

Effectiveness of Stepwise Surgical Training Program in Ocular Surgery

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Summary

Background: Training programs are putting increasing emphasis on teaching and assessment of surgical skills. Ocular surgery having a learning curve, is better taught in parts in a stepwise manner as per the training level of the resident.

Methods: A pre-post study was conducted at Mayo Hospital, including a total of 15 post-graduate residents. Step 2, 5, 12 and 13 from ICO-OSCAR:Phaco were evaluated. Pre-training scores were given by resident and supervisor for each step. Training comprised of 3 theater lists with repetition of one step in 5 cases and giving of post-training scores. Mean pre and post-training scores were calculated and paired t-test applied. (p-value <0.01 significant). Correlation was calculated between post- training scores by resident and supervisor.

Results: Out of 15 resident 9 (60%) were in second year of residency and 6 (40%) were in third year. Mean pre-training scores by resident were 2.6, 2.3, 2.7, 2.1 which increased to 4.7, 3.8, 4.4 and 4.3 post-training (p-value 0.00) and mean pre-training scores by the supervisor were 2.7, 2.0, 2.4, 2.7 which increased to mean post-training scores of 4.6, 3.7, 4.3 and 3.6 (p-value 0.00) for incision, capsulorhexis, irrigation/aspiration, and lens insertion respectively. Post training scores of resident and supervisor showed positive correlation for 3 out of 4 steps; 0.289, 0.510, 0.577, -0.99, respectively for incision, capsulorhexis, irrigation/aspiration, and negative for lens insertion.

Conclusion: Pre-post training score differences of both residents and supervisors were statistically significant. The step-wise surgical training program was more acceptable by residents. More ideas need to be generated and step-wise training method pruned with input from supervisors.

Keywords: Ocular surgery; Ophthalmological surgical procedure; Phacoemulsification; Training techniques

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Introduction

Training methodologies have been in continuous evolution and the aim is always to introduce innovations that benefit the training of the residents while ensuring patient safety [1]. Training of Residents and Assessment go hand in hand. Residents are assessed based on their medical knowledge, interpersonal skills, practice based learning and professionalism [2]. The American Board of Ophthalmology included another area in addition to these, namely Surgery [3]. Assessing the surgical skills for ophthalmology residents is increasingly becoming an important part of assessments [4]. Teaching of surgical skills needs to go in consortium with their assessment. Commonly practiced way to teach a surgical procedure is making resident do the steps from beginning to end, and repetition of the whole procedure occurs. International Council of Ophthalmology's Ophthalmology Surgical Competency Assessment Rubric (ICO-

OSCAR: Phaco) provides a detailed, step-wise scoring system to score the efficiency of residents in ocular surgery [5]. Other tools like OASIS [6]. (Objective Assessment of Skills in Intra-ocular surgery) and GRASIS [7]. (Global Rating Assessment of Skills in Intraocular Surgery) have been in use by certain training institutes. Their utility is essentially the same but the difficulty to use a complicated tool makes them not widely appreciated and are adopted by institutions individually for varying levels of complexities. Any ocular surgery is usually learnt from beginning to end. However, some steps are easier done than others, so learning curves associated with different steps are varied [8]. We proposed and conducted a step-wise surgical training program,

in which one step is repeated instead of the whole procedure, and once one step is adequately mastered the next step is introduced. This study was designed to analyse the effectiveness of this stepwise surgical training program in ocular surgery.

Material and Methods

It was a pre-post study design conducted at Eye Unit-3 Institute of Ophthalmology Mayo Hospital, College of Ophthalmology and Allied Vision Sciences, Lahore from September 2022 to December 2022. Sample size of 15 post-graduate residents under training was taken. Non probability, purposive sampling was done. Post-graduate residents year 2 and 3 under training in Institute of Ophthalmology were included in the study. Residents who were unable to complete the minimum number of procedures because of mandatory rotations were excluded from the study.

Data Collection

After approval from Institutional Review Board, 15 post-graduate residents who fulfilled the above criteria were included in the study. Written informed consent was taken. ICO-OSCAR: Phaco Proforma was used as reference [9]. Participants filled the pre-training Proforma in which they scored their confidence in particular step of phacoemulsification (out of four steps being evaluated from ICO-OSCAR:Phaco; Step 2: Incision & Paracentesis, Step 5: Capsulorhexis: Formation and Circular Completion, Step 12: Irrigation and aspiration technique, Step 13: Lens insertion, rotation and final position). Each theater day the resident did the said step on 5 consecutive surgeries. After each list, residents filled a post-training Proforma and scored the confidence in performed step. An increase in score by 2 or more was seen as completion of the said step or three theaters lists whichever came first. A change in score of <2 after three lists was seen as inefficient training method and the resident abandoned the program to continue with normal training structure. Concurrently pre-training and post-training Proforma were filled by supervisor where the resident performance was scored. Once one step had been completed the residents began next step for 3 weeks. Uptil 12 week's four steps per resident were completed as part of the training program.

Data Analysis

All the collected data was entered into and analysed using SPSS version 21. Mean pre-training and post-training scores by residents and supervisors were calculated. Paired t-test was applied to calculate pre-post training change significance. P-value <0.01 was taken as significant. Correlation was calculated between post training scores by residents and supervisors. A correlation of >0.5 was taken as positive correlation. Effectiveness was seen as per the operational definitions.

Outcome

P-value <0.01 in comparison of pre-post training scores and a positive correlation >0.5 between mean post-training scores of resident and supervisor was taken as effective training program.

Results

Out of 15 resident 9(60%) were in second year of residency and

6(40%) were in third year. Mean pre training scores by resident were 2.6, 2.3, 2.7, 2.1 which increased to 4.7, 3.8, 4.4 and 4.3 post training (p-value 0.00) for incision, capsulorhexis, irrigation/aspiration, and lens insertion respectively [Table 1].

Mean pre-training scores by the supervisor were 2.7, 2.0, 2.4, 2.7 which increased to mean post training scores of 4.6, 3.7, 4.3 and 3.6 by supervisor (p-value 0.00) for incision, capsulorhexis, irrigation/aspiration, and lens insertion respectively [Table 2].

Post training scores of resident and supervisor showed positive correlation for 3 out of 4 steps; 0.289, 0.510, 0.577, -0.99, respectively for incision, capsulorhexis, irrigation/aspiration, and negative for lens insertion. [Table 3] [Figure 1].

Discussion

Training programs are centered upon imparting an all-encompassing teaching covering several aspects of professional training simultaneously. Equipping the trainees adequately for safe and methodical surgery is one desirable outcome of the training program. Cataract extraction is the most common ocular surgery performed and one of the most important ones taught as part of ophthalmology specialist training [10]. Teaching ocular surgery is tricky requiring both availability of sufficient resources and time from the supervisor [11]. Trainees take twice the time to perform a surgery than a trainer [12]. This means that supervising a full procedure may be more time consuming, but teaching in a graded manner may lessen the time required to be put in by the supervisor. Mean number of surgeries done by residents as per a survey of 129 ophthalmology programs was 113 per resident. While most residents began their surgeries during first year, 43% of them only completed part of the surgery [13]. This goes

Table 1: Resident score table.

Step	Mean pre-training score	Mean post-training score	P-value
INCISION	2.6	4.7	0.00
CAPSULORHEXIS	2.3	3.8	0.00
IRRIGATION/ASP	2.7	4.4	0.00
LENS INSERTION	2.1	4.3	0.00

Table 2: Supervisor score table.

Step	Mean pre-training score	Mean post-training score	P-value
Incision	2.7	4.6	0.00
Capsulorhexis	2.0	3.7	0.00
Irrigation/asp	2.4	4.3	0.00
Lens insertion	2.7	3.6	0.00

Table 3: Correlation between post-operative resident and supervisor scores.

Step	Mean post-training score resident	Mean post-training score supervisor	Correlation
Incision	4.7	4.6	0.289
Capsulorhexis	3.8	3.7	0.510
Irrigation/asp	4.4	4.3	0.577
Lens insertion	4.3	3.6	-0.99

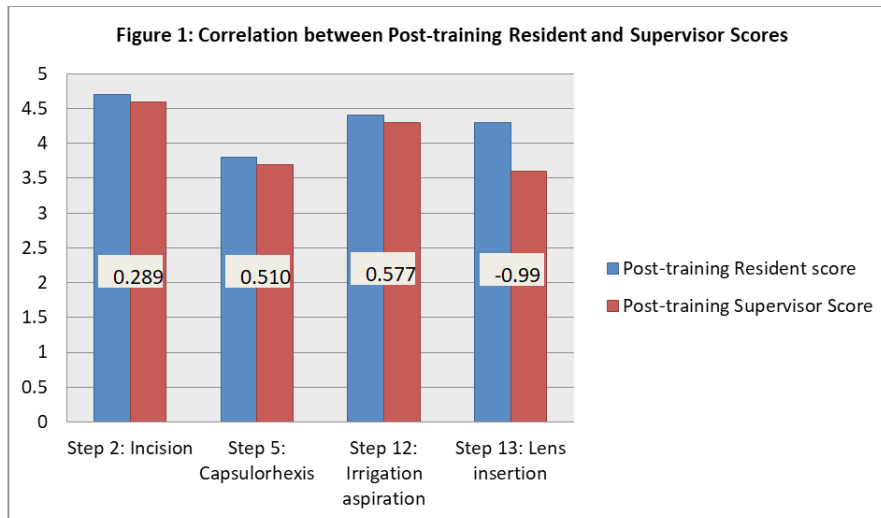


Figure 1 Correlation between Post-training Resident and Supervisor Scores.

to show that mastery over all steps cannot be achieved alike and some steps may be done before others can be performed with the same finesse. The Accreditation Council for Graduate Medical Education has mandated 86 cases to be completed as part of Ophthalmology residency training [14]; however it has been shown that residents performing around 300 surgeries have significant difference in complications rate and superior surgical technique in the last 50 cases than their first 50 cases [15]. This means that putting a cap at total number of 86 is far from exhaustive and more benefit may be obtained with a higher case load. Previously it was the Halsted method of “read one, see one and do one” in practice¹⁶, but in line with ACGME guidelines to innovate teaching methods, Dreyfus model was introduced. As per Dreyfus model [17], the expectations to elicit a particular step are different from a novice, advanced beginner and proficient surgeon, ranging from basic hand-eye coordination, one-handed technique to two-handed technique respectively. The teaching of surgical skills may be broken down into steps, and from a novice, only simpler steps may be elicited while advance beginners engaged for more challenging steps. Once sufficient confidence has been gained at one Dreyfus step, resident can move on to next stage. This method of deliberate practice is what we are suggesting with our stepwise surgical training program. Recent paradigm shift to assessment of surgical skills in addition to teaching has resulted in creation of various scoring methods of

which ICO-OSCAR: Phaco rubric is one example. Wet labs and virtual reality simulators may be gaining in importance as well [18]. In response to ACGME’s call of innovation, an Eye Surgical Skills Assessment Test (ESSAT) was developed and survey conducted from 22 residency programs [19]. This tool consisted of detailed scoring for phacoemulsification wound construction and suturing techniques. This tool also assesses breaking the surgical procedure into parts. As more and more tools are being developed for assessment of surgical skills of residents targeted at various steps of the entire procedure, it is prudent that we start teaching in a step-wise graded manner as well, in addition to covering the cap of total number of surgeries to be performed.

Conclusion

Pre-post training score differences of both residents and supervisors were statistically significant. The step-wise surgical training program was more acceptable by residents. More ideas need to be generated and step-wise training method pruned with input from supervisors to make it more beneficial for teaching and assessment of resident surgical skills.

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