

TRANSCANALICULAR DCR

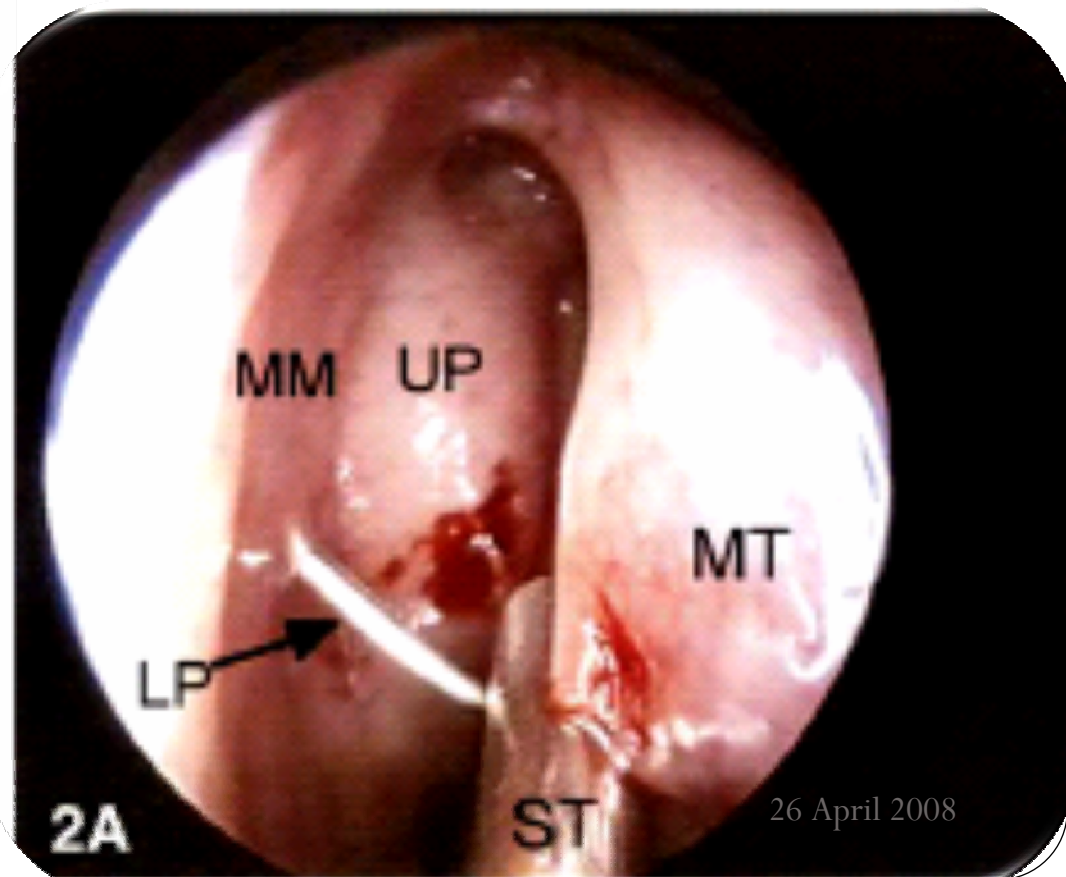
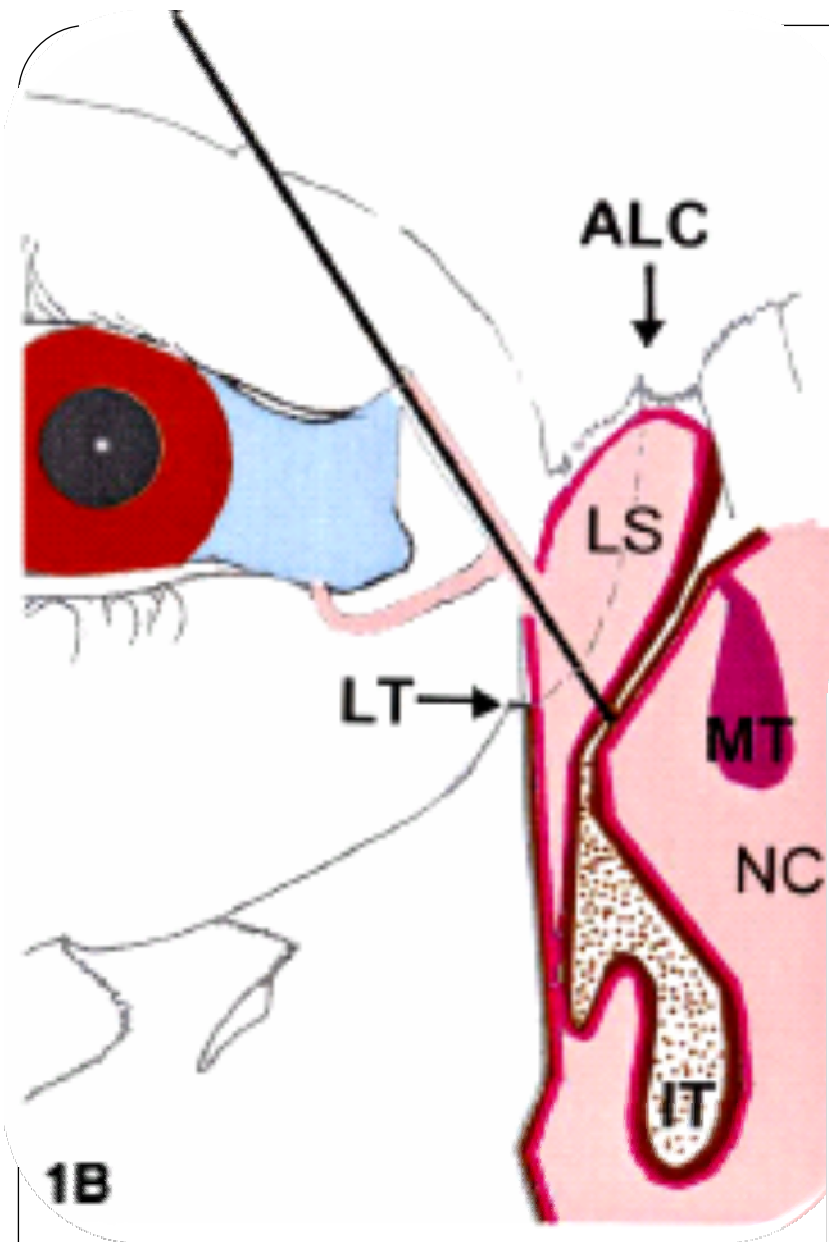
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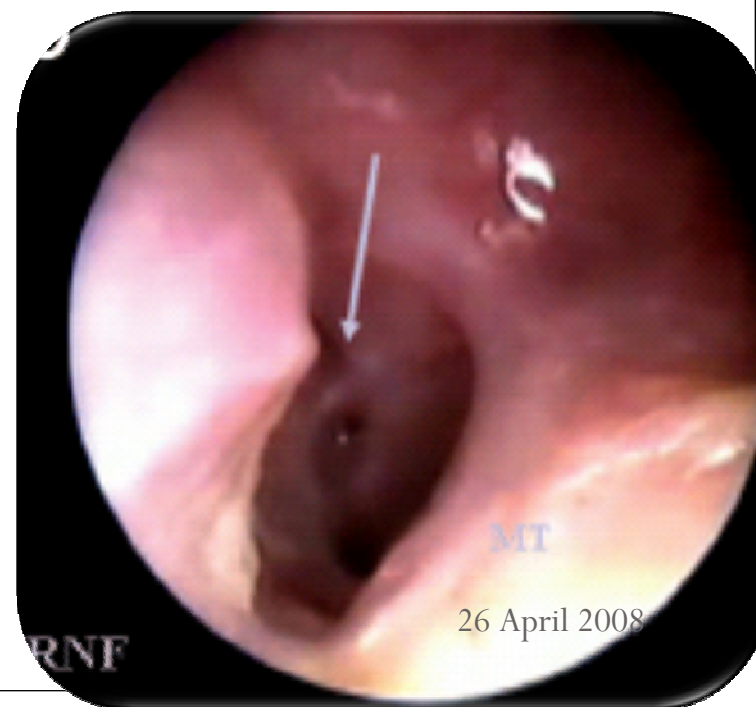
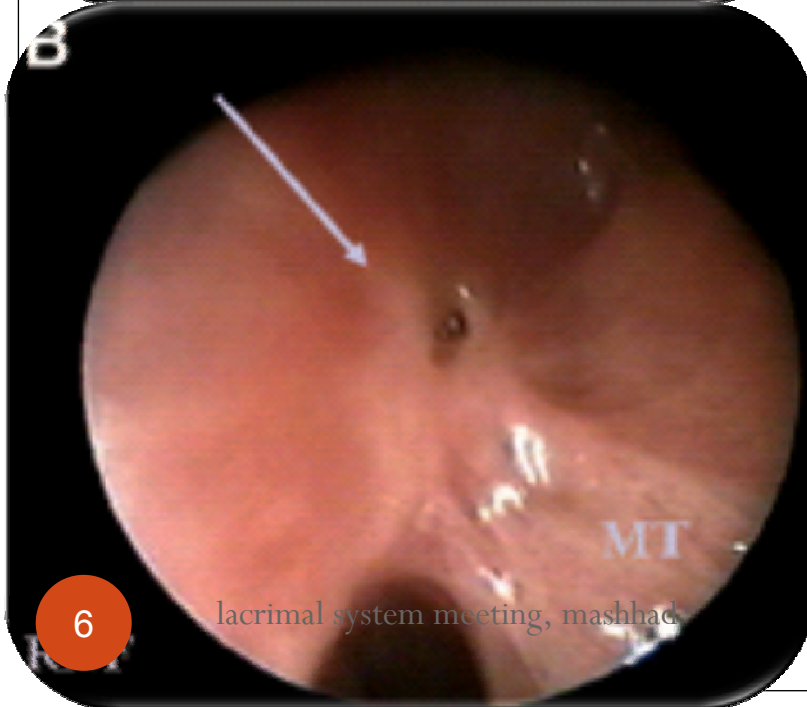
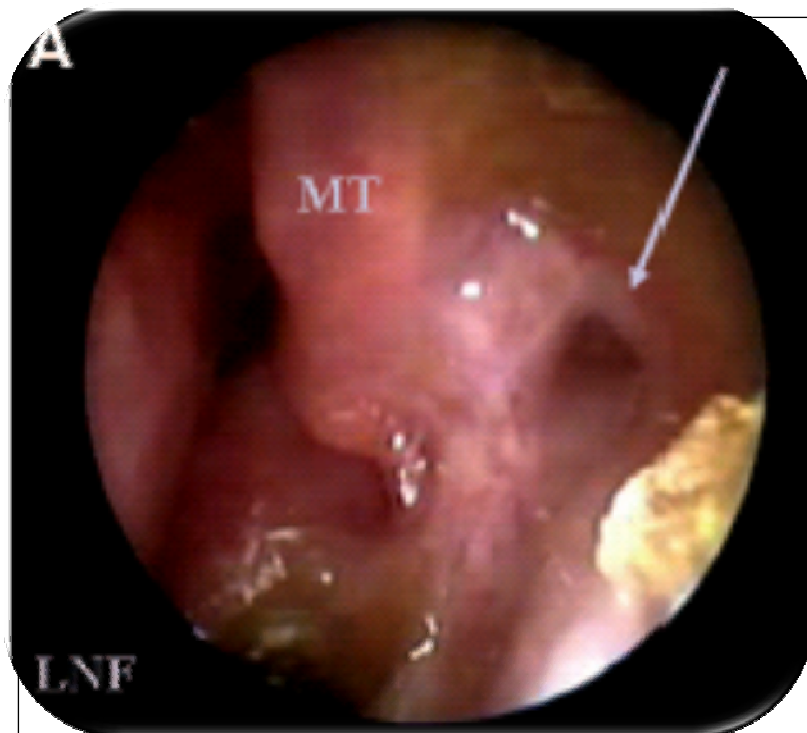
- Primary acquired nasolacrimal duct obstruction (NLDO), with or without dacryocystitis, is a common disorder. NLDO more frequently affects women than men, and most often in middle age. Conventional external dacryocystorhinostomy (DCR) is currently the most commonly performed surgical procedure for the treatment of NLDO, with the most effective results in the long term. Several alternative techniques—such as silicone intubation, polyurethane stents, balloon catheter dilatation, endonasal DCR, and laser-assisted endonasal DCR—have been used with variable success according to published series

- First described in 1963 the transcanalicular (or endocanalicular) approach to NLDO was abandoned, until lasers offered technical refinements that facilitate its use. Laser TCDCR is a minimally invasive procedure designed to obtain lacrimonasal patency and reduce epiphora in patients with NLDO. When compared with the more conventional external or endonasal DCR, the benefits of this newer technique may include decreasing operating time, reducing morbidity, enhancing cosmesis, and shortening functional recovery, as compared with other approaches such as external or endonasal DCR.

*Previous studies of transcanalicular laser
dacryocystorhinostomy and success rates*

Authors	Year	N	Laser	Success
Christenbury ⁶	1992	12	Argon	50%
Piaton et al. ¹¹	1994	41	Nd:YAG	75%
Dalez & Lemagne ¹²	1996	26	Ho:YAG	47%
Patel et al. ¹³	1997	24	Nd:YAG	46%
Pearlman et al. ¹⁴	1997	34	Nd:YAG	85%
Pérez Santoja et al. ¹⁵	1997	22	Nd:YAG	30%
Rosen et al. ¹⁶	1997	14	Nd:YAG	64%
Woo et al. ¹⁷	1998	6	Nd:YAG	83%
Kuchar et al. ¹⁸	1999	19	Er:YAG	84%
Eloy et al. ²⁶	2000	29	Diode	59%
Muellner et al. ²²⁻²⁴	2001	48	KTP	83%
Caversaccio et al. ²⁰	2001	12	Erbium	75%
Piaton et al. ²¹	2001	289	YAG	65%
Hofmann et al. ²⁵	2003	78	KTP	83%
Alañón et al. ^{10,27,28}	2004	43	Diode	90%
Hong et al. ⁷	2005	102	Nd:YAG	81%
Henson et al. ³²	2007	40	Diode	87%
Maeso & Sellarés ³³	2007	150	Diode	92%
Plaza et al. ⁸	2007	25	Diode	88%





Endocanalicular laser-assisted dacryocystorhinostomy. An anatomic study

P. S. Levin and D. J. StormoGipson

Stanford (Calif) University School of Medicine, 1992

- In human cadaver specimens, a laser fiberoptic was advanced through the canalicular systems to create fistulas between the nasolacrimal sac and nose. A 400- to 600-microns, blunt-tipped quartz fiberoptic was then advanced through the upper and/or lower canaliculus to the medial aspect of the nasolacrimal sac. After 10 to 15 laser pulses (10 W for 0.1 second), a 2.5 x 2.5-mm fistula was created between the lacrimal sac and the nose just anterior and inferior to the middle turbinate. Additional laser pulses can further enlarge the fistula. Endocanalicular laser-assisted dacryocystorhinostomy has potential advantages compared with endonasal laser-assisted dacryocystorhinostomy, including the following: laser energy is directed away from the eye; the technique resembles standard nasolacrimal probing; and nasal endoscopy and instrumentation may prove unnecessary

Bull Soc Belge Ophtalmol. 1996;263:139-40

[Transcanalicular dacryocystorhinostomy by pulse Holmium-YAG laser]

Dalez D, Lemagne JM. Bruxelles

- We report the results of 26 Holmium-Yag transcanalicular DCR made in 23 outpatients, under topical anaesthesia. Success rate was 47% (follow-up: 1 to 7 months). Failures occurred within the first month.

Ophthalmologe. 1997 Oct;94(10)

Endoscopy of the lacrimal ducts]

Emmerich KH, Meyer-Rüsenberg HW, Simko P.

Augenklinik, Klinikum Darmstadt.

- The available picturing methods in the diagnosis of functional and mechanical stenosis of the lacrimal drainage system do not allow direct optical evaluation of the mucosa. With the help of dacryoendoscopy, *for the first time* there is the possibility of receiving a direct morphological picture of the tissue of the lacrimal drainage system. PATIENTS AND METHODS: In a clinical study in the period January to June 1996, dacryoendoscopies were done before an operative intervention in the lacrimal drainage system to find out what information can be obtained with dacryoendoscopy and what use this extra information is. RESULTS: In all of the dacryoendoscopies performed, direct evaluation of the mucosa was possible. Normal findings could be clearly differentiated from mucosa of acute or chronic inflammatory processes. The choice of the operative strategy changed in part of the planned operations, although in 37 cases where the preoperative diagnosis was stenosis of the lacrimal sac, only in 26 cases was dacryocystorhinostomy performed. Dacryoendoscopy provides an additional means of guaranteeing the quality of operative procedures, e.g., after intubation. CONCLUSIONS: Dacryoendoscopy provides an important additional diagnostic possibility in the diagnosis of diseases of the lacrimal drainage system. Dacryoendoscopy offers the possibility of direct evaluation of the mucosa, the choice of operative strategy is checked and, if necessary, changed, and with the connection of an erbium YAG Laser there is minimal invasive surgery with the aim of rechannelization of the lacrimal drainage system.

Ophthalmology. 1997 Jul;104(7):1191-7

Transcanalicular neodymium: YAG laser for revision of dacryocystorhinostomy.

Patel BC, Salt Lake City 84132, USA.

- **BACKGROUND:** Laser-assisted dacryocystorhinostomy (DCR) has failed to match the success rates of external DCR. It has been suggested that this technology may be best suited for revision of failed DCR cases. The authors prospectively evaluated the efficacy *of transcanalicular laser-assisted revision DCR (TCLARDCR)*. **METHODS:** A neodymium:YAG (Nd:YAG) laser was used for transcanalicular revision of 24 failed DCRs. Failure had followed one (n = 15), two (n = 7), or three (n = 2) previous external DCRs. **RESULTS:** Mean duration of the surgery was 78.2 minutes. Success was achieved in 11 cases (46%; mean follow-up, 20 months). There was no correlation between early loss of stents and failure. Three cases had partial relief of symptoms. Three of the failures unsuccessfully underwent further TCLARDCR. **CONCLUSIONS: The authors' success rate of 46% with TCLARDCR compares poorly with the 85% success for external revision DCR.** With TCLARDCR, specific anomalies like the sump syndrome cannot be addressed adequately. There is a theoretical risk of canalicular injury. Laser lacrimal surgery also is equipment dependent and more costly than external DCR. The TCLARDCR cannot be recommended for revision DCR using the Nd:YAG laser (Lasersonics, Milpitas, CA)

Klin Monatsbl Augenheilkd. 1997 Dec;211(6):375-9

[Dacryoendoscopy and laser dacryoplasty: technique and results]

Emmerich KH Augenklinik, Klinikum Darmstadt.

- **BACKGROUND:** In a bicentric study in the eye clinic of Darmstadt and the eye clinic of the St. Josef Hospital Hagen 261 dacryoendoscopies were performed until February 1997. **MATERIALS AND METHODS:** **In 261 dacryoendoscopies** (143 women, 93 men and 25 children, the average age was 46.6 years). In dependence of the assessment of the mucosa conditions intraoperatively in all 261 cases the planned operative strategy was checked and if needed changed. After surgical interventions of the lacrimal system 70 cases of dacryocystorhinostomia externa were seen 138 cases of intubation of the lacrimal drainage system and 53 cases of laserdacryoplastic. Intubation of the lacrimal system was always performed after laserdacryoplastic and after a patency was produced (average age 58.3 years). **RESULTS:** Suitable indications for a laserdacryoplastic are: circumscribed stenosis of the distal saccus, point-sized stenosis of the canaliculus, membranous restenosis after dacryocystorhinostomia externa. The method shows no important rate of intraoperative complications, only in one case there was intraoperatively a protrusion bulbi and a haematoma of the eyelid, which postoperatively eased fastly away. The postoperative convalescence is in comparence to conventional surgical interventions of the lacrimal drainage system enormously shortened. The follow-up after 3 months showed a subjective improvement of epiphora in *more than* 75% of the patients, the success of this intervention therefore could be compared with conventional surgical methods of the lacrimal drainage system. **CONCLUSION:** **The dacryoendoscopy is a new important diagnostic development, which shows with help of better developed endoscopy-systems compared to previous systems a much better quality of the image and is therefore a valuable diagnostic help.** Due to the check of the preoperative indication it is intraoperatively possible to confirm or, if needed, to change the indication after dacryoendoscopy. The laserdacryoplastic is an important new therapeutical development of the dacryoendoscopy and shows in suitable indications a comparable success-rate of conventional surgical interventions of the lacrimal drainage system. Therefore the possibility exists to carry out minimal invasive interventions of the lacrimal drainage

Ophthalmologe. 1998 Dec;95(12)

[Dacryoendoscopy--current status]

Emmerich KH, Augenklinik, Klinikum Darmstadt.

In the years from 1995 to 1997 in the eyeclinic of Darmstadt and the eyeclinic of the St. Josef Hospital Hagen 261 dacryoendoscopies were done in a bicentric study. **PATIENTS AND METHODS:** A dacryoendoscopy was done in 261 patients with an average age of 46.6 years (143 women, 93 men and 25 children). In dependence of the assessment of the mucosa conditions intraoperatively in all 261 cases the planned operative strategy was checked and if needed changed. As following surgical interventions of the lacrimal system were seen 70 cases of dacryocystorhinostomia externa, 138 cases of intubation of the lacrimal drainage system and 53 cases of laserdacryoplastic. **RESULTS:** The dacryoendoscopy had succeeded as method for the assessment of the mucosa conditions. In a study of 261 dacryoendoscopies an examination of the mucosa was possible in every case. No complications were seen while dacryoendoscopy. With help of the dacryoendoscopy the planned operative strategy was determined. Therefore we had the possibility to choose a minimal invasive operation-procedure in 53 cases. **CONCLUSIONS:** The dacryoendoscopy is a new important diagnostic development in diagnosis of diseases of the lacrimal drainage system. With help of better developed endoscopy-systems a much better quality of the picture is attainable. The results of the dacryoendoscopy offer the possibility to check the preoperative indication and to optimize the surgical treatment. At last only with help of the dacryoendoscopy these findings could be ascertained in which case a laserdacryoplastic is senseful.

Ophthalmologe. 1998 Jul;95(7)

[Opening of lacrimal duct stenoses with endoscope and laser]

Müllner K. Universitäts-Augenklinik Graz.

- **BACKGROUND:** Since the development of lacrimal endoscopes with which the mucosa and disorders of the lacrimal drainage system can be examined directly, the choice of surgical technique has changed decisively. Flexible miniendoscopes can be combined with a laser for the first time, allowing for exact localization of the stenosis and subsequent therapy. **PATIENTS AND METHODS:** Between January 1996 and February 1997, 12 patients with acquired lacrimal stenosis were treated with an Hyb:erbium-YAG laser. After endoscopic localization, the stenosis or stricture was opened using the laser. Bicanicular intubation into the nose was performed and was left for at least 3 months. Five patients were treated for stenosis of the lower canaliculus and seven patients for postsaccal stenosis. **RESULTS:** The longest follow-up period was 22 months and the shortest 9 months. Treatment was successful in 4 cases with a canalicular stenosis, but restenosis occurred in all cases of postaccal stenosis and in 1 case of canalicular stenosis, and required a DCR. **CONCLUSIONS:** *At this time we conclude that disorders of the canaliculi can be successfully treated with endoscopic localization, opening with a laser and subsequent silicone tube intubation. A high rate of restenosis may be expected in cases of postsaccal stenosis.*

Klin Monatsbl Augenheilkd. 1999 Jul;215(1):28-32

[Endoscopic treatment of lacrimal duct stenoses using a KTP laser--
report of initial experiences - [Müllner K](#), [Wolf G](#).

- **BACKGROUND:** Since four years, endoscopes with which the mucosa and disorders of the lacrimal drainage system can be examined directly, are available. The wish to treat lacrimal disorders with endoscopes and laser have remained. **PATIENTS AND METHODS:** Between January 1996 and February 1997. 12 patients with acquired lacrimal stenosis were treated with an Hyb:Erbium-YAG-laser and 32 patients were treated with a KTP-laser (quasi-cw mode, wavelength 532 nm and 10 W power). Five patients were treated for lower canaliculus stenosis and seven patients for postsaccal stenosis with the Hyb:Erbium-YAG-laser. 32 patients with postsaccal stenosis were treated with the KTP-laser to perform a bony window of 5 x 5 mm. Bicanalicular intubation into the nose was performed and was left for at least three months. **RESULTS:** The longest follow up period was 30 months while the shortest was 13 months in the Hyb:Erbium-YAG-laser group. Treatment was successful in four cases with a canalicular stenosis, but restenosis occurred in all cases of postsaccal stenosis and in one case of canalicular stenosis and required a conventional DCR. In the KTP-laser group 25 patients are patent and have no symptoms, 4 patients have watering cold weather and 3 patients had a restenosis. Follow-up range between 2 months and 12 months. **CONCLUSIONS:** *The Hyb:Erbium-YAG-laser is successful in thin membranes and small restenosis. With the KTP-laser a successful transcanalicular laser assisted DCR is possible*

Ophthalmic Surg Lasers. 1998 Jun;29(6):
Transcanalicular laser-assisted revision of failed dacryocystorhinostomy.
Woo KI, Seoul, Korea.

- **BACKGROUND AND OBJECTIVE:** Despite the high success rate of external dacryocystorhinostomy (DCR), recurrent tearing after DCR can be troublesome. The authors performed transcanalicular revision in 6 patients with failed DCR. **PATIENTS AND METHODS:** With the use of a continuous wave Nd:YAG laser with a sclerostomy probe, the internal ostium was reopened by a transcanalicular approach. The authors applied 0.4 mg/ml of mitomycin-C around the opening for 5 minutes intranasally and inserted a silicone tube as a stent. **RESULTS:** A total of 7 operations were performed in 6 patients. The operation was successful after the first revision in 5 of the 6 patients, but 1 of the patients required a second procedure. **CONCLUSIONS:** The transcanalicular laser-assisted revision has several advantages. It is simple and fast, skin incision is avoided, there is good hemostasis, it is less traumatic, and there is less postoperative morbidity.

Br J Ophthalmol. 1999 Apr;83(4):443-7. Links
Endoscopic laser recanalisation of presaccal canalicular obstruction.
Kuchar A, Novak P, Pieh S, Fink M, Steinkogler FJ. Austria.

- AIM: To document the results of erbium (Er)-YAG laser treatment in presaccal canalicular obstruction in combination with the use of a flexible endoscope. METHODS: For the first time an Er-YAG laser (Schwind, Sklerostom) was attached to a flexible endoscope (Schwind, Endognost) and used to recanalise a stenosis of the upper, lower, or common canaliculus. In 17 patients (mean age 41.5 (SD 11.9) years), 19 treatments (two bilateral) were performed. In all cases the scar was observed using the endoscope and was excised by laser ablation. A silicone intubation was performed in all cases. In addition to the endoscopy an irrigation was performed to prove the intactness of the lacrimal pathway system after laser treatment. RESULTS: Membranous obstructions with a maximum length of 2.0 mm (14 procedures) in the canaliculus were opened easily using the laser, and the silicone intubation was subsequently performed without difficulty. Scars thicker than 2.0 mm could not be opened safely without canaliculus penetration (five procedures). Irrigation was positive in all cases up to the end of a 6 month period, providing the tubes remained in place. The maximum follow up is now 17 months (minimum 8 months) and in 16 cases (84.2%) the canaliculi are still intact. CONCLUSION: **Endoscopic laser treatment combined with silicone intubation enables us to recanalise presaccal stenoses of canaliculi under local anaesthesia up to a scar thickness of 2.0 mm. Best results can be achieved in cases where much tissue can be saved. Under such conditions this procedure can substitute for more invasive surgical techniques, especially a conjunctivo-dacryocystorhinostomy (CDCR)**

97th DOG Annual Meeting 1999

LASERASSITED TRANSCANALICULAR DCR- FIRST RESULTS

K. Müllner, G. Wolf, Univ.- Augenklinik Graz

- Background: Since four years, endoscopes with which the mucosa and disorders of the lacrimal drainage system can be examined directly, are available. The wish to treat lacrimal disorders with endoscopes and laser have remained.
Patients and Methods: Since September 1997 45 patients were treated with a KTP-laser (quasi-cw mode, wavelength 532 nm and 10 W power). with aquired postsaccal stenosis. A transcanalicular laserassited DCR was performed. The aim was to perform a bony window of at least 5x5 mm in diameter. Bicanalicular intubation into the nose was performed and was left for at least three months.
Results: 35 patients are patent and have no symptoms, 5 patients have watering by cold weather and 4 patients had a restenosis. Follow up range between 2 months and 17 months. With the KTP- Laser is it possible to perfrom bony windows and penetrate thick membranes.
Conclusions: *With the KTP-laser a successful trans canalicular laser assisted DCR is possible*

Ophthalmologe. 2000 Oct;97(10):

[Laser canaliculoplasty]

Steinhauer J,

- **BACKGROUND:** Laser canalicular plastic surgery using the erbium-YAG laser is a new method for treating canaliculus stenosis. We compared results of this method with those of conventional surgical operations on canaliculi. **PATIENTS AND METHODS:** Between 1996 and 1998 a total of 44 cases of symptomatic canaliculus stenosis were treated by laser. An erbium-YAG laser with a maximum power of 100 mJ was used in conjunction with a sapphire fiber 3 cm long and 325 microns in diameter. Endoscopic diagnosis of the other parts of the lacrimal passage was carried out before and after laser treatment and after tubular intubation. After an average of 12 months the results were assessed via questionnaires and follow-up examinations. **RESULTS:** The success rate for reducing epiphora was 67%. Overall 86% of patients reported an improvement in canaliculus communis stenosis. **CONCLUSIONS:** *Laser canalicular plasty as minimally invasive surgical treatment is an excellent surgical method for treating point-focal, noninflammatory canalicular stenosis.*

Endolacrimal laser assisted lacrimal surgery

Klaus Muellner, Austria

- *AIMS:* To utilise the improved optical qualities of newly developed lacrimal endoscopes and newly miniaturised laser fibres for diagnostic visualisation and laser surgery of the lacrimal system.
METHODS: A KTP laser (wavelength 532 nm, 10 W energy) was used for laser assisted dacryocystorhinostomy (DCR) with endolacrimal visualisation in 26 patients. Bicanalicular silicone intubation was placed in all patients for at least 3 months.
- *RESULTS:* After 3-9 months of follow up, the silicone tube in all 21 patients who underwent KTP laser DCR are still patent, three patients have eye watering in extremely cold weather and two required a conventional DCR.
CONCLUSIONS: The KTP laser generates enough power to open the bony window in DCR surgery. Precise endolacrimal visualisation via a specially designed miniendoscope is essential for surgical success.

Ophthalmologe. 2001 Feb;98(2)

Laser-assisted transcanalicular dacryocystorhinostomy.

Initial results

Müllner K, Wolf G, Luxenberger W, Hofmann T.

- **BACKGROUND:** Endoscopes for direct examination of the mucosa and disorders of the lacrimal drainage system have been available for four years. This had led to the wish to be able to treat lacrimal disorders by endoscopes and laser. **PATIENTS AND METHODS:** Since September 1997 we have treated 48 patients by laser-assisted transcanalicular dacryocystorhinostomy (DCR) using a **KTP laser**, including all those with stenosis to the nasolacrimal duct and all those with postsaccal stenosis. A bony window with diameter of **5 x 5 mm** was created. Bicanalicular intubation into the nose was performed and was left for 3-6 months. **RESULTS:** We found 40 patients to have patent lacrimal pathway and no symptoms, 4 watering in cold weather, and 4 a restenosis. **CONCLUSIONS:** The **KTP-laser** is sufficiently powerful to create bony windows at least 5 mm in diameter, and a transcanalicular laser-assisted DCR is therefore possible.

J Fr Ophtalmol. 2001 Mar;24(3)

[Revision of failed dacryocystorhinostomies using the transcanalicular approach. Results of 118 procedures]

Piaton JM Paris, France.

- **PURPOSE:** To assess the efficacy of transcanalicular dacryocystorhinostomy for the revision of other procedures. The results are analyzed following the use of two different types of laser: the Neodymium: YAG (Nd: YAG) laser and the Holmium: YAG (Ho: YAG) laser. To study the efficacy of using two antimetabolite drugs in this context: mytomycin-C (MMC) and 5-fluoro-uracil (5-FU). **METHODS:** One hundred and fourteen patients were operated on. Of these, 88 had already undergone one procedure, 25 two procedures, and 5 three procedures. The Nd: YAG laser was used in 78 procedures, the Ho: YAG in 30 procedures, and both lasers in 10 procedures. Twenty patients were treated with an application of MMC and 25 patients with an application of 5-FU. **RESULTS:** The results are based on 106 procedures. **The total success rate was 49.06% after one revision and 58.49% after two or three revisions.** There is no statistically significant difference between the Nd: YAG and Ho: YAG lasers. The **use of antimetabolites** did not improve the success rate. **CONCLUSION:** *Transcanalicular dacryocystorhinostomy is a very useful method because it does not cause cutaneous scarring and it has a low rate of morbidity given that it causes very little surgical traumatism.* The revision of other dacryocystorhinostomy methods using the transcanalicular approach is theoretically a positive indication because it does not dissect scarring tissues and because the osteotomy has already been performed. However, the success rate is lower than for the external and endonasal approaches. The success rate is not modified by the use of antimetabolites or by the type of laser.

Transcanalicular THC:YAG Dacryocystorhinostomy

Holak N., Holak H.

Städtisches Klinikum Braunschweig, Augenklinik 2001

- **Background:** The transcanalicular THC:YAG - Dacryocystorhinostomy (DCR) allows a slightly minor rate of success compared to the classical external surgical DCR (90%) and a similar rate of success to the endonasal DCR.
- **Purpose:** Evaluation of a larger case amount over a long period.
- **Material and Methods:** In a five-year study 58 procedures of the transcanalicular THC:YAG DCR were performed under local anaesthesia by one surgeon. The size of 3- 4 mm of the ostium was achieved under endoscopic control. The used Laser was a sLase210 (New Star Lasers/Sunrise, Anburn CA, USA), working with 2-4 Watt at 2100 nm. 8% were provided with a silicon ring intubation, 92% with monocanalicular stents for 2 months. 5% already underwent a prior surgery. The observation extended from 7 month to 5 years. The examinations were performed after 1-6 month and then in 1-5 years.
- **Results:** 94% of the patients could be irrigated in the period of observation, but 6% suffered still of epiphora and had to be therefore included with additional 6% to the failed procedures. 10% of the failures occurred in the first year after the procedure and 12% after 3 years.
- **Conclusions:** *The THC:YAG - DCR allows after a short operation an reconvalence a 88% rate of success in long term follow up with a minimal trauma or external scarring*

lacrimal system meeting, mashhad

26 April 2008

J Fr Ophtalmol. 2001 Mar;24(3):253-64

[Holmium: YAG and neodymium: YAG laser assisted trans-canalicular dacryocystorhinostomy. Results of 317 first procedures]

Piaton JM Paris, France.

- **PURPOSE:** To assess the results of the first procedures of trans-canalicular dacryocystorhinostomy according to two different lasers: Neodymium: YAG (Nd: YAG) laser or Holmium: YAG (Ho: YAG) laser. To study the efficiency of two anti-metabolite drugs: mitomycin-C (MMC) and 5 fluoro-uracile (5 FU). To analyse the rate of efficiency of the Ho: YAG laser in the canalicular obstructions. **METHODS:** Three hundred and seventeen patients were operated: 226 with the Nd: YAG laser, 77 with the Ho: YAG laser and 14 with both lasers; 68 were treated with an application of MMC and 40 patients with an application of 5-FU. Sixty-three patients suffered from a canalicular obstruction. **RESULTS:** The results are based on 289 procedures 6 months after the operation. **The global rate of success was 63.32% after one intervention and 70.24% after one or two revisions.** There is no statistically significant difference between Nd: YAG or Ho: YAG lasers. The use of antimetabolites did not improve the success rate. In 65% of the cases the canalicular patency is reached. **CONCLUSION:** *Laser-assisted transcanalicular dacryocystorhinostomy is a very useful method* because it does not cause cutaneous scarring and for it has a low rate of morbidity given that it causes very little surgical traumatism. Consequently, it can be used under topical anaesthesia and for patients at risk or suffering from coagulation problems. It can be undertaken in the cases of extremely narrow nasal fossae when an endonasal dacryocystorhinostomy is impossible. This procedure is less successful than external or endonasal dacryocystorhinostomy. The success rate is not modified by the use of antimetabolites or by the type of laser.

Transcanalicular Endoscopic Laser-assisted Dacryocystorhinostomy (TELA-DCR)

Medical Laser Application, 2003 December;18(4)

- **Objective:**To assess the results in combined dacryoendoscopy followed by lacrimal drainage surgery with a transcanalicular laser-assisted approach combined with microsurgical endonasal DCR (TELA-DCR).
- **Methods:**Retrospective follow-up of a case series between 1998 and 2003. 82 patients were included in the study (43 females/39 males, age 47.8 years). All patients underwent a combined examination by an ophthalmologist (GVA) and an otorhinolaryngologist (AS/KL) consisting of a routine clinical examination of the eyes, the lacrimal system and the nasal cavity as well as the paranasal sinuses with probing and syringing of the lacrimal drainage system, a radiological examination with digital subtraction dacryocystography (dsDCG) and computerized tomography (CT) of the bony structures. Of 122 lacrimal systems with dacryoendoscopy (Schwind Vitroptic®, Germany), 68 had a bicanalicular silicone intubation without surgery, 12 had a transcanalicular laserdacryoplasty (Erb:YAG-Laser; Schwind-Sclerostome®, Germany) with bicanalicular silicone intubation (Ritleng; FCI Ophthalmics, France) and 42 had TELA-DCR with a silastic-sheet inlay in the bony window for two to three days. 7 of these 42 have already had lacrimal surgery elsewhere. 2 had external lacrimal surgery (Toti procedure) and 5 had endonasal surgery (West procedure). Dacryoendoscopy was used to review the diagnosis of digital subtraction dacryocystography (dsDCG) and for surgical intervention in the same session. Surgery was done in general anesthesia. All patients were admitted to the inpatient department for 24 hours and were discharged the day after surgery. Follow-up (4–65 months) was done by the surgeons only. The silicone tubes were left for three to six months and removed endonasally by the same surgeons again.
- **Results:**Of 122 interventions with dacryoendoscopy 68 needed a bicanalicular stenting with a silicone tube for relative stenosis only. 12 of these needed further intervention by DCR (17.6%) due to restenosis. 12 out of 122 had primary laserdacryoplasty and 2 (16.6%) of these needed DCR later. 42 of 122 had primary TELA-DCR. 5 out of these 42 primary TELA-DCR were revision-DCR after external or endonasal DCR elsewhere and 2 of these needed a 2nd TELA-DCR for restenosis (4.8%). Anatomically all lacrimal systems are still patent ever since. 76 patients (92.7%) are free of symptoms. ***Overall anatomic patency rate was 82.4% in tubing as single intervention, 83.4% in laser-dacryoplasty and 95.2% in TELA-DCR.***
- **Conclusions:**Combined dacryoendoscopy and TELA-DCR is an efficient, safe and successful method in the management of lacrimal obstructive disease. **Our experience suggests that TELA-DCR may be considered as a treatment option in selected patients with lacrimal obstructive disease.**

Endolacrimal KTP Laser–Assisted

Dacryocystorhinostomy [Thiemo Hofmann,](#)

Arch Otolaryngol Head Neck Surg. 2003;129(3):329-332

- **Objective** To describe our experience with potassium-titanyl-phosphate (KTP) laser–assisted dacryocystorhinostomy, controlled via endolacrimal and endonasal endoscopy. The development of miniendoscopes enables endoscopy of the lacrimal drainage system via the lacrimal puncta to visualize the exact site of a stenosis. **Design** A case series of 78 patients, with 1-year postoperative follow-up.
- **Settings** A university medical center.
- **Patients** Consecutive sample of 78 adult patients who required surgery for dacryostenosis.
- **Intervention** Endolacrimal use of a KTP laser to perform a bony osteotomy of the lacrimal sac into the nasal cavity. The position for the perforation was controlled by endonasal endoscopy. The procedure was performed under either general or local anesthesia.
- **Results** One year after surgery, 65 (83%) of the 78 patients were free of symptoms. Seven patients experienced intermittent tearing, and 6 had revision surgery because of restenosis.
- **Conclusions** . *The success rate of 83% achieved with KTP laser–assisted dacryocystorhinostomy, using miniendoscopes for lacrimal endoscopy to visualize the exact site of obstruction, is better compared with that of prior studies without the use of miniendoscopes (with success rates of 47%-85%). The advantages of this technique are that it is a minimally invasive procedure, requires a short operating time, and avoids use of an external incision.*

J Korean Ophthalmol Soc. 2004 Jan;45(1):1-7. Korean
The Surgical Results of Transcanalicular LASER-assisted
Dacryocystorhinostomy.

Lee TS, Kim JS, Cho SH, Choi JS. Korea

- **PURPOSE:** The purpose of this study is to evaluate **the effectiveness of transcanalicular laser-assisted dacryocystorhinostomy(DCR) comparing with previous endonasal DCR.** **METHODS:** The patients were divided into two groups; One is transcanalicular laser-assisted DCR, the other is endonasal DCR. 35 patients with NLD obstruction underwent transcanalicular laser-assisted DCR. The bony ostium was created using a transmitting Nd:YAG fiberoptics catheter laser through the canaliculus. On the other hand, 45 patients with NLD obstruction underwent endonasal DCR. The authors compared success rate, postoperative complication and operative time between two groups. **RESULTS:** *The success rate of transcanalicular laser-assisted DCR group and endonasal DCR group were 88.6% (31 /35) and 88.9% (40/45), respectively. There was no significant difference between two groups in success rate ($p>0.99$). Postoperative granuloma formation was seen in 29% (transcanalicular group) and 58% (endonasal group), respectively. The operative time for transcanalicular and endonasal DCR was needed for 28.3min, 47.7min, respectively. There were statistically significant differences in less granuloma formation and shorter operative time in transcanalicular group than in endonasal group ($p<0.01$).* **CONCLUSIONS:** *When patients with NLD obstruction have a thin bony portion of the lacrimal fossa, transcanalicular laser-assisted DCR with shorter operative time and less postoperative complications may be chosen as the beneficial procedure rather than endonasal DCR.*

Am J Rhinol. 2005 May-Jun;19(3):322-5. Links

Revision dacryocystorhinostomy: a comparison of endoscopic and external techniques.

Tsirbas A South Australia

- **BACKGROUND:** Success rates for revision dacryocystorhinostomy (DCR) are lower than primary DCR. Scarring of the sac may limit the ability of the surgeon to achieve good nasal and lacrimal mucosa apposition. This study evaluates the comparative success rates of the external and endoscopic techniques for revision DCR. **METHODS:** Seventeen consecutive revision endoscopic DCRs (average age, 60.9 years) and 13 revision external DCRs (average age, 65.1 years) performed from January 1999 to December 2000 performed by separate surgeons were entered into the study. Patients with functional nasolacrimal and canalicular obstruction were excluded. The average follow-up was 11.1 months for the endoscopic DCR group and 10 months for the external DCR group. **RESULTS:** A successful DCR required complete relief of symptoms and an endoscopically determined anatomic patency of the nasolacrimal system. Revision endoscopic DCR surgery was successful in 76.5% of cases (13 of 17 cases) and external DCR surgery was successful in 84.6% (11 of 13 cases). This difference was not statistically significant. ($p = 0.64$, Fisher exact test with a two-tailed probability). **CONCLUSION:** *Revision endoscopic DCR has a success rate of 76.5%, which compares favorably with that of the revision external DCR (84.6%).*

Ophthalmology. 2005 Sep;112(9): 1629-1633

Endocanalicular laser dacryocystorhinostomy analysis of 118 consecutive surgeries

Hong JE, Massachusetts, USA

- **PURPOSE:** To describe the outcomes of endocanalicular laser dacryocystorhinostomy (ECL DCR) for patients with nasolacrimal duct obstruction (NLDO). **DESIGN:** Retrospective, noncomparative, interventional case series. **PARTICIPANTS:** One hundred eight consecutive patients who underwent ECL DCR. **METHODS:** The records of the patients who underwent ECL DCR at 1 of 2 academic centers were reviewed and the data analyzed. **MAIN OUTCOME MEASURES:** Success was defined as the resolution of symptoms or unobstructed lacrimal irrigation. **RESULTS:** One hundred eighteen consecutive ECL DCR surgeries performed on 108 patients between June 1997 and June 2003 were reviewed, excluding 6 lost to follow-up. Endocanalicular laser DCR was the initial surgical intervention for all cases except 6 that had previously undergone surgery (external or endonasal DCR) at outside hospitals. Twenty-seven of the surgeries were considered failures on the basis of recurrent epiphora or discharge, or reflux on nasolacrimal irrigation. One of the failures was permanently corrected with balloon dacryoplasty. Nine of the other failures had a repeat procedure, with 7 remaining patent after one repeat procedure and an additional one remaining patent after a third procedure. All 6 ECL DCR procedures that were performed after external or endonasal DCR at an outside institution remained patent. Among the 102 initial lacrimal surgeries in this series, **there was a 73.6% success rate. The overall success, including repeat procedures, was 81.5%.** The success of this technique as a repeat procedure after previous external, endonasal, or ECL DCRs was 87.5%. **CONCLUSIONS:** *Endocanalicular laser DCR offers a minimally invasive alternative procedure for the treatment of NLDO. In our series, the success rates are comparable to those previously reported. The technique had a high success rate when used to treat recurrent NLDO after previous lacrimal surgery.*

Orbit. 2005 Mar;24(1):15-22. Links

Endoscopic radiofrequency-assisted dacryocystorhinostomy with double stent: a personal experience.

Javate R, Pamintuan F. Manila,

- AIM: To report the success rate of endoscopic radiofrequency-assisted dacryocystorhinostomy with double stent and the use of a Griffiths collar button. METHOD: A prospective, single surgeon, uncontrolled, interventional case series study was designed to include 112 patients with nasolacrimal duct obstruction. Endoscopic radiofrequency-assisted dacryocystorhinostomy (ERA-DCR) with insertion of a Griffiths collar button was done on 102 patients with unilateral nasolacrimal duct obstruction and 10 patients with bilateral nasolacrimal duct obstruction. The operation was defined as a success if: a) preoperative epiphora was resolved; b) nasolacrimal patency was achieved as confirmed by lacrimal irrigation as well as by endoscopic observation of fluorescein dye flowing through the surgical ostium on lacrimal irrigation. RESULTS: A total of 122 ERA-DCR procedures was done, of which 117 procedures involved cases of primary acquired nasolacrimal duct obstruction (PANDO) and five procedures involved cases of previously failed endonasal DCR. Two failures were observed in this study out of the 117 procedures done on PANDO cases. The success rate is computed at 98% (115/117). The postoperative follow-up period was 28.08 +/- 14.7 months. CONCLUSION: *Endoscopic radiofrequency-assisted dacryocystorhinostomy with double stent and the use of a Griffiths collar button shows a success rate of 98% in the long-term patency of the intranasal ostium.*

Transcanalicular laser-assisted dacryocystorhinostomy: initial results]

Kanecadan RT - *Arq Bras Oftalmol* -2006 sep; 69(5): 691-4

PURPOSE: To describe the technique and initial results of laser-assisted dacryocystorhinostomy performed through the canaliculi. **METHODS:** *Ten* patients with nasolacrimal duct obstruction underwent transcanalicular laser-assisted dacryocystorhinostomy. A silicone tube was inserted through the canaliculi and the ostium into the nasal cavity where it will be kept for 6 months. **RESULTS:** All ten operations were performed without negative occurrences. One patient presented displacement of the silicone tube one day after surgery. Nine of the ten patients reported disappearance of epiphora at the end of the first week following surgery. During the first month, one of these patients presented with epiphora due to obstruction of the lacrimal-nasal fistula and another lost the silicone tube in the first month following surgery. **CONCLUSIONS:** *Transcanalicular laser-assisted dacryocystorhinostomy is a potentially useful method to perform dacryocystorhinostomy.*

Transcanalicular Dacryocystorhinostomy With Diode Laser: Long-term Results

Ophthalmic Plastic & Reconstructive Surgery. 23(3):179-182, May/June 2007.

Plaza, Guillermo M.D., Ph.D.

- Purpose: To evaluate the effectiveness of transcanalicular dacryocystorhinostomy with diode laser in treatment of epiphora in adults.
- Methods: A prospective, noncomparative, interventional case series of transcanalicular dacryocystorhinostomy in 25 patients presenting with epiphora due to nasolacrimal obstruction. Patient age ranged from 32 to 72 years. Patients were evaluated postoperatively at 12, 24, and 36 months. Patients were evaluated for symptom improvement through a visual analog scale, and patency of osteotomy by lacrimal system irrigation with fluorescein and direct visualization by nasal endoscopy. Success was defined as resolution of epiphora.
- Results: *Transcanalicular dacryocystorhinostomy was able to re-establish patency of the lacrimal system in 88% of cases after 36 months of surgery.* No differences were found between patients older than 65 years and younger patients (chi-square, $p > 0.05$). Early (12 months) and late (36 months) results were similar (chi-square, $p > 0.05$).
- Conclusions: In this prospective series, transcanalicular dacryocystorhinostomy was effective in treatment of epiphora in adults with little morbidity

Combined surgery: endoscopic transcanalicular DCR and balloondilatation technique

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Z JAVDANI ²²Ophthalmology, Mechelen

- *Purpose:* Combined surgery technique for high rate percentage of success in trans-canalicular dacryocystorhinostomy or a balloon dilatation technique alone.
- *Methods:* In this approach, transcanalicular endoscope with micro drill performing surgery like usual, dilatation of the opened channel with balloon dilatation and following injection of Healon-5 in the lacrimal duct are employed to reduced the risk of failure. This method is investigated through the **two cases**. Percentage of success of balloon catheter overall is estimated between 25% to 90% depends on the partial or complete obstruction. In the most of these cases of failure, cannulation was not possible because of complete obstruction. This problem might be solved by using micro drill before balloon dilatation technique.
- *Results:* In 2 cases, no more epiphora after 6 months follow-up were observed. (100 % of success rate was achieved by 2 patients). However, more cases are needed to show the real success rate.
- *Conclusions:* Performing **transcanalicular DCR using micro drill** and following balloon dilatation of the naso-lacrimal duct following an injectable product like Healon-5 or healon-gv (by which will hold the nasolacrimal duct open and will stay in the duct for a short period) can diminish the failure of balloon dilatation technique. In this way, the forming of synechia in all the duct from the punctum to the end of the distal duct will be reduced

Ophthal Plast Reconstr Surg. 2007 Mar-Apr;23(2)
Use of the diode laser with intraoperative mitomycin C in
endocanalicular laser dacryocystorhinostomy.

Henson RD Philippines

- **PURPOSE:** To determine the safety and efficacy of the diode laser with intraoperative mitomycin C in endocanalicular laser dacryocystorhinostomy (ECL-DCR). **METHODS:** In a prospective case series of 40 ECL-DCRs using the diode laser, mitomycin C was placed intraoperatively in all cases. The main outcome measure was resolution or improvement of epiphora and no major laser damage intranasally. Patients were followed for at least 18 months. **RESULTS:** Forty consecutive ECL-DCRs on 30 patients (23 females, 7 males, mean age 62 years) were performed from April 2000 to December 2001. The success rate at 12 months postoperatively was 87.5%. All failures were due to a constricted nasal osteotomy. No significant intraoperative or postoperative complications were recorded. **CONCLUSIONS:** *Diode laser ECL-DCR with mitomycin C appears to be a safe and effective treatment modality for primary acquired nasolacrimal duct obstruction.*

- TCDCR with diode was first described by Eloy et al. in 2000 with success in only 50% of cases after 6 months of follow-up. The diode laser system delivers laser energy via a true optical fiber for which the diameter varies from 400 to 1000 μ m. The energy is designed to be maximal at the tip of the laser probe, enabling use as a contact laser. It operates at a wavelength of 810 nm, in the near-infrared portion of the spectrum, inducing excellent hemostasis because of its high absorption of melanin and hemoglobin. It also has been used operating at a wavelength of 980 nm, with excellent hemostasis. The diode laser might be used with a power setting of 5 to 10 watts. It will only perforate and enlarge the desired area of bone and mucosa

Conclusion

- TCDCR with diode laser is a minimally invasive approach that has been shown to restore and maintain patency of the nasolacrimal system in 88% of selected patients with primary NLDO after 36 months of follow-up. When introducing such innovations in lacrimal surgery, further studies such as multicenter randomized clinical trials would be useful to evaluate its role and effectiveness as compared with the gold-standard external DCR

