Autologous Simple Limbal Epithelial Stem Cell Transplant for Treatment of Limbal Stem Cell Deficiency

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Abstract

55 year old male with history of unilateral ocular trauma presents with decrease in vision, pain, and foreign body sensation. An autologous simple limbal epithelial stem cell transplant for limbal stem cell deficiency improves symptoms.

I. Case History

- 55 yo Hispanic male
- Chief complaint: gradually decreasing VA OS over 6 months with associated pain and foreign body sensation
- Ocular history: trauma OS 1980's (bicycle accident), no previous ocular surgeries
- Medical history: hypertension, anemia, history of substance abuse
- Ocular meds: Pred Forte, artificial tears
- Systemic meds: Lisinopril, Amlodipine

II. Pertinent findings:

- VA with correction: 20/20 OD, CF OS
- Cornea: clear OD, general haze with 360 neovascularization, sub-epithelial fibrosis in periphery at 5:00 and 9:00 OS, obscuring view in
- Lids: clear OU
- Conj: clear OD, 2+ injection OS
- A/C: deep and quiet OD
- Iris: clear OD
- Lens: 1+ NS OD
- IOP: 19 mm Hg OD, OS by Goldmann applanation
- Slit lamp photos, anterior segment OCT as described above
- No staining or impression cytology performed
- Biopsy showed chronic inflammation with no neoplastic changes

III. Differential diagnosis

- Ocular surface squamous neoplasia (OSSN)
  - High resolution anterior segment OCT and biopsy used to differentiate OSSN and LSCD (1)

IV. Diagnosis and discussion

- Causes: congenital, trauma (2), diseases with internal stem cell exhaustion, idiopathic (3)
- Symptoms: decreased VA, photophobia, tearing, pain (4)
- Slit lamp findings: irregular corneal epithelial reflex, thickened fibrovascular pannus, chronic keratitis, scarring, calcification
- Limbal stem cells maintain corneal integrity and act as barrier between corneal and conjunctival epithelia (3)
• Damaged limbal stem cells can cause conjunctivalization, resulting in thickened, irregular, unstable epithelium, often with secondary neovascularization and inflammatory cell infiltration, leading to corneal ulceration and scarring (5)
• Subclinical deficiency at time of insult may eventually progress to overt disease as stem cell population depletes
• Can be detected clinically, but best confirmed by impression cytology (6)

V. Treatment/Management

• Correct diagnosis is crucial as LSCD patients are poor candidates for conventional corneal transplants (7)
• Optimizing environment for damaged limbal stem cells in partial LSCD
  o Steroids, serum tears
  o Amniotic membrane transplantation: promotes epithelial cell migration, adhesion, and proliferation (7)
• Boston Type 1 Keratoprosthesis
  o Does not require stem cells
  o Risk of glaucoma, infection, retinal detachment (8)
• Limbal stem cell transplantation in total LSCD
  o Limbal autograft (donor tissue from fellow eye) and allograft (from living relative or cadaver) (9)
    ▪ Limited limbal tissue harvested due to risk of iatrogenic LSCD in donor eye
    ▪ Risk of tissue rejection
    ▪ Requires aggressive immunosuppression
  o Ex vivo limbal stem cell transplantation
    ▪ Culture small amount of tissue, minimizing donor stem cell depletion; grow ex vivo
    ▪ Only epithelial cells (not Langerhans' cells and blood vessels) are transplanted, reducing possibility of rejection (7)
    ▪ Procedures not performed in US
  o Simple limbal epithelial transplantation (SLET): for unilateral LSCD (10)
    ▪ Donor tissue from healthy eye divided into small pieces and distributed over amniotic membrane placed on cornea
    ▪ Low risk, no need for ex vivo tissue culture, no immunosuppression (11)
    ▪ Patient’s VA improved from CF to 20/25+ with very significant improvement of symptoms
    ▪ 1 year out, awaiting long term results

VI. Conclusion

• LSCD is characterized by abnormal corneal epithelial maintenance, resulting in conjunctivalization of cornea
• Current treatment methods have high rates of complications, graft rejection, need for life-long immunosuppression therapy
• SLET promises to be low-risk and effective technique for treating unilateral LSCD
• Correct diagnosis and prompt referral are key to managing efficiently
References


