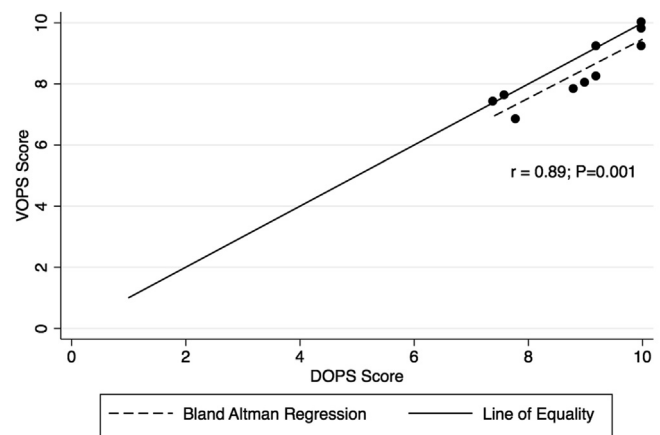

Fig. 1. Scatter plot of VOPS (y-axis) vs. DOPS (x-axis). There is a "line of equality" with slope of 1, representing perfect equivalence of the methods. Our points fall below the line of equality, suggesting that VOPS has negative bias. The linear regression for the points has a slope that is not significantly different from 1 (good equivalence). The y-intercept (constant term) of −0.20 shows that VOPS consistently scores residents 0.20 points lower vs. DOPS.