American Journal of Ophthalmology Case Reports 26 (2022) 101462

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Reconstruction with umbilical amnion following ocular evisceration: A case study

Lisa S. Bunin

Private Practice, 1611 Pond Rd #403, Allentown, PA, 18104, USA

ARTICLE INFO

Keywords:
Amniotic membrane
Umbilical cord
Orbital soft tissue
Reconstruction
Socket
Ocular prosthesis
Ocular evisceration

ABSTRACT

Purpose: To report the use of cryopreserved amniotic membrane from the umbilical cord (UC) in the reconstruction of a dehisced wound with the additional ability to increase orbital volume, expand superior and inferior fornices, and improve cosmesis following evisceration of a blind, painful, atrophic, sunken eye with ptosis.

Observations: Patient developed conjunctival wound dehiscence without implant exposure following evisceration. One month later, reconstruction was performed with UC to cover the defect, increase the orbital volume, and expand orbital fornices to allow placement of a large ocular prosthesis with superior lip for ptosis elevation. Postoperatively, at the 6th week, the socket was healthy and the globe had good movement. At the 7th week, the ocular prosthesis was sized and fitted. At the 8th month, the structural integrity of the socket was maintained with deep fornices, and the patient had excellent cosmetic result with natural appearance and movement of the prosthetic eye.

Conclusions and importance: This case highlights the successful utilization of UC graft to augment soft tissue volume, restore socket structural integrity and increase socket volume, and achieve good cosmesis and ocular motility following evisceration.

1. Introduction

Evisceration is considered a viable treatment option for various ocular conditions such as ocular trauma and painful blind eyes so as to allow improved prosthetic motility by preserving conjunctiva, sclera, extraocular muscles, and orbital fat.[1] Unfortunately, post-operative complications are common and may include ptosis,[2] wound dehiscence, implant extrusion, implant migration, and socket contracture. The rate of post-evisceration complications is highly variable and dependent on many factors such as surgical technique, implant material, and patient history of previous surgeries; however, wound dehiscence is consistently one of the most common local complications.[3] Dehiscence usually occurs due to high incisional wound tension, abrasion of orbital tissues, poor implant fit, and orbital infection/inflammation. Management of wound dehiscence can be performed by re-suturing the conjunctiva, debulking the implant, and/or secondary closure with a tissue graft.

Amniotic membrane grafts have been used widely over many decades in ophthalmology because of their inherent regenerative properties that are known to reduce inflammation, inhibit fibrosis, and promote epithelialization which make them an attractive grafting substrate for many indications.[4] Comparatively, the amniotic membrane extending to the umbilical cord (UC) is about ten times thicker than that covering the amniotic cavity and has been more commonly used as a tectonic support such as preventing shunt tube erosion in glaucoma surgery.[5] More recently, this thicker amniotic membrane from UC has also been used in oculoplastic indications that involve reconstruction of the socket, fornix, eyelid, or ocular surface.[6–8] Herein, we describe a case of wound dehiscence post-evisceration that was successfully reconstructed with the added ability to increase orbital volume using amniotic membrane from UC.

2. Findings

A 51-year-old female presented with a blind, painful, atrophic, phthisical right eye with a history of severe proliferative diabetic retinopathy complicated by vitreous hemorrhage, hyphemia, and retinal detachment. The increasing ocular pain was refractory to narcotic medications and began to interfere with daily activities so she was referred to our clinic for removal of the eye. On examination, the right eye was shrunken with signs of phthisis and globe atrophy with 6 mm of enophthalmos. There was marked asymmetry and ptosis of the right

E-mail address: lbuninmd@yahoo.com.

https://doi.org/10.1016/j.ajoc.2022.101462
Received 2 November 2021; Received in revised form 22 February 2022; Accepted 26 February 2022
Available online 1 March 2022

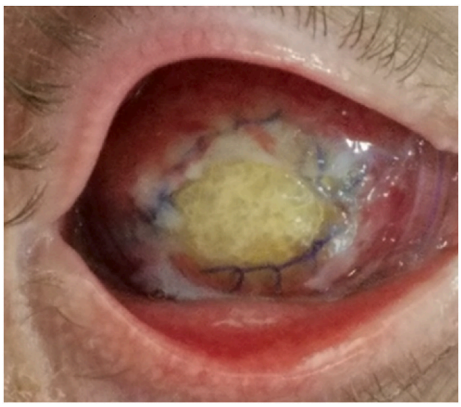

Fig. 1. Patient presentation. Patient presented with conjunctival suture dehiscence exposing the denuded cornea and making the hydroxyapatite implant visible.

upper eyelid. She was in severe pain and refused retrobulbar alcohol injection, instead wanting a more permanent solution. A thorough discussion of the treatment options and their affiliated risks and benefits were carried out. Ultimately, evisceration was decided upon by the patient and surgeon.

Two weeks later, an evisceration was performed to preserve as much orbital tissue as possible because of the severe bulbar and orbital atrophy. The corneal epithelium was denuded, and the rest of the cornea was preserved to allow enough volume so that the smallest hydroxyapatite sphere implant of 16mm could be placed. There was extensive scarring of the conjunctiva and loss of Tenon's capsule but layered closure was carried out successfully.

Post-operatively, the patient had good movement of the globe with the orbital implant and conformer in place. However, the conjunctival sutures began to dehisce and developed a conjunctival epithelial defect that would not heal. The underlying denuded cornea, but not the hydroxyapatite implant, became exposed without signs of infection (Fig. 1). It was determined that there was insufficient conjunctival tissue to cover the implant/globe and the orbit would require reconstruction with better coverage of the ocular implant. An additional goal was to increase the orbital volume to a large enough extent to match the fellow eye, and to increase the orbital fornices inferiorly and superiorly to allow placement of a large ocular prosthesis with superior lip for ptosis elevation.

Approximately 1 month after the evisceration, the orbit was repaired by cleaning the wound edges of the dehisced conjunctiva and removing the remaining sutures. The denuded cornea was noted to be fully present with the hydroxyapatite implant securely intact. A scleral shell from the local eyebank was placed over the cornea and sutured to the host sclera as far back as the muscle insertions which added volume and allowed good globe movement. Next, Tenon's and conjunctiva were mobilized as much as possible but still could not close over the globe (Fig. 2A).

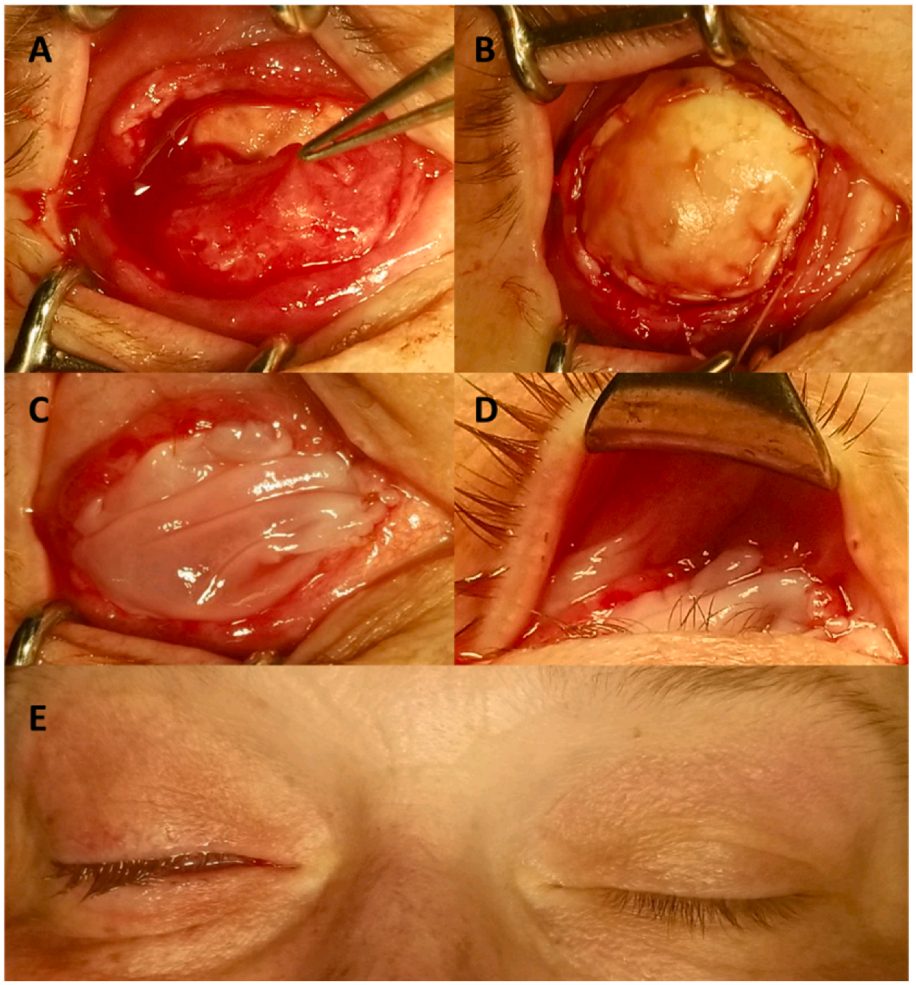

Fig. 2. Surgical Socket Reconstruction. Conjunctival and Tenon's tissue was not sufficient to cover the exposed globe despite undermining (A). A scleral shell was sutured over the exposed implant to add volume (B). UC was then sutured over the scleral shell (C) that allowed maintenance of a deep superior fornix (D). A conformer was placed and the eye achieved excellent volume resembling the fellow eye immediate post-op (E).

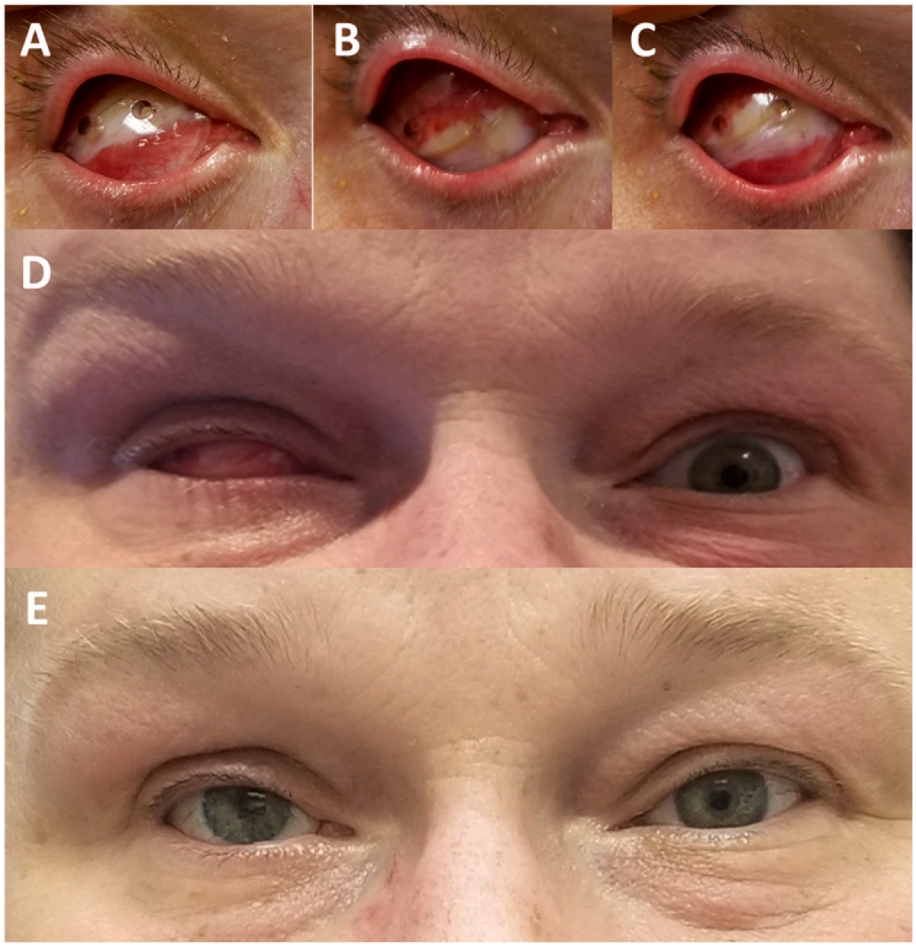

Fig. 3. Post-operative Outcome. Globe and graft had good movement for upward, downward, and straight forward gaze (A, B, C) which allowed for transfer to final prosthesis and elimination of her 6mm of enophthalmos. However, the right upper lid remained ptotic with compensatory elevation of the right eyebrow (D). At 8 months (E), the patient had a well fitted and retained prosthesis with a superior lip allowing elevation of the ptotic lid (and elimination of the compensatory brow elevation), providing similar aesthetic outcome as the non-operative eye.

Instead, the ends were sutured onto the scleral graft with 5-0 chromic suture so that there was good fornix formation (Fig. 2B). Next, a 2.5 × 2.0 cm AmnioGuard® (Bio-Tissue, Miami, FL) was placed and sutured using interrupted and running 5-0 chromic suture to the conjunctiva 3–5 mm beyond the previously suture line of conjunctiva-sclera. AmnioGuard was not sutured taut (Fig. 2C) which allowed for deeper fornices (Fig. 2D) to mitigate any potential contraction that may inevitably occur due to the amount of inflammation the patient had from her prior retinal detachment and phthisis. The suture knots were then buried. Minimal cautery was used throughout the procedure. Neomycin/polymyxin B/dexamethasone ointment (Maxitrol; Alcon, Fort Worth, TX) and a conformer were placed in the eye. Immediate post-operatively, the eye depth and volume were noted to be similar to the fellow eye (Fig. 2E).

At the post-operative 6th week, the patient's socket was healthy and had good movement of the globe (Fig. 3A–C). However, she still had ptosis of the right upper eyelid with compensatory elevation of the right eyebrow (Fig. 3D). She was referred for fitting for an ocular prosthesis after 7 weeks. She returned at 8 months post-op with a well fitted prosthesis with an added superior lip that allowed for lifting her ptotic eyelid to be equal height to the non-operative eye (Fig. 3E). Her socket was healthy with deep fornices, and excellent globe and prosthesis movement.

3. Discussion

Post-evisceration wound dehiscence is common and can be managed by re-suturing conjunctiva, debulking the implant, and/or secondary closure with a tissue graft. In this particular case with a ptotic lid, there was a lack of healthy conjunctival tissue that would provide an increase in socket size and preservation of the fornices so as to ultimately allow for a larger ocular prosthesis with superior lip, saving her an additional eyelid surgery. Alternatively, autografting of healthy conjunctiva from the fellow eye or oral or nasal mucosal tissue could have been considered but had the disadvantages of graft harvesting and donor-site morbidity, and the limited supply would not have been able to achieve as large a volume augmentation as needed in this case. Although amniotic membrane has similarly been utilized to manage exposure of hydroxyapatite and porous polyethylene implants and exposure of dermis-fat grafts with beneficial results,[9–11] it was thought to be too thin for this application to add volume. Hence, reconstruction with the thicker amniotic membrane from UC was performed which allowed increased orbital volume to match the fellow eye, expanded coverage of the ocular implant, and deepened fornices to allow placement of the ocular prosthesis with superior lip for ptosis elevation. The 2.5 × 2.0 cm AmnioGuard was only slightly trimmed and applied in a relaxed, non-tight state. This allowed reconstruction of the deep inferior and superior fornices and mitigation of any potential contraction due to post-operative inflammation. The final outcome at 8 months showed excellent cosmesis and motility with volume similar to the fellow, unoperated eye, and elevation of the ptotic eyelid. The patient also had no pain and was able to return to her daily activities without issue.

The successful result of this case is consistent with the literature reporting the use of amniotic membrane from UC in cases of anophthalmic socket contracture, implant explosure, and entropion repair.[6,7] In 3 cases of spherical orbital implant (2 porous polyethylene and 1 acrylic) exposure that occurred post-enucleation, AmnioGuard was positioned over the defect between the conjunctival edge and the implant and complete wound healing was achieved over the 5–9 month

follow-up period.[6] Our current case is unique to the existing literature as the implant was not exposed, enucleation was not previously performed, and multiple issues were addressed in one setting. The umbilical amnion graft in our case was used for more purposes than to act as a barrier to promote healing. Rather, in this case of dehiscence post-evisceration wherein the implant was not exposed, the graft was used to bolster the orbital volume to a large enough extent to match the fellow eye, to increase the orbital fornices inferiorly and superiorly to allow placement of a large ocular prosthesis with superior lip for ptosis elevation, and to eliminate her 6mm of enophthalmos. In addition, the novel use of AmnioGuard over a donor scleral shell acted as a "pillow-top" to maintain the space with durability, increase thickness, and promote soft tissue augmentation (similarly seen in applications to prevent erosion after shunt tube surgery and promote regeneration of ulcers), and may potentially mitigate complications of closure with a donor scleral shell alone.[12] Hence, this case demonstrates another novel use of AmnioGuard to provide volume support, socket reconstruction, good cosmesis, and maintained ocular motility.

The thin and thick amniotic membranes share similar histological features such as an epithelial layer, a basement membrane, and stroma rich in hyaluronic acid. They are also both rich in structural proteins, growth factors, and HC-HA/PTX3, of which the latter is known to upregulate anti-inflammatory cytokine IL-10, downregulate pro-inflammatory cytokine IL-12, and polarize macrophage toward anti-inflammatory phenotype.[13–15] The benefits of the amniotic membrane from UC is its thickness (about 10 times thicker), increased concentration of HC-HA/PTX3, and superior tensile strength. The UC is also advantageous to other tissue materials (such as hard palate, sclera, conjunctiva, dermis, and fascia lata) because it is readily available off-the-shelf, is relatively thick and flexible for secure handling and suturing, and has anti-inflammatory, anti-scarring, and pro-regenerative properties. These collective properties most likely contributed to excellent cosmesis outcome and maintenance of the fornix depth in the present case without complication or reoperation.

4. Conclusions

This case highlights the utilization of the thick amniotic membrane from UC to reconstruct a wound dehiscence after evisceration and reconstruct the fornices and restore the orbital volume similar to the fellow, unoperated eye. Post-op, the patient had no pain, was able to return to her daily activities without issue, and had excellent ocular cosmesis with retained ocular motility and a higher quality of life.

Patient consent

Written consent to publish deidentified medical information and clinical photographs was obtained from the patient. This report does not contain any personal information that could lead to the identification of the patient.

Funding

TissueTech.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

The following author has no financial disclosures: LSB.

Acknowledgements

Authors would like to acknowledge the support of TissueTech for an educational grant to cover the article processing charge.

References

1. Nakra T, Simon GJ, Douglas RS, Schwarcz RM, McCann JD, Goldberg RA. Comparing outcomes of enucleation and evisceration. *Ophthalmology*. 2006;113(12):2270–2275.
2. Custer PL, Maamari RN, Huecker JB, Gordon MO. Anophthalmic ptosis and the effects of enucleation on upper eyelid function. *Ophthalmic Plast Reconstr Surg*. 2021;37(3s):S80–s84.
3. Ababneh OH, AboTaleb EA, Abu Ameerh MA, Yousef YA. Enucleation and evisceration at a tertiary care hospital in a developing country. *BMC Ophthalmol*. 2015;15:120.
4. Tighe S, Mead OG, Lee A, Tseng SCG. Basic science review of birth tissue uses in ophthalmology. *Taiwan J Ophthalmol*. 2020;10(1):3–12.
5. Sheha H, Tello C, Al-Aswad LA, Sayed MS, Lee RK. Outcomes of the shunt tube exposure prevention study: a randomized clinical trial. *Ophthalmology Glaucoma*. 2019;2(6):392–401.
6. Slentz DH, Joseph SS, Nelson CC. The use of umbilical amnion for conjunctival socket, fornix, and eyelid margin reconstruction. *Ophthalmic Plast Reconstr Surg*. 2020;36(4):365–371.
7. Slentz DH, Nelson CC. Novel use of cryopreserved ultra-thick human amniotic membrane for management of anophthalmic socket contracture. *Ophthalmic Plast Reconstr Surg*. 2019;35(2):193–196.
8. Finger PT, Jain P, Mukkamala SK. Super-thick amniotic membrane graft for ocular surface reconstruction. *Am J Ophthalmol*. 2019;198:45–53.
9. Lee-Wing MW. Amniotic membrane for repair of exposed hydroxyapatite orbital implant. *OphthalPlastReconstrSurg*. 2003;19(5):401–402.
10. Romera MA, Fernandez E, Martinez G, Torres JJ, Alonso T, Andreu D. Amniotic membrane transplantation for conjunctival epithelization of exposed dermis-fat [corrected] graft. *Orbit*. 2007;26(2):133–135.
11. Chen Y-h, Cui H-g. Amniotic membrane transplantation for porous sphere orbital implant exposure. *J Zhejiang Univ - Sci B*. 2007;8(9):616–619.
12. Gerding H. Complications after modified evisceration with closure of the anterior scleral shell by donor scleral graft. *Klin Monbl Augenheilkd*. 2021;238(4):358–360.
13. He H, Li W, Tseng DY, et al. Biochemical characterization and function of complexes formed by hyaluronan and the heavy chains of inter-alpha-inhibitor (HC*HA) purified from extracts of human amniotic membrane. *J Biol Chem*. 2009;284(30):20136–20146.
14. He H, Zhang S, Tighe S, Son J, Tseng SC. Immobilized heavy chain-hyaluronic acid polarizes lipopolysaccharide-activated macrophages toward M2 phenotype. *J Biol Chem*. 2013;288(36):25792–25803.
15. Koh TJ, DiPietro LA. Inflammation and wound healing: the role of the macrophage. *Expet Rev Mol Med*. 2011;13:e23.