

# Clinical analysis of tear film after lamellar keratoplasty

Wan-Rong Huang, Qiu-Lian Chen, Jin-Hong Cai, Yue Zhang

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Xiamen Eye Center of Xiamen University, Xiamen 361001, Fujian Province, China

**Correspondence to:** Yue Zhang. Xiamen Eye Center of Xiamen University, Xiamen 361001, Fujian Province, China. zmoon0225@126.com

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## Abstract

• **AIM:** To study the tear film stability after lamellar keratoplasty.

• **METHODS:** Five female and eight male patients with lamellar keratoconus, aged from 18 to 32, were involved. After lamellar keratoplasty, Schirmer I test (S I t), tear break-up time (BUT) test, fluorescein staining test were used to judge the effect of the surgery at different time point.

• **RESULTS:** The S I t were greatly increased in 7 days post operation ( $11.86 \pm 2.28$  -  $25.14 \pm 1.97$ ,  $19.86 \pm 1.61$ ) ( $P < 0.05$ ), there is no significant difference between 2<sup>nd</sup> month, 3<sup>rd</sup> month post-operative and pre-operation ( $11.86 \pm 2.28$  -  $14.57 \pm 1.48$ ,  $8.14 \pm 0.86$ ) ( $P > 0.05$ ). The mean break-up time decreased in 7 days post operation ( $5.00 \pm 1.31$  -  $2.71 \pm 0.18$ ,  $2.57 \pm 0.20$ ,  $2.71 \pm 0.36$ ,  $2.43 \pm 0.20$ ) ( $P < 0.05$ ). The mean scores of fluorescein increased post-operatively ( $0.14 \pm 0.14$  -  $8.00 \pm 0.00$ ,  $8.00 \pm 0.00$ ,  $8.00 \pm 0.00$ ,  $7.57 \pm 0.20$ ) ( $P < 0.01$ ).

• **CONCLUSION:** Lamellar keratoplasty influence the tear film stability, artificial tears and improving corneal epithelium cured medicine should be used after surgery.

• **KEYWORDS:** keratoconus; lamellar keratoplasty; tear film

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## INTRODUCTION

Lamellar keratoplasty possesses many advantages and was extensively used in clinic, especially for keratoconus patients. With more and more recognition about ocular surface disease, we are thinking highly of dry eye

symptom including foreign body sensation, dry feeling etc after ocular surgery<sup>[1]</sup>, especially occurred following keratoplasty. Therefore, the tear film conditions of 13 patients after lamellar keratoplasty from September 2010 to June 2011 were studied.

## MATERIALS AND METHODS

**Subjects** A total of 13 eyes underwent lamellar keratoplasty from September 2010 to June 2011, including male 8 eyes, female 5 eyes, aged 18-32(mean  $26 \pm 4.8$ )years. The preoperative ocular surface states of every patient were studied as control group. Preoperation preparation and anaesthesia were in accordance with the operation routine of penetrate keratoplasty. Operating procedure: After anaesthesia, the central lamellar cornea was cut off, with diameter of 7.5mm and thickness over half layer, and then the corneal plant was sutured by 10-0 nylon strings. Eye ointment (3g/L tobramycin+1g/L dexamethasone) was dropped immediately, and dropped by eyewater (3g/L tobramycin+1g/L dexamethasone) 4 every day over 3 months.

**Methods** Slit-lamp microscope, break-up time (BUT), Schirmer I test (S I t), fluorescence (FL) were used to observe the alterations of tear film at different time points in pre-operation and post-operation. Slit-lamp microscope, BUT, S I t, FL were used to observe the alterations of tear film at pre-operation and 7, 30, 60, 90 days in post-operation. Score standard: Corneal staining: without fluorescein coloring, 0 score; with a little punctiform fluorescein coloring, 1 score; with more fluorescein coloring, 2 score; with close punctiform and lamellar fluorescein coloring, 3 score. Dividing cornea into four equal quadrants to score, score range: from 0 to 12. BUT: normal value: 10-45 seconds, less than 10 seconds as tear-film instability.

**Statistical Analysis** All the data were analyzed with SPSS 11.0, measurement data employed analysis of variance.  $P < 0.05$  was regarded statistically significant.

## RESULTS

**S I t** S I t was greatly increased within 7 days post operationly, compared with preoperation, the differences were statistically significant ( $P < 0.05$ ). Lacrimal secretory volume taper and achieved preoperative level at 60 days postoperation, and were lower at 90 days than preoperation, but the differences were not statistically significant(Table 1).

**Table 1 Alterations of tear film before and after partly lamellar keratoplasty (Mean±SD)**

Time	S I t	BUT	FL
3d Pro-op	11.86±2.28	5.00±1.31	0.14±0.14
1wk post-op	25.14±1.97	2.71±0.18	8.00±0.00
1mo post-op	19.86±1.61	2.57±0.20	8.00±0.00
2mo post-op	14.57±1.48	2.71±0.36	8.00±0.00
3mo post-op	8.14±0.86	2.43±0.20	7.57±0.20

**Tear Film BUT** Compared with preoperation, BUT reduced significantly since 7 days after operation, and BUT at different time points within 90 days after operation were less than before those before operation, The differences were statistically significant ( $P < 0.05$ ). BUT at different time points after operation showed no statistical significance (Table 1).

**Fluorescein Staining** Compared with pre-operation, the mean scores of FL increased from 7 days to 90 days postoperation, the differences were statistically significant ( $P < 0.05$ ). The scores of fluorescence after 7 days postoperation were no significant differences compared with any time points postoperation (Table 1).

#### DISCUSSION

Early studies showed that ocular surgeries can affect the states of tear film on the ocular surface [1]. There were some complications occurred after corneal transplantation, such as implant rejection, exhaustion of endothelium function and epithelium disorder, these can cause the failure of the surgery, besides these the changes of ocular surface and tear film components can also induce the failure of keratoplasty [2]. Some studies indicated that physiologic function of tear film changed after some ocular operations [3-5], the changes may lead to dry eye symptom even influence operation effect. Accordingly, it is very important to learn condition of tear film after lamellar keratoplasty to reduce complication. Stabilization of tear film is foundation to keep ocular surface health, and stable tear film depends on quality and quantity of composition and normal lacrimal kinetics. Dry eye refers to abnormal quality and quantity of lacrimal fluid and abnormal lacrimal kinetics induced by any causes, and accompanying with complaint and ocular surface tissue affection [6]. Etiological factors are multiplicity, including systemic disease, drug, environmental contamination, local inflammatory reaction, malposition of eyelid, age and gender, etc [7]. The study indicated that multiple index of stabilization of tear film after lamellar keratoplasty changed markedly compared with pre-operation, The S I t were greatly increased 7 days after operation. With extension of observation time, S I t degraded gradually, and achieved preoperative level. We considered that the increased S I t may relate to irritating secrete of lacrimal fluid induced by corneal wound healing and sutures on the cornea after surgery. BUT reduced significantly 7 days postoperatively, and fluorescein stain degree increased markedly. This

condition exists in the whole observation process postoperation. We concluded that the condition may due to mechanical injury of cornea, inflammatory reaction, tissue edema, corneal wound healing post operation, these causes reducing conglutinating function of hydrated mucoprotein to the corneal epithelium, then the stabilization of tear film decreased and tear film couldn't well-distributed on the ocular surface [8]. The corneal sensation decreased due to the transporting obstruction of acetylcholine and cholinesterase in the damaged corneal nerves fibers during operative procedure [9]. Benzalkonium Chloride in the eye drops had epithelium toxicity and it would made the spotted destroy of epithelium with shorten BUT [10]. In addition, the form changes of implant and plant bed was also a reason for the unstabilization of tear film.

Stabilization of tear film was destroyed after lamellar keratoplasty, patients may complain of uncomfortable symptom or even dry eye. For better quality of visual acuity and lower uncomfortable complain, we should notice some points: avoid mechanical injury of corneal epithelium as far as possible during operation; choose better eyedrops induced less injury of ocular surface epithelium preoperatively and postoperatively; decrease applied frequency as far as possible on the foundation of preventing infection and rejection positively; employ artificial tears to avoid symptom increased for patients with dry eye preoperatively, and apply artificial tears routinely to increase viscosity of tissue on ocular surface to alleviate uncomfortable symptom and protect tear film postoperatively; perform operation after identifying etiological factor and applying reasonable medicine to control symptom of dry eye.

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