ABSTRACT
This lecture focuses on the imaging of ocular and orbital injuries, with an emphasis on computed tomography (CT scan) as the modality of choice. It includes the most common scenarios in which optometrists participate in the management of trauma victims. The basics of ordering and interpreting CT scans in the setting of trauma are addressed.

LEARNING OBJECTIVES
1. To encourage participation in the evaluation of ocular & orbital trauma
2. To educate on when & how to order imaging for ocular & orbital trauma
3. To ensure appropriate interpretation of ocular & orbital imaging
4. To elevate provider confidence in ocular & orbital trauma management

OUTLINE
I.  Introduction
   A. Imaging for ocular & orbital trauma
      1. Why do optometrists need a working knowledge of CT scan imaging?
         a) Many ocular & orbital diseases require imaging for appropriate management
         b) Ocular injuries often mandate imaging to rule out orbital injuries
         c) Imaging results & interpretation can help facilitate the best management plan
      2. Why do optometrists need to participate in the care of trauma victims?
         a) Ocular & orbital injuries are common in the setting of facial & head trauma
         b) Access to eye care specialists in the ED setting is often limited
         c) Optometrists have the training, knowledge base, and clinical skills to provide these services
   B. CASE#1: Blow-out fracture
      1. Optometric exam - A systematic exam is essential
         a) History - 46 year old female thrown from moving car
         b) Entrance exam - Restricted supraduction OD
         c) Anterior segment exam - Desmarres retractors
         d) Diagnosis - R/O blow-out fracture
         e) Management - Entrapment requires clinical confirmation & surgical referral
      2. Imaging study
         a) CT scan ordering - CT of orbits & facial bones
         b) CT scan interpretation - CT scan images reveal orbital floor fracture

II. Imaging Basics
   A. Basic bony anatomy of the orbit & surrounding structures
      1. Orbit - 7 bones of the orbit
2. Facial bones, sinuses, cranium - brief overview

B. X-Ray
   1. Basic radiography
      a) Brief history of X-ray
      b) Fast, affordable & decent for fractures
      c) Soft tissue is poorly differentiated
      d) Limited use in optometry
   2. Clinical applications for the optometrist
      a) Systemic work-up for uveitis
      b) Foreign body detection

C. CT Scan
   1. Basic computed tomography
      a) Brief history of CT
      b) Modality of choice for trauma
      c) Radiation exposure
      d) Use of contrast
      e) Tips for interpretation of a CT scan
   2. Clinical applications relevant to the optometrist
      a) Head trauma
      b) Headache & visual field/neurologic defects?
      c) Ocular, orbital & facial trauma
      d) Proptosis (tumor, cellulitis, orbitopathy)
      e) Sinusitis
      f) Stroke

III. CT Scans for Ocular Trauma
   A. CASE#2: Open Globe Injury
      1. Optometric Exam
         a) History - 25 year old male hit in OD with a cane
         b) Ocular examination - LP OD, hyphema & 360 degrees hemorrhagic chemosis
         c) Birmingham Eye Trauma Terminology
         d) Diagnosis - Open globe or closed globe?
         e) Management - CT scan & surgical referral as appropriate
      2. Imaging Study
         a) CT scan ordering - CT of orbits & facial bones
         b) CT scan interpretation - Open globe clues,
         c) CT scan has 70% sensitivity for open globe
   B. CASE#3: Closed Globe Injury
      1. Optometric Exam
         a) History - 27 year old victim of A&B (kicked in eye OS)
         b) Ocular examination - 2+ injection & macular hemorrhage OS
         c) Diagnosis - Choroidal Rupture
         d) Management - No surgical referral, periodic monitoring for CNVM
2. Imaging Study
   a) CT Scan ordering - CT not required, but often performed by ED
   b) CT Scan interpretation - Incidental findings

IV. CT Scans for Orbital & Facial Trauma
   A. CASE#4: Orbital Trauma
      1. Optometric Exam
         a) History - 51 year old male kicked in face (+) LOC
         b) Ocular examination - Laceration above right brow, right lid ecchymosis
         c) Diagnosis - Normal posterior segment findings OU
         d) Management - CT required
      2. Imaging Study
         a) CT Scan ordering - Orbital & facial CT scan
         b) CT Scan interpretation - Access to prior studies, acute vs. remote fracture

   B. CASE#5: Facial Trauma
      1. Optometric Exam
         a) History - 24 year old male victim of A&B with baseball bat
         b) Ocular examination - Left lateral canthal laceration, negative open globe
         c) Diagnosis - Requires CT imaging: intracranial hemorrhage
         d) Management - Transfer to Trauma I center (Life-Eye-Orbit)
      2. Imaging Study
         a) CT Scan ordering - Head CT, orbital & facial CT
         b) CT Scan interpretation - Intracranial air & hemorrhage

V. Conclusions: Getting involved
   A. Optometrists need to know when and how to order imaging for trauma
      1. Work with physicians from other disciplines
         a) Develop good relationships
         b) Maintain good communication, always send consultation letters
         c) These services benefit the patient, our profession & your “bottom-line”
         d) Market your expertise beyond refractive eye-care
      2. Don’t be afraid to advocate for your patients
         a) Trauma patients frequently have inadequate access to good follow-up care
         b) Specialists don’t always recognize the big picture
   B. Seek opportunities to examine more trauma patients
      1. On-Call “The OD in the ED”
         a) Hospital based setting
         b) Develop relationships with local ED providers
         c) Get credentialed at local hospital, provide on-call services
         d) Be available to ED/urgent care providers for phone consultations and f/u appt
      2. Under-served population for ocular trauma patients
VII. Bibliography


78. Winegar BA, Murillo H, Tantiwongkosi B. Spectrum of critical imaging findings in complex facial skeletal trauma. RAdiographics 2013; 33:3-19.