

# Amniotic membrane transplantation and trabeculectomy in a patient with pseudophakic bullous keratopathy

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## ABSTRACT

Imam Tiharyo, Suhardjo, Wahyu Trianto - *Amniotic membrane transplantation and trabeculectomy in a patient with pseudophakic bullous keratopathy*

**Objective:** To report the success of amniotic membrane transplantation combined with trabeculectomy in a patient with Pseudophakic bullous keratopathy.

**Case Report:** Amniotic membrane transplantation and trabeculectomy followed by tarsoraphy had been successfully performed in an eye of male patient 67 years old with pseudophakic bullous keratopathy, with increased intraocular pressure, the visual acuity for both eyes was hand movement, intraocular pressure in the right eye was 25 mmHg and 18 mmHg in the left eye. Patient felt painful in both eyes also. Pre surgical and post surgical medication with oral and eye drop antibiotic, oral and eye drop steroid, and oral vitamin was given.

**Result:** The painful of both eyes disappeared on the 1<sup>st</sup> day after amniotic membrane transplantation and no recurrence in 2 week observation. In the right eye amniotic membrane dissolves on the 4<sup>th</sup> day after surgery, an epithelization occurred on the 5<sup>th</sup> day after surgery. On the 7<sup>th</sup> day the visual acuity was 2/60. Amniotic membrane dissolves on the 3<sup>rd</sup> day in the left eye, epithelization occurred on the 4<sup>th</sup> day. On the 7<sup>th</sup> day the visual acuity reached 3/60 and remained constant until the 2<sup>nd</sup> week of observation

**Conclusion:** Amniotic membrane transplantation followed by tarsoraphy is effective for pseudophakic bullous keratopathy treatment

**Key words:** Pseudophakic - bullous keratopathy - amniotic membrane transplantation - trabeculectomy - intraocular pressure - visual acuity

## ABSTRAK

Imam Tiharyo, Suhardjo, Wahyu Trianto - *Transplantasi membran amnion dan trabekulektomi pada penderita pseudofakia keratopati bulosa.*

**Tujuan :** Untuk melaporkan keberhasilan transplantasi membran amnion dan trabekulektomi pada keratopati bulosa.

**Laporan Kasus :** Transplantasi membran amnion dan trabekulektomi yang disertai tarsorafasi dilakukan pada dua mata seorang penderita laki-laki umur 67 tahun yang menderita pseudofakia keratopati bulosa dan tekanan intraokular yang meningkat, dengan visus mata kanan dan kiri 1/300, sedangkan tekanan intraokular pada mata kanan 25 mmHg, pada mata kiri 18 mmHg. Selain penurunan penglihatan pasien juga mengeluh nyeri pada kedua matanya. Pre dan post operasi pasien mendapat terapi antibiotik oral, antibiotik tetes mata, steroid oral, steroid tetes mata, dan vitamin oral.

**Hasil :** Keluhan nyeri hilang pada hari pertama setelah transplantasi membran amnion, dan tidak berulang sampai 2 minggu pengamatan. Pada mata kanan membran amnion larut pada hari ke-4 post operasi, epitelisasi terjadi pada hari ke-5 post operasi. Pada hari ke-7 visus 2/60. Pada mata kiri membran amnion larut pada hari ke 3, epitelisasi terjadi pada hari ke 4. pada hari ke tujuh visus mencapai 3/60 dan menetap hingga minggu ke-2 pengamatan

**Simpulan :** Transplantasi membran amnion yang disertai tarsorafasi, efektif untuk penanganan keratopati bulosa.

## INTRODUCTION

Bullous keratopathy is a disorder caused by decompensation of corneal endothelium, characterized with corneal stroma edema, with epithelial blister or bulla<sup>1,7</sup>. Because of the condition, there would be cloudy in the cornea that causes pain and reduced visual acuity as well as infection. Several causes of endothelial decompensation are resulted from intraocular surgical procedures including cataract extraction, pseudophakic or aphakic. It could be also resulted from non-operative causes such as uncontrolled glaucoma and dystrophy of endothelium Fuchs<sup>1,3,7</sup>. Endothelial decompensation occurred on pseudophakic bullous keratopathy is caused by direct or indirect damage of corneal endothelium, including contact between surface of corneal endothelium and surgical instruments, intraocular lens, or medicamentous used during operation procedure such as viscoelastic or by manipulation<sup>3</sup>.

Those particulars could be explained by histopathological changes in corneal stroma and epithelium. Without sufficient function of endothelium in keeping corneal stroma deturegency, stromal hydration would increase, keratocyte would disappear, and Bowman layer as well as epithelial basal membrane would reduce or tear, glicosamino-glican within the stroma would be removed as well. These changes cause increased intraepithelial edema and hydration. Alteration at the surface then causes poor epithelial adhesion or persistent repeated erosion, explaining several conditions complicated by infectious keratitis and ulcer<sup>1,3,6</sup>. Bullous keratopathy occurs in the late stage of epithelial edema. Blister is formed as corneal epithelium is separated from Bowman layer, and on the late stage blister could be filled with fibrotic tissue and filament<sup>6,7</sup>.

Amniotic membrane AM is the innermost layer of the placenta and consists of a single layer of ectodermally derived amnion cells firmly attached to a basement membrane. Clinically,

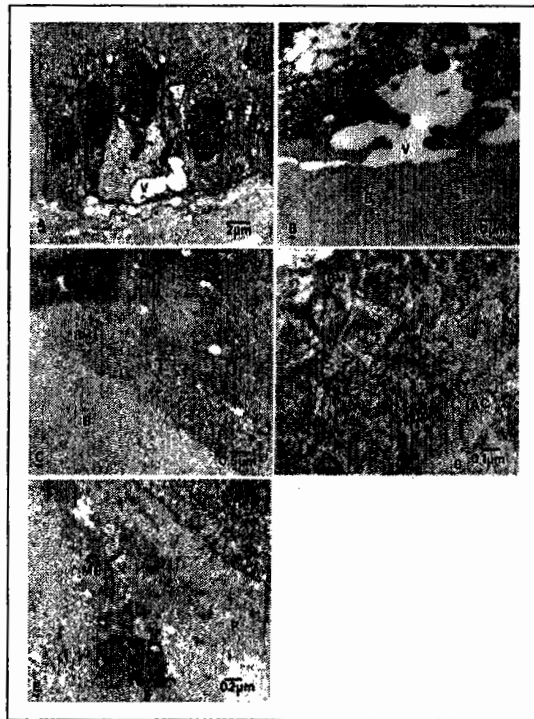


FIGURE 1. Feature of corneal bullous keratopathy in electron microscopy. a, Vacuole V on basal layer of epithelial cell E. b, Subepithelial vacuole V between epithelial cells E and Bowman membrane B. c, Thinning of basal membrane BM between epithelial cells E and Bowman membrane BM. d, Basal membrane is filled with filament AC upon Bowman membrane BM. e, Subepithelial pannus P filled with microfilament MF and keratocyt KR.

*Apple and Rabb.: Clinicopathology Corelation of Ocular Disease<sup>6</sup>*

preserved AM used as a basement membrane substitute has been applied successfully for the management of persistent epithelial defects with and without ulcerations. Furthermore, multilayered amniotic membrane transplantation (AMT) has been described to be useful for the treatment of deep corneal ulcers, descemetocelles and small corneal perforation. Interestingly, these clinical studies indicated that corneal inflammation subsided rapidly after AMT. For instance, inflammation has been identified as a crucial factor determining the outcome of ocular surface reconstruction. Clinically applied as a patch, AM modulates acute inflammation. There is an experimental evidence that this might be related to the expression of different anti-inflammatory proteins, inhibition of proteinase activity, exclusion of polymorphonuclear cells by subsequent apoptosis and decrease of lipid peroxidation.<sup>12</sup>

Human AM has been prepared as previously described. Briefly, human AM was processed after elective caesarean delivery when blood borne microorganisms such as human immunodeficiency virus types 1 and 2, hepatitis virus type B and C, and syphilis had been excluded by serological tests. Hepatitis virus type C was additionally excluded by polymerase chain reaction. Human AM has the characteristic of anti-adhesion and it is thought could increase epithelization and could reduce inflammation<sup>1,2,4,5</sup>. Transplantation of fresh human AM shows its success on persistent epithelial corneal defect, sterile corneal ulcer, bullous keratopathy, and partial stem cell limbal deficiency<sup>1,2,4,5,8,9</sup>. Based on those particulars, the author would report the success of treatment on pseudophakic bullous keratopathy with AMT.

## CASE REPORT

A 67 year old man, retired from government office, presented in the external ocular disease division, Ophthalmology Department of Dr. Sardjito Hospital. He was referred by an ophthalmologist with main complaint of pain in both eyes with reduced vision. The visual acuity of his two eyes was reduced to hand moving 1/300. One year ago

the patient underwent cataract surgery on both eyes. After surgery his vision was becoming better. However, 10 months after the surgery his vision kept reducing, and he felt pain in his eyes. His consciousness was normal, nutritional status was good, blood pressure was 120/70 mmHg, respiration rate was 12 x/min, heart rate was 84 x/min, and body temperature was 37°C. There was no regional lymph node enlargement.

On eye examination, his visual acuity was hand movement, there was corneal edema, bullous keratopathy, and pannus in both eyes. Intraocular pressure of the right eye was 25 mmHg and left eye was 18 mmHg.



FIGURE 2. Patient with pseudophakic bullous keratopathy

This patient was diagnosed bullous keratopathy. It was planned to perform AMT on both eyes and trabeculectomy on the right eye. Trabeculectomy was performed because the intraocular pressure of the right eye was 25 mmHg; it was expected that trabeculectomy could lower intraocular pressure and didn't disturb healing process.

Surgery was performed with general anesthesia. After aseptic and antiseptic steps on the right eye and its surrounding, trabeculectomy was performed with limbal base method, followed by making scleral limbal conjunctival flap with ½ scleral thickness. Window with 2x2 mm in size was made, followed by peripheral iridectomy, iris reposition, and suture between scleral flap and conjunctiva using nylon 10-0. Shortly after that, AMT with *overlay method* was performed. Firstly, humor aqueous aspiration was performed to make corneal surface not too tense, so that if intraocular pressure turn back to normal, amnion would attach firmly to corneal surface. After cleaning corneal layer and adherent corneal stroma was seen, prepared AM was taken from its storage place and was sliced in the same size with surface of cornea removed before, and

was sited in that place with membrane basal surface upwards. Basal membrane side was differentiated from stromal side with sponge touch. Basal membrane side would not attach to sponge, while stromal side would attach to it.

First segment of AM was transplanted as a filler material in stromal layer *amniotic membrane filling*. Second AM was transplanted as basement membrane *amniotic membrane graft*. AM was located upon corneal surface. Third AM was transplanted as cover *amniotic membrane patch* and interrupted suture with nylon 10-0 was performed.

AM was placed covering up the wound to corneal limbus with epithelial side upwards to protect reepithelization area <sup>1,4,5,10</sup>. On the left eye,

AMT was performed with the same technique. After transplantation, tarsoraphy was performed; oral antibiotics, eye drops antibiotics, oral steroid, eye drops steroid, and oral vitamin were given. Pain complaint on both eyes disappeared on day 1 post operation. On follow up, it could be detected that AM on the right eye dissolved on day 4 post transplantation and reepithelization occurred on day 5, while on the left eye AM dissolved on day 3 post transplantation and reepithelization occurred on day 4. On day 7, visual acuity of the right eye was 2/60 and the left eye was 3/60.

Intraocular pressure was measured with non-contact tonometry on day 7. Intraocular pressure of the right eye was 19 mmHg and the left eye was 15 mmHg. AM dissolved completely on week



FIGURE 3. Prosedure and technic amnion membrane transplantation



FIGURE 4. follow up day + 7 and day + 2 weeks after amnion membrane transplantation

2 post AMT. Final visual acuity of the right eye was 2/60 and the left eye was 3/60. Intraocular pressure of the right eye was 20 mmHg and the left eye was 17 mmHg.

## DISCUSSION

This report shows the success of AMT in relieving ocular pain and improving reduced visual acuity on bullous keratopathy. Renato *et al* 1999 during the follow-up period of 33.8 weeks, 3-96 weeks after AMT, found 43 (90%) of 48 eyes with intolerable pain preoperatively becoming pain free postoperatively.<sup>1</sup> The pain relieving using AMT was related to restoration of corneal epithelium integrity. Compared to our study pain relieving occurred on day 1 after membrane transplantation and there was no recurrence until week 2 of observation. Visual acuity of both eyes before transplantation was 1/300, and improved on day 7 post membrane transplantation; the right eye was 2/60, the left eye was 3/60. These visual acuity remained constant until week 2 after membrane transplantation. In this case epithelium recovery and wholeness were kept along follow up period. Heiligenhaus *et al* in Oct 2003, found the time between AMT and epithelial healing varied between 7 and 28 days (mean 17; SEM 2.7) days. The healing of stromal inflammation was noted in all of the seven treated eyes between the day 7 and 28 after AMT (mean 16.4 ± 2.5). These particulars support several former studies using AMT as one of the best methods for corneal disorder, in which AM facilitated epithelization, reduced inflammation and vascularization as well as reduced scar on cornea<sup>1,2,4,5,8,10,11</sup>. Transplantation was performed with *multi layer AMT* method<sup>1,4,5,10</sup>. AMT has more advantages than other methods such as conjunctival flap or lamellar keratoplasty, which have disadvantages such as neovascularization, cloudy cornea, fibrosis, anterior sinechia, glaucoma, uveitis, and graft failure<sup>1,2</sup>. Elevating intraocular pressure is one of the causes of endothelial decompensation on bullous keratopathy. Using trabeculectomy, it is expected that there is a persistent reduction of intraocular pressure and improvement of aqueous humor outflow, so that no healing process disturbance after membrane transplantation. Tarsoraphy is

performed to maintain globe layer humidity, as well as prevent dehydration of corneal layer.

## CONCLUSION

Based on the evidences such as pain relieving and better visual acuity it is concluded that AMT is effective in the treatment of bullous keratopathy. Other particulars that occur are reepithelization and reduction of inflammation. This surgical is technically easy to performed and could avoid several potential complication such as ptosis, as well as produce cosmetics appearance that is better than conjunctival flap. Thus, AMT could be main consideration beside conjunctival flap to treat pain, fasten wound healing, and maintain cosmetic appearance of the patient, as well as fixing reduction of visual function.

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