

Original Article

Short Term Efficacy of Ectropion Management Using Plasma Assisted Non-Invasive Surgery (PANIS)

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Abstract

Purpose: To investigate the feasibility of using the plasma-assisted noninvasive surgery (PANIS) technique for managing ectropion in an office-based setting.

Patients and Methods: Ectropion was treated in six eyes of six patients using local anesthesia and the PANIS technique, performed in an office setting with the assistance of a slit-lamp. Plasma spots were generated using the PLEXR PLUS device (GMV Srl, Rome, Italy) to sublimate the palpebral conjunctiva by pulling the lower eyelid outward. Treatments were conducted in two sessions spaced one month apart. Visual parameters, dry eye tests, ocular surface disease index (OSDI) questionnaire results, and patient satisfaction were evaluated before and six months after the second PANIS session.

Results: The study included six patients (2 females and 4 males) with a mean age of 70.17 years. Uncorrected visual acuity (UCVA) improved by one line in four cases. Best corrected visual acuity (BCVA) showed improvement in two patients after six months. Changes in intraocular pressure (IOP) were not significant. The mean improvement in Tear Meniscus Height (TMH) was 0.085 mm. In terms of ectropion grade improvement, two cases showed a three-grade improvement, three cases showed a one-grade improvement, and one case showed a two-grade improvement. No patients required further surgical treatment.

Conclusion: The PANIS method might offer a minimally invasive office-based procedure for both cosmetic and functional treatment of ectropion. Future studies with a higher number of participants and longer follow-up duration, are needed to provide more data regarding the long-term results of this method and its safety profile.

Keywords: PANIS; Plasma; Ectropion; Eyelid.

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Introduction

Ectropion is characterized by the lower eyelid eversion, causing eye redness, dry eye syndrome, photophobia, chronic inflammation, epiphora, keratopathy, and, in severe untreated cases, corneal ulceration and globe perforation^{1, 2}. While congenital ectropion is very rare, acquired ectropion can result from involutional changes (the most common cause), paralytic conditions, cicatricial damage, and mechanical factors. Involutional ectropion, associated with loosening and laxity of eyelid skin due to aging, has a prevalence of 2.9 % in the elderly population^{1, 3, 4}. Paralytic ectropion, a significant risk factor for exposure keratopathy, may be caused by facial nerve palsy. Cicatricial ectropion is described as being caused by external factors that can burn and affect the eyelid, potentially resulting in chronic epiphora⁵. Finally mechanical ectropion can be induced by an increased weight of the eyelid margin secondarily to an eyelid mass or tumor⁶.

The use of lubricants for treating ectropion may offer temporary symptom relief but does not address the underlying causes. In contrast, surgical treatments can improve eyelid malposition but may lead to symptoms during healing and is associated with a relatively high recurrence rate. A commonly employed surgical therapy, lateral tarsal strip (LTS) surgery, which tightens the eyelid by reconstructing the lateral strip, is the most common surgical approach. However, LTS remains controversial due to a recurrence rate of 8.3 %, indicating the need for less invasive and more effective approaches⁷. The recurrence rate for recent surgical treatments, such as canthoplasty with skin grafting, might be lower than that of the LTS method, but the reported recurrence rate is still relatively high⁸.

The safety of plasma-assisted noninvasive surgery (PANIS) has been demonstrated in rabbits' eyes⁹, and its efficacy in treating various eye conditions such as pinguecula¹⁰, punctal occlusion¹¹, and conjunctival cyst¹² has been explored. In the present study, we aim to evaluate the PANIS approach for treating ectropion in a small group of patients, assessing its efficacy and potential shortcomings as a less invasive treatment method.

Patients and Methods

The present study is a case series study conducted from May 2022 to September 2022 at the Vision Health Clinic, Tehran, Iran. The diagnosis of ectropion was confirmed using slit-lamp examination by two experienced ophthalmologists (one being a general ophthalmologist and the other an oculoplastic surgeon). The study protocol was approved by the Ethics Committee of Semnan University of Medical Sciences (Approval number: IR. SEMUMS. REC. 1398. 320). Written informed consent was obtained from six patients entering the study, including two females and four males. Six eyes from these six participants (two right eyes and four left eyes) underwent the PANIS procedure.

Before implementing PANIS, we categorized our six patients based on the etiological aspect. This classification included three cases of involutional ectropion and three cases of cicatricial ectropion. Additionally, considering the grading aspect using the system outlined in table 1, three patients were classified as the extreme grade, while three patients fell into the severe grade.

The PANIS procedure began with local anesthesia using three doses of 0.5 % tetracaine eye drops (Sina Daru, Tehran, Iran), administered at 5-minute intervals.

Table 1: Grading system for accessing the severity of ectropion

Grade	Eyelid Condition	Signs And Symptoms
MILD	Eyelid margin eversion (medial or lateral)	-
MODERATE	Lower eyelids eversion with the exposure of underlying sclera	Mild dry eye syndrome and redness
SEVERE	Entire lower eyelids isolated from the eyeball	Mild epiphora and conjunctivitis
EXTREME	Severe lower eyelids ectropion	Keratitis or corneal ulcer

Subsequently, behind the slit-lamp, plasma spots generated with a green handpiece (V peak-to-peak = 600 V, Power = 1 W, Frequency = 75 kHz) of the PLEXR PLUS (GMV Srl, Rome, Italy) were applied to the palpebral conjunctiva while the lower eyelid was everted. The sublimation mechanism of plasma resulted in stretching the eyelid skin and repositioning it toward the globe. This procedure was repeated one month after the first session. All patients undergoing the PANIS procedure were prescribed medications, including ciprofloxacin 0.3 % eye drops every six hours and betamethasone 0.1 % eye drops every four hours, with a tapering regimen over one month.

Visual parameters and dry eye signs, including uncorrected visual acuity (UCVA), refraction error, best corrected visual acuity (BCVA), intraocular pressure (IOP), tear meniscus height (TMH), and ocular surface disease index (OSDI), were measured before and 6 months after the second session. Slit-lamp examinations and patients' complaints and symptoms were also documented before, 1

week, 1 month, 3 months, and 6 months after the sessions.

Result

In this case series study, six eyes from six patients with a mean age of 69.33 years were included. Two of the eyes were right, and four were left. Among the patients, two were female, and four were male. The demographic criteria of the patients are presented in table 2. As expected, uncorrected visual acuity (UCVA), refractive errors, and best corrected visual acuity (BCVA) did not change significantly. However, an improvement of one line in UCVA was observed in four patients. Intraocular pressure (IOP) showed no significant change after a 6-month follow-up period. Tear meniscus height (TMH) improved, with a mean value of 0.085 mm. Patients' satisfaction and the condition of dry eye were evaluated using the OSDI questionnaire, with the mean value of improvement reported as 42.9. In slit-lamp examinations, signs of chronic conjunctivitis, redness, vessel engorgement, and tearing in

Table 2: Demographic criteria of patients entering the study

		UCVA	Refraction			BCVA	IOP	TMH	OSDI
68 years old Female Right Eye	Before	3/10	-1.25	-1.50	90	9/10	12	0.08	78.9
	After	4/10	-1.25	-1.25	90	10/10	12	0.19	23.4
72 years old Male Left Eye	Before	8/10	Plano	-1.00	65	9/10	15	0.04	84.3
	After	9/10	Plano	-1.00	65	9/10	11	0.08	13.9
73 years old Male Left Eye	Before	HM	Plano	Plano	-	HM	7	0.02	72.9
	After	HM	Plano	Plano	-	HM	10	0.08	54.5
59 years old Female Left Eye	Before	7/10	plano	-1.50	100	9/10	12	0.14	62.5
	After	8/10	Plano	-1.25	90	9/10	12	0.21	32.4
61 years old Male Right Eye	Before	9/10	Plano	-1.00	130	10/10	14	0.11	49.2
	After	9/10	plano	-1.00	130	10/10	11	0.22	27.5
83 years old Male Left Eye	Before	5/10	Plano	-3.00	90	8/10	13	0.04	74.5
	After	6/10	Plano	-3.00	90	8/10	12	0.16	13.2

all six patients were significantly reduced after PANIS treatment (Figure 1). No serious changes in vision parameters or recurrence were observed after six months of follow-up. The cosmetic outcome was deemed acceptable by both the patients and the surgeon.

Discussion

We have presented the outcomes of six eyes from six patients undergoing PANIS for the treatment of ectropion as a minimally invasive method with promising preliminary results. Although surgical methods for treating ectropion have been utilized for a long time with varying degrees of success, the expensive nature of surgical treatments, along with a relatively high percentage of recurrence among patients, has led to the search for less invasive treatment modalities for ectropion^{7, 8, 13}. A less invasive treatment using hyaluronic acid filler injections has been suggested

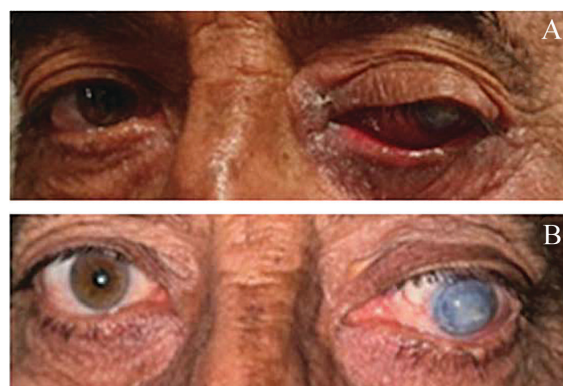


Figure 1: (A) Before treatment, (B) 6 months after PANIS procedure

in the treatment of cicatricial ectropion by expanding the tethered anterior lamella of the skin¹³. However, a recent meta-analysis comparing the results of less invasive methods and surgical methods for cicatricial ectropion treatment reported a lower percentage of complete correction among patients treated with the hyaluronic acid injection method compared to surgical treatment¹⁴.

Another suggested less invasive method is the injection of autologous fat graft (AFG) to increase the mechanical stretch and remodel the scar in patients with cicatricial ectropion^{15, 16}. A limitation of these methods is that they are more suitable for patients with cicatricial ectropion and might not result in an acceptable outcome in other categories of ectropion, such as paralytic or mechanical ectropion.

Based on our preliminary results, we suggest that the PANIS method might be considered as an alternative minimally invasive treatment for ectropion.

Conclusion

The PANIS method might offer a minimally invasive office-based procedure for both cosmetic and functional treatment of ectropion. Future studies with a higher number of participants and longer follow-up duration, are needed to provide more data regarding the long-term results of this method and its safety profile.

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Footnotes and Financial Disclosures

Conflict of Interest:

The authors have no conflict of interest with the subject matter of the present study.