Vision Correction of the Athlete
Lecture objectives

➢ Define ‘vision’ relative to common paradigm
➢ Identify and discuss appropriate options for refractive error of the athlete
➢ Understand when contact lenses are preferred vs. spectacles
➢ Discuss refractive surgery and understand its benefits and limitations
Overview:
- Vision and Sport
- Environmental Analysis in Sports
- The Vision Pyramid

Refractive Errors:
- When to Prescribe
- Prescribing Guidelines
- Optimize Refraction Correction
- Other Considerations
- Functionally Monocular Athletes

Contact Lenses
- Contact Lenses
- CL vs. Spectacles - Benefits
- Performance Contact Lenses
- Selecting the Optimal Lens
- Orthokeratology

Spectacles & Eyewear
- ANSI Standards in Sports
- Spectacle Considerations
- Refractive Compensation for Athletes
- Eyewear Design Factors
- Performance Sun Eyewear
- Special Lens Design Factors

Refractive Surgery
- Wavefront-guided vs. conventional: Conclusion
- 'Cleaning Up' After Refractive Surgery
- Preserving Visual Acuity and Contrast Sensitivity

Discussion
Overview

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- Vision and Sport
- Environmental Analysis in Sports
- The Vision Pyramid
Vision vs. ‘VISION’

- **Current paradigm**
  - Perfect vision – 20/20 (VA only!)

- **Redefine ‘Vision’ as**
  - Eyes working together
  - Eyes working with body

- **Comprehensive Visual Skill Set, includes**
  - Contrast sensitivity
  - Eye-hand/body/foot coordination
  - Dynamic visual acuity
  - Peripheral awareness
  - Etc., etc.
Vision and Sport

➢ Each sport has unique visual demands
➢ Critical visual skills differ by sport
➢ Athletes must overcome various challenging visual conditions
Environmental Analysis in Sports

➢ Ocular hazards
➢ Ocular/facial/head protection
  • visibility & mechanical forces
➢ Temperature/humidity/precipitation/altitude
➢ Dust & foreign body potential
➢ Environmental variability
➢ Lighting & glare
The Vision Pyramid

- An excellent approach to organizing and prioritizing visual factors
- Each of the vision functions could be placed at the appropriate position on the pyramid

Courtesy of Drs. David Kirsch and Dan Laby
Agenda:

- When to Prescribe
- Prescribing Guidelines
- Optimize Refraction Correction
- Other Considerations
- Functionally Monocular Athletes
When to prescribe...

- Based on VA’s?
- Based on sport demand?
- Based on effort required to achieve clarity?
- Based on refractive error guidelines?
Prescribing Guidelines

- Myopia: beginning at -0.25D
- Hyperopia: beginning at +1.00D
- Astigmatism: beginning at -0.50D
  • WTR VS ATR VS OBLIQUE
- Anisometropia: beginning at 0.50D
  • Consider each meridian
Optimize Refractive Correction

- Accurate refraction
- Push into the ‘green’
- Binocular balance
- Leave low presbyopes lie (the young ones) unless symptomatic or appreciative
- Avoid progressives when possible
Other Considerations for the Rx

- Timing of first prescription
- Value of over minusing
- Prescribing for twilight
- Prescribing for specific distances
- Prescribing modalities:
  - Contact lenses
  - Spectacles
  - Refractive surgery
Functionally Monocular Athletes

- Criteria: <20/40 (6/12) best corrected
- Risk of blindness increased by >15x
- Risk is averted with protective eyewear use
- Discourage participation in sports with a risk for serious eye injury in which an effective method of eye protection does not exist
  - Examples: boxing, wrestling, martial arts
Contact Lenses

Agenda

- Contact Lens Overview
- CL vs. Spectacles - Benefits
- Performance Contact Lenses
- Selecting the Optimal Lens
- Orthokeratology
Contact Lenses and Sports

➢ Contact lenses are vision correction of choice for most sports and athletes
➢ Easiest, quickest way to improve performance
➢ Optimize CL fit to activity and demands
  • Silicone hydrogel CW
  • Single-use daily disposable lenses
  • Soft toric (stable designs)
➢ Gain is attributable to ECP
CL vs. Spectacles - Benefits

- Natural, unrestricted field of vision
- Less aberrations, no minus/plus effect
- Potential for better eye teaming (depth)
- Don’t fog up, become soiled
- No displacement in collisions and under dynamic conditions
- Allow over-wear of goggles, sunglasses, protective eyewear
- More comfortable, natural vision correction
- Psychological - confidence inspiring
Performance Contact Lenses

- Consider sport-specific demands
- Predict what difficulties contact lens wear may present and be able to prevent or address them
- Factors to consider:
  - Gaze positions (ex: upgaze for cyclists)
  - Speed of eye movements (re-orientation)
  - Length of competition
  - Environment (humidity, temperature, altitude, debris, wind, UV exposure)
  - Replacement possibilities
  - Tint possibilities
Selecting the Optimal Lens

- Design
- Material
- Modality
- Replacement schedule
- Lens care & maintenance
Selecting the Optimal Lens: Design

➢ **Maximize visual performance**
  • Correct even low cylinder with soft toric
  • Consider aspheric design lens
  • Tinted lenses for specific applications

➢ **On-eye stability critical**
  • May elect to fit slightly tighter than normal
  • Choose stable toric lens design

➢ **Comfort is key – no distractions**
  • Minimize complaints of dryness, irritation
Selecting the Optimal Lens: Material

- Generally, low water is preferred to minimize effects of dehydration
- Optimize oxygen performance
- RGP’s rarely preferred due to risk of dislocation and impact of foreign bodies
Selecting the Optimal Lens: Modality

- **Daily wear (DW)**
  - Most common modality

- **Extended wear (EW)**
  - Busy lifestyles - convenience
  - Long-term visual correction needs

- **Single-use daily disposable lenses**
  - Greatest level of convenience
  - Preferred for younger athletes and activities with higher risk of contamination
    - Water and mud sports
Selecting the Optimal Lens: Replacement Schedule

- Replace lenses prior to performance degradation
- Daily, 2-week or monthly
- Need varies by individual
  - Evaluate tearfilm integrity
  - Evaluate lenses at end of proposed schedule
- Make it easy to remember, easy to comply
Selecting the Optimal Lens: Lens Care & Maintenance

Lens care
➢ Ideal – no lens care
➢ Multi-purpose solutions
➢ Hydrogen peroxide

Maintenance
➢ Daily lens check
  • ‘Look good, see good, feel good’
➢ Lens lubricants/rewetting drops PRN
➢ Emergency replacement lenses & case
Orthokeratology

- Temporary correction of refractive error
- No lens wear during sporting activities
- May be considered for athletes having issues with contact lens wear, provided safe corneal physiology exists and patient is mature and compliant
- While VA may meet sport accepted standards, contrast sensitivity may be adversely effected
Spectacles

Agenda:

- ANSI Standards in Sports
- Spectacle Considerations
- Refractive Compensation for Athletes
- Eyewear Design Factors
- Performance Sun Eyewear
- Special Lens Design Factors
ANSI Standards in Sports

- Street glasses should never be used during sports activities
- Polycarbonate or high-impact resistant lenses are a must
- Sports goggles and frames must meet ASTM safety standards; ANSI standards do not apply to sport.
- Prescribe protection for athletes following eye trauma or ocular surgeries when the ocular tissues have been weakened (e.g., keratoplasty, RK)
Spectacle Considerations

➢ **Wrap designs**
  - Cyclists, speed skaters, and skiers all need protection from the wind

➢ **Shooting designs**
  - Spectacles often preferred to CLs due to superior image clarity and stability
  - Pistol shooters may occlude non-dominant eye
  - Adjustable frames align LOS with shooting angle
  - Trap and skeet shooters may spot lens of nondominant eye
Refractive Compensation for Athletes

Considerations for presbyopes
Individualized bifocal designs may be necessary for presbyopic corrections to reduce interference for play, i.e., an offset bifocal addition in the temporal or superior aspect of the lens for golfers
Eyewear Design Factors

"Street" eyewear
  • Inappropriate for most dynamic sports

“Sports” eyewear
  • Traditional designs
  • Wrap-around style
  • Tint (filter) considerations
Performance Sun Eyewear

➢ Impact resistance
➢ Comfort
➢ Visual Field
➢ Anti-Scratch
➢ Anti-Fog (hydrophilic)
➢ Hydrophobic (wax)
➢ Interchangeable
➢ Appearance
Performance Sun Eyewear

➢ Optical performance, esp. in periphery
  • Laser head form testing
  • Monocular “image jump” test
  • Binocular depth change test
  • More “jump” = altered image localization

➢ Engineered Tints for Specific Sports
Special Lens Design Factors

➢ Goggle designs
  • Ski goggles
  • Swimming goggles
  • Diving masks

➢ Rx’ing in Goggles/Masks
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Ref refractive surgery

Types of surgery include:
• LASIK - instant gratification vs. PRK – time off for healing required (~3-4 wks)
• Microkeratome vs. femtosecond laser
• Wavefront-guided custom ablation vs. standard procedure

Athlete should weigh the benefits and risks before pursuing surgical options

Important factors to consider include:
• The level visual acuity needed for optimal performance in their sport
• The risks of obtaining that level of visual acuity and negatively impacting other vision aspects, such as contrast sensitivity or increasing corneal aberrations
• Would it be better to “wait until” I retire to have the convenience of life without glasses or contacts?
Wavefront-guided vs. conventional: Conclusion

- Wavefront-guided custom LASIK (i.e. Zyoptix) provides:
  - Reduced higher order wavefront aberrations than conventional LASIK
  - Significantly better visual quality under conditions of low contrast and/or low illumination conditions than conventional LASIK treatments

- Significant SA remains
‘Cleaning Up’ After Refractive Surgery

➢ Refractive surgery may leave significant SA
  • Daytime - not an issue
  • Night and poor illumination – now it’s an issue

➢ Myopes – residual + SA
  • Supplemental CL w/ aspheric optics

➢ Presbyopes – residual minus SA
  • Supplemental spherical optics (plus lens designs have minus SA)
Preserving Visual Acuity and Contrast Sensitivity

- Preserve the ocular surface!
  - Wetting agents (not too thick)
  - Daily disposable lenses
  - Proper CL care –
    - RUB ‘n rinse!
    - Hydrogen peroxide
    - More frequent CL replacement
- Address any meibomian gland dysfunction
- Nutritional supplements – Omega 3, zeaxanthin, lutein
Discussion

➢ Review general prescribing guidelines for refractive error.
➢ What are the main benefits of contact lens correction vs. spectacles?
➢ Why should street eyewear not be used for sports?
➢ How would you advise functionally monocular athletes regarding sport?
➢ Which sports are best suited for ortho-K or refractive surgery?