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RESEARCH LETTER

Autologous serum eye drops for treatment of dry eye syndrome

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INTRODUCTION

Dry eye syndrome (DES) is a common ocular condition characterised by discomfort, visual disturbances, and tear film instability due to inadequate tear production or excessive evaporation.[1] Traditional treatments for DES include artificial tears, anti-inflammatory drugs, and punctal plugs; however, their efficacy varies among patients.[2] Autologous serum eye drops (ASED), derived from a patient's blood, offer a promising alternative because they contain growth factors and nutrients similar to natural tears.[3] While international studies have demonstrated positive outcomes with ASED,[4,5] there is a lack of comprehensive comparative data on its efficacy versus conventional eye drops in local populations. This study aims to evaluate the clinical efficacy and safety of ASED compared to commercial eye drops in patients with DES.

A total of 40 patients diagnosed with DES by ophthalmologists were enrolled by randomisation into two groups: autologous serum eye drops and commercial eye drops. Data was collected from 15 Nov 2021 to 15 May 2022. Patients were evaluated at four-week intervals over a six-month follow-up period. All patients provided informed consent to participate in the study before enrollment. The primary outcomes of interest were changes in visual acuity (in decimal scale), fluorescein score, and tear break-up time between the autologous serum and commercial eye drop groups. Laboratory procedures involved the collection and preparation of ASED. Clinical and laboratory parameters were used to determine the patient's outcome. Means and standard deviations (SD) of visual acuity (using the decimal scale) and other statistical analyses were calculated for pre- and post-operative stages. Chi-square and independent *t* tests were used to determine statistical differences between commercial eye drops and ASED. $P<0.05$ was considered statistically significant.

HIGHLIGHTS

1. Autologous serum solutions exhibit significant clinical outcomes compared to commercial eye drops
2. The absence of trials currently limits the efficacy of autologous serum-based tears in treating severe dry eye and chronic epithelial abnormalities.
3. Serum eye drops can be formulated using unpreserved blood.

The assessment of potential autologous blood donors must be in a state of overall good health, free from significant ailments. Anaemia, with a haemoglobin level of 11 g/dL, is considered a relative contraindication. The blood donation process for voluntary donors remains unchanged, except for using gel tube vacutainers without anticoagulants for blood collection. A series of standardised diagnostic tests were conducted.

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TABLE 1 **Visual acuity, fluorescein score, and tear break-up time for conventional eye drops and autologous serum eye drop (ASED) in pre- and post-operative stages (n=40)**

	Commercial eye drop (n=20)	ASED (n=20)	*P*
Visual acuity			
Preoperative	0.22 (0.11)	0.22 (0.11)	0.99
Postoperative	0.10 (0.10)	0.0 (0.0)	<0.001
Fluorescein score			
Preoperative	10.8 (3.0)	10.8 (3.0)	0.99
Postoperative	5.4 (2.5)	2.2 (1.3)	<0.001
Tear break up time, sec			
Preoperative	5.6 (2.4)	5.8 (2.3)	<0.001
Postoperative	7.8 (2.9)	10.2 (3.1)	0.001

Visual acuity is given in decimal scale

Donations were maintained at a temperature of +4 degrees Celsius for 10 minutes to prevent bleeding cessation and ensure complete clot retraction. After centrifugation to isolate the serum, yielding approximately 2 mL per tube from a complete donation, the serum was diluted with an equivalent volume of sterile normal saline. The entire procedure was carried out in sterile screw-capped glass dropper bottles to dispense 1.5 mL aliquots of serum. These bottles were labelled with patient information and storage instructions before being transferred to a clean room with positive air pressure in a laminar flow cabinet. Once a specimen was extracted from a single eppendorf tube, any microorganisms were cultured and safely disposed of. The remaining tubes were cryopreserved at -30° C for future use. The product's viability is indicated as lasting for six months from the production date. Administering the serum to patients involves daily infusions, with specific intervals determined by individual symptoms, typically ranging from 3 to 6 times per day. Unused serum containers were discarded at the end of each day. The serum was processed according to a globally recognised methodology and then formulated into eye drops for patients in the autologous serum group.

Visual acuity improvements in the ASED group are more than eye drops. The mean preoperative visual acuity score for both groups was similar. Still, postoperatively, the eye drop group had a mean visual acuity score of 0.10 (0.10), indicating a significant improvement compared to the preoperative score. In contrast, the ASED group had a postoperative mean visual acuity score of 0.0 (0.0), demonstrating a substantial enhancement in visual acuity, indicating a significant improvement compared to the eye drop and a more substantial improvement in postoperative fluorescein scores compared to eye drop.

The mean preoperative tear break-up time (TBUT) was 5.6 (2.4) seconds in the eye drop group and 5.8 (2.3) seconds in the ASED group. Postoperative TBUT showed significant improvement in both groups, with the eye drop group reaching 7.8 (2.9) seconds and the ASED group showing a greater improvement to 10.2 (3.1) seconds (P <0.01).

The findings align with previous international studies that demonstrated the superior efficacy of ASED in managing DES. The significant reduction in fluorescein scores in the ASED group suggests better epithelial healing and tear film stability and studies have reported an increase in tear production similar to our study outcome.[5, 6] Despite replicating existing research, this study confirms the reproducibility of ASED benefits in a different population and setting, reinforcing its potential as a standard treatment for DES. However, the study lacks innovative elements and primarily replicates existing research. The results do not provide new scientific explanations for the observed outcomes, but they validate the effectiveness of ASED in a new demographic. Future studies could focus on understanding the molecular mechanisms underlying the enhanced efficacy of ASED and exploring potential enhancements to the preparation and administration protocols. It excluded the specimen stored in the refrigerator for 24 hours.

Using autologous serum is important because the repeated blood draws required for its preparation can inconvenience patients undergoing prolonged treatment. However, its implementation remains limited due to concerns about microbial growth during Storage.

ASED is generally reserved for severe cases or patients who have not responded to less costly treatments owing to its elevated cost and restricted accessibility. Further research is needed to innovate and enhance the therapeutic protocols for ASED to maximise patient outcomes.

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Author contributions

Conception and design: SSIS, MAM, MSA. *Acquisition, analysis, and interpretation of data:* SSIS, AH. *Manuscript drafting and revising it critically:* ES. *Approval of the final version of manuscript:* SSIS, AH, MAM, MSA, ES. *Guarantor of accuracy and integrity of the work:* SSIS, AH, MAM, MSA, ES.

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Conflict of interest

We do not have any conflict of interest.

Ethical approval

Ethical approval was taken from the Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University. Keeping compliance with the Helsinki Declaration for Medical Research Involving Human Subjects 1964, all the study subjects were informed verbally about the study design, the purpose of the study and potential benefits derived from the study. They were assured they had full rights to withdraw themselves from the study at any time for any reason whatsoever. Subjects who had given informed consent to participate in the study were included as study samples. The IRB memo number was - BSMMU/2021/10491.

Data availability statement

The data supporting this study's findings are available upon reasonable request.

REFERENCES

1. Craig JP, Nichols KK, Akpek EK, Caffery B, Dua HS, Joo CK, Liu Z, Nelson JD, Nichols JJ, Tsubota K, Stapleton F. TFOS DEWS II Definition and Classification Report. Ocul Surf. 2017 Jul;15(3):276-283. DOI: https://doi.org/10.1016/j.jtos.2017.05.008.
2. Fox RI, Chan R, Michelson JB, Belmont JB, Michelson PE. Beneficial effect of artificial tears made with autologous serum in patients with keratoconjunctivitis sicca. Arthritis Rheum. 1984 Apr;27(4):459-461. DOI: https://doi.org/10.1002/art.1780270415.
3. Messmer EM. The pathophysiology, diagnosis, and treatment of dry eye disease. Dtsch Arztebl Int. 2015 Jan 30;112(5):71-81; quiz 82. DOI: https://doi.org/10.3238/arztebl.2015.0071.
4. Noble BA, Loh RS, MacLennan S, Pesudovs K, Reynolds A, Bridges LR, Burr J, Stewart O, Quereshi S. Comparison of autologous serum eye drops with conventional therapy in a randomised controlled crossover trial for ocular surface disease. Br J Ophthalmol. 2004 May;88(5):647-652. DOI: https://doi.org/10.1136/bjo.2003.026211.
5. Poon AC, Geerling G, Dart JK, Fraenkel GE, Daniels JT. Autologous serum eyedrops for dry eyes and epithelial defects: clinical and in vitro toxicity studies. Br J Ophthalmol. 2001 Oct;85(10):1188-1197. DOI: https://doi.org/10.1136/bjo.85.10.1188.
6. Urzua CA, Vasquez DH, Huidobro A, Hernandez H, Alfaro J. Randomized double-blind clinical trial of autologous serum versus artificial tears in dry eye syndrome. Curr Eye Res. 2012 Aug;37(8):684-688. DOI: https://doi.org/10.3109/02713683.2012.674609.