# Lateral Canthotomy & Cantholysis

## Emergency Surgical Treatment of Orbital Compartment Syndrome (OCS)

Curriculum for Lateral Canthotomy & Cantholysis (LCC)

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## INSTRUCTOR DOCUMENTS



## STUDENT DOCUMENTS



**Congratulations! You are about to lead a training on a sight-saving procedure Lateral Canthotomy and Cantholysis.**

This is a comprehensive guide that includes all documentation and guidance and needed for both you, the instructor, as well as students. Pay special attention to the pages in this training booklet, they are noted as **"Instructor Documents"** and **"Student Documents"**. Each section includes its own set of documentation that will be used throughout the training. You are encouraged to read through instructor documents before leading a training session. Additionally, this package includes a comprehensively narrated Curriculum presentation – play this presentation during the didactics phase of the training to give students and learners a broad overview of Orbital Compartment Syndrome (OCS) and Lateral Canthotomy and Cantholysis (LCC). The PowerPoint is self-narrated – you may pause the presentation at any time to ensure all students can take notes and ask questions. All information in the presentation will provide the students ample knowledge to succeed in this training. Supplemental refresher tools, such as the Lateral Canthotomy and Cantholysis application (for Android and Apple devices) and the LCC Refresher Card (Printable) are available to students after the training to stay refreshed on essential information from the training.

# Lateral Canthotomy and Cantholysis (LCC) – A Sight Saving Procedure

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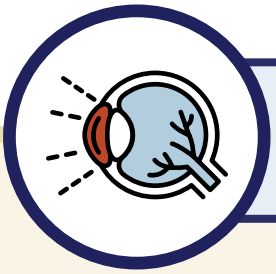
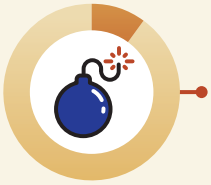


**Lateral Canthotomy and Cantholysis (LCC)** is a sight-saving procedure for patients with orbital compartment syndrome (OCS) who require emergent care.



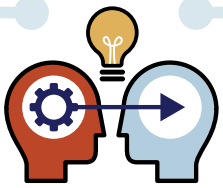
Eye injuries have contributed from **between 5-10%** of combat trauma over the past 15 years, mainly due to IEDs.[2]

Orbital compartment syndrome (OCS) can quickly lead to blindness due to ischemia (lack of blood supply) to both the optic nerve and retina.[5]

Multiple cases of preventable blindness were reported due to a lack of ophthalmologic injury treatment.[3]

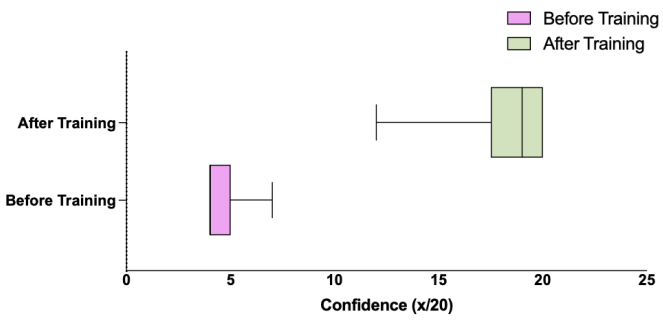
Timely treatment is crucial; many patients treated with LCC within two hours of injury had full recovery of vision, while those treated after 2.5 hours had minimal recovery of vision.[7]

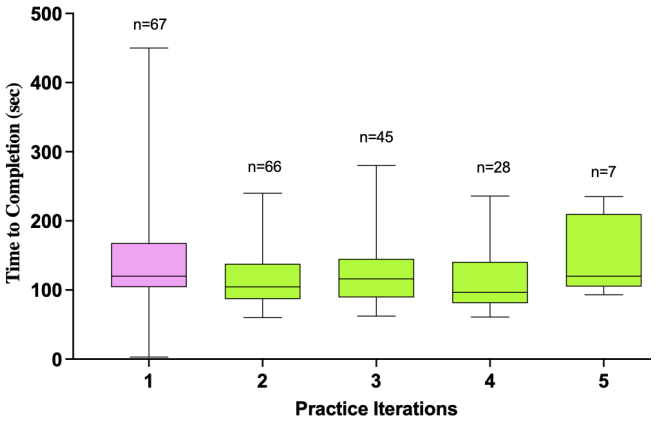
Release of this pressure is critical and lateral canthotomy and cantholysis (LCC) is utilized to relieve orbital compartment syndrome.[4]



A Mastery Learning model allows learners to practice with coaching as many times as needed to reach competence.

POWERED BY VALIDATION DATA:




Top: Data collected from novice learners show a decrease in time-to-completion of each respective practice iteration of the LCC procedure.

Bottom: The graph depicts a significant increase in confidence to adequately perform an LCC prior to taking this training course in LCC (Pre-curricular) compared to completing the training (Post-curricular)

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Training Documents

# INSTRUCTOR

## GETTING STARTED: INSTRUCTOR ROLES AND RESPONSIBILITIES

Use this Roles and Responsibilities Worksheet to guide each phase of the LCC Training. The Instructor will provide guidance, mentor hands-on training, and evaluate learners, preferably in an austere medical environment. The bolded items refer to documents included in this training package – use the respective documents needed in each phase of the training outlined below.

**Pre-Training Preparation - Consider the following questions to guide your training preparation:**

- How many students will attend a training session? Based on the total number of students who plan to attend, training areas should be configured and optimized to support this number.
- How many instructors can support the training? This can significantly change total throughput during the testing phase, which must be completed one-on-one (one trainer to one student). Consider our "Good, Better, Best" ratios of trainers to students for the Hands on Training Phase, based on total student count.

**Good:** 1 Trainer to 8 students, **Better:** 1 Trainer to 4 Students, ★ **Best:** 1 Trainer to 1 or 2 students

- How can the training space be optimized for the course? Depending on what room(s) are available, consider having distinct spaces for Introductions & Didactics, Hands on Training, and Testing Phases. If space is limited, consider prioritizing a separate, austere testing environment for the final evaluation phase.

**Phase 1 - INTRODUCTIONS & DIDACTICS: Once students have been directed to the training room/station, the Instructor can begin training.**

- Prepare learning materials - Print a copy of the **Instructor Materials** for yourself and adequate copies of the **Student Materials** for each student.
- Play the **Lateral Canthotomy & Cantholysis PowerPoint** - This is a fully narrated presentation. You can pause at any time to take questions or to reinforce a point - all critical information is included in the narration. You may use the **Instructor Notes Page** for your reference if need be. Encourage students to take notes on their **Student Notes** pages and ask clarifying questions as needed. *NOTE: The presentation contains graphic images of eye injuries – please review the slideshow beforehand, and make students aware of this prior to initiating training.*
  - An optional **Knowledge Assessment** can be administered after the PowerPoint presentation. You may elect to review answers with students. The **Knowledge Test Answer Key** is provided in your instructor materials.
- *This should take ~30 minutes to complete.*

**Phase 2 - HANDS-ON TRAINING: After the Didactic Phase, consider moving to a different space with pre-set stations to start the Hands-on Training Phase.**

- Set up stations with LCC Simulators (Task Trainers) and all surgical equipment needed.
  - Equipment List - **See Slide 21 of the PowerPoint Presentation**.
  - Review the list of all necessary equipment to perform the LCC with students. (See **Training Set Up Suggestions**).
- Introduce the Lateral Canthotomy & Cantholysis Simulator/Task Trainer (Suggested task trainer - Lateral Canthotomy and Cantholysis Training System by Sonalysts)
  - Demonstrate proper identification of anatomical landmarks on the model. Emphasize the difference in pressure of an orbital compartment syndrome (OCS) eye compared to a non-OCS eye.
- Demonstrate the procedure to the class:
  - Review proper usage and safety mechanisms of surgical tools NOTE: Proper syringe usage is not included as part of this training. When demonstrating the injection step, simply simulate needle usage with the needle sheathed. Remind students not to open up the needle to avoid being stuck.
  - Using the **LCC Procedural Checklist**, the instructor will read aloud each step while demonstrating the procedure in real time on the simulator.
  - Demonstrate how to properly identify an eye with OCS versus a normal eye (control eye) using the appropriate eye simulator for each. Ensure students palpate each eye to note the difference in intraocular pressure. Consider putting one control (non-OCS) eye and one OCS eye in the simulator, and have students take turns to first feel and correctly identify which eye needs the procedure before moving forward. Instructors can then go through the entire step-wise process of the LCC.
  - Answer questions from students as needed.
  - This should take ~15 minutes to complete. Then have the class split into small groups or pairs for hands-on mentored practice.

- Practice in small groups using the Mastery Learning Model
  - At each training station, have a simulator, surgical tools, practice log, time-keeping device, and LCC procedural checklist at the ready. Have students each differentiate an OCS eye from a non-OCS eye. With instructor approval after correctly identifying the eye, students may run through the entire procedure using the checklist at each table.
  - Students should practice all steps in the procedure, using a stopwatch or timer, while marking their progress on the **LCC Practice Log** worksheet. Ensure that students wait the full 30 second pause during the clamp step.
  - Have each student review the steps they completed on the **LCC Checklist** in order to determine their practice LCC score for each attempt.
  - The instructor can move about the practice space and provide feedback to each small group or pair, providing corrections and guidance as needed.
  - Students are ready to test out once the practice log has been reviewed by the instructor and the student can do the procedure at least twice consecutively (both Right and Left eye) under 3 minutes, with all items on the checklist completed.
  - On average, most students will need 4-6 practice attempts to complete the LCC in under 3 minutes and achieve a passing LCC score.

    *NOTE: Notice that the LCC Practice Checklist has more steps than the LCC Evaluation checklist – the extra steps in the practice version are meant to enhance student understanding and improve technique.*
  - This training phase can take anywhere from ~20-30 minutes depending on the learner and class size.

## Phase 3 - SUMMATIVE EVALUATION: In the austere testing environment, prepare to evaluate students.

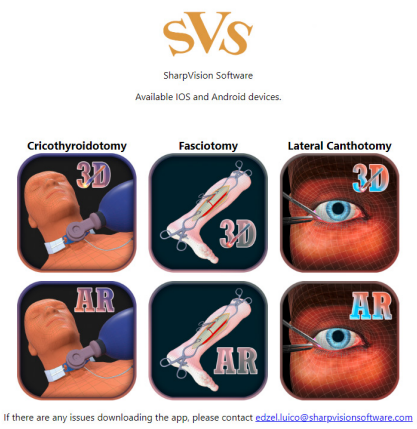
- Set up the LCC Simulator in an austere environment or training lane.
- Evaluate student performance using the **Lateral Canthotomy & Cantholysis Evaluation Checklist** and a timer.
- Do not provide feedback during the test out.
- A passing performance is defined as successful completion of the procedure under 3 minutes and all critical items on the Procedural Checklist
- Provide feedback following completion of procedure, and retest if necessary.

## Phase 4 - DEBRIEF

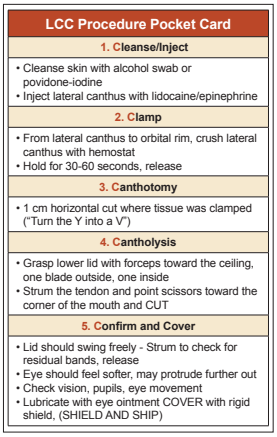
- Review performance and provide suggestions to students as needed

## NEW! POST TRAINING Suggested Refresher Tools

- Virtual Reality Lateral Canthotomy & Cantholysis application is available for download on Andriod and Apple devices:
  iOS: **http://battlefieldarassist.us/**
  Android: **https://drive.google.com/drive/folders/1dlW-91rve8iKvMKYuSZjhBB4t1MJ298O**.
  - After training, this application will refresh students on the LCC procedure as well as testing knowledge and skills
  - Students can use the application in the future to refresh their procedural knowledge on LCC.
- Printable **LCC Pocket Card**
  - Students can keep pocket cards for quick access to review LCC steps.







**LCC Procedure Pocket Card**

**1. Cleanse/Inject**
- Cleanse skin with alcohol swab or povidone-iodine
- Inject lateral canthus with lidocaine/epinephrine

**2. Clamp**
- From lateral canthus to orbital rim, crush lateral canthus with hemostat
- Hold for 30-60 seconds, release

**3. Canthotomy**
- 1 cm horizontal cut where tissue was clamped ("Turn the Y into a V")

**4. Cantholysis**
- Grasp lower lid with forceps toward the ceiling, one blade outside, one inside
- Strum the tendon and point scissors toward the corner of the mouth and CUT

**5. Confirm and Cover**
- Lid should swing freely - Strum to check for residual bands, release
- Eye should feel softer, may protrude further out
- Check vision, pupils, eye movement
- Lubricate with eye ointment COVER with rigid shield, (SHIELD AND SHIP)

# Event Flow and Training Locations (Fillable Sheet)

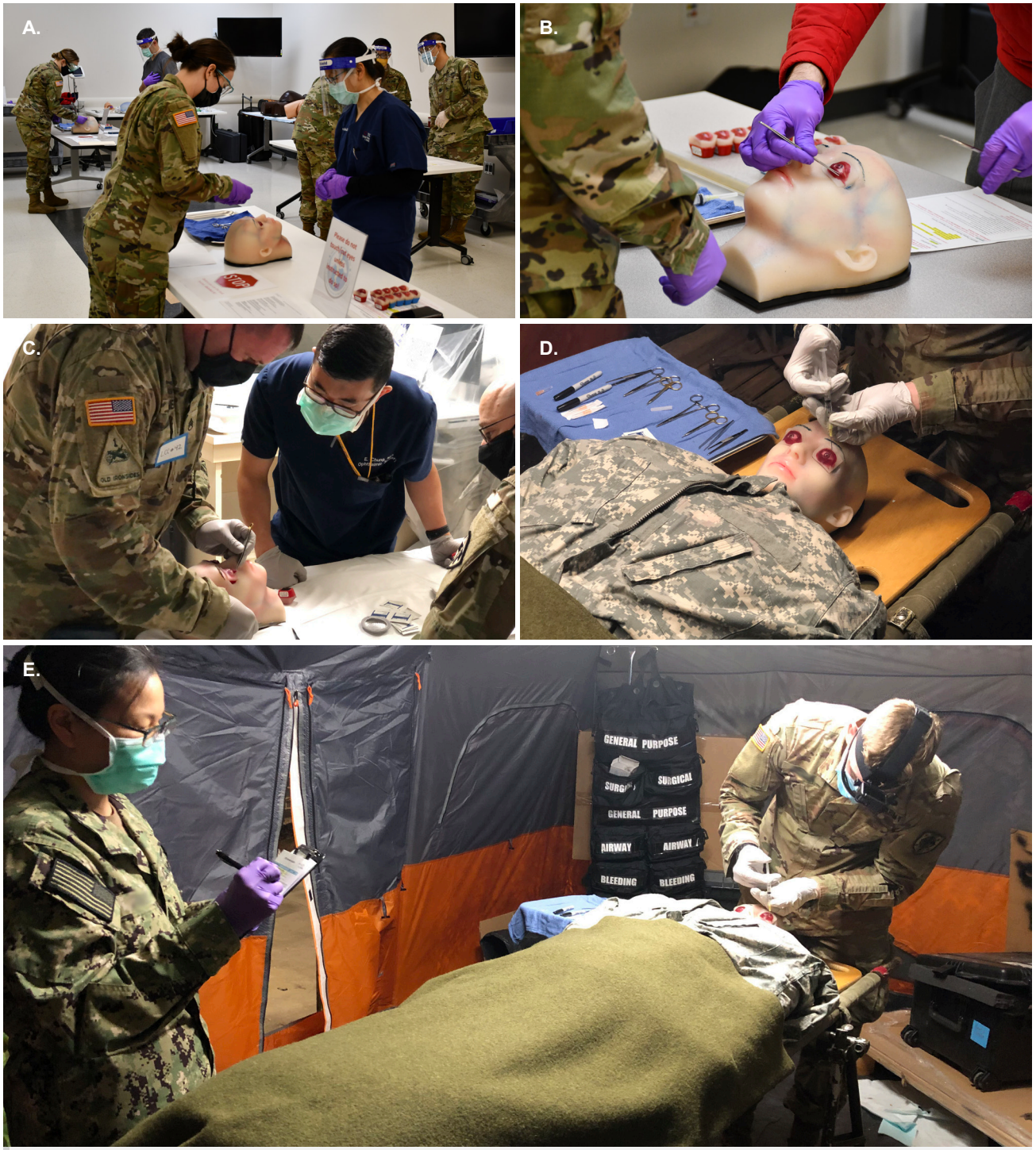


## EVENT FLOW AND TRAINING LOCATIONS

**Instructions:** Use this Fillable Worksheet to assist in planning your training. You may want to designate spaces based on the Sub-Components of each training phase detailed below and in the "Getting Started Guide".

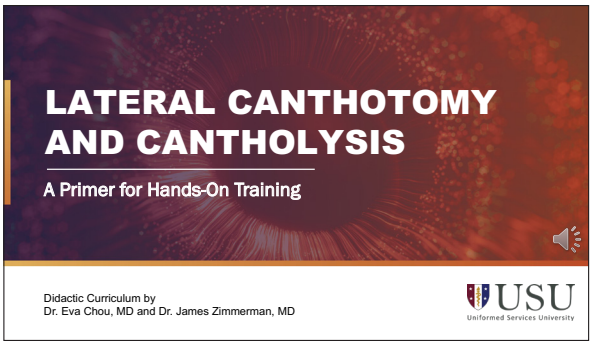
| Phases | Sub-Components | Room Location (Fill-In) |
|---|---|---|
| **Introduction** | • Introductions and Housekeeping<br>• Review of Training<br>• Review of Student expectations | |
| **Phase 1: Didactic Training** | • PowerPoint Curriculum Presentation<br>• Knowledge Test and Review of Answers (Optional) | |
| **Phase 2: Hands on Training** | • Surgical Equipment Review<br>• Demo of LCC on task trainer by SME/Instructor and Checklist Review<br>• Mentored practice on model<br>• Trainees can ask questions before evaluation | |
| **Phase 3: Summative Evaluation** | • LCC Procedure Testing (In a "testing" environment) | |
| **Phase 4: Post-Evaluation Procedures** | • If trainee fails, provide extensive review with PowerPoint and Checklist<br>• Allow student to retest if needed | |
| **Debriefing** | • Subject debrief of performance | |

| Additional components: | Room Location |
|---|---|
| **Independent study** | |
| **Breaks** | |




***A.*** *Hands-On Training - Multiple stations are set up where students and instructors work in small groups to first practice properly identifying the OCS eye and completing the LCC procedure (Task trainer by Sonalysts). Students are encouraged to recite each step of the procedure as they do it, and mark their progress on the practice log.* ***B.*** *An instructor demonstrates the full-thickness lower lid cut, as part of the LCC procedure.* ***D. and E.*** *An example of an austere environment used for the Summative Evaluation phase.* **D.** *A student simulates local anesthetic administration in the Summative Evaluation phase.* ***E.*** *An instructor evaluates a student as they perform the final evaluation.*

**Instructions:** Here is a preview of the slides in the PowerPoint Presentation. The PowerPoint is self-narrated – you may pause the presentation at any time to ensure all students can take notes or ask questions.

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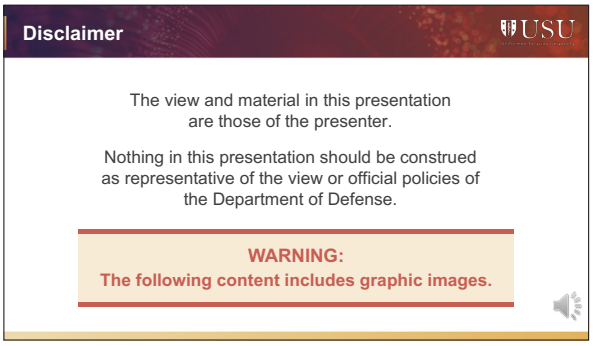


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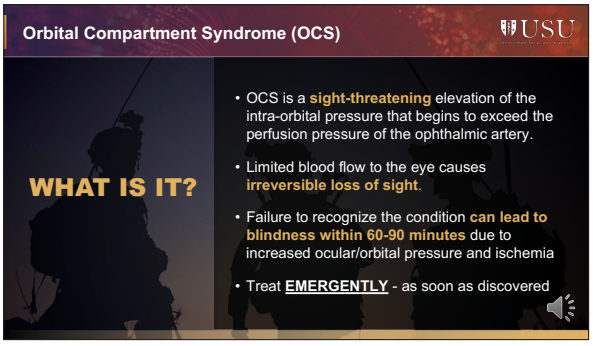


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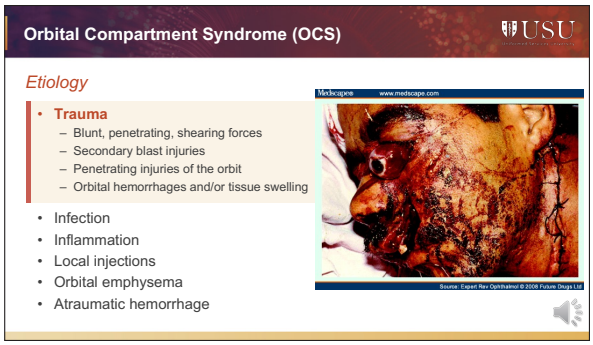


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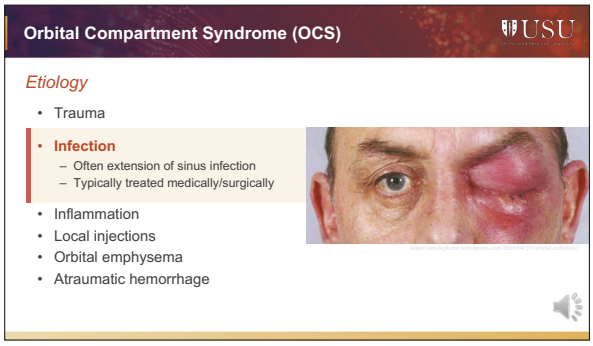


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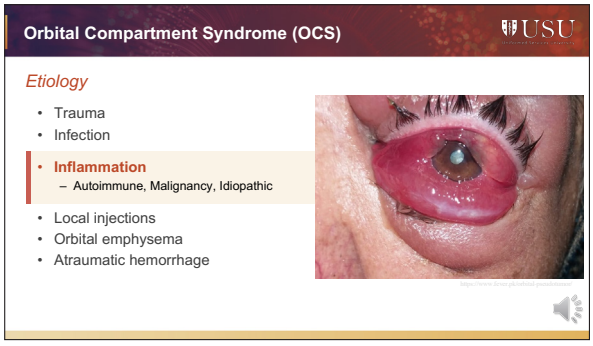


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## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- **Local injections**
  - Retrobulbar injections
- Orbital emphysema
- Atraumatic hemorrhage

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## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- Local injections
- **Orbital emphysema**
  - Air in the orbit
- Atraumatic hemorrhage

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## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- Local injections
- Orbital emphysema
- **Atraumatic hemorrhage**
  - Orbital Arteriovenous Malformations (AVMs)

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## ANATOMY

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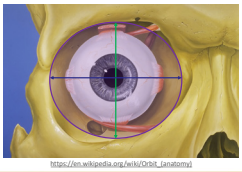
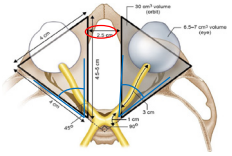
## Orbital Anatomy

- Orbital Volume = **25-30 ml**
- Minimal room for expansion → the only direction is out = **PROPTOSIS**
  - Maximum proptosis of the globe (eyeball) is 8-9 mm
- The eyelids and orbital septum (soft tissue surrounding the globe) limit proptosis



https://en.wikipedia.org/wiki/Orbit_(anatomy)



https://plasticsurgerykey.com/orbital-anatomy/

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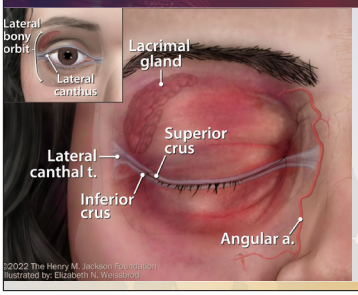
## Periorbital Anatomy




The lateral canthal tendon holds the eyelid to the orbit

**In order to release the tendon, there are horizontal and vertical cuts that must be created**

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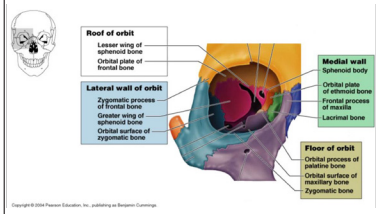
## Orbital Anatomy




Four "walls" of the orbit **protect** and **surround** its contents

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## DIAGNOSIS

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## Diagnosis

**ORBITAL COMPARTMENT SYNDROME IS A CLINICAL DIAGNOSIS!**

Radiographic evidence should **NOT** be relied upon for decision making, and should **NEVER** delay lateral canthotomy and cantholysis

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## Diagnosis

**SIGNS AND SYMPTOMS**

**Signs**

- **Tense eyelids** with ecchymosis defined by orbital rim
- Often must pry open lids to examine the eye
- Decreased visual acuity
- Afferent Pupillary Defect (APD)
- **Decreased eye movement** – patient above unable to look down
- **Proptosis**
- Resistance to retropulsion
- Elevated intraocular pressure (IOP)

**Symptoms**

- Diplopia
- **Vision loss**
- **Acute eye pain**

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## Indication

**When should a lateral canthotomy and inferior cantholysis be performed?**

Lateral canthotomy and inferior cantholysis is indicated for casualties presenting with serious orbital hemorrhage.

**Keys to Recognition:**

- Severe eye pain
- Tense proptosis ("rock hard" orbit)
- Afferent pupillary defect
- Decreased eye movement

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## Indication

**URGENT LATERAL CANTHOTOMY AND CANTHOLYSIS**

- **Perform AS SOON AS RECOGNIZED**
  - Failure to recognize the condition may result in blindness within **60-90 minutes** from increased intraocular pressure and ischemia
- Releases the orbital septum
- Allows for the contents of the orbit to expand out of the confines of the orbital bones
- Simple to perform with minimal surgical tools and minimal time to complete

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## TREATMENT

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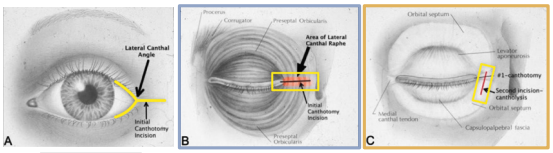
## Treatment

*Periocular and Orbital Anatomy*




**2 Cuts**
1. Canthotomy
2. Cantholysis

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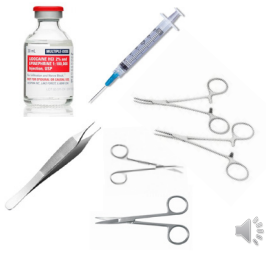
## Treatment

*Instruments/Supplies Needed*

- Local anesthetic
  (1% or 2% lidocaine with epinephrine)
- Syringe and needle
  (25 or 27 gauge needle)
- Toothed forceps (e.g. Adson)
- Straight hemostat
- Straight blunt-tipped scissors
  (e.g. tenotomy or iris)



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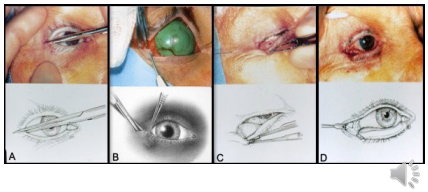
## Treatment

**Five C's of LCC**

1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

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## HOW TO – Lateral Canthotomy & Cantholysis

**Remember the 5 C's:**
1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

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## Treatment

**Five C's of LCC**

1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

**1. Clean the periocular skin**
- 5% povidone-iodine solution (if available)
- 10% povidone-iodine swab
- Alcohol swab if nothing else available

**2. Inject local anesthetic into the lateral canthus**
- 1 or 2% lidocaine with 1:100,000 epinephrine
- 25 or 27 gauge needle best
- ~ 1-3 ml
- May be difficult to inject into edematous tissues


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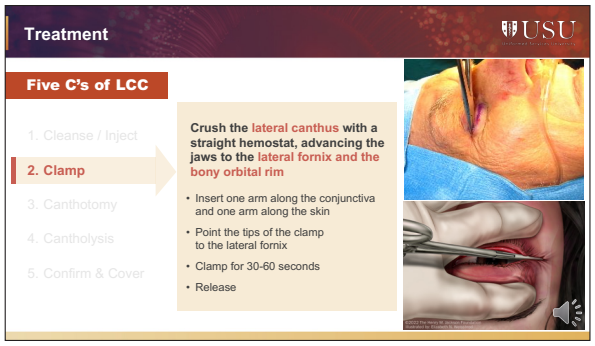


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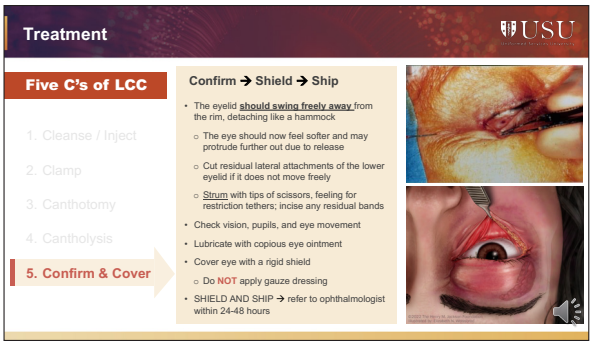


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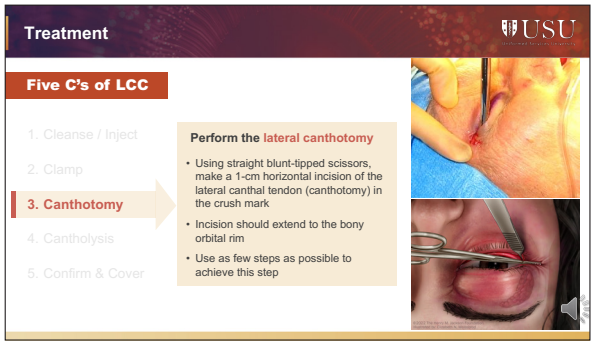


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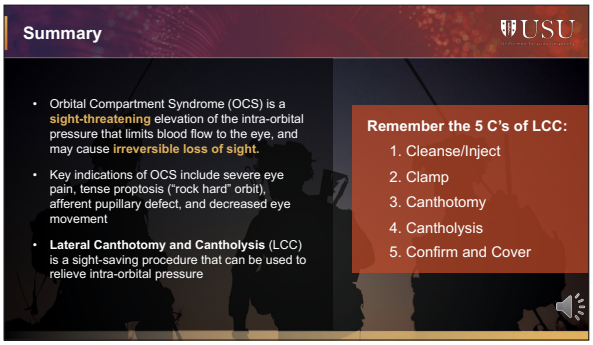


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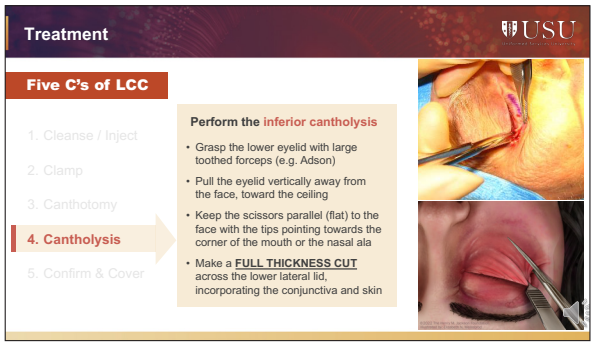


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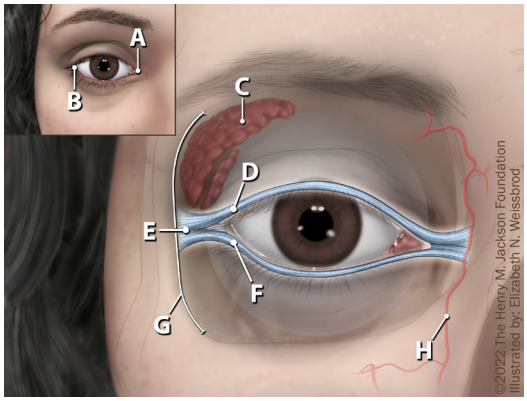
**Instructions:** Assess your knowledge on Lateral Canthotomy and Cantholysis using this quiz.

Please insert the letter in the picture next to the anatomical structure it represents:




| | | | |
|---|---|---|---|
| **A** | Medial canthus | **E** | Lateral canthal tendon |
| **G** | Lateral bony orbit | **H** | Angular artery |
| **C** | Lacrimal gland | **D** | Superior crus |
| **B** | Lateral canthus | **F** | Inferior crus |

Please circle the correct answer.

1. Common symptoms of Orbital Compartment Syndrome (OCS) include which of the following? Select choice(s) that apply:

   **a. Diplopia, Eye pain, Vision loss**
   b. Vertigo, Vision Loss, Eye pain
   c. Vision loss, Rhinorrhea, Diplopia
   d. Vertigo, Rhinorrhea, Eye Pain

2. (True/**False**) One of the common complications to Lateral Canthotomy and Cantholysis (LCC) is injury to the Angular Artery.

3. (True/**False**) A common potential complication of LCC is injury to the Lacrimal gland.

4. For the best outcome LCC should be completed within ____ of injury.

   a. 3 hours
   **b. Immediately upon suspicion of orbital compartment syndrome**
   c. 24 hours
   d. 72 hours

5. Signs of OCS include which of the following (select all that apply):

   a. Low intraocular pressure, Constricted pupil, Decreased visual acuity, Afferent pupillary defect
   b. Decreased visual acuity, Low intraocular pressure, Constricted pupil, Orbital fracture
   **c. Proptosis, Decreased visual acuity, Afferent pupillary defect, Ocular movement restriction**
   d. Afferent pupillary defect, Orbital fracture, Proptosis, Decreased visual acuity

6. OCS is most likely with which of the following mechanisms of injury (select all that apply)?

   **a. Secondary blast injury**
   b. Fall from height
   c. Primary blast injury
   **d. Blunt Trauma**

7. An LCC is contraindicated if _____ is present.

   a. Orbital Fracture
   **b. Open Globe Injury**
   c. Nasal Fracture
   d. Normal intraocular pressure

8. (**True**/False) OCS should be less common if an orbital floor fracture is present.

9. (True/**False**) Prior to performing an LCC for diagnosed OCS, a CT needs to be performed to look for evidence of OCS and orbital fractures.

10. (True/**False**) Vision loss from OCS is due to lack of blood flow to the eye, which can permanently damage vision.

11. Which one is NOT one of the five C's of LCC:

    a. Clamp
    b. Confirm and cover
    **c. Cauterize**
    d. Canthotomy
    e. Cantholysis

12. (True/**False**) The best way to assess for orbital compartment syndrome is intraocular pressure testing.

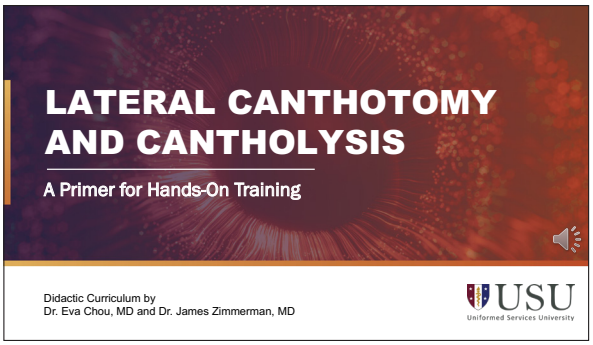
**END OF THE INSTRUCTOR TRAINING GUIDE**

Training Documents

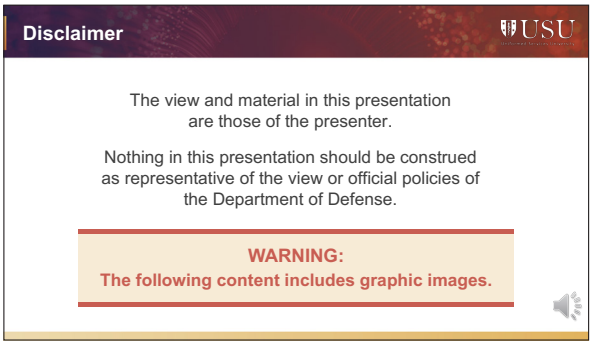
# STUDENTS

**WARNING:**
**The following content includes graphic images.**

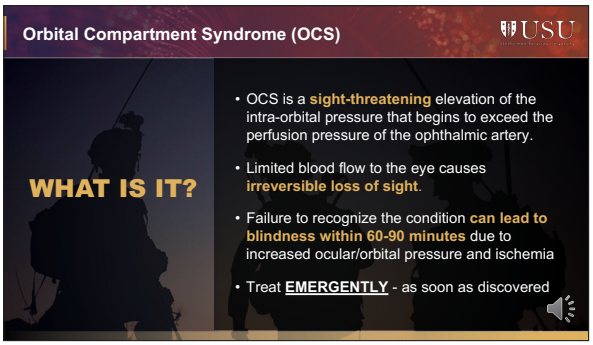
**Instructions:** Here is a preview of the slides in the PowerPoint Presentation. You are encouraged to take notes or ask questions as needed.




1




2




3

## Orbital Compartment Syndrome (OCS)

*Etiology*

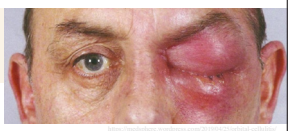
- **Trauma**
  - Blunt, penetrating, shearing forces
  - Secondary blast injuries
  - Penetrating injuries of the orbit
  - Orbital hemorrhages and/or tissue swelling
- Infection
- Inflammation
- Local injections
- Orbital emphysema
- Atraumatic hemorrhage


4

## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- **Infection**
  - Often extension of sinus infection
  - Typically treated medically/surgically
- Inflammation
- Local injections
- Orbital emphysema
- Atraumatic hemorrhage



5

## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- **Inflammation**
  - Autoimmune, Malignancy, Idiopathic
- Local injections
- Orbital emphysema
- Atraumatic hemorrhage

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## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- **Local injections**
  - Retrobulbar injections
- Orbital emphysema
- Atraumatic hemorrhage

7

## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- Local injections
- **Orbital emphysema**
  - Air in the orbit
- Atraumatic hemorrhage

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## Orbital Compartment Syndrome (OCS)

*Etiology*

- Trauma
- Infection
- Inflammation
- Local injections
- Orbital emphysema
- **Atraumatic hemorrhage**
  - Orbital Arteriovenous Malformations (AVMs)

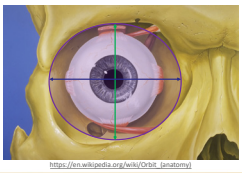
9

# ANATOMY

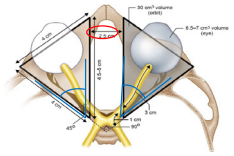
10

## Orbital Anatomy

- Orbital Volume = **25-30 ml**
- Minimal room for expansion → the only direction is out = **PROPTOSIS**
  - Maximum proptosis of the globe (eyeball) is 8-9 mm
- The eyelids and orbital septum (soft tissue surrounding the globe) limit proptosis



https://en.wikipedia.org/wiki/Orbit_(anatomy)



https://plasticsurgerykey.com/orbital-anatomy/

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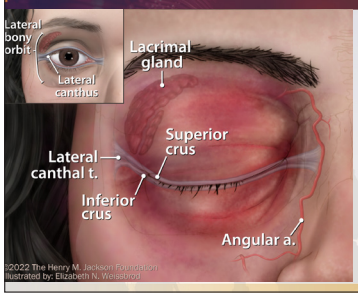
## Periorbital Anatomy

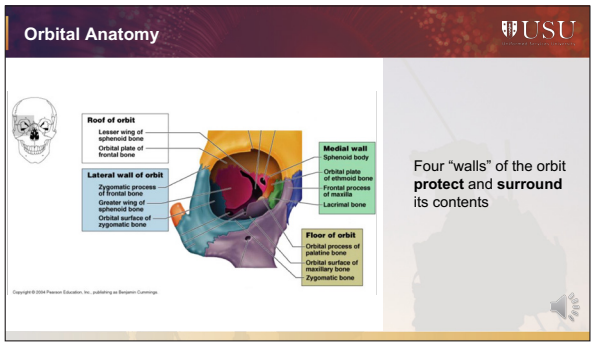





The lateral canthal tendon holds the eyelid to the orbit

**In order to release the tendon, there are horizontal and vertical cuts that must be created**

12


Orbital Anatomy
USU
Roof of orbit
Lesser wing of sphenoid bone
Orbital plate of frontal bone
Lateral wall of orbit
Zygomatic process of frontal bone
Greater wing of sphenoid bone
Orbital surface of zygomatic bone
Medial wall
Sphenoid body
Orbital plate of ethmoid bone
Frontal process of maxilla
Lacrimal bone
Floor of orbit
Orbital process of palatine bone
Orbital surface of maxillary bone
Zygomatic bone
Four "walls" of the orbit **protect** and **surround** its contents

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USU
DIAGNOSIS

14


Diagnosis
USU
ORBITAL COMPARTMENT SYNDROME IS A CLINICAL DIAGNOSIS!
Radiographic evidence should NOT be relied upon for decision making, and should NEVER delay lateral canthotomy and cantholysis

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## Diagnosis

### SIGNS AND SYMPTOMS

**Signs**

- **Tense eyelids** with ecchymosis defined by orbital rim
- Often must pry open lids to examine the eye
- Decreased visual acuity
- Afferent Pupillary Defect (APD)
- **Decreased eye movement** – patient above unable to look down
- **Proptosis**
- Resistance to retropulsion
- Elevated intraocular pressure (IOP)

**Symptoms**

- Diplopia
- **Vision loss**
- **Acute eye pain**

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## Indication

**When should a lateral canthotomy and inferior cantholysis be performed?**

Lateral canthotomy and inferior cantholysis is indicated for casualties presenting with serious orbital hemorrhage.

**Keys to Recognition:**

- Severe eye pain
- Tense proptosis ("rock hard" orbit)
- Afferent pupillary defect
- Decreased eye movement

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## Indication

### URGENT LATERAL CANTHOTOMY AND CANTHOLYSIS

- Perform AS SOON AS RECOGNIZED
  - Failure to recognize the condition may result in blindness within **60-90 minutes** from increased intraocular pressure and ischemia
- Releases the orbital septum
- Allows for the contents of the orbit to expand out of the confines of the orbital bones
- Simple to perform with minimal surgical tools and minimal time to complete

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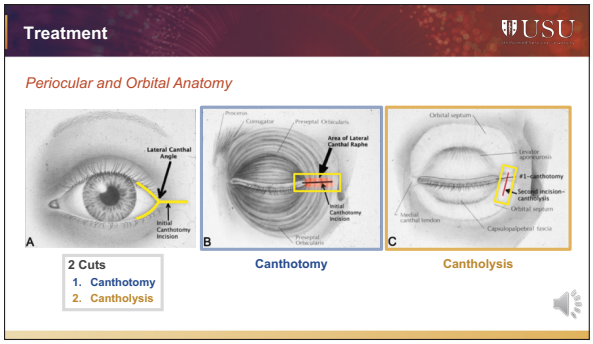
USU
TREATMENT

19


Treatment
USU
Periocular and Orbital Anatomy
Lateral Canthal Angle
Initial Canthotomy Incision
A
Area of Lateral Canthal Raphe
Vertical Canthotomy Incision
B
Canthotomy
#1 - canthotomy
Second incision - cantholysis
C
Cantholysis
2 Cuts
1. Canthotomy
2. Cantholysis

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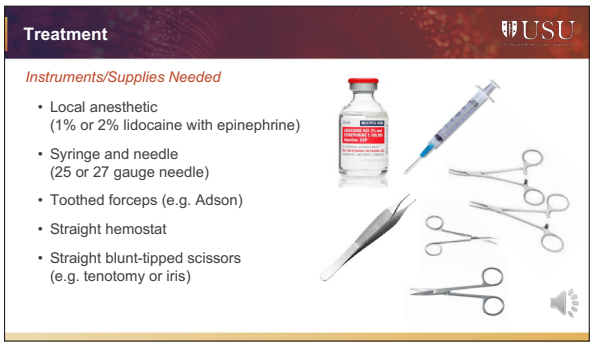
Treatment
USU
Instruments/Supplies Needed
• Local anesthetic (1% or 2% lidocaine with epinephrine)
• Syringe and needle (25 or 27 gauge needle)
• Toothed forceps (e.g. Adson)
• Straight hemostat
• Straight blunt-tipped scissors (e.g. tenotomy or iris)

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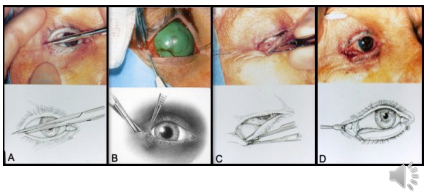
## Treatment

### Five C's of LCC

1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

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## HOW TO – Lateral Canthotomy & Cantholysis

**Remember the 5 C's:**

1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

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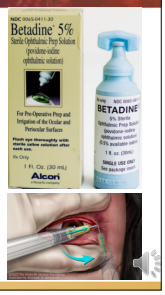
## Treatment

### Five C's of LCC

1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover

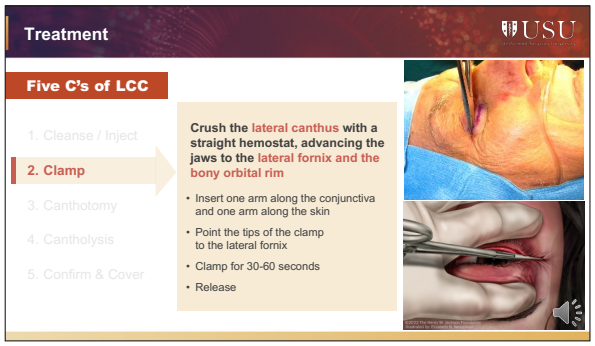
**1. Clean the periocular skin**
- 5% povidone-iodine solution (if available)
- 10% povidone-iodine swab
- Alcohol swab if nothing else available

**2. Inject local anesthetic into the lateral canthus**
- 1 or 2% lidocaine with 1:100,000 epinephrine
- 25 or 27 gauze needle best
- ~ 1-3 ml
- May be difficult to inject into edematous tissues






24


Treatment
USU
Five C's of LCC
1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover
Crush the lateral canthus with a straight hemostat, advancing the jaws to the lateral fornix and the bony orbital rim
• Insert one arm along the conjunctiva and one arm along the skin
• Point the tips of the clamp to the lateral fornix
• Clamp for 30-60 seconds
• Release

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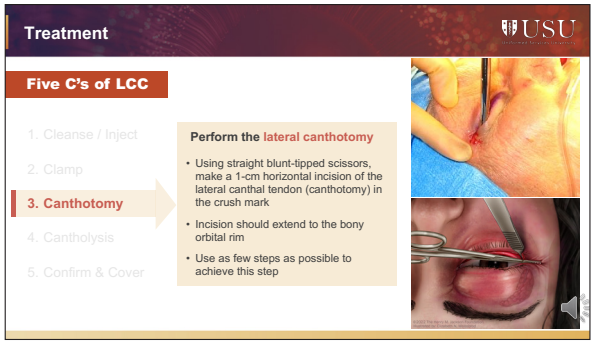
Treatment
USU
Five C's of LCC
1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover
Perform the lateral canthotomy
• Using straight blunt-tipped scissors, make a 1-cm horizontal incision of the lateral canthal tendon (canthotomy) in the crush mark
• Incision should extend to the bony orbital rim
• Use as few steps as possible to achieve this step

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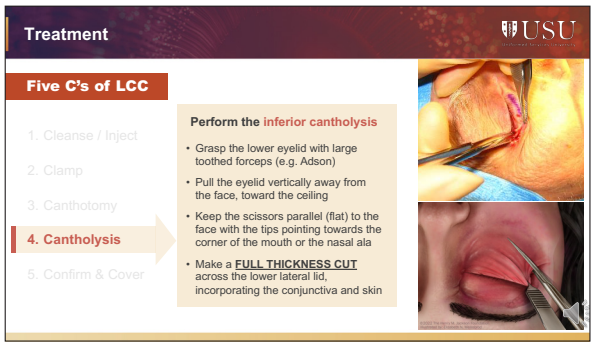
Treatment
USU
Five C's of LCC
1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover
Perform the inferior cantholysis
• Grasp the lower eyelid with large toothed forceps (e.g. Adson)
• Pull the eyelid vertically away from the face, toward the ceiling
• Keep the scissors parallel (flat) to the face with the tips pointing towards the corner of the mouth or the nasal ala
• Make a FULL THICKNESS CUT across the lower lateral lid, incorporating the conjunctiva and skin

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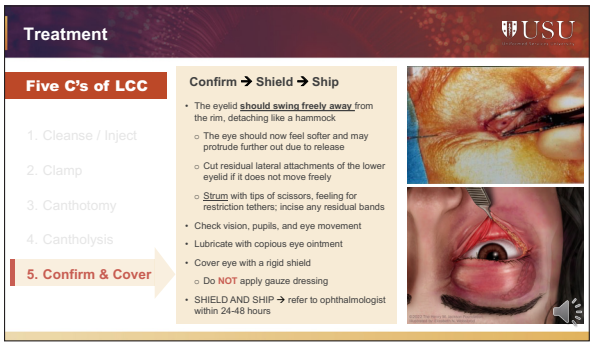
Treatment
USU
Five C's of LCC
1. Cleanse / Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm & Cover
Confirm → Shield → Ship
• The eyelid should swing freely away from the rim, detaching like a hammock
○ The eye should now feel softer and may protrude further out due to release
○ Cut residual lateral attachments of the lower eyelid if it does not move freely
○ Strum with tips of scissors, feeling for restriction tethers; incise any residual bands
• Check vision, pupils, and eye movement
• Lubricate with copious eye ointment
• Cover eye with a rigid shield
○ Do NOT apply gauze dressing
• SHIELD AND SHIP → refer to ophthalmologist within 24-48 hours

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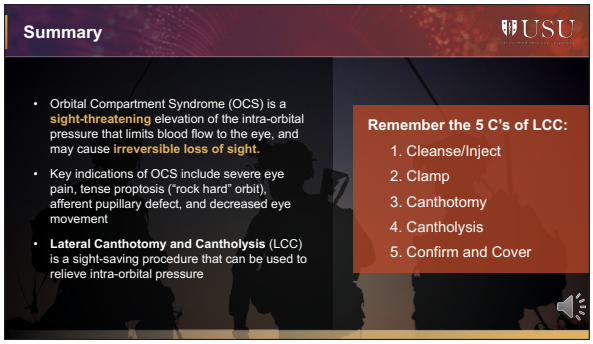
Summary
USU
• Orbital Compartment Syndrome (OCS) is a sight-threatening elevation of the intra-orbital pressure that limits blood flow to the eye, and may cause irreversible loss of sight.
• Key indications of OCS include severe eye pain, tense proptosis ("rock hard" orbit), afferent pupillary defect, and decreased eye movement
• Lateral Canthotomy and Cantholysis (LCC) is a sight-saving procedure that can be used to relieve intra-orbital pressure
Remember the 5 C's of LCC:
1. Cleanse/Inject
2. Clamp
3. Canthotomy
4. Cantholysis
5. Confirm and Cover

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1972

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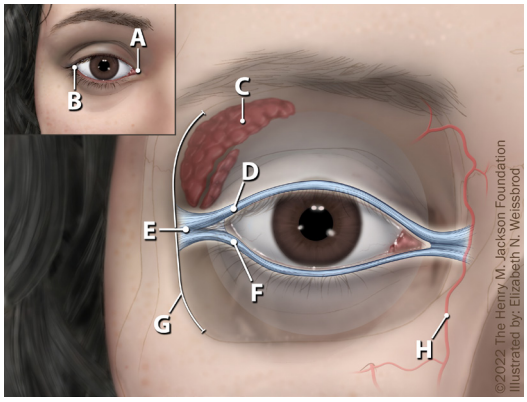
# Lateral Canthotomy and Cantholysis Knowledge Assessment

Uniformed Services University

**Instructions:** Assess your knowledge on Lateral Canthotomy and Cantholysis using this quiz.

Please insert the letter in the picture next to the anatomical structure it represents:




_____ Medial canthus

_____ Lateral bony orbit

_____ Lacrimal gland

_____ Lateral canthus

_____ Lateral canthal tendon

_____ Angular artery

_____ Superior crus

_____ Inferior crus

Please circle the correct answer.

1. Common symptoms of Orbital Compartment Syndrome (OCS) include which of the following? Select choice(s) that apply:
   a. Diplopia, Eye pain, Vision loss
   b. Vertigo, Vision Loss, Eye pain
   c. Vision loss, Rhinorrhea, Diplopia
   d. Vertigo, Rhinorrhea, Eye Pain

2. (True /False) One of the common complications to Lateral Canthotomy and Cantholysis (LCC) is injury to the Angular Artery.

3. (True/False) A common potential complication of LCC is injury to the Lacrimal gland.

4. For the best outcome LCC should be completed within ____ of injury.
   a. 3 hours
   b. Immediately upon suspicion of orbital compartment syndrome
   c. 24 hours
   d. 72 hours

5. Signs of OCS include which of the following (select all that apply):
   a. Low intraocular pressure, Constricted pupil, Decreased visual acuity, Afferent pupillary defect
   b. Decreased visual acuity, Low intraocular pressure, Constricted pupil, Orbital fracture
   c. Proptosis, Decreased visual acuity, Afferent pupillary defect, Ocular movement restriction
   d. Afferent pupillary defect, Orbital fracture, Proptosis, Decreased visual acuity

6. OCS is most likely with which of the following mechanisms of injury (select all that apply)?
   a. Secondary blast injury
   b. Fall from height
   c. Primary blast injury
   d. Blunt Trauma

7. An LCC is contraindicated if _____ is present.
   a. Orbital Fracture
   b. Open Globe Injury
   c. Nasal Fracture
   d. Normal intraocular pressure

8. (True/False) OCS should be less common if an orbital floor fracture is present.

9. (True/False) Prior to performing an LCC for diagnosed OCS, a CT needs to be performed to look for evidence of OCS and orbital fractures.

10. (True/False) Vision loss from OCS is due to lack of blood flow to the eye, which can permanently damage vision.

11. Which one is NOT one of the five C's of LCC:
    a. Clamp
    b. Confirm and cover
    c. Cauterize
    d. Canthotomy
    e. Cantholysis

12. (True/False) The best way to assess for orbital compartment syndrome is intraocular pressure testing.

# Lateral Canthotomy & Cantholysis Practice Procedural Checklist

Uniformed Services University

**Name:** _____

**Instructions:** Use the practice procedural checklist below to guide you, step-by-step, on how to perform the Lateral Canthotomy & Cantholysis. If critical steps are not completed correctly, re-attempt until reaching proficiency. Award student a point under the Pass (P) or Fail (F) columns as they practice the procedure.

| **Section 1: Initial Evaluation/ Diagnosis of Eye** | **F** | **P** |
|---|---|---|
| **Palpate periorbital region for tense proptosis** | | |
| **Correctly identify the eye in need of LCC?** | | |
| **Section 2: Injection/preparation [Cleanse and Inject, Clamp]** | | |
| **Clean Periorbital Region** (Time STARTS here) | | |
| **Inject along canthus from margin to rim** | | |
| **Clamp/crush lateral canthus for 30-60 seconds** | | |
| **Section 3: Lateral Canthotomy [Canthotomy]** | | |
| Make incision straight and horizontal | | |
| Use scissors effectively (one in/one out, no more than 2 cuts to complete) | | |
| **Complete canthotomy to the rim?** | | |
| **Section 4: Inferior Cantholysis [Cantholysis]** | | |
| **Use tactile feedback (visible strumming of tendon)** | | |
| **Grasp eyelid, pull away from the eye towards ceiling with toothed forceps** | | |
| **Point scissors toward the lateral oral commissure/nasal ala?** | | |
| Limit further cuts after tendon/eyelid released | | |
| **Full release of the lower lid (lid can be pulled away from orbit and eyeball)** | | |
| **FINAL STEPS [Confirm and Cover]** | | |
| **Verification of completion (Palpation)** | | |
| **No inadvertent injury to the eyeball** (Time ENDS here) | | |
| **Use a Fox Shield to cover eye** | | |
| | | |
| **Time to completion (<3 minutes)** Actual Time to Completion: _____ | | |
| Total score (ALL items) | | **/16** |

**Bolded items indicate critical steps. If any are missed, the student must start over.**

Notes/Feedback:

# Lateral Canthotomy & Cantholysis Skills Practice Log

Uniformed Services University

**Name:** _____

**Instructions:** Use this log to track practice attempts during the Hands-On practice phase of training. Note the total time to completion, score, and any comments to aid in improving future attempts. In order to advance to the testing phase, students must complete the procedure at least twice consecutively (both Right and Left eye) under 3 minutes, with all items on the checklist completed.

** Recommend having student do at least two practice attempts on each eye (left and right), a minimum of four attempts total.*

| Practice Attempt # | Total Time to completion | Checklist Score (out of 16 points) | Comments (Include if learner did the procedure on the L/R Eye, and feedback on improvements) |
|---|---|---|---|
| 1* | | | |
| 2* | | | |
| 3* | | | |
| 4* | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

Comments/Feedback:

_____

_____

_____

_____

_____

**To be completed by Instructor:**

By what attempt was the student ready for testing? _____

Instructor Sign-off: _____

# Lateral Canthotomy & Cantholysis Evaluation Checklist

Uniformed Services University

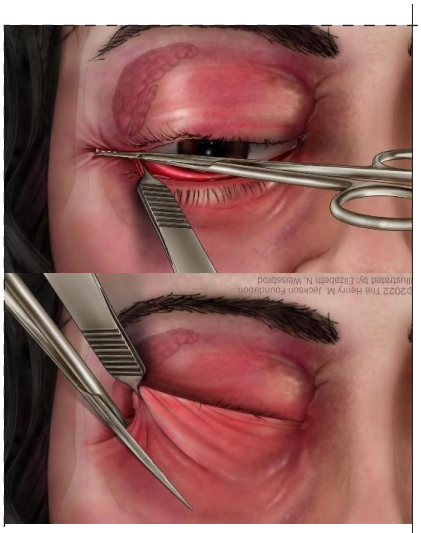
**Evaluator Instructions:** Use the procedural checklist below to assess students during the Summative Evaluation phase. If critical steps are not completed correctly, the attempt should be LCC scored as a failed attempt – have students re-attempt until proficiency is met.

| **Part 1: Initial Evaluation/Diagnosis of Eye** | **Skill Met** | | **Grader Notes** |
|---|---|---|---|
| Palpate periorbital region for tense proptosis/Resistance to retropulsion | P | F | |
| Correctly identify the eye in need of Lateral Canthotomy and Cantholysis | P | F | |
| *Initial Evaluation/Diagnosis score (2 points):* | | | |
| **Part 2: Injection/Preparation ["Cleanse and Inject and Clamp"]** | **Skill Met** | | **Grader Notes** |
| Clean periocular region/eyelid skin (START TIMER AT THIS STEP) | P | F | |
| Inject 1 or 2% Lidocaine with Epinephrine in the lateral canthus area | P | F | |
| Crush lateral canthus with hemostat, jaws reach lateral fornix & orbital rim | P | F | |
| *Injection/Preparation score (3 points):* | | | |
| **Part 3: Lateral Canthotomy ["Canthotomy"]** | **Skill Met** | | **Grader Notes** |
| Using scissors, complete a horizontal cut to the bony orbital rim | P | F | |
| *Lateral Canthotomy score (1 point):* | | | |
| **Part 4: Inferior Cantholysis ["Cantholysis"]** | **Skill Met** | | **Grader Notes** |
| Use tactile feedback by strumming tendon | P | F | |
| Grasp lower lid and pull away from the eye (towards ceiling) with Adson forceps. Point scissors toward lateral oral commissure/nasal ala. | P | F | |
| Complete cantholysis with full thickness lower lid cut (lid can be pulled away from orbit and eyeball) | P | F | |
| **Part 5: Verification and Time ["Confirm and Cover"]** | | | |
| Verify completion by palpation (STOP TIMER HERE AFTER VERIFICATION) | P | F | |
| No advertent injury to the eyeball | P | F | |
| Cover with a Fox Shield | P | F | |
| Time to completion of procedure - LESS THAN 3 minutes | P | F | |
| *Cantholysis Score & Verification Score (6 points):* | | | |
| **Total time to Complete LCC** | ____ : ____ (min) (sec) | | |
| **Final Score (out of 13 points total)** | | | |

**Printable Pocket Card:** Keep this card for quick reference and access to review the Lateral Canthotomy & Cantholysis steps in case an emergent surgical airway is needed.

## PRINTING INSTRUCTIONS

1. Print this card out, preferably on cardstock
2. Cut out card on dotted lines. Card is meant to be folded in half - double sided.
3. Place card in wallet or in an easily accessible place for quick reference when needed
4. Optional – Laminate if possible



**LATERAL CANTHOTOMY & CANTHOLYSIS (LCC)**

for treatment of orbital compartment syndrome

**THE FIVE C'S OF LCC**

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The **Virtual Reality Lateral Canthotomy and Cantholysis Application** (Android/Apple, pictured below) is available here:

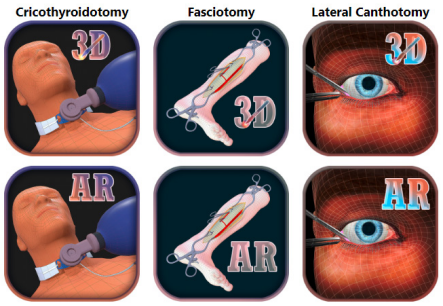
iOS: **http://battlefieldarassist.us/**

Android: **https://drive.google.com/drive/folders/1dlW-91rve8iKvMKYuSZjhBB4t1MJ298O**.

Encourage students to download the app after the training. The app can be accessed at any time to refresh their memory on knowledge and procedural practice.

This application can be used to view a Lateral Canthotomy and Cantholysis demonstration, as well as testing knowledge and skills.


SVS
SharpVision Software
Available IOS and Android devices.




If there are any issues downloading the app, please contact edzel.luico@sharpvisionsoftware.com

# References & Award Information

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## Award Information


a. "The Uniformed Services University of the Health Sciences (USU), 4301 Jones Bridge Rd., A1040C,Bethesda, MD 20814-4799 is the awarding and administering office;" and:

b. "This project is (or was) sponsored by the Uniformed Services University of the Health Sciences (USU); however, the information or content and conclusions do not necessarily represent the official position or policy of, nor should any official endorsement be inferred on the part of, USU, the Department of Defense, or the U.S. Government."

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