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Original Article

Management of acquired punctal stenosis with perforated punctal plugs

Ozlen Rodop Ozgur *; Levent Akcay [1]; Nesrin Tutas [2]; Onur Karadag [3]

Abstract

Purpose: To evaluate the efficiency of perforated punctal plug in acquired punctal stenosis.
Materials and methods: Forty-five eyes of 33 patients who had epiphora due to punctal stenosis were included in this study. After biomicroscopic examination and lacrimal dilatation punctal stenosis was managed with the perforated punctal plugs in all patients. In the following period epiphora, plug tolerance, lacrimal drainage were evaluated and graded. Lacrimal drainage was evaluated with fluorescein dye disappearing test.
Results: The age of the patients ranged between 31 and 80 (mean 55.78 ± 13.11). Preoperatively punctal dilatation and lacrimal system irrigations were performed on all patients. Lacrimal system irrigation was positive in all patients. Perforated punctal plugs were placed in the inferior puncti in all patients. The plugs were explanted 6 months after operation. The follow-up period ranged between 6 and 24 months. Plug tolerance was good in 97.8% of the eyes in the 1st month visit. Epiphora decreased remarkably in 88.9% of the patients 1 month after plug implantation, except one whose plug dropped off spontaneously in 2 weeks. Fluorescein disappearing times were found under 3 min in 97.8% of the eyes after plug explanations.
Conclusion: Punctum stenosis is one of the several disorders that cause lacrimal drainage obstruction. Perforated punctal plugs are found convenient and effective in managing punctal stenosis.

Keywords: Epiphora, Punctal stenosis, Perforated plug

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Introduction

Punctum stenosis is one of the frequent causes of epiphora besides canalicular or nasolacrimal duct obstruction. It can be congenital or acquired. Acquired punctum stenosis may result from inflammatory or infectious eye disease, systemic or topical drug toxicity, lid malposition, different forms of trauma, tumours or ageing changes. Chronic inflammation and subsequent fibrosis appear to be the basic ultrastructural response to various noxious stimuli. Associated canalicular and nasolacrimal sac or duct stenosis or obstruction might be present in some cases.[1–7]

Pure punctum stenosis treatment relies on punctum dilatation, surgical opening or punctum stenting with canalicular tubes or punctum plugs. However canalicular tubing is unnecessary if there is no intracanalicular pathology.[5,6,8–12]

The purpose of this study was to investigate the clinical outcomes and tolerances of polyvinylpyrrolidone (PVP) coated perforated punctum plugs (PPP) in punctum stenosis and agenesis.

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Dr. Lutfi Kirdar Kartal Training and Research Hospital, Eye Clinic, Istanbul

* Corresponding author at: Tepegoz sk. No: 61/11 Cıftehavuzlar, Istanbul 34730, Turkey. Tel.: +90 216 3609468.
e-mail addresses: ozlen74@yahoo.com (O.R. Ozgur), maskeli1@ttnet.net.tr (L. Akcay), drnesrintutas@hotmail.com (N. Tutas), onurkaradag@hotmail.com (O. Karadag).
[1] Present address: Dunya Goz Hastanesi, Istanbul, Turkey.
[2] Present address: Nigde State Hospital, Nıgde, Turkey.
[3] Present address: Darıca Farabi Hospital, Kocaeli, Turkey.

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Materials and methods

Forty-five eyes of 33 patients with punctal stenosis who received perforated punctal plug implants were included in the study. The study conforms to the provisions of the Declaration of Helsinki in 1995. Proper informed consent for both the treatment and participation in the study was obtained from the patients.

Patients with lid malposition, canalicular or nasolacrimal sac or duct obstruction, previous eyelid or lacrimal drainage surgery, untreated conjunctivitis or blepharitis were excluded.

Diagnosis was based in order on a history of tearing, biomicroscopic examination, fluorescein dye disappearance test, punctal dilatation and diagnostic canaliculi probing, nasolacrimal duct irrigation, and if passage is patent after irrigation fluorescein dye disappearance test repetition. Epiphora was scored using the combination of Munk score and epiphora score used by Malet et al. (Table 1).[8,12]

In biomicroscopic examination special attention was given to tear meniscus, lid margin, conjunctiva and punctal orifice. Associated conjunctivitis or blepharitis was treated. Punctal orifice was graded based on biomicroscopic examination which was examined before punctal dilatation (Table 2).

After biomicroscopic examination fluorescein dye disappearance test was performed with a drop of 2% fluorescein and assessment after 3 and 5 min of the remaining dye in the tear meniscus. All patients had over 5 min dye disappearance time. Fluorescein dye disappearance test was graded (Table 3).

Punctal dilatation, canaliculi probing and nasolacrimal duct irrigation were performed in the office or operating room under surgical microscope. After instillation of a topical anaesthetic drop (proparacaine hydrochloride ophthalmic solution), a punctal finder was used to open the papilla and pushed forward to dilate the lower punctum. Afterwards a canaliculi probe was introduced. A soft stop that could not be overcome was defined as canalicular obstruction. A soft stop that could be overcome was defined as canalicular membranous stenosis. A hard stop was defined as patent upper canalicular system. Irrigation was performed with a 5 ml syringe filled with serum saline and a 26 gauge lacrimal cannula through the lower punctum and canaliculi. A normal system was defined as free passage of saline into nose or nasopharynx without any reflux through the upper or lower punctum. Patients with any associated canalicular or nasolacrimal duct pathology were not included in the study.

Fluorescein dye disappearance test was repeated after punctum dilatation and found to be under 3 min (grade 1 or 2) in all patients.

After punctum dilatation PVP coated PPP (FCI, S1-3512u) implantation was performed.

Demographic data, laterality, symptoms, findings of biomicroscopic examination and diagnostic probing and irrigation were recorded. Findings of biomicroscopic examination, fluorescein dye disappearance test and plug tolerance were investigated at postoperative 1st day, 1st month, 3rd month, 6th month, 1st year and 2nd year visits (Table 4). Plugs were explanted after 6 months.

Table 1. Score scale of epiphora.

Score	Description	Clinical findings
0	No epiphora	No tearing
1	Mild epiphora	Tearing sometimes in windy days
2	Moderate epiphora	Always tearing, but sometimes need to wipe
3	Permanent epiphora	Always tearing and need to wipe

Table 2. Grading of punctal orifice.

Grade	Clinical findings
0	No punctum(agenesis)
1	Papilla is covered with a membrane(difficult to recognise)
2	Less than normal size but recognisable
3	Normal (easily recognised)

Table 3. Grading of fluorescein dye disappearance test.

Grade	Fluorescein dye disappearance time
1	<3 min
2	3–5 min
3	>5 min

Table 4. Plug tolerance of patients.

Tolerance	Clinical findings
Good	No irritation. No secretion
Mild	Secretion, mild irritation
Poor	Secretion and irritation

Results

The age of the patients ranged between 31 and 80 (mean 55.78 ± 13.11). Twenty-one (63.6%) patients were female and 12 (36.4%) were male. The right lower punctum was involved in 11 (29.8%) patients, the left lower punctum was involved in 8 (27%) patients and bilateral lower puncti were involved in 13 (43.2%) patients. Upper punctum was involved in 5 eyes (11.1%).

In preoperative examination, thirty-five eyes (77.8%) had papilla covered with a membrane (grade 1) (Fig. 1), and 10 (22.2%) eyes had punctum less than normal size (grade 2). All eyes had moderate (grade 2, n:27) or permanent (grade 3, n:18) epiphora. Fluorescein dye disappearance test was over 5 min (grade 3) in all patients. Free passage into the

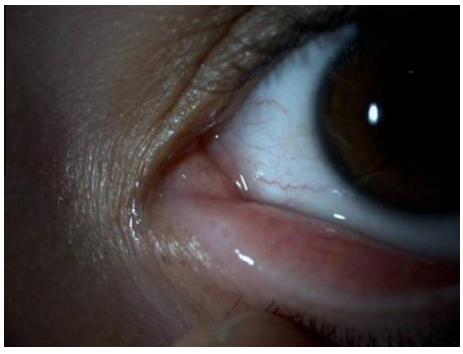

Figure 1. Punctum stenosis grade 1 (punctum covered with a membrane).

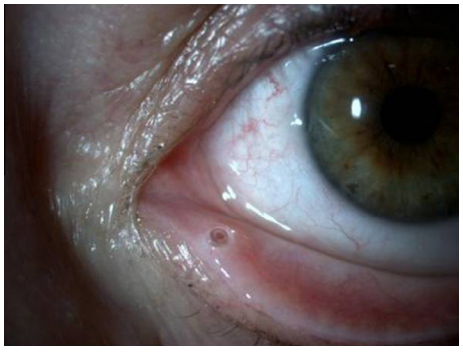

Figure 2. Appearance of an implanted PVP coated perforated punctal plug.

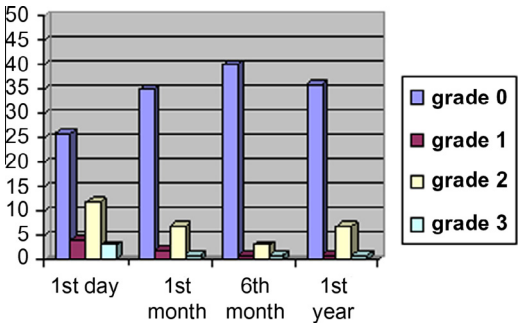

Figure 3. Postop epiphora grading changes.

nose was obtained in all patients with nasolacrimal system irrigation. Fluorescein dye disappearance test was repeated in eyes that had normal passage with irrigation and it was found to be under 3 min in all patients that could be evaluated in the office.

Surgical procedure: After punctal dilatation, control irrigation was performed. Plugs were implanted with their own preloaded inserter after puncti were dilated with the inserters' own dilatator. In Fig. 2 the punctum with an implanted perforated punctal plug is seen.

Upper punctal dilatation was performed besides punctal plug implantation in patients having also upper punctum involvement.

Epiphora

The epiphora score was grade 0 or 1 in 30 eyes (66.7%) at 1st day postoperatively, and grade 0 or 1 epiphora score was present at the 1st month visit in 37 eyes (82.2%), in the 6th month visit (after plugs were explanted) in 41 eyes (91.1%), and in the 1st year visit in 37 (82.2%) eyes (Fig. 3).

Fluorescein dye disappearance test

It was under 5 min (grade 1 or 2) in 32 eyes (71.1%) after plug implantation day 1, and improved in all eyes at 1st and 3rd month visits [grade 1 in 37 eyes (82.2%), grade 2 in 8 eyes (17.8%)]. Fluorescein dye disappearance test was under 3 min in all eyes after plug explantation except 1 eye whose plug dropped off in the second week (97.8%). But the number of eyes with a fluorescein dye disappearance test under 5 min decreased to 37 (82.2%) at the 1st year visit.

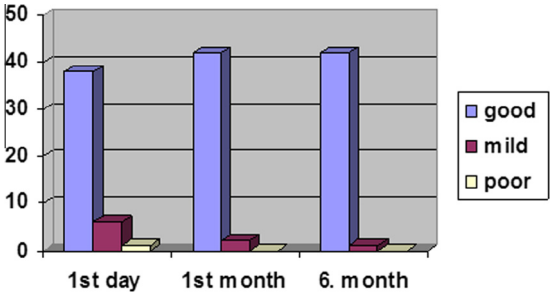

Figure 4. Plug tolerance of the patients.

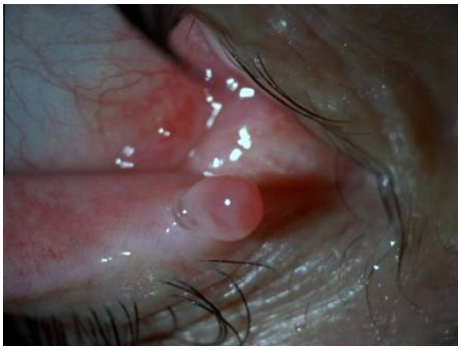

Figure 5. Granuloma formation in the perforated punctal plug.

Puncti were observed stenotic again in the 8 eyes in which fluorescein dye disappearance test was over 5 min (grade 3).

Plug tolerance

Plug tolerance was found good in 84.4% ($n = 38$) of the eyes at 1st day postoperatively and remaind the same at 1st week, and improved to 93.3% ($n = 42$) at the 1st month visit (Fig. 4). Early plug drop off occured in 2 patients (one within 2 weeks, one within 3 months). In one patient pyogenic granuloma formation within the plug was observed 5 months after implantation (Fig. 5). The granuloma was excised, the plug was explanted and remaining piece of the granuloma was excised. The passage was found open after granuloma excision and plug explantation according to the fluorescein dye disappearance test and irrigation. No other serious complications were observed related to the plug.

Eleven of the puncti were observed at least for 2 years, and 2 of them (18.18%) were determined as stenotic according to fluorescein dye disappearance test (which was grade 3), epiphora score (which was 2 or 3) and biomicroscopic examination of the puncti (which was grade 1 or 2).

Discussion

Epiphora is caused by different obstruction levels in the lacrimal drainage system. In the first step, it is important to distinguish epiphora from lacrimation. Any ocular surface pathology causing lacrimation should be eliminated. If it is decided that it is epiphora, it is very important to determine the obstruction level of the lacrimal drainage system.

Punctal stenosis is one of the frequent causes of epiphora. Biomicroscopic examination is important in a patient with

tearing. Besides ocular surface examination, the aspect of the punctum should be determined. If punctum dilatation and irrigation are performed without biomicroscopic examination or only dacryoscintigraphy is performed without any other diagnostic tests used for lacrimal system, the diagnosis might be mistaken. In this view, to diagnose punctum stenosis we performed a fluorescein dye disappearance test, punctum dilatation and diagnostic canaliculi probing, and nasolacrimal duct irrigation, if passage was patent after irrigation fluorescein dye disappearance test repetition.

The punctal orifice is normally 0.3 mm in diameter.[5,10] We graded the punctal orifices from 0 to 3 according to the aspect and sizes of the punctal openings similar to Kashkouli et al. but we did not grade puncti any further according to their size measured with the slit of the lamp microscope.[1] In our study, 77.8% of the eyes had papilla covered with a membrane preoperatively (grade 1) and 22.2% eyes had punctum less than normal size (grade 2). Kashkouli et al. found grade 1 punctal opening rate 86% and 57% in eyes with more than and less than 6 months duration of symptoms, respectively.

Female patients were significantly (63.6%) more in our study which is compatible with the literature. Postmenopausal hormonal changes may be the reason for this sex difference.[1,10,14]

There are various methods to treat punctal stenosis which are repeated dilatations (generally ineffective); surgical opening with one snip, two snips, three snips or punch punctoplasty; microsurgical punctoplasty with sutures; balloon dilatation; electrocautery; laser treatment or temporary stenting (canalicular tubing, punctal plugs). Despite the high success rate, microsurgery sections the fibrous ring of the punctum, with the subsequent risk of stricturotomy if bicanalicular intubation is later required.[5,6,9,10,15]

Perforated punctal plugs were first introduced by Bernard et al. to obtain an artificial punctum. The first ones were made of silicone but were not coated with hydrophilic polyvinylp yrrolidone, therefore secretions were obstructing the central orifice. For this reason, the FCI laboratories along with the Le Mans Centre for Technology Transfer (Dr. Legeay) modified the hydrophobic nature of plugs, making their surface hydrophilic by coating the silicone plugs with polyvinylpyrrolidone.[9,12] In this study PVP coated PPP were used.

In a retrospective series of 44 eyes treated with the placement of a perforated punctal plug for acquired punctal stenosis, the success rate was 84.1% (37 of 44 eyes) for the improvement of epiphora.[16] Chang et al. reported a success rate of 85% in their series of 20 eyes.[17]. Similarly, our results showed improvement in the epiphora and the fluorescein dye disappearance test. All eyes had grade 2 or 3 epiphora before plug implantation, and 82.2% of the eyes had grade 0 or 1 epiphora after 1 month following plug implantation. Although epiphora score was 0 or 1 in 91.1% of the eyes after plug explantation after 6 months it decreased to 82.2% after 1 year follow-up. Fluorescein dye disappearance test score was directly proportional to epiphora score which was grade 1 or 2 in 100% at 1st month postoperatively and decreased to 82.2% after 1 year follow-up. Some of the puncti became stenotic again during the follow-up period. The possible explanation for this drawback might be the ongoing of ageing changes, as all these patients were over 62 years old. Malet et al. compared 20 silicone PPP and 20 PVP coated silicone plugs. They removed all the silicone plugs and 10 of the PVP coated plugs after 2 months. They reported that all puncti with silicone plugs were stenotic after 6 months. But the 10 patients with PVP plugs did not have epiphora and tolerance was excellent.[9] We left the plugs for 6 months in all of our patients and only 17.8% of them became stenotic again at 1 year. The big difference between Malet's results and ours might be related to the timing of plug removing. Leaving the plug longer might be more effective.

The advantages of the perforated punctal plugs over surgery are that lacrimal sphincter is not disturbed and it is a less invasive procedure. However there are several complications of punctal plugs including pyogenic granuloma, expulsion, migration, local irritation, and the possibility of punctal laceration during insertion.[9,13,16–22] Plug tolerance was good in 93.3% of our patients during the 1 and 6 months follow-up. The complications were early plug drop-off in 2 patients and pyogenic granuloma in 1 patient. Spontan plug loss was reported in 4 eyes in the study by Chung.[17] In the study by Malet et al. they compared the tolerance of silicone and PVP coated silicone perforated plugs. They found PVP coated plugs superior to silicone plugs as plug tolerance was good in 75% of eyes and mild in 25% of eyes with PVP coated plugs, and it was only mild in 75% and poor in 25% of eyes with silicone plugs.[9]

In conclusion punctal stenosis without any additional ocular surface and lid problems or nasolacrimal system stenosis can be easily treated with PVP coated PPP. Although restenosis may develop in elderly patients, in long term it is a tolerable and effective procedure for isolated punctal stenosis.

Conflict of interest

The authors declared that there is no conflict of interest

References

1. Kashkouli BM, Beigi B, Murthy R, Astbury N. Acquired external punctal stenosis: etiology and associated findings. *Am J Ophthalmol* 2003;**136**:1079–84.
2. Hurwitz JJ. Disease of the punctum. In: Hurwitz JJ, editor. *The lacrimal system*. Philadelphia: Lippincott-Raven Press; 1996. p. 149–53.
3. O'Donnell FE. Medial ectropion: association with lower lacrimal obstruction and combined management. *Ophthalm Surg* 1986;**17**:573–6.
4. Seiff SR, Shorr N, Adams T. Surgical treatment of punctal-canalicular fibrosis from 5-fluorouacil therapy. *Cancer* 1985;**56**:2148–9.
5. Soiberman U, Kakizaki H, Selva D, Leibovitch I. Punctal stenosis: definition, diagnosis and treatment. *Clin Ophthalmol* 2012;**6**:1011–8.
6. Kashkouli BM, Pacdel F, Kiavash V. Assessment and management of proximal and incomplete symptomatic obstruction of the lacrimal drainage system. *Mid East Afr J Ophthalmol* 2012;**19**:60–9.
7. Ali MJ, Mishra DK, Baig F, Lakshman M, Naik MN. Punctal stenosis: histopathology, immunology, and electron microscopic features – a step toward unraveling the mysterious etiopathogenesis. *Ophthal Plast Reconstr Surg* 2014 June 2 (Epub).
8. Kristan RW, Branch L. Treatment of lacrimal punctal stenosis with one-snip canaliculotomy and temporary punctal plugs. *Arch Ophthalmol* 1988;**106**:878–9.
9. Malet T, Challier B, David N, Bertrand A, George JL. Clinical and scintigraphic comparison of silicone and polyvinylpyrrolidone coated silicone perforated plugs. *Br J Ophthalmol* 1998;**82**:1416–9.
10. Offutt WN, Cowen DE. Stenotic puncta: microsurgical puctoplasty. *Ophthalmic Plast Reconstr Surg* 1993;**3**:201–5.
11. Edelstein J, Reiss G. The wedge punctoplasty for treatment of punctal stenosis. *Ophthalmic Surg* 1992;**12**:818–21.

12. Bernard JA, Fayet B, Pouliquen Y. Nouveaux modeles de clous meatiques et de pose-clous. *Bull Soc Ophthalmol FR* 1989;**89**:1131–2.
13. Munk PL, Lin DT, Morris DC. Epihora: treatment by means of dacryocystoplasty with balloon dilatation of the nasolacrimal drainage apparatus. *Radiology* 1990;**177**:687–90.
14. Hurwitz JJ. Disease of the punctum. In: Hurwitz JJ, editor. *The lacrimal system*. Philadelphia: Lippincott-Raven Press; 1996. p. 139–41.
15. Jeanolas D, George JL, Lesure P, Heymann V. Microsurgical treatment of narrow lacrimal points. *Bull Soc Ophthalmol Fr* 1987;**87**:159–61.
16. Konuk O, Urgancioglu B, Unal M. Long-term success rate of perforated punctal plugs in the management of acquired punctal stenosis. *Ophthal Plast Reconstr Surg* 2008;**24**:399–402.
17. Chang M, Ahn SE, Baek S. The effect of perforated punctal plugs in the management of acquired punctal stenosis. *J Craniofac Surg* 2013;**24**:1628–30.
18. Bohlman H. Perforated punctal plug in the treatment of partial punctal stenosis. *Optometry* 2003;**74**:524–8.
19. Hsu HS. Ampullary pyogenic granuloma as a complication of lacrimal plug migration. *Chang Gung Med J* 2002;**25**:415–8.
20. Bukhari AA. Management options of acquired punctal stenosis. *Saudi Med J* 2013;**34**:785–92.
21. Fayet B, Benabderrazik S, Bernard JA, Deligne L, Hürbli T, D'Hermies F, et al. Sténoses canaliculaires compliquant la pose de bouchons lacrymaux. Incidence et mécanismes. *J Fr Ophtalmol* 1992;**15**:25–33.
22. Kim BM, Osmanovic SS, Edward DP. Pyogenic granulomas after silicone punctal plugs: a clinical and histopathologic study. *Am J Ophthalmol* 2005;**139**:678–84.