EGYPTIAN OPHTHALMOLOGICAL SOCIETY Summer Meeting 2018

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Effect of Platelet rich plasma on healing of corneal wound

Experimental study

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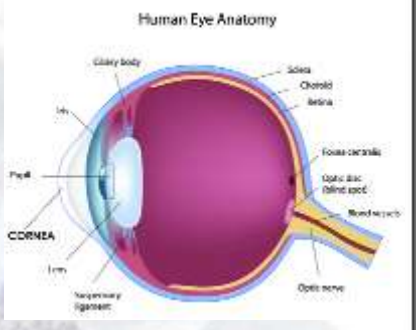
Introduction

Introduction

Trauma or disease may cause haze in the cornea through myofibroblast-mediated wound healing activity, leading to visual impairment.*



* (Wilson, 2012)

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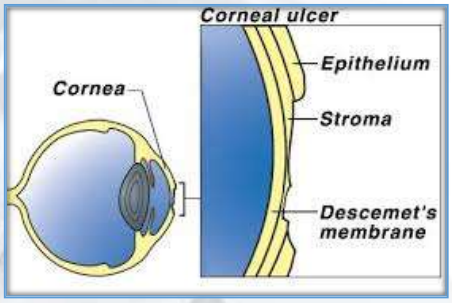
Introduction

- Corneal lesions present pathological responses usually associated with loss of transparency, especially in the absence of appropriate therapy.*



* Gigler et al, 2007

Introduction

Corneal wound healing is comprised of a cascade of events.*

- Keratocyte apoptosis
- Keratocyte proliferation & migration
- Myofibroblast Accumulation
- Inflamatory cell infiltration
- Stromal remodling
- Myofibroblast apoptosis

* Mohan et al, 2001

Introduction

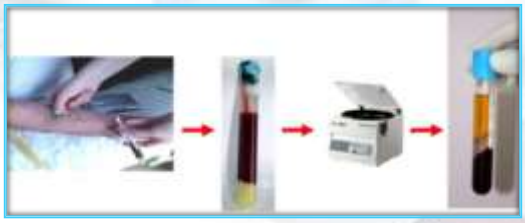
- Myofibroblast apoptosis has an important role in the regulation of corneal haze through the removal of the cellular contribution to the opacity. *

* (Wilson et al, 2007)

Introduction

Platelet-rich plasma (PRP): has been widely used in a variety of clinical applications as:

- Oral and maxillofacial surgery
- Orthopedic surgery
- Soft tissue diseases & burns
- Hard-to-heal wounds*



* (Galliera et al, 2012, Lubkowska et al, 2012)

Introduction

- The effectiveness of PRP is based on its high level of growth factors such as:
  - Platelet-derived growth factor (PDGF),
  - Vascular endothelial growth factor (VEGF)
  - Transforming growth factor (TGF), & others.

- These growth factors are important in modulating cell migration and proliferation during the healing process. *

* (Alsousou et al, 2013 and Foster et al, 2009)

Introduction

- In ophthalmology:

Many studies has demonstrated the role of PRP in:

- Moderate to severe dry eye
- Persistent epithelial corneal defect
- Recurrent corneal erosion
- Neurotrophic keratopathy
- Superior limbic keratoconjunctivitis
- Graft-versus-host disease
- Post-LASIK Ocular surface syndrome
- Others;

* (Alsousou et al, 2013 and Foster et al, 2009)

Dry eye

Use of PRP in Dry eye:

In 2007, Alio et al. demonstrated that the use of autologous PRP is very effective in 80% of patients suffering from dry eye symptoms, improving both patient satisfaction and ocular surface syndrome. (on 36 eyes)

Original Paper

Ophthalmic Research

Symptomatic Dry Eye Treatment with Autologous Platelet-Rich Plasma

Jorge L. Alio[a, c] José R. Colecha[a] Silvia Pastor[a] Alejandra Rodriguez[a, b] Alberto Artola[a, c]

Another study (2011) demonstrated that PRP can be used in the treatment of severe dry eye in patients with different etiopathologies such as Sjogren's Syndrome.

Cornea. 2011 Dec;30(12):1312-7. doi: 10.1097/ICO.0b013e31820d86d6.

Efficacy of plasma rich in growth factors for the treatment of dry eye.

López-Plandolit S[1], Morales MC, Freire V, Grau AE, Durán JA

Ribeiro et. al. (2016) analyzed the efficacy of PRP treatment in 12 diabetic patients. The results showed improvement in 100% of patients in relation to symptoms & regarding Schirmer's test.

The Use of Platelet-Rich Plasma in Dry Eye Disease

Marina Vargas Moura Resende Ribeiro, Eurica Adélia Nogueira Ribeiro and Luiz Feliciano Ribeiro

➢In 2017, Another study performed with larger number of subjects (N=368)

Ophthalmology and Therapy
December 2017, Volume 6, Issue 2, pp 285–293 | Cite as

Treatment of Dry Eye Disease with Autologous Platelet-Rich Plasma: A Prospective, Interventional, Non-Randomized Study

Authors | Authors and affiliations

Jorge L. Alio, Alejandra E. Rodriguez, Renan Ferreira-Oliveira, Dominika Wróbel-Dudzińska, Ahmed A. Abdelghany

Conclusion

The topical use of autologous platelet-rich plasma as monotherapy is an effective treatment to improve signs and symptoms in patients suffering from moderate to severe chronic DED.

Persistent epithelial defect

Use of PRP in persistent epithelial defect:

The effect of PRP on PEDs was evaluated by means of a prospective study in 20 eyes

Cornea. 2010 Aug;29(8):843-8. doi: 10.1097/ICO.0b013e3181a81820.

Plasma rich in growth factors as a therapeutic agent for persistent corneal epithelial defects.

López-Plandolit S[1], Morales MC, Freire V, Etxebarría J, Durán JA.

Results showed full recovery of the epithelial defect in 85% of cases (17 of 20 eyes). The tolerance to PRGF eye drops treatment was good in 95% of cases (19 of 20). Only one case showed discomfort to PRP treatment showing redness and itching.

Recurrent Corneal erosions

Use of PRP in RCE:

Korean J Ophthalmol. 2016 Apr;30(2):101-107. English.
Published online March 25, 2016. https://doi.org/10.3341/kjo.2016.30.2.101

Autologous Platelet-rich Plasma Eye Drops in the Treatment of Recurrent Corneal Erosions

Jun Hun Lee,[1] Myung Jun Kim,[1] Sang Won Ha,[2] and Hong Kyun Kim[1]

[1]Department of Ophthalmology, Kyungpook National University School of Medicine, Daegu, Korea.

[2]Cheil Eye Hospital, Daegu, Korea.

Conclusions

The use of PRP eye drops for the treatment of RCE was shown to be effective in reducing the recurrence rate without any significant complications.

Neurotropic ulcer

In 2011, A study showed, in a case report, the use of solid PRP associated to Tutopatch® (a biological membrane obtained from bovine pericardium) as a protection in a case of progressive neurotrophic corneal ulcer that did not respond to any treatment including AMT.

Treatment of a neurotrophic corneal ulcer with solid platelet-rich plasma and Tutopatch®

V.J. Ortuño-Prados, J.L. Alio*

ARCH SOC ESP OFTALMOL. 2011;86(4):121–123

DISCUSSION: We found this form of treatment very effective for progressive ulcers. Tutopatch® may constitute an alternative to amniotic membrane transplantation.

Post LASIK OSS

Use of PRP post LASIK OSS:

J Ophthalmol. 2017; 2017: 2457620.
Published online 2017 Dec 12. doi: 10.1155/2017/2457620
PMCID: PMC5742881
PMID: 29379652

Autologous Platelet-Rich Plasma Eye Drops for the Treatment of Post-LASIK Chronic Ocular Surface Syndrome

Jorge L. Alio,[1,2] Alejandra E. Rodriguez,[3] Ahmed A. Abdelghany,[4,5] and Renan F. Oliveira[6]

Methods

This prospective interventional consecutive clinical study include 156 eyes of 80 patients affected by post-LASIK chronic OSS who were treated with autologous E-PRP 6 times a day as monotherapy for 6 weeks.

Conclusion

Monotherapy with autologous E-PRP is a well-tolerated, safe, and effective treatment for the management of post-LASIK ocular surface syndrome.

Post LASIK OSS

Other applications

- Treatment of macular hole
- Amniotic membrane transplantation combined with clot of platelet-rich plasma in cases of corneal perforation
- In Vivo lamellar keratoplasty using PRP as bioadhesive

Complications

Complications:

- Frequent blood extractions, mainly in the groups requiring prolonged treatment.
- Peripheral corneal infiltrate and ulcer
- Eyelid eczema
- Microbial keratitis especially in patients with an epithelial defect
- Increased discomfort or epitheliopathy
- Scleral vasculitis and melting

The above complications are rare

Aim of The Work

Aim of the work

- Studying the histopathogical effect of platelet rich plasma on repair of corneal wound.

Materials & Methods

Materials & Methods

- The study is Interventional Exprimental carried at animal lab of Medical studies & research institute, Alexandria.
- Study included:
  - 10 adult male Albino rabbits, weighing 2.0 –4.0 Kg.
  - The animal procedure was performed in accordance with guidelines for ethical conduct in care and use of animals.

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Introduction

Experimental design

Rabbits divided into two main groups;

Control Group	PRP treated group
Five rabbits Corneal wound, left eye * Allowed for wound repair Received no treatment	Five rabbits which had corneal wound in left eye* single dose of subconjunctival autologous PRP

* The right eye is kept normal and studied for normal Histology

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Materials & Methods

Blood sampling and platelet rich plasma preparation

- Aspiration of 5 ml of rabbit blood through ear central vein, mixed with 3.8% sodium citrate.

Materials & Methods

Blood sampling and platelet rich plasma preparation

The tubes were centrifuged using double centrifugation technique to increase the concentration of platelets *

* Maria et al, 2010

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Materials & Methods

Surgical procedure

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Materials & Methods

Surgical procedure

1. Marking:

   The center of the cornea was marked using a 7-mm trepan blue stained Ring.

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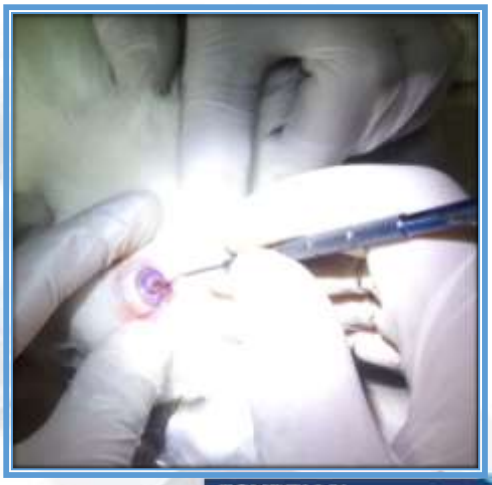
Materials & Methods

Surgical procedure

2. De-epithelialization

Corneal epithelium in the marked area was removed using a knife.

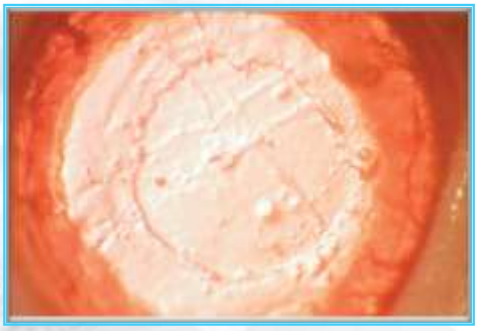


Materials & Methods

Surgical procedure

3. Stromal injury:

- 27-gauge needle was used to make four incisions in the central corneal stroma forming crossed pair of parallel horizontal and vertical incisions.



Materials & Methods

Surgical procedure

- PRP treated group received a single dose of subconjunctival autologous PRP.
- A total of 0.5 ml PRP was injected into the superior conjunctival fornix using 1-mL syringe.
- Other rabbits received no treatment and assigned as control group. *

*Tanidir et al, 2010..

Materials & Methods

Materials & Methods

Histopathological examination

- Rabbit eye Excised after 7 days and fixed in 10% formalin.
- The paraffin sections were prepared and cut.
- The sections then were stained with H & E and Masson's trichrome and studied for histopathological changes.
- Also electron microscopy was done for each of the groups.

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Results

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Results

- Gross Picture

Naked eye examination of cornea reveals that treated group had clear cornea while control group present central unclearity representing delayed healing

Control Group

PRP Treated Group

Results

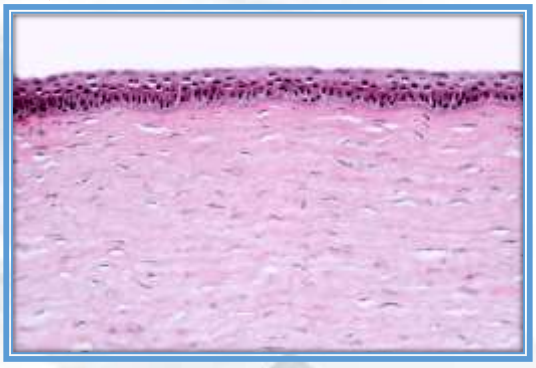
Histological examination

- Normal cornea (H& E)

Close to Human

Intact Epithelium

Uniform arrangement of Collagen



Right eye H & E X 200

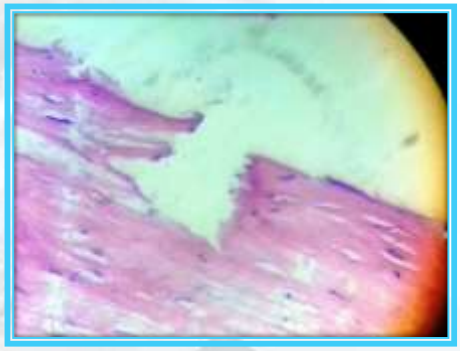
Results

Microscopic Picture

- Corneal injury (H& E)

Absence of Epithelium

Stromal Wound



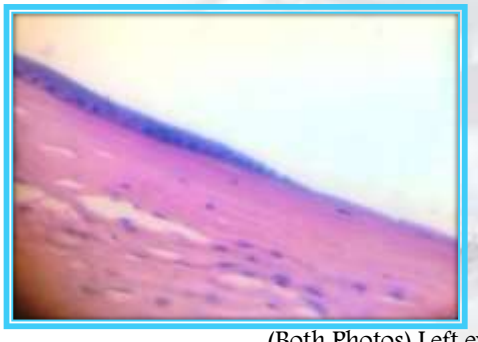
Left eye H & E X 100

Results

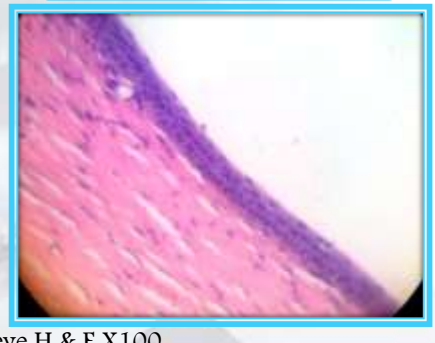
Histopathological examination

Healing (H & E)

Control Group



PRP Treated Group



(Both Photos) Left eye H & E X100

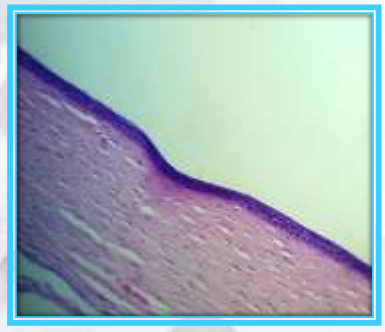
Results

Histopathological examination

Low Power (H & E)

Control Group

PRP Treated Group



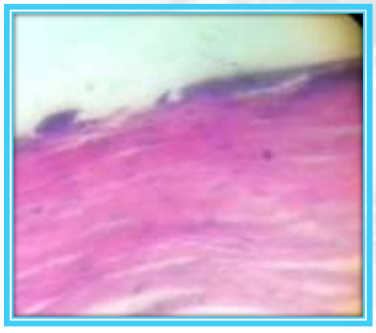
(Both Photos) Left eye H & E X25

Results

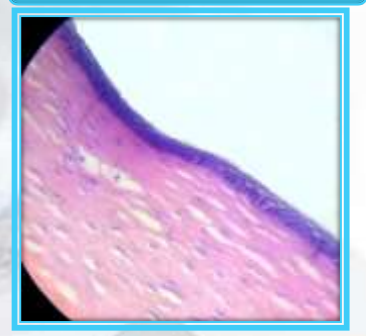
Histopathological examination

High Power (H & E)

Control Group



PRP Treated Group

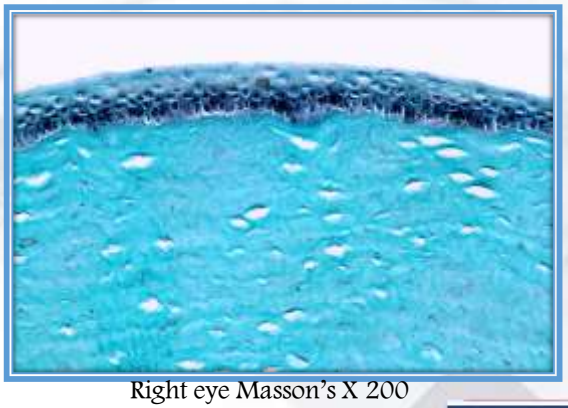


Left eye H & E X100

Results

Histological examination

Normal cornea (Masson's Trichrome)



Right eye Masson's X 200

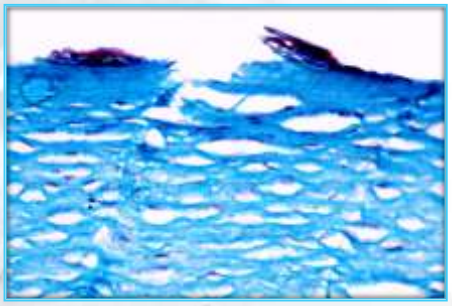
Results

Microscopic Picture

- **Corneal injury (Masson)**

Absence of Epithelium

Stromal Wound

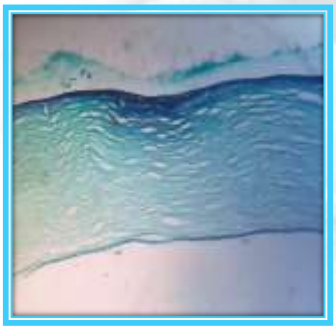
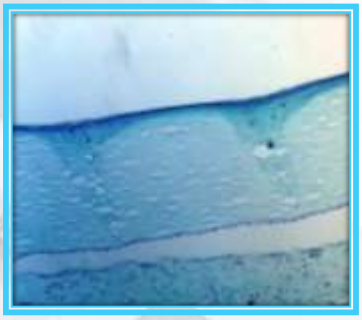


Left eye H & E X 100

Results

Histopathological examination

Low Power (Masson)

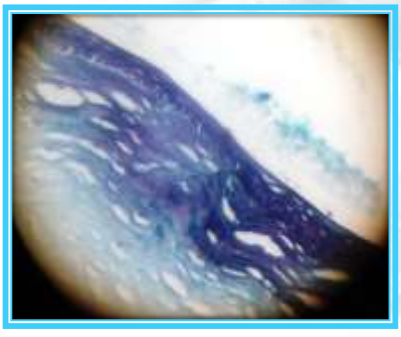
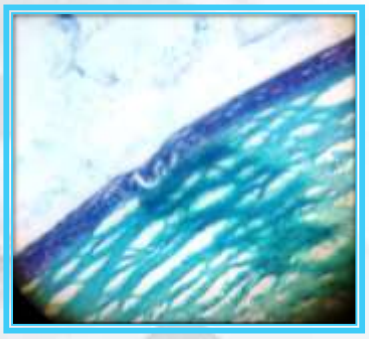
Control Group	PRP Treated Group
	

Left eye Masson's X 25

Results

Histopathological examination

High Power (Masson)

Control Group	PRP Treated Group
	

Left eye Masson's X 100

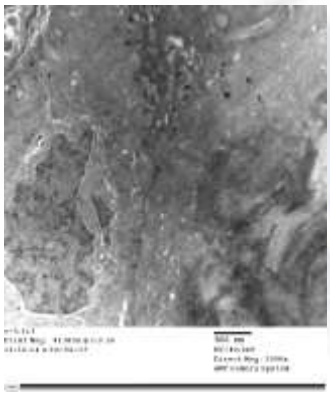
Results

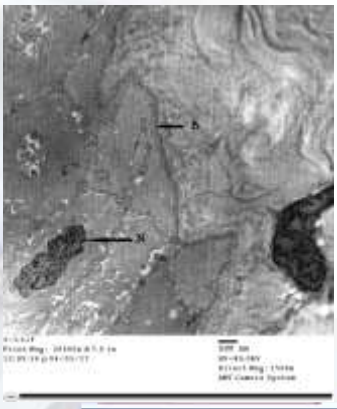
Histopathological examination

Control Group

EM

PRP Treated Group





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Conclusion

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Conclusion

- There is microscopic evidence of improvement of healing of corneal wound with use of PRP in the form of:
  - Rapid Regular epithelial healing.
  - Better remodeling of stroma with decreased population of cells & uniform arrangement of collagen bundle.