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Trans-scleral Cyclophotocoagulation Curriculum: Lecture and Skills Practice

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Abstract

Introduction: Trans-scleral cyclophotocoagulation (TS-CPC) is a laser procedure that is often used in the treatment of end-stage glaucoma and glaucoma that is refractory to medical and surgical treatments. However, formal teaching in proper indications and techniques for TS-CPC can be improved in many institutions. In an effort to standardize TS-CPC teaching, a TS-CPC lecture curriculum and a skills practice session were introduced. **Methods:** The lecture and the wet-lab curriculum were developed at the University of Washington to formally teach first- and second-year ophthalmology residents the indications and techniques for TS-CPC. A global rating scale of procedural performance was also developed to assist in evaluating the trained residents on their first three TS-CPC procedures. **Results:** Since its introduction in 2017, the course has been highly rated by seven residents (five PGY-2 and two PGY-3), with an increase in pre- versus posttest scores, as well as an increase in pre- versus postcurriculum scores for three survey questions regarding curriculum objectives. **Discussion:** We feel that this course is valuable in improving learner knowledge of and confidence in performing TS-CPC. Knowledge about indications and technical aspects of TS-CPC improved on testing following the curriculum, as did the self-assessed confidence levels of the residents. Furthermore, there were a number of positive descriptive comments made by the residents. We plan to hold this training session every year at our institution.

Keywords

Ophthalmology, Trans-scleral Cyclophotocoagulation, Glaucoma, Wet Lab, Laser

Appendices

- A. Instructor's Guide.docx
- B. Lecture.pptx
- C. Pretest.docx
- D. Posttest.docx
- E. Retrospective Pretest.docx
- F. Pre-Posttest Answers.docx
- G. Evaluation Form.pdf

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of this session, learners will be able to:

1. List the indications for trans-scleral cyclophotocoagulation (TS-CPC).
2. Accurately explain the TS-CPC procedure to, obtain informed consent (including risks of the procedure) from, and discuss postprocedure management with patients.
3. Perform safe and effective TS-CPC.
4. Evaluate their own performance of the first three TS-CPC procedures on patients using a global rating scale of procedural performance.

Introduction

Trans-scleral cyclophotocoagulation (TS-CPC) is a laser procedure that is often used in the treatment of end-stage glaucoma and glaucoma that is refractory to medical and surgical treatments.¹ However, formal teaching in proper indications and techniques for TS-CPC can be improved in many institutions. Ophthalmology residents often have the opportunity to perform this procedure as early as their first year of residency, though most have never seen the procedure performed.

In an effort to standardize TS-CPC teaching, a TS-CPC lecture curriculum and a skills practice session were introduced. By familiarizing residents with the risks, benefits, and indications of the procedure, as well as the laser equipment and procedure techniques, we can improve resident confidence and safety in

managing patients who require this procedure. To our knowledge, this is the first formalized teaching curriculum for TS-CPC on MedEdPORTAL.

This curriculum was implemented at the University of Washington in 2017 among seven ophthalmology residents (five PGY-2 and two PGY-3) and will be held annually in the future. The target audience is first- and second-year ophthalmology residents and glaucoma fellows. Third-year ophthalmology residents may also benefit from the curriculum.

Methods

The first portion of the course lasts for approximately 20-30 minutes and should be held in a conference room with a projector. Prior to the course, the instructor should have reviewed the lecture slides and notes (Appendices A & B) and prepared sufficient copies of the pretest (Appendix C) for learners ahead of time. The instructor should also print out sufficient copies of the posttest (Appendix D) and the global rating scale of procedural performance (Appendix G) for the end of the session.

Alternatively, the instructor may choose to administer only the retrospective pretest (Appendix E) at the end of the course instead of the pre- and posttests. A document with the answers to these tests (Appendix F) is also provided. The instructor should consider setting up the equipment for the wet lab ahead of time to facilitate a smooth transition following the lecture. This entails having the laser unit plugged in, with a G-probe ready for use, safety goggles readily available, and the Styrofoam holder on a stand or table nearby.

Learners receive approximately 5-10 minutes to complete the pretest, at which point the lecture is given (15-20 minutes). The lecture reviews the indications for TS-CPC, the risks and benefits, and the pre- and postprocedure management, as well as providing an overview of the TS-CPC procedure. After the lecture, the learners all move to the wet lab for the skills practice session, which typically takes 20-30 minutes. The wet lab should be any space that allows the use of porcine eyes. The porcine eyes should be placed in the Styrofoam holder and can be reinflated with balanced salt solution using a syringe and a 30-gauge needle as needed. The instructor then demonstrates the proper laser technique as covered by the lecture, and each learner has the opportunity to practice performing TS-CPC on a porcine eye.

Once all learners have had the opportunity to practice, they return to the lecture site and conclude the teaching session by completing the posttest (5-10 minutes) or the retrospective pretest. Learners then are evaluated on their performance on their first three TS-CPC procedures on patients by the supervising attending using the global rating scale of procedural performance (Appendix G), which assesses various aspects of procedural competency, including tissue handling, time and motion, instrument handling, flow of motion, and knowledge during the procedure.

Results

This curriculum has been implemented at the University of Washington among the first- and second-year residents. With five residents per year, up to 10 residents participate annually. Since the curriculum's introduction in 2017, we have had seven total learners (five PGY-2 and two PGY-3), and the course has been very highly rated, with the average response to the question "How would you rate this course overall?" being 5 out of 5. There was an increase in pre- versus posttest scores following the course (means = 5.6 ± 1.5 versus 10.5 ± 0.7 , respectively; $p = .002$, paired t test; Figure 1), as well as an increase in pre- versus postcurriculum scores for the following three survey questions regarding curriculum objectives (all on a scale of 1-5; Figure 2):

- Survey question 1: How comfortable are you with knowing the indications for performing TS-CPC? Pretest mean score = 2.0 ± 1.2 versus posttest mean score = 4.4 ± 0.9 ($p = .02$, paired t test).
- Survey question 2: How comfortable are you with discussing the risks and benefits of TS-CPC with a patient? Pretest mean score = 1.8 ± 1.3 versus posttest mean score = 4.8 ± 0.4 ($p = .005$, paired t test).

Figure 1. Pre- and posttest scores.

Figure 2. Pre- and postcourse survey results on curriculum objectives.

- Survey question 3: How comfortable are you with performing TS-CPC? Pretest mean score = 1.6 ± 1.3 versus posttest mean score = 4.6 ± 0.9 ($p = .009$, paired t test).

Additional qualitative feedback on the course included the following:

- “I thought the pretest was a good idea so I knew what to focus in on during the talk. No real suggestions to improve, wish we could do this more for other procedure-based things (SLT, YAG, PRP, PI).”
- “I think it was excellent and wish we had more of this type of teaching. I think having both the didactic and the hands-on part were great, and actually going through step by step with supervision was perfect!”

Discussion

Overall, we found that our curriculum significantly improved learners’ knowledge about TS-CPC and their self-assessed confidence in the three objectives of this curriculum.

Compared to other ophthalmic laser procedures, TS-CPC is one of the least difficult to learn. However, learners still commented that it was extremely helpful to be introduced to the laser apparatus, setup, and settings prior to their first procedure on a patient. Furthermore, many of our learners made comments

during the curriculum regarding specific information that they found useful. A number of them commented that it was the first time any instructor had emphasized the importance of laser safety goggles covering the appropriate laser wavelength. They also found that specifying the 1- to 2-mm posterior location for the probe footplate placement was very useful and appreciated the tip of using transillumination to assist in identifying the anterior border of the ciliary body. Of note, these concepts were frequently missed on the pretest.

Two options are provided for assessing efficacy of the curriculum: the traditional pre- and posttest to be given at the beginning and end of the course, respectively, or a single retrospective pretest at the end of the course. As the retrospective pretest is administered only once, it may be useful in situations where time for the course is limited or there is a need to maximize wet-lab or lecture time. Furthermore, the retrospective pretest minimizes response-shift bias in case a participant's frame of reference changes over the course of the curriculum. However, the retrospective pretest addresses only the learner's subjective assessment of his or her knowledge before and after the course, whereas the pre- and posttests assess specific topics. An instructor may choose to use a combination of the knowledge assessment questions in the pre- and posttests for a more objective assessment of knowledge improvement and the retrospective pretest for a more subjective assessment of knowledge improvement.

A recent study comparing checklist evaluations to global assessment rating scales found that the latter were better assessments of procedural competency.² Within the ophthalmology literature, a few global rating scales have been created based on one developed and validated by Reznick, Regehr, MacRae, Martin, and McCulloch at the University of Toronto.³ These include the Global Rating Assessment of Skills in Intraocular Surgery,⁴ used to assess cataract surgery proficiency, and the Eye Surgical Skills Assessment Test (ESSAT),⁵ used to assess three simulated ophthalmic surgical procedures. We modified the global rating scale used in the ESSAT to evaluate procedural proficiency for TS-CPC. All learners are observed and assessed on their first three TS-CPC procedures on patients using this form.

A limitation of our model is that the porcine eyes did not respond exactly the way human patient eyes do. We were unable to simulate the pops that can occur in human patient eyes when energy levels are high. This may be due to the increased thickness of the porcine sclera compared to human eyes, which could make the laser energy transfer to the ciliary body less effective. One of the treatment protocols adjusts the laser power based on when audible pops in the tissue are heard. Ideally, our laser model would be able to reproduce this so that our learners can appreciate the sound of these pops. However, in a survey of ophthalmologists who perform TS-CPC, only 19.4% of responders felt that it was necessary to hear pops during the procedure,⁶ so this is not considered a crucial component to successful TS-CPC. Though likely less cost-effective, an alternative to porcine eyes is donor human cadaver eyes, which may more successfully reproduce an audible pop.

Given the unanimous score of 5 out of 5 from all of our learners and the overall positive feedback we received, we feel that this course is valuable in improving learner knowledge and confidence in performing TS-CPC. We plan on continuing to hold this training session every year with an emphasis on ensuring participation from the newest residents and encouraging more senior residents to consider refresher course participation.

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Disclosures

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Ethical Approval

Reported as not applicable.

References

1. Ishida K. Update on results and complications of cyclophotocoagulation. *Curr Opin Ophthalmol*. 2013;24(2):102-110. <https://doi.org/10.1097/ICU.0b013e32835d9335>
  2. Walzak A, Bacchus M, Schaefer JP, et al. Diagnosing technical competence in six bedside procedures: comparing checklists and a global rating scale in the assessment of resident performance. *Acad Med*. 2015;90(8):1100-1108. <https://doi.org/10.1097/ACM.0000000000000704>
  3. Reznick R, Regehr G, MacRae H, Martin J, McCulloch W. Testing technical skill via an innovative "bench station" examination. *Am J Surg*. 1997;173(3):226-230. [https://doi.org/10.1016/S0002-9610\(97\)89597-9](https://doi.org/10.1016/S0002-9610(97)89597-9)
  4. Cremers SL, Lora AN, Ferrufino-Ponce ZK. Global Rating Assessment of Skills in Intraocular Surgery (GRASIS). *Ophthalmology*. 2005;112(10):1655-1660. <https://doi.org/10.1016/j.ophtha.2005.05.010>
  5. Fisher JB, Binenbaum G, Tapino P, Volpe NJ. Development and face and content validity of an eye surgical skills assessment test for ophthalmology residents. *Ophthalmology*. 2006;113(12):2364-2370. <https://doi.org/10.1016/j.ophtha.2006.08.018>
  6. Agrawal P, Dulkan S, Nolan W, Sung V. The UK National Cyclodiode Laser Survey. *Eye (Lond)*. 2011;25(2):168-173. <https://doi.org/10.1038/eye.2010.174>
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