



Role of autologous platelet-rich plasma (PRP) eye drops as monotherapy for the treatment of severe dry eye disease

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Abstract

Objective: To evaluate use of autologous platelet-rich plasma (PRP) eye drops for the treatment of severe dry eye disease.

Materials & Method: This is a retrospective study conducted at a tertiary eye care centre. 30 patients with severe dry eye disease (DED) were included in this study. Data obtained from medical records of patients. Following information noted from medical records. Type of dry eye as evaporative DED (EDED) or aqueous deficient DED (ADDED). Following information were noted before treatment with PRP eye drops and on each follow up visits; OSDI score (Subjective symptoms), Corneal Fluorescein Staining (CFS), Tear Film Breakup Time (TBUT), Tear Meniscus Height (TMH) and Schirmer's score (SCH 1). Follow up done at 1 week, 1 month, 3 month and final follow up done at 6 months.

Results: Out of 30 cases 19 (63.3 %) were women, and 11 (36.6 %) were men. 16 (53.3 %) had EDED, while 14 (46.6%) had ADDED. 6 months of monotherapy with autologous PRP resulted reduction in dry eye symptoms in 28 (93.3 %) cases. CFS decreased in 23 (76.6 %) patients, TBUT improved in 26 (86.6%) patients, tear meniscus height improved in 24 (80.0%) patients and schirmers score improved in 16 (53.3 %) patients.

Conclusion: Autologous PRP is an effective treatment to improve signs and symptoms of dry eye disease.

Introduction

Asian studies on dry eye showed that the prevalence of dry eyes is higher in Asian population than the western population and it is between 14.5%-93.2%.¹⁻⁶ The prevalence of dry eye in India is ranging from 18.4% to 40.8%.¹⁻³ This variation is because of lack of uniformity in the diagnostic criteria of dry eye. There are many etiological factors for dry eye like age, sex, smoking, occupational factors, geographical factors (high altitude, hot dry air) systemic

diseases like Sjögren syndrome, Meibomian glands dysfunction, air conditioning, vitamin A deficiency etc.^{5,7-10} There are two main mechanisms that explain this ocular surface dysfunction: aqueous deficiency and excessive evaporation of the tear film.¹¹ Preservative-free artificial eye drops are the main conventional treatment for dry eye providing ocular surface lubrication. However, they lack the complex composition of natural tears such as water, salts, lipids, proteins, and growth factors.¹²

Furthermore, taking into consideration that inflammation plays a main role in the pathogenesis of dry eye, other therapeutic alternatives such as topical corticosteroids and cyclosporine are used as a second-line treatment in severe dry eye.^{13,14} However, their use is limited due to several side effects, including ocular burns, strong irritation, increase of intraocular pressure, and glaucoma.^{15,16} Autologous serum and PRP have similar compositions, since they have various growth and healing factors present in the blood.¹⁷ However, autologous serum contains proinflammatory cytokines derived from leukocytes and monocytes, which may be harmful to patients with immunological disorders or diseases.¹⁸ Thus, the PRP is advantageous for not containing these immunoglobulins of the inflammation, and also for regulating the expression of several genes in the cellular communication and differentiation, improving the biological activity of the corneal epithelial cells when compared to the autologous serum.¹⁹ In addition, PRP becomes more effective when presenting higher indexes of growth factors such as: EGF (epithelial growth factor), vitamin A, neural growth factor (NGF), Insulin type I growth factor¹⁷ and platelet factor IV.²⁰

Materials & Method

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Result

30 patients were included in this study of which 11(36.6%) were male, 19 (63.3%) were female, with age ranging from 18- 75 years (mean 49.52 ± 13.98) (Table 1)

Table- 1 Characteristics of the Study Group

Characteristics	No.
Male	11(36.6%)
Female	19(63.3%)
Mean age (years)	49.52 ± 13.98

Out of 30 cases in present study, 13(43.3%) cases had mixed DED followed by 11cases (36.6%) of EDED and 6(20%) of ADDED. (Table 2)

Table- 2 Distributions of eyes according to Clinical Type

Type	Number (30)	%
ADDED	6	20%
EDED	11	36.6%
MIXED DED	13	43.3%

In present study Ocular Surface Disease Index (OSDI) was used to evaluate symptomatic improvements. Average OSDI reduced to 32±19.89 from 76.21±15.85 at 6 month post PRP therapy. 28(93.3%) patients showed major improvement in symptoms. (Table 3)

Table-3 Pre and Post Treatment OSDI Score

OSDI score	No. of patients				
	0 day (Pre-PRP therapy)	1week	1 month	3 month	6 month
81-100	15	13	7	2	1
61-80	8	8	9	5	1
41-60	6	7	5	9	7
21-40	1	2	6	9	12
0-20	0	0	3	5	9
Total	30				

Improvement in tear film breakup time (TBUT) represents the improvement in stability of the tear film. In present study TBUT improved in 76.6% (26) patients with initial mean value of 2.48±1.25 seconds to 7.31±3.48 seconds at 6 months of follow up. (Table 4)

Table- 4 Pre and Post Treatment TBUT

TBUT Seconds	No. of patients				
	0 day (Pre-PRP therapy)	1 week	1 month	3 month	6 month
0-3	25	18	11	8	6
>3-6	3	8	9	6	1
>6-10	2	3	8	11	16
>10	0	1	2	5	7
Total	30				

Improvement in the tear meniscus height (TMH) in 80% (24) of the patients at 6 months. Initial mean score of 0.04 ± 0.08 mm TMH was improved to 0.24 ± 0.21 mm (Table 5)

Table- 5 Pre and Post Treatment TMH

TMH	No. of patients				
	0 day (Pre-PRP therapy)	1week	1month	3month	6month
Absent	20	20	15	9	6
0-0.2	9	8	9	11	8
0.3-0.5	1	2	5	8	12
>0.5	0	0	1	2	4
Total	30				

Corneal Fluorescein staining (CFS) positively correlates with severity of dry eye. At presentation mean CFS score was 2.72 ± 0.45 which reduced to 0.79 ± 1.21 and improvement was seen in 76.6% (23) of the patients. (Table 6)

Table -6 Pre and Post Treatment CFS

CFS (score)	No. of patients				
	0 day (Pre-PRP therapy)	1 week	1 month	3month	6month
Diffuse (3)	21	18	11	7	6
Coarse punctate (2)	8	5	4	1	1
Fine punctate (1)	1	7	2	5	3
Absent (0)	0	6	13	17	20
Total	30				

The initial mean Schirmer-1(SCH-1) value was 2.72 ± 2.32 mm which was improved to 5 ± 3.73 mm after 6 months follow up and improvement was seen in 53.3% (16) of patients (Table 7)

Table -7 Pre and Post Treatment SCH Score

SCH-1 value	No. of patients				
	0 day (Pre-PRP therapy)	1week	1month	3month	6month
0-2	16	16	13	12	10
3-4	8	8	8	5	4
5-10	6	6	8	10	11
>10	0	0	1	3	5
Total	30				

Discussion

Dry eye disease is a multifactorial in nature with presentation in all the age groups. DED is one of the most common problems in patients attending the eye clinic. Its presentation varies from mild symptomatic to a severe disabling disease. The frequently reported complaints of patients with DED are sandy gritty eye irritation, burning, redness, intermittent sharp pain and photophobia but often there is no correlation between the signs and symptoms of dry eye disease.²¹ Although mild dry eye can be treated with the use of artificial tear substitutes but severe form of dry eye needs special attention and care because without sufficient tear film, irritation can translate to scratches on the cornea, Over time, corneal scratches due to dry eye can produce scarring and result in permanent vision loss. In extreme cases, the entire eye can be lost. Autologous PRP is a hemoderivative with a high concentration of platelets obtained through a relatively simple process, which requires minimal manipulation and no addition of any other particular substance.²² Platelets have a lot of important functions that are repairing tissue damage, coagulation prevents blood loss, secreting proteins, cytokines and other mediators; including tissue regeneration by cell migration, proliferation, and angiogenesis, and preventing infections because of its antianabolic action. They also have anti-inflammatory and analgesic action.²³ In the present study there was symptomatic improvement (OSDI Score) in 93.3% (28) of the patients, while CFS reduced in 76.6% (23), schirmer's score improved in 86.6% (26) after 6 months monotherapy treatment with PRP, these results are comparable to a study done

by George L. Alio in 2017²⁴ Ribeiro et. al. (2016)²⁵ showed improvement in 100% of patients in relation to symptoms, regarding Schirmer's test, 41.66% of patients showed improvement, 50% did not show alterations, and 8.33% had a reduced value after the test. Study by Alio JL²⁶ (2007) showed symptomatic improvement in 89% of patients and significant improvement on tear meniscus and conjunctival hyperemia and a decrease or disappearance of corneal fluorescein staining. Sanchez-Avila RM²⁷ showed a significant reduction ($P < 0.05$) in OSDI scale (41.86%). A study by Drew VJ²⁸ showed 89% of patients using PRP eye drops four to six times per day reported subjective absence of DES symptoms. Benefits extended to include increased visual acuity, increased tear production, and improvements in ocular surface condition. A similar conclusion was reached by a study investigating the effect of this PRP on human lacrimal function²⁹

Conclusion

Dry eye disease is like global warming which is increasing day by day with changing scenario and complexities which makes it difficult to manage it accurately. Subjective symptoms(OSDI) are seen to be improving within days of starting PRP eye drops, while the signs are seen improving within a week of starting treatment. Additional advantages as no added preservatives, autologous in origin makes PRP eye drop a tolerable and safe treatment to improve signs and symptoms in patients suffering from severe chronic DED.

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