

The First Large Pan-nordic Survey of the Management of Acquired Lacrimal Drainage Obstruction in Adults

Elin Bohman^{1*}, Jonathan C. P. Roos² and Eva Dafgard Kopp¹

¹Division of Ophthalmology and Vision, Department of Clinical Neuroscience, Karolinska Institutet, St. Erik Eye Hospital, Stockholm, Sweden

²Department of Ophthalmology, Norfolk and Norwich University Hospital, Norwich, NR4 7UY, UK

*Corresponding author: Elin Bohman, Division of Ophthalmology and Vision, Department of Clinical Neuroscience, Karolinska Institutet, St. Erik Eye Hospital, Stockholm, Sweden, Tel: +46 86723165; E-mail: elin.bohman@sl.se

Received date: February 15, 2019; Accepted date: March 06, 2019; Published date: March 12, 2019

Copyright: ©2019 Bohman E, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Objective: To survey current practices in the management of acquired lacrimal drainage obstructions in adults in the Nordic countries, and to identify the challenges in providing treatment to aid discussions on which procedures should be offered, how treatment can be improved and services organized.

Method: A detailed questionnaire was sent to 79 ophthalmological clinics performing lacrimal surgery in the five Nordic countries, making this the largest pan-Nordic survey of lacrimal drainage procedures to date. The questionnaire included items on the frequency of lacrimal surgery, the specialty of the surgeon (ENT or ophthalmology), referral rates and current management depending on type of lacrimal obstruction and presence of infection.

Results: The response rate was 65%. Results show the widespread use of canaliculodacryocystoplasty (CDCP) with silicone tube stenting at an early stage both for canalicular stenosis and nasolacrimal duct obstructions (NLDO), but with marked differences in the duration of stenting. After dacryocystitis, dacryocystorhinostomy was the preferred approach but CDCP was considered an option. A conservative approach was generally adopted in the surgical treatment of functional epiphora, and it was unlikely that eyelid surgery would be performed for this indication at about half of the clinics. Respondents reported that a lack of surgical competence and training was their greatest challenge, and that the demand for treatment was greater than the resources available.

Conclusions: The Nordic countries face challenges in terms of training and the provision of lacrimal surgery. The use of CDCP for complete NLDO is controversial as it is not based on solid evidence. The period for which the stent is left in place following CDCP varies in all types of obstruction, and there is a lack of consensus. These findings highlight the need for further studies into both the optimal duration of silicone stenting following CDCP, and the success and cost-effectiveness of CDCP in treating NLDO.

Keywords: Epiphora; Functional epiphora; Lacrimal drainage obstruction; Lacrimal stenosis; Management; Lacrimal surgery; Dacryocystorhinostomy; Canaliculodacryocystoplasty

Introduction

Watery eyes are a common complaint in general ophthalmology. When caused by increased tear production due to ocular surface disease, poor tear quality or eyelid malposition, it is referred to as lacrimation or reflex tearing. Epiphora, on the other hand, is the term describing excess tears due to the reduced function of the lacrimal drainage apparatus, caused by either partial or complete obstruction, or by a lacrimal pump failure [1].

About 45% of patients referred for tearing are found to have acquired lacrimal drainage obstruction (ALDO) [2], which is associated with significant morbidity. Patients with ALDO have been found to experience limitations in the activities of daily life similar to those reported by patients listed for second eye cataract surgery [3].

Published surveys of the procedures used in lacrimal surgery have been concerned with congenital lacrimal stenosis [4-6], various aspects

of dacryocystorhinostomy (DCR) [7-14] or preoperative evaluation [15]. To the best of our knowledge, the preferred lacrimal procedure in adults has not been investigated previously.

The aim of this study was thus to survey the practices used in the management of ALDO in the Nordic countries, and to identify the challenges in providing treatment.

Materials and Methods

A 16-item anonymous questionnaire, consisting of questions on the frequency of lacrimal surgery, the specialty of the surgeon (ENT or ophthalmology), referral rates and management, was created using an online platform (Survey Monkey Inc.). The Ethics Review Board at Karolinska Institutet, Stockholm, Sweden, concluded that ethical approval was not needed, and as no item concerned individual patients, and therefore no approval was sought. The study adhered to the Declaration of Helsinki.

Contact information for ophthalmological clinics affiliated to the National Health Service and private clinics offering lacrimal surgery in the Nordic countries was collected *via* the Nordic Society of

Oculoplastic and Reconstructive Surgery and official lists of ophthalmological clinics. An invitation to participate was sent by email, either to the person in charge of lacrimal surgery or the director of each clinic. Each clinic was asked to complete one questionnaire reflecting the collective management strategies of the clinic. Personal reminders were sent after six to eight weeks. Completion was not mandatory for any items of the questionnaire, and thus the number of

responses varied between items. For this reason, the results are presented as absolute numbers as well as percentages.

Table 1 presents the 16 items of the questionnaire and their response options. Items were constructed so that previous responses affected the next question presented, so when DCR was not performed, the following items relating to that procedure were bypassed.

No.	Question and response options
1	Which Nordic country do you work in? Denmark, Finland, Iceland, Norway or Sweden
2	What type of clinic do you work in? Academic, Regional or Private
3	Does your clinic provide a syringing, probing and stent insertion service for adults? Yes/No
4	How many canaliculodacryocystoplasty (CDCPs) with stent insertion are performed at your clinic per year? <2, <10, <20, <50, >50
5	How long is the tube usually left in place following CDCP? 1 month/2 months/3 months/6 months/Longer than 6 months.
6	Is dacryocystorhinostomy (DCR) performed at your clinic? Yes/No
7	Approximately how many DCRs are performed at your clinic per year? <2, <10, <20, <50, >50
8	Is DCR performed endoscopically, or using an external approach? External, Endoscopic, Both
9	In complex cases, or when revisional surgery is required, do you refer the patient to another clinic? Yes/No
10	Do ENT surgeons perform DCRs at your clinic? Yes/No
11	Are you, as an ophthalmologist, involved in these ENT-led procedures, for example, helping with probing and follow-up? Yes/No
12	Approximately how many patients are referred from your clinic to the ENT department for DCR per year? <2, <10, <20, <50, >50
13	At first presentation, which procedure would you be most likely to adopt in the case of punctal stenosis, proximal canalicular stenosis, distal canalicular stenosis, non-infected nasolacrimal duct obstruction (NLDO), NLDO with chronic infection, previous dacryocystitis, previous nasal fracture or functional epiphora? Punctoplasty, Primarily CDCP with stenting, Primarily DCR, DCR or CDCP with the same frequency, DCR with a Jones tube, None of these
14	For a patient with recurrent or persistent symptoms, which procedure would you be most likely to adopt? Response options as in item 13
15	Does your clinic offer eyelid surgery for functional epiphora? Yes, Only in exceptional cases, No

16	What do you feel is the greatest challenge in providing a lacrimal service at your clinic?
	Free-text answers

Table 1: Items in the questionnaire and response options.

Results

The response rate was 65% (51 responses from 79 clinics): Denmark 7/10 (70%), Finland 9/15 (60%), Iceland 1/1 (100%), Norway 7/16 (44%) and Sweden 27/37 (73%). Respondents worked mainly in regional clinics (63%), and the remainder in academic clinics (University hospitals) (32%) or in private clinics (14%).

Of the responding clinics, 69% provided canaliculodacryocystoplasty (CDCP) with silicone stenting for adults. About one-third of the clinics, 27% [9], provided a high-volume service (>50 cases per year), 24% [8] performed fewer than 10 CDCPs per year, and 48% [16] performed fewer than 20 per year, suggesting that such services are decentralized in the Nordic countries. Sixteen clinics, including the single respondent from Iceland, stated that they did not perform CDCP in adults, showing wide variation in the use of this procedure in the Nordic countries. The length of time the stent was left in place also varied; in Denmark and Norway three months or less was common, while in Sweden and Finland six months was common at the majority of clinics (Table 2).

	1 month	2 months	3 months	6 months	>6 months
Denmark	1 (17%)	2 (33%)	3 (50%)	0	0
Finland	0	1 (12%)	2 (25%)	5 (63%)	0
Iceland	0	0	0	0	0
Norway	0	0	4 (100%)	0	0
Sweden	0	0	3 (21%)	11 (79%)	0
Total	1 (3%)	3 (9%)	12 (38%)	16 (50%)	0

Table 2: Length of time the stent is left in place following CDCP, by country.

Only about 50% of the responding clinics performed DCR, and of those, 36% performed fewer than 10 per year. Three high-volume

centres were identified, with over 50 cases per year (3 of the 25 where DCR was performed). Figure 1 shows the preference for endoscopic or endonasal approach by country. ENT surgeons primarily provide DCR in Finland and Denmark (where an ophthalmologist assists with probing), while in Iceland, Norway and Sweden, ophthalmologists take the overall lead.

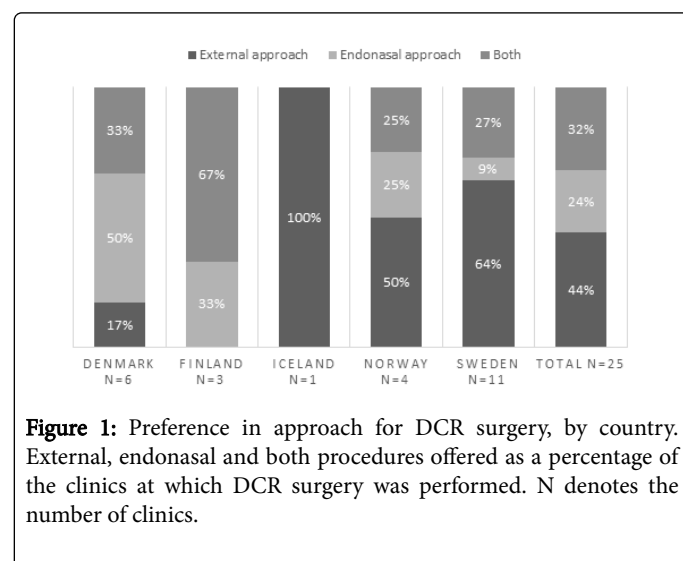


Figure 1: Preference in approach for DCR surgery, by country. External, endonasal and both procedures offered as a percentage of the clinics at which DCR surgery was performed. N denotes the number of clinics.

Tables 3 and 4 present the frequency of interventions for primary ALDO and recurrence following an intervention, by country and overall. In general, CDCP is preferred for obstructions above the lacrimal sac and DCR for those located below, but CDCP is the first option at 13 clinics (33%) for the treatment of non-infected nasolacrimal duct obstruction (NLDO), and either CDCP or DCR would be chosen at 3 clinics (18%). When treating recurrent or persistent symptoms, DCR was preferred for the treatment of all variants of NLDO at the majority of the clinics, but CDCP was an option at some clinics.

Procedure		Puncto-plasty	Usually CDCP	Usually DCR	Equal frequency CDCP or DCR	Neither CDCP nor DCR	DCR with Jones tube
Punctal stenosis	All	79	5	0	0	15	0
	Den	83	16	0	0	0	0
	Fin	100	0	0	0	0	0
	Ice	100	0	0	0	0	0
	Nor	60	0	0	0	40	0
	Swe	72	6	0	0	22	0

Proximal canalicular Stenosis	All	14	59	0	3	11	14
	Den	0	60	0	0	0	40
	Fin	13	75	0	0	13	0
	Ice	100	0	0	0	0	0
	Nor	40	40	0	0	20	0
	Swe	6	61	0	6	11	17
Distal canalicular stenosis	All	0	58	13	21	5	3
	Den	0	20	40	40	0	0
	Fin	0	78	11	11	0	0
	Ice	0	0	0	100	0	0
	Nor	0	60	20	0	20	0
	Swe	0	61	6	22	6	6
Non-infected NLDO	All	0	33	38	18	8	3
	Den	0	0	83	17	0	0
	Fin	0	22	33	22	11	11
	Ice	0	0	100	0	0	0
	Nor	0	40	20	20	20	0
	Swe	0	50	28	17	6	0
NLDO with chronic infection	All	0	10	69	8	8	5
	Den	0	0	83	17	0	0
	Fin	0	11	78	0	0	11
	Ice	0	0	100	0	0	0
	Nor	0	40	20	0	20	0
	Swe	0	6	72	6	11	66
NLDO with history of dacryocystitis	All	0	5	77	8	8	3
	Den	0	0	83	17	0	0
	Fin	0	11	89	0	0	0
	Ice	0	0	100	0	0	0
	Nor	0	20	40	20	20	0
	Swe	0	0	78	6	11	6
NLDO with history of nasal fracture	All	0	16	59	11	11	3
	Den	0	20	60	20	0	0
	Fin	0	13	63	13	0	13
	Ice	0	0	100	0	0	0
	Nor	0	40	20	0	40	0
	Swe	0	11	67	11	11	0

Functional epiphora	All	9	43	3	0	43	3
	Den	0	80	0	0	20	0
	Fin	0	63	0	0	38	0
	Ice	100	0	0	0	0	0
	Nor	40	20	0	0	20	20
	Swe	0	31	6	0	63	0

Table 3: Response to item 13: “Which procedure would you be most likely to adopt in the first instance?”, by country and overall (%).

Of the responding clinics, 22 (48%) either did not offer eyelid surgery for functional epiphora, or only in exceptional cases. The responses regarding eyelid surgery are given in Table 5.

Thirty responses were obtained to the final free-text item concerning respondents’ opinions on the challenges they faced in providing a lacrimal service. These are given in supplementary file. Of these, 13 cited problems regarding a lack of surgical competence. In nine cases, the respondent felt that the resources available were

insufficient to meet the demand (long waiting times, limited resources, large number of patients), and two stated that lacrimal surgery was not prioritized nationally by their governments. Four respondents felt that the referral of patients with lacrimation or functional epiphora was a distraction from their main service, which they felt, by implication, was lacrimal surgery of outflow obstructions. Two expressed concerns over ENT surgeons performing DCR surgery, and then expecting the ophthalmologist to manage follow-up and persistent symptoms.

Procedure							
		Puncto-plasty	Usually CDCP	Usually DCR	Equal frequency CDCP or DCR	Neither CDCP nor DCR	DCR with Jones tube
Distal canalicular stenosis	All	0	34	23	14	11	17
	Den	0	40	20	20	0	20
	Fin	0	43	0	43	14	0
	Ice	0	0	0	0	0	100
	Nor	0	25	50	0	25	0
	Swe	0	33	28	6	11	22
Non-infected NLDO	All	0	9	74	9	9	0
	Den	0	20	60	20	0	0
	Fin	0	0	71	14	14	0
	Ice	0	0	100	0	0	0
	Nor	0	0	75	0	25	0
	Swe	0	11	78	6	6	0
NLDO with chronic infection	All	0	3	83	3	6	6
	Den	0	17	67	17	0	0
	Fin	0	0	100	0	0	0
	Ice	0	0	100	0	0	0
	Nor	0	0	75	0	25	0
	Swe	0	0	83	0	6	11
NLDO with history of dacryocystitis	All	0	3	83	3	6	6
	Den	0	17	83	0	0	0

	Fin	0	0	100	0	0	0
	Ice	0	0	100	0	0	0
	Nor	0	0	50	0	25	25
	Swe	0	0	83	6	6	6
NLDO with history of nasal fracture	All	0	3	76	6	6	9
	Den	0	20	60	20	0	0
	Fin	0	0	100	0	0	0
	Ice	0	0	100	0	0	0
	Nor	0	0	75	0	25	0
	Swe	0	0	2	6	6	17
Functional epiphora	All	6	24	18	9	42	0
	Den	0	40	40	0	20	0
	Fin	0	17	33	33	17	0
	Ice	100	0	0	0	0	0
	Nor	25	25	0	0	50	0
	Swe	0	24	12	6	59	0

Table 4: Response to item 14: “For a patient with recurrent or persistent symptoms, which procedure would you be most likely to adopt?”, by country and overall (%).

	Yes	Only in exceptional cases	No
Denmark	6 (86%)	1 (14%)	0
Finland	7 (78%)	1 (11%)	1 (11%)
Iceland	0	1 (100%)	0
Norway	2 (33%)	2 (33%)	2 (33%)
Sweden	9 (39%)	9 (39%)	5 (22%)
Total	24 (52%)	14 (30%)	8 (17%)

Table 5: Availability of eyelid surgery for functional epiphora by country.

Discussion

This paper presents the results of the largest pan-Nordic survey of the management of adult lacrimal duct obstruction. By mapping the procedures employed by country and clinical scenario, we were able to provide a baseline regarding standard practice, and hence a reference point for comparison.

The current practice regarding the management of ALDO in the Nordic countries largely follows the standards of care elsewhere, although the use of CDCP in treating adult NLDO, especially after acute dacryocystitis, in cases of chronic infection or stenosis recurrence, is less common elsewhere. The Nordic approach is arguably controversial, as it is not based on solid evidence. Few studies have been published regarding the outcome of CDCP in adults. Only

one small study has been conducted on CDCP for complete NLDO, by Angrist and Dortzbach, who reported a success rate of 22% (2/9) when using bicanalicular silicone stenting in adults [16]. This outcome should be compared with the success rates of 86% to 97% that have been reported for endonasal DCR [17-19], and 90% to 96% for the external approach [20-24]. Success rates for other types of obstruction are reported to be 88% for canalicular stenosis [25], and between 60% and 76% for partial NLDO [26,27].

We found that the length of time the stent was left in place after CDCP varied between countries. The majority of clinics in Finland and Sweden left stents *in situ* for six months, while in Denmark and Norway they are normally removed 3 months postoperatively. This may lead to the assumption that the longer stenting duration in Finland and Sweden is related to the use of CDCP in the management of NLDO, but this is not the case. More clinics in Norway, where three months is standard, are likely to choose CDCP for the treatment of NLDO than in Finland, where 63% of clinics leave the stent in place for six months. The duration of stenting following CDCP, for any type of obstruction, is probably related to local tradition, as there is a lack of evidence in the literature supporting any particular duration.

Functional epiphora is diagnosed when lacrimation and anatomical stenosis have been excluded as the principal cause and the poor outflow is attributed to lacrimal pump failure [1,28]. Treatment of this entity is generally aimed at improving pump function through eyelid surgery, such as treating laxity or lateral canthal elevation to aid medial flow. These results in symptomatic improvement in 63%-87% of patients postoperatively [29-32], but about half of the clinics in this Nordic survey would either not perform lid surgery for this indication, or be unlikely to perform it. In the case of functional epiphora, the

situation may be further complicated by the co-existence of an incomplete obstruction [33]. One study has reported a success rate of 59% in patients with a patent lacrimal drainage system on syringing who were treated with CDCP [34]. Success rates for DCR in the setting of functional epiphora vary from 50% to 81% [34,35]. In the present study, one clinic offered DCR for functional epiphora, and another 15 clinics offered CDCP, but only 8 would repeat this treatment if symptoms recurred, reflecting a generally conservative approach to surgery for this indication. Given the limited resources available, reserving procedures for those patients with functional epiphora and severe symptoms is perhaps a reasonable approach.

Asked to identify their greatest challenges in providing a lacrimal service the respondents expressed frustration over the fact that the demand for lacrimal surgery far exceeds the resources available, and that the condition is not given sufficient priority, despite the socially isolating effects of epiphora. Respondents also expressed the desire for surgical training. A lack of DCR-trained surgeons in the Nordic countries could explain the popularity of CDCP in the treatment of NLDO, as it is a faster, less invasive, and a less expensive procedure, with a shorter learning period for the surgeon. The patient is also able to return to work the same day, and may prefer this intervention. However, in the limited number of studies on the efficacy of CDCP in treating NLDO, a lower success rate has been reported, and subsequent reoperation and additional visits may, therefore, increase costs. Further studies are required and a cost-benefit analysis is needed to determine whether CDCP or DCR is more cost-effective. If it is found that DCR is less costly in the long term, surgical training in DCR should perhaps be prioritized.

Conclusion

In conclusion, the Nordic countries face challenges in terms of training and the provision of lacrimal surgery. There is little support in the literature for the use of CDCP for complete NLDO, but this may be the only option available if there is a lack of DCR-trained surgeons in the Nordic countries. The duration of stenting following CDCP varies for all types of obstruction, and is probably related to local tradition, as there is a lack of evidence supporting a particular duration. These findings highlight the need for further studies into both the optimal duration of silicone stenting following CDCP, and the success and cost effectiveness of CDCP in the treatment of NLDO.

Acknowledgements

The preliminary findings were presented orally at the 2017 Biannual Meeting of the Nordic Society of Oculoplastic and Reconstructive Surgery.

References

- Kanski JJ, Bowling B, Nischal, KK, Pearson A (2012) *Clinical ophthalmology: a systematic approach*. Edinburgh: Elsevier/Saunders.
- Tirakunwichcha S, Rengwanidchakul E, Asawaphureekorn S, Tengtrisorn S, Juangphanich K, et al. (2010). Incidence of acquired lacrimal drainage system obstruction in epiphoric patients in Thailand. *Asian Biomed* 4: 159-162.
- Bohman E, Wyon M, Lundstrom M, Dafgard Kopp E (2018) A comparison between patients with epiphora and cataract of the activity limitations they experience in daily life due to their visual disability. *Acta Ophthalmol* 96: 77-80.
- Galindo-Ferreiro A, Palencia-Ercilla T, Ferreira LM, Galvez-Ruiz A, Zornoff DCM, et al. (2017) survey of management of congenital nasolacrimal duct obstruction by pediatric primary health care providers in Spain. *Eur J Ophthalmol* 27: 502-505.
- Puvanachandra N, Trikha S, MacEwen CJ, Morris RJ, Hodgkins PR (2010) A national survey of the management of congenital nasolacrimal duct obstruction in the United Kingdom. *J Pediatr Ophthalmol Strabismus* 47: 76-80.
- Schellini SA, Ariki CT, Sousa RL, Weil D, Padovani CR (2013) Management of congenital nasolacrimal duct obstruction--latin american study. *Ophthalmic Plast Reconstr Surg* 29: 389-392.
- Ali MJ, Psaltis AJ, Wormald PJ (2015) The Frequency of Concomitant Adjunctive Nasal Procedures in Powered Endoscopic Dacryocystorhinostomy. *Orbit* 34: 142-145.
- Al-Shaikh S, Javed F, Fincham G, Latif M, Bhutta M (2010) UK survey of the present role of ear, nose and throat surgeons in lacrimal surgery. *Ann R Coll Surg Engl* 92: 583-586.
- Barmettler A, Ehrlich JR, Lelli G Jr (2013) Current preferences and reported success rates in dacryocystorhinostomy amongst ASOPRS members. *Orbit* 32: 20-26.
- Chen S, Le CH, Liang J (2016) Practice patterns in endoscopic dacryocystorhinostomy: survey of the American Rhinologic Society. *Int Forum Allergy Rhinol* 6: 990-997.
- Gaub V, Islam T, Saleh GM, Zuberbuhler B, Vize C (2008) The practice of dacryocystorhinostomy (DCR) surgery by ophthalmologists in the United Kingdom (UK). *Orbit* 27: 279-283.
- Kwok T, Ali M J, Yuen H (2018) Preferred practice patterns in endoscopic dacryocystorhinostomy among oculoplastic surgeons in Asia-Pacific region. *Orbit* 37: 248-253.
- Nair A G, Kamal S, Agarwal A (2016) Indian Survey on Practice Patterns of Lacrimal and Eyelid Disorders (iSUPPLE) Report 2: Mitomycin-C and Lacrimal Stents in Dacryocystorhinostomy. *J Craniofac Surg* 27: 2015-2019.
- Nair AG, Kamal S, Agarwal A (2017) Indian survey on practice patterns of lacrimal & eyelid disorders (iSUPPLE): Report 3 - Cataract and nasolacrimal duct obstruction. *Saudi J Ophthalmol* 31: 145-149.
- Nagi KS, Meyer DR (2010) Utilization patterns for diagnostic imaging in the evaluation of epiphora due to lacrimal obstruction: a national survey. *Ophthalmic Plast Reconstr Surg* 26: 168-171.
- Angrist RC, Dortzbach RK (1985) Silicone intubation for partial and total nasolacrimal duct obstruction in adults. *Ophthalmic Plastic and Reconstructive Surgery* 1: 51-54.
- Chisty N, Singh M, Ali MJ, Naik MN (2016) Long-term outcomes of powered endoscopic dacryocystorhinostomy in acute dacryocystitis. *Ophthalmic Plast Reconstr Surg* 126: 551-553.
- Marcet MM, Kuk AK, Phelps PO (2014) Evidence-based review of surgical practices in endoscopic endonasal dacryocystorhinostomy for primary acquired nasolacrimal duct obstruction and other new indications. *Curr Opin Ophthalmol* 25: 443-448.
- Tsirbas A, Wormald PJ (2003) Mechanical endonasal dacryocystorhinostomy with mucosal flaps. *Br J Ophthalmol* 87: 43-47.
- Cokkeser Y, Evereklioglu C, Er H (2000) Comparative external versus endoscopic dacryocystorhinostomy: results in 115 patients (130 eyes). *Otolaryngology and Head and Neck Surg* 123: 488-491.
- Dolman P J (2003) Comparison of external dacryocystorhinostomy with nonlaser endonasal dacryocystorhinostomy. *Ophthalmology* 110: 78-84.
- Fayers T (2010) External dacryocystorhinostomy with and without silicone intubation. *Brit J Ophthalmol* 94: 1267-1268.
- Tarbet KJ, Custer PL (1995) External dacryocystorhinostomy. Surgical success, patient satisfaction, and economic cost. *Ophthalmology*, 102: 1065-1070.
- Tsirbas A, Davis G, Wormald PJ (2004) Mechanical endonasal dacryocystorhinostomy versus external dacryocystorhinostomy. *Ophthalmic Plast Reconstr Surg* 20: 50-56.
- Hussain RN, Kanani H, McMullan T (2012) Use of mini-monoka stents for punctal/canalicular stenosis. *Brit J Ophthalmol* 96: 671-673.

26. Kashkouli MB, Kempster RC, Galloway GD, Beigi B (2005) Monocanalicular versus bicanalicular silicone intubation for nasolacrimal duct stenosis in adults. *Ophthalmic Plast Reconstr Surg* 21: 142-147.
27. Andalib D, Nabie R, Abbasi L (2014) Silicone intubation for nasolacrimal duct stenosis in adults: monocanalicular or bicanalicular intubation. *J Craniofac Surg* 25: 1009-1011.
28. Chan, W., Malhotra, R., Kakizaki, H., Leibovitch, I., & Selva, D. (2012). Perspective: what does the term functional mean in the context of epiphora? *Clin Exp Ophthalmol*, 40: 749-754
29. Guercio B, Keyhani K, Weinberg DA (2007) Snip punctoplasty offers little additive benefit to lower eyelid tightening in the treatment of pure lacrimal pump failure. *Orbit* 26: 15-18.
30. Kielhorn I, Rowson NJ (2002) Lateral canthal surgery in the management of epiphora. *Orbit* 21: 111-116.
31. Narayanan K, Barnes EA (2005) Epiphora with eyelid laxity. *Orbit* 24: 201-203.
32. Salour H, Khosravifard K, Bagheri A, Abrishami Y, Kheiri B, et al. (2016) Efficacy of tightening of orbicularis oculi muscle in patients with functional nasolacrimal duct obstruction. *Orbit* 35: 11-15.
33. Sagili S, Selva D, Malhotra R (2012) Lacrimal scintigraphy: "interpretation more art than science". *Orbit* 31: 77-85.
34. Cho WK, Paik JS, Yang SW (2013) Surgical success rate comparison in functional nasolacrimal duct obstruction: simple lacrimal stent versus endoscopic versus external dacryocystorhinostomy. *European Archives of Oto-Rhino-Laryngology*, 270: 535-540.
35. Peter NM, Pearson AR (2010) External dacryocystorhinostomy for the treatment of epiphora in patients with patent but non-functioning lacrimal systems. *Br J Ophthalmol* 94: 233-235.