

Surgical skill assessment rubric for Ahmed glaucoma valve implantation surgery

Dear Editor,

Implantation of a glaucoma drainage device is one of the options in the management of complex and refractory glaucoma.^[1] In the past, this device was reserved for patients with failed filtration surgeries. However, in current practice, Ahmed Glaucoma Valve (AGV) is used as a primary procedure especially in eyes with high risk of trabeculectomy failure including neovascular glaucoma; Irido-corneal endothelial syndrome; secondary glaucoma due to uveitis; post keratoplasty; and post-vitreo-retinal surgeries.^[2] Hence, skill in AGV surgery is crucial for ophthalmology trainees, especially those specializing in glaucoma management. Implantation of AGV is technically challenging with a long learning curve especially for beginners. Currently, the emphasis is on assessing the competency of the learner with less inter personnel variations.^[3-5] Tools have been designed to objectively assess the competency of an ophthalmic trainee for different surgical procedures such as Global Rating Assessment of Skills in Intraocular Surgery (GRASIS)^[6]; Objective assessment of skills in intraocular surgery (OASIS)^[7]; and Next Accreditation System in Ophthalmology (NSA).^[5]

The "International Council of Ophthalmology – Ophthalmology Surgical Competency Assessment Rubric" (ICO-OSCAR) is a standardized, internationally validated tool to teach and to assess beginner's competence in performing surgery. This skill-based rubric allows the trainer to objectively assess the beginner's competency in performing a procedure. It also gives the beginner a tool to better understand one's own performance. To date, rubrics have been produced for adult cataract surgery (extracapsular cataract extraction, small incision cataract surgery, and phacoemulsification),^[8] strabismus,^[9] lateral

tarsal strip,^[10] pediatric cataract surgery,^[11] trabeculectomy,^[12] vitrectomy,^[13] anterior approach ptosis surgery,^[14] pan-retinal photocoagulation,^[15] external dacryocystorhinostomy^[16] and pterygium surgery.^[17] Many rubrics had also been designed for assessment of different surgeries on simulators in wet-lab^[18,19] No such tool exists for glaucoma drainage devices. In this paper, we describe our method of developing a rubric for Ahmed Glaucoma Valve (AGV) implantation surgery and conducting Face and Content validation. Face validity is the extent to which the rubric serves the aim of the study (assessment of trainee skills) and Content validity is the extent to which the rubric covers all the steps of the surgery.

Modified Dreyfus model of skill acquisition (novice, beginner, advanced beginner, competent, expert)^[20] was used to structure this rubric with a numeric value for each level of skill. 'Expert' is the highest level of competence, when a surgery can be performed with intuition, making appropriate modifications as required in the surgical steps. As beginners are not expected to become expert during training, the grading point 'expert' was excluded. Surgical procedure was described stepwise and in detail [Fig. 1]. Each step is graded for the level of skill, from novice to competent, based on performance. A description of the performance required for each grade in a step is elaborated. Each grade in each step is given a numeric value starting from novice to competent (1–4). A total of 14 surgical steps and 5 global indices have been described in the rubric. Global variations are included for a few surgical steps (steps 9 and 14: scleral tunnel/track/patch graft) so that the tool can be adapted globally. The trainee is asked to score oneself at each step, and on completion of all steps, the total score helps the trainee surgeon to know the level of competency. The evaluator also scores each step, and the total score of the evaluator and that of the trainee are compared. If a particular step is not done by the trainee, that step is not scored (score = 0). Based on this, the evaluator would be able to discuss the pitfalls of each step and provide specific feedback to the trainee which would make

Figure 1: Surgical Skill Assessment Rubric: Ahmed Glaucoma Valve Implantation Surgery

Step No	Surgical steps	Novice (Score-1)	Beginner (Score-2)	Advanced Beginner (Score-3)	Competent (Score-4)	Score (score-0 if not applicable as the step is not done by the trainee, but by the preceptor)	Remarks
1	Surgical time-out	Has not heard of time out	Aware of surgical time-out but cannot perform confidently. With assistance, can perform but all information is not covered	With minimal help, can perform time-out well. Cannot decide on the size of AGV implant (FP7/FP8)	Can perform Time-out Independently. Performs all the steps correctly. Relevant data, Size of AGV is selected appropriately and is shared with the team members		
2	Eye draping and Placement of speculum	Does not know the steps of draping. Needs help.	Can drape with oral instructions. Surgical site not completely exposed. Lashes are exposed.	Drapes independently. Incomplete coverage of lashes. Only a part of the drape is blocking the view of the surgical site	Drapes independently. Lashes completely covered under the drape. Good eye/head positioning		
3	Exposure of surgical site: Corneal/Limbal Traction Suture	No knowledge on the purpose, location and method of applying the traction suture or the suture material used	Completes on multiple attempts. Needs instruction for correct needle placement and completion. Corneal suture depth is too deep or superficial.	Completes with minimal difficulty. Depth of the needle is adequate, rarely is superficial or too deep causing leak.	Applies with ease. Appropriate length, depth of bite, achieve sufficient exposure of the surgical site		
4	Conjunctival Peritomy	Not able to perform. Multiple irregular cuts, damage to conjunctiva. Chances of Button hole or tears in the conjunctiva	Can perform with difficulty and needs guidance. Knowledge on judgement related to length, depth and instrument and tissue management is inadequate	can perform adequate conjunctival opening with minimal guidance	Performs conjunctival incision without trauma to the adjacent tissue. Conjunctival opening, posterior dissection appropriate for implant insertion		
5	Haemostasis	Unaware of the need and technique of haemostasis, type of cautery. Uses excessive or inadequate cautery	Aware of the need for haemostasis, type of cautery required, and technique. But performs cautery with difficulty	Able to apply cautery but has complications like inadvertent tissue (conjunctival edge or scleral burns), thinning or shrinkage of tissue. Complete haemostasis is not achieved	Applies cautery efficiently and precisely to bleeders only without complications. Has knowledge of pros and cons of various cautery tips		
6	Priming The AGV	No knowledge on purpose and procedure of priming. Cannot engage the cannula into the tube	Has knowledge on purpose and procedure of priming but needs prompting. Cannot engage the cannula into the tube	Is able to perform priming safely. Can engage the cannula and prime, but with multiple attempts	Has complete knowledge of the correct technique and the amount of fluid used to prime. Can prime in a single attempt		

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Figure 1: Contd...

Step No	Surgical steps	Novice (Score-1)	Beginner (Score-2)	Advanced Beginner (Score-3)	Competent (Score-4)	Score (score-0 if not applicable as the step is not done by the trainee, but by the preceptor)	Remarks
7	Anchoring the Plate	Unable to suture the plate to the sclera. Inadequate dissection of sub-tenon's space to insert plate. Improper technique of suture needle holding and suture tying	Able to anchor plate with multiple attempts. Improper needle holding and knot tying techniques. Too loose or too tight sutures. Likely displacement of plate	Able to anchor plate with minimal difficulty. Need more than one attempt. Plate displacement unlikely.	Plate sutured to sclera at adequate position with no difficulty. Plate displacement unlikely.		
8	Creation of scleral track if done	Unable to create scleral track. Superficial track that buttonholes or deep full thickness track with perforation	Able to create flap but not an ideal track. Too superficial/Too deep track. May need additional patch graft	Able to create flap with minimal difficulty. Scleral track depth is adequate	A partial thickness rectangular scleral flap of adequate depth is created. An additional trench is fashioned over the scleral bed for the tube to rest in. Chance of tube extrusion is minimal		
9	Tube track and entry (anterior chamber (AC), posterior chamber, pars plana)	Improper needle bending, inadequate length. Multiple attempts required. Scleral depth is too deep/too shallow. AC entry not in correct plane. Trauma to cornea/iris causing Descemet's detachment or hyphema. Too anterior or posterior entry	Scleral tract correct depth but with multiple attempts. AC entry is not in correct plane. Likely damage to iris root/cornea causing descemet's detachment or hyphema	Able to pass needle at adequate scleral depth. With multiple attempts. Occasionally, AC entry not exactly in the angle but may damage the cornea/iris causing Descemet's detachment or Iridodialysis/Hyphema	Needle track is made 3-4 mm behind the limbus, good track, adequate depth. AC entry in mid angle and parallel to the iris plane. No trauma to cornea/iris Needle entry into the ciliary sulcus/pars plana as planned		
10	Trimming of the Tube	Unable to judge the desired length. Tube too long or too short. No bevel or short bevel/trims bevel down	Able to judge the desired length but unable to cut at desired site. Cannot assess the length until inserted into the AC. May withdraw and need tube trimming multiple times	Able to judge the tube length. Can perform bevel up trimming. May be long or short occasionally	Able to trim the tube at desired length allowing 2mm or desired length in the AC or sulcus. Bevel up trimming to prevent tube block by iris or lens		
11	Tube Insertion	Unable to insert the tube through scleral tract even with multiple attempts. Likely damage to cornea/iris. Tube entered into the ciliary sulcus or vitreous cavity	Able to insert the tube with multiple attempts. Likely damage to cornea/iris while insertion. Likely kinking of the tube and peritubular leak. Cannot manage if enters into ciliary sulcus or into the vitreous cavity	Able to insert tube with minimal attempts. Minimal damage to adjacent tissue. peritubular leak less likely. Can perform iridectomy to expose the tube tip when accidentally the tube enters the sulcus or make additional entry site when tube entry fails despite multiple attempts through the first track	Able to insert tube in single attempt. No kinking and no peritubular leak as tube snugly fits in the scleral tract. Occasionally may need second entry, can manage to perform iridectomy to expose the tube tip or make a 2nd entry successfully		

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Figure 1: Contd...

Step No	Surgical steps	Novice (Score-1)	Beginner (Score-2)	Advanced Beginner (Score-3)	Competent (Score-4)	Score (score-0 if not applicable as the step is not done by the trainee, but by the preceptor)	Remarks
12	Tube fixation with 10-0 nylon suture	Forget or unable to fixate the tube. Multiple unsuccessful attempts made	Able to fixate the tube to underlying sclera but with multiple attempts. Suture depth in sclera is not adequate or suture tied too tightly or too loosely	Able to fixate the tube to sclera. Suture breaks often and needs few attempts Suture depth adequate, unable to bury the knot	Able to fixate the tube with 10-0 nylon. Suture is of adequate depth and firmly adhered to sclera, able to bury the knot		
13	Scleral/corneal patch graft if used	Unable to suture/fix scleral patch graft with glue over the tube. Fashions inadequate/oversized patch graft. Improper technique of suturing or applying fibrin glue	Able to suture graft/fix with fibrin glue but with mobility and displacement. Patch graft trimming inadequate to cover the entire length of the tube. Likely chances of graft dehiscence/displacement and tube exposure	Able to suture graft/fix with fibrin glue with few attempts. Patch graft trimmed to adequate size. Tube exposure less likely	Scleral patch graft is trimmed to adequate size and sutured to sclera/fixated with fibrin glue so with entire length of sub-conjunctival tube covered. Tube exposure unlikely		
14	Conjunctival closure	Cannot perform conjunctival closure. Unable to mobilise the two cut edges of conjunctiva for traction-free, watertight closure. Cannot differentiate between the tenon's tissue and solidified fibrin glue. Improper tissue handling seen.	Insufficient conjunctival closure. Large gape or severe traction at the wound. Needs additional sutures in the area of gape. Increased traction causing occasional conjunctival buttonhole/tears	Can perform good watertight conjunctival closure with guidance. Can judge and put additional sutures if required for good watertight closure	Can efficiently close conjunctiva with adequate tissue approximation, Good tissue handling, closure without any gape or traction/ conjunctival tears.		

learning more objective and quicker. The trainee can then work on improving on the steps with a low score.

The rubric was assessed for face and content validity by a group of expert glaucoma surgeons, having over 5-10 years' experience in performing Ahmed Glaucoma valve implantation and training others in this procedure. These surgeons work across the network of our four tertiary eye care centers located in different states of India. They made various suggestions after assessing the initial draft tool, and recommended modifications to certain steps that are followed by different surgeons. Appropriate amendments were made to the rubric and finally drafted.

The surgical skill assessment tool has an important role in objectively assessing the competence of a novice surgical trainee. The systematic evaluation of the level of competency and scoring helps the trainee to acquire appropriate skills, to improve and to master a new surgical technique. The clearly defined steps help the trainer to objectively assess and appropriately guide the trainee, thereby decreasing subjective variations in assessing. Surgical rubric also helps the trainer to clearly communicate the improvements expected from a trainee to become competent with the procedure. Thus, it serves a dual purpose of training and assessment. To the best of our knowledge, no surgical assessment tools are available for Ahmed Glaucoma Valve Implantation surgery. This rubric for AGV implantation not only details various surgical steps but also takes global indices into consideration. These non-surgical professional attributes commonly known as "non-technical skills for surgeons" (NOTSS)^[21] take into account various aspects such as situation awareness, decision making, communication and coordination with the surgical team members, and also help trainees to develop leadership qualities. This rubric could be developed into standardized tool for training and assessing a novice surgical trainees' competence in performing AGV implantation surgery. The next steps would be to further test the rubric at a multicentre level for further validation and refinement, to standardize it for global implementation.

Few steps for example Antimetabolite use were not included in the rubric as trainees are not expected to make any modifications in the surgery. The study was validated by the institutional expert panel but not by international experts. However, care has been taken that all the steps followed globally are incorporated in the final steps. Hence, this tool for AGV surgery can be used internationally to train and assess the surgical skills.

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Conflicts of interest

There are no conflicts of interest.

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