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Original Article

Comparison of Trans Canalicular Diode Laser Dacryocystorhinostomy with and Without Intubation in Patients with Acquired Nasolacrimal Duct Obstruction

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ABSTRACT

Objective: To compare the outcomes of trans-canalicular diode laser dacryocystorhinostomy with and without intubation in patients with acquired nasolacrimal duct obstruction.

Study Design: Quasi-Experimental study

Place and Duration of Study: PNS Shifa Hospital Karachi, Pakistan from Jan 22 to Jan 24.

Methodology: The study included 216 patients having acquired nasolacrimal duct obstruction. All the patients were randomly divided into two groups; Group-1 consisted of patients who underwent Trans Canalicular Diode Laser Dacryocystorhinostomy with intubation and Group-2 included those who underwent Trans Canalicular Diode Laser Dacryocystorhinostomy without intubation. Data analysis was done by using SPSS version 23 we employed the Chi-square test to compare qualitative variables such as gender, and laterality and an independent t-test for comparison of quantitative variables (age) between both groups.

Results: A total of 216 patients were included in the study. The mean age was 45.81± 13.70 years. There was no statistically significant difference between both groups in terms of age, gender and laterality (p >0.05). The success rate was higher in Group 1 (74.1%) as compared to Group 2 (51.9%), as p-value <0.001.

Conclusion: The study concluded that the success percentage differed between the two groups undergoing TCD laser-DCR surgery with and without using silicon tubes. The success rate was higher in participants having TCD laser-DCR surgery with intubation.

Keywords: External dacryocystorhinostomy (Ex-DCR) Acquired nasolacrimal duct obstruction, Intubation, Trans-canalicular diode laser dacryocystorhinostom

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INTRODUCTION

Acquired blockade of naso lacrimal duct is defined as blockade of lacrimal drainage system in adults. This obstruction can lead to symptoms such as excessive tearing (epiphora) or recurrent infections with thick, purulent discharge.[1] The most frequent cause of acquired NLD obstruction is chronic dacryocystitis.[2] To address this condition, a standard surgical procedure called external dacryocystorhinostomy (Ex-DCR) is performed, which connects the lacrimal sac with nasal cavity.[3]

In 1904 Toti4 introduced Ex-DCR. This procedure underwent improvements in 1921 by Dupuy-Dutemps and Bourguet[5], who introduced the anastomosis of mucosal linings. In 1962, Jones[6] further enhanced the technique by incorporating silicone intubation of the lacrimal tract. To perform the surgery, the skin is incised and then lacrimal sac is connected to the middle turbinate after making an osteotomy in the lacrimal bone . Afterwards mucosa of nasal cavity and lacrimal sac are connected and passing of DCR is optional; allowing for a sufficient bypass to ensure proper tear drainage.[7]

The Ex-DCR technique has an outstanding success rate; however, it causes a noticeable scar on the face. Sometimes, there may be concerns about bleeding before and after the surgery, as well as prolonged operation and recuperation periods.[8] As a result, researchers are still looking for the optimum DCR approach that would achieve an outstanding rate of success while leaving no scars. The introduction of improved fiber optic endoscopes and sensitive surgical equipments gained popularity in the endonasal lacrimal surgery. For performing lacrimal surgery endoscopically, laser energy utilized to create an osteotomy. Laser-assisted surgical procedures have various benefits over mechanical DCR approaches, including precise tissue removal by ablation with minimum damage to neighboring tissues.[9]

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Endoscopic lacrimal techniques can transmit laser energy in two ways: endonasally (ENL-DCR), or through the canaliculae (TCD laser-DCR). Both methods enable surgeon to find out lacrimal sac and accomplisha an osteotomy. TCD laser-DCR is regarded as a safer option compared to ENL-DCR because it ensures that the laser beam is moving away from orbit and directed to the nose. Various laser wavelengths have been utilized for osteotomy in DCR procedures, including the Potassium-Tytanyl-Phosphate (KTP) laser, Holmium: Yttrium-Aluminum-Garnet (Ho: YAG) laser, Erbium: YAG (Er:YAG) laser, Neodymium:YAG (Nd:YAG) laser, and the diode laser.[10]

The aim of this study is to compare the outcomes of Trans-canalicular diode Laser Dacrocystorhinostomy with and without intubation in the patients with acquired nasolacrimal duct obstruction.

METHODOLOGY

This study was conducted at PNS Shifa Hospital Karachi from Jan 2022 to Jan 2024 after receiving approval from the Institutional Review Board (IRB), (vide no ERC/2022/EYE/0)1. By conducting an extensive review of the existing literature, a sample size of 216 was determined using the WHO calculator. The data included age, gender, laterality (left, right, or both eyes), with or without intubation, and outcome (success). The confidence interval was set at 95%, with a margin of error of 05%.[11] For sampling, a non-probability consecutive sampling technique was employed.

Inclusion Criteria: Patients who were diagnosed with acquired NLD obstruction were included in this study.

Exclusion Criteria: Patients with obstruction of proximal lacrimal system i.e. puntum and canliculus, previous surgery on lacrimal system, and with active infection and or inflammation of lacrimal system were excluded from the study.

All patients provided written agreement prior to enrollment, and their confidentiality was maintained at all levels. All the patients were checked by an oculoplastic surgeon. The examination included complete ophthalmic assessment, regurgitation test, probing and lacrimal sac syringing. All the patients had an anatomical or functional nasolacrimal duct blockage. Required blood investigations were also done to rule out any systemic illness and unilateral surgeries were performed. For our study, all the patients were divided into two groups; Group-1 consists of the patients who underwent TCD laser-DCR with silicon intubation and Group-2 included those who underwent TCD laser-DCR without intubation (Figure 1).

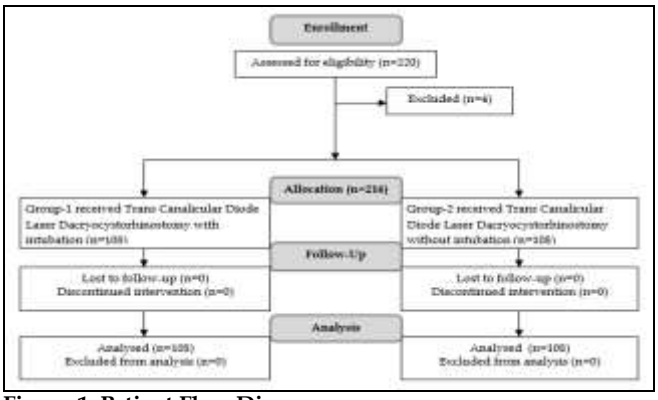

Figure-1: Patient Flow Diagram

Topical 0.5% Proparacaine Hydrochloride drops were instilled in the respective fornix. Infra orbital and infra trochlear block was given with combination of 2-3ml of 2% Lignocaine Hydrochloride and 0.5% Bupivacaine Hydrochloride. Nasal cavity was also numbed with Lignocaine nasal spray. After doing the sterile draping both upper and lower puncti were dilated and the required hard stop was achieved with the probe. Diode laser probe was inserted from the lower punctum, hard stop achieved, and probe rotated at an acute angle to be in the required direction. The red light of probe was observed through nasal mucosa by nasal endoscope. Energy was set 5 Watts to make the osteotomy of approximately 5x5mm in size. Lacrimal sac was then flushed with Normal Saline after removing laser probe to confirm patency and then Methyl gel injected into the sac to obtain its volume. Silicone tube was passed in patients of Group-1 through both puncti and both ends were retrieved from nose and tied in the middle meatus; while patients in Group-2 underwent same procedure but without intubation. Post operatively oral Co-Amoxiclav (Amoxicillin 500mg and Clavulanic acid 125mg) and Paracetamol 500mg for 3 days while topical 0.3% Tobramycin and 01% Dexamethasone eye drop preparation for 2 weeks were advised. Follow up was done at day 1, day 7, day 14, day 28 and day 90. Probing and sac syringing (PSS) was repeated on day 14 and day 28 to check patency and success. Success was defined as the lack of epiphora or achievement of free flow on PSS. Failure was considered as anatomical

if there was closure of the osteum or physiological if osteum was open, but symptoms still persisted.

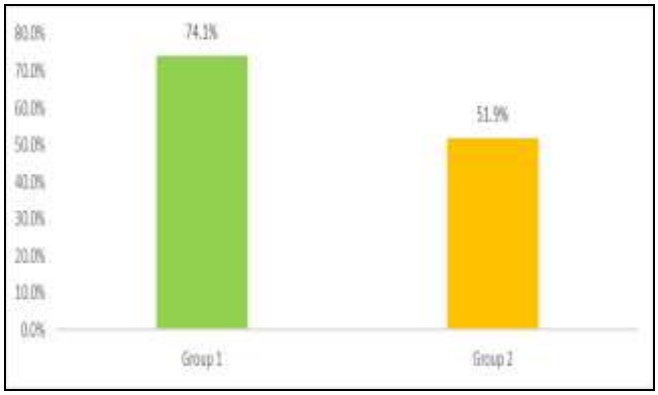

Figure-2: Comparison of Success between the groups (n=216)

Data analysis was done by using SPSS version 23. Descriptive statistics were used to calculate means ± standard deviation for continuous variables. Frequencies and percentages were calculated for categorical variables. To assess the normal distribution of continuous data, we conducted the Kolmogorov-Smirnov and Shapiro-Wilk tests. Following confirmation of normality, we employed the Chi-square test to compare qualitative variables such as gender, and laterality and the independent t-test for comparison of quantitative variables (age) between both groups. Additionally, the study employed the Chi-square test to assess success rates among the two groups and genders. A *p*-value of less than 0.05 to indicate statistical significance was considered.

RESULTS

A total of 216 patients were included in the study. Mean age was 45.81±13.70 years. Out of total patients, 117(54.16%) were males and 99(45.83%) were females; while 109(50.46%) were right, and 107(49.53%) were left sided surgeries. Table-I shows the mean age of the study population, as well as the frequency of gender and laterality among the groups. Age, laterality, and gender did not differ significantly between the two groups (p>0.05). Success rate was higher in Group-1 (74.1%) as compared to Group-2 (51.9%), as p value ≤0.001 shown in Figure-2. There was no statistically significant difference in success between the two genders as p value = 0.590 shown in Table-II, The average surgical time of Groups-1 was 16.96±2.91 minutes and for Group-2 was 14.74±3.89 minutes (range: 8 –21 minutes in both groups), shown in Table-III.

DISCUSSION

The findings of this study indicate a difference in success rates between the two groups undergoing TCD laser-DCR surgery with and without silicone tube intubation. Participants who underwent intubation demonstrated higher success rates, along with increased surgical time and greater total laser energy (Joules) utilization.

Table I: Comparison of Demographic Characteristics among Groups (n=216)

Characteristic	Total (n=216)	Group-1 (n=108)	Group-2 (n=108)	*p*-value
Age (Years) Mean ± SD	45.81± 13.70	45.32±13.72	46.29± 13.72	0.607
Gender n(%)				
Male	117(54.2%)	56(51.9%)	61(56.5%)	0.495
Female	99(45.8%)	52(48.1%)	47(43.5%)	
Laterality n (%)				
Right	109(50.5%)	56(51.9%)	53(49.1%)	0.683
Left	107(49.5%)	52(48.1%)	55(50.9%)	

Table-II: Comparative Analysis of Success of Surgery among Genders (n=216)

Characteristic	Male Mean ± SD (n=117)	Female Mean ± SD (n=99)	*p*-value (Between groups)
Success	67(57.3%)	69(69.7%)	0.59

Table-III: Comparison of Surgical Time, Total Laser Energy (Joules) among the groups (n=216)

Parameter	Group-1 Mean ± SD (n=108)	Group-2 Mean ± SD (n=108)	*p* value
Surgical Time (Minutes)	16.96±2.91	14.74±3.89	<0.001

Trans canalicular diode laser dacryocystorhinostomy (TCD laser-DCR) is a surgical technique that offers significant advantages. It is a minimally invasive technique that utilizes natural anatomical pathways, reducing damage to surrounding tissue and avoiding visible scars on the skin.[12-13] The laser-based approach allows precise cutting and tissue removal through ablation, while ensuring minimal pain and nasal bleeding.[14] When compared to the traditional dacryocystorhinostomy, TCD laser-DCR is both easier and faster to perform. To further enhance the success of the procedure, silicon tube can be passed during DCR surgery. This serves the purpose of maintaining patency and preventing blockage in the lacrimal passage and promoting proper healing of the affected area.[15] Silicon is useful since it is gentle on the conjunctiva and tolerated well in the canaliculi. Moreover, silicon intubation is recommended for patients with various

conditions such as constrictor damaged lacrimal sacs,mechanically demaged canaliculi , canalicular diseases, or persistent congenital nasolacrimal duct blockages.[16]

Limited amount of research in literature regarding DCR surgery while using or without silicon tubes is present. While some other studies have found that using silicon stents during DCR has no substantial advantage over not using stents,[17,18] others suggest that using intubation is beneficial during DCR surgery.[19] Feng *et al*,[20] performed meta-analysis of the DCR while using or not using silicon intubation, including 9 trials and 514 patients. Study determined that silicon tube intubation provided no advantages for primary DCR.

In our study the success rate of the TCD laser-DCR surgery in group with tube intubation was 74.1% and in group without tube intubation was 51.9% having significant difference between these two group with p≤0.001. Previous studies also found similar results of success rate as in our study. In a study by Yildirim *et al*,[21] the success percentage of TCD laser-DCR surgery in group with tube intubation was 84.4% and in group without tube intubation was 63.6% having significant difference between these two group with *p*=<0.05. Surgical time in the Group-1 participants was more than the Group-2 participants due to the time requirement for the tube intubation. Our study found that the average surgical time for the Group-1 participants was 16.96±2.91 minutes while for the Group-2 participants it was 14.74±3.89 minutes. Yildirim *et al*,[21] also found similar results that more time is required for the patients who underwent surgery with tube intubation.

LIMITATIONS OF STUDY

Our study has limitation as it was single center study with a small sample size. For more accurate and precise results this study should be conducted on the large scale. Moreover, complications occur due to the procedure were also not discussed in this study.

CONCLUSION

The study concluded that the success percentage differed between the two group undergoing TCD laser-DCR surgery with and without using silicon tubes. Success rate, surgical time, Total Laser Energy (Joules) was high in participants having TCD laser-DCR surgery with intubation.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FB & UUY: Data acquisition, data analysis, critical review, approval of the final version to be published.

MKS & KB: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

KH & BS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Lee SM, Lew H. Transcanalicular endoscopic dacryoplasty in patients with primary acquired nasolacrimal duct obstruction. Graefes Arch Clin Exp Ophthalmol 2021; 259: 173-180. https://doi.org/10.1007/s00417-020-04833-2
2. Awais M, Naqvi SA, Akram A, Shahid M. Transcanalicular diode laser assisted dacryocystorhinostomy: A breakthrough in the treatment of acquired nasolacrimal duct obstruction. Pak J Med Sci 2020; 36(4): 804. https://doi.org/10.12669%2Fpjms.36.4.1906
3. Yanagisawa D, Yuzuriha S. Lacrimal plasty with dacryocystorhinostomy-anastomosis using microsurgery. Plast Reconstruct Surg Glob Open 2023; 11(1): e4730. https://doi.org/10.1097%2FGOX.0000000000004730
4. Tot A. Nuovo metodo conservatore dicura radicale delles oppurazionicronichedel saccolacrimale (dacriocistorinostomia). Clina Moderna Firenza 1904; 10: 385-387.
5. Dupuy-Dutemps L. Procedeplastique dedacryocystorhinostomieetses resultants. Ann Ocullstisque 1921; 158: 241-261.
6. LT J. The cure of epiphora due to canalicular disorders, trauma and surgical failures on the lacrimal passages. Trans Am Acad Ophthalmol Otolaryngol 1962; 66: 506-524.
7. Trimarchi M, Giordano Resti A, Vinciguerra A, Danè G, Bussi M. Dacryocystorhinostomy: evolution of endoscopic techniques after 498 cases. Eur J Ophthalmol 2020; 30(5): 998-1003. https://doi.org/10.1177/1120672119854582
8. Ozturker C, Purevdorj B, Karabulut GO, Seif G, Fazil K, Khan YA, et al. A Comparison of transcanalicular, endonasal, and external dacryocystorhinostomy in functional epiphora: a minimum two-year follow-up study. J Ophthalmol 2022; 2022: 3996854. https://doi.org/10.1155/2022/3996854
9. Miragall V, Oeken J, Güldner C. Results and clinical aspects of primary endonasal endoscopic dacryocystorhinostomy with silicone tube. Eur J Otorhinolaryngol 2022; 279(5): 2409-2415. https://doi.org/10.1007/s00405-021-07004-z
10. Ababneh OH, Şimşek İB, Kaynak P, El Toukhy EA. Acquired Lacrimal Obstruction. Oculoplastic Surgery: A Practical Guide to Common Disorders. 2020: 237-253. https://doi.org/10.1007/978-3-030-36934-7_22
11. Everekliogluc, Sener H, Polat OA, Sonmez HK, GunaySener AB, Horozoglu F. Success rate of external, endonasal, and transcanalicular laser DCR with or without silicone stent intubation for NLD obstruction: a network meta-analysis of randomized controlled trials. Graefes Arch Clin Exp Ophthalmol 2023; 261: 1-6. https://doi.org/10.1007/s00417-023-06089-y
12. Cevat UÇ, Selim GE. Influence of weekly endoscopic debridement on success rate of endoscopic transcanalicular diode laser dacryocystorhinostomy. Arch Clin Exp Med 2022; 7(2): 48-50. https://doi.org/10.25000/acem.1129840
13. Kaynak P. Transcanalicular Laser-Assisted Dacryocystorhinostomy. Oculofacial, Orbital, and Lacrimal Surgery: A Compendium 2019: 517-530. https://doi.org/10.1007/978-3-030-14092-2_46

14. Lemaitre S, Sarandeses-Diez T, Gonzalez-Candial M. Anatomical and functional outcomes of transcanalicular diode laser assisted dacryocystorhinostomy as a primary procedure. J Fr Ophtalmol 2021; 44(3): 404-408. https://doi.org/10.1016/j.jfo.2020.05.028
15. Yu B, Xia Y, Sun JY, Ye Q, Tu YH, Zhou GM, et al. Surgical outcomes in acute dacryocystitis patients undergoing endonasal endoscopic dacryocystorhinostomy with or without silicone tube intubation. Int J Ophthalmol 2021; 14(6): 844. https://doi.org/10.18240%2Fijo.2021.06.08
16. Nitin T, Uddin S, Paul G. Endonasal Endoscopic Dacryocystorhinostomy with and Without Stents-A Comparative Study. Indian J Otolaryngol Head Neck Surg 2022; 74(Suppl 2): 1433-1441. https://doi.org/10.1007/s12070-021-02561-5
17. Al-Qahtani AS. Primary endoscopic dacryocystorhinostomy with or without silicone tubing: a prospective randomized study. Am J Rhinol Allergy 2012; 26(4): 332-334.https://doi.org/10.2500/ajra.2012.26.3789
18. Smirnov G, Tuomilehto H, Terasvirta M, Nuutinen J, Seppa J. Silicone tubing is not necessary after primary endoscopic dacryocystorhinostomy: a prospective randomized study. Am J Rhinol 2008; 22(2): 214-217. https://doi.org/10.2500/ajr.2008.22.3132
19. Al-Asadi SZ, Al-AbbasiAM. Efficacy of diode laser transcanaliculardacryocystorhinostomy in acquired nasolacrimal duct obstruction. Gomal J Med Sci 2011; 9(2).
20. Feng YF, Cai JQ, Zhang JY, Han XH. A meta-analysis of primary dacryocystorhinostomy with and without silicone intubation. Can J Ophthalmol 2011; 46(6): 521-527. https://doi.org/10.1016/j.jcjo.2011.09.008
21. Yildirim Y, Kar T, Topal T, Cesmeci E, Kaya A, Colakoglu K, et al. Comparison of transcanalicularmultidiode laser dacryocystorhinostomy with and without silicon tube intubation. J Ophthalmol 2016; 2016: 6719529. https://doi.org/10.1155%2F2016%2F6719529