COMPARATIVE STUDY OF EXTERNAL DACRYOCYSTORHINOSTOMY WITH ENDOSCOPIC ENDONASAL DACRYOCYSTORHINOSTOMY

By

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B.L.D.E (Deemed to be university)

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In

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Under the guidance of

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ABSTRACT:

Aim-

To study the outcome and to compare the success rate of external dacryocystorhinostomy and endoscopic endonasal dacryocystorhinostomy.

Methods:

This observational study was carried out in the Department of Ophthalmology, Shri B M Patil Medical College, VIJAYAPURA from October 2016 to April 2018. A total of 46 consecutive patients were selected for DCR surgery. Among those 23 patients underwent external DCR and 23 patients underwent endoscopic endonasal DCR. Data regarding ocular examination, lacrimal drainage system, per-operative and postoperative complications and ultimate surgical outcome were collected and analyzed. Surgical success was defined by patient's resolution of symptoms with patency of lacrimal drainage system. Failure was defined as no symptomatic reduction in epiphora and/or inability to irrigate the lacrimal drainage system postoperatively

Results:

It was observed that the major intra operative complication in both the groups was haemorrhage, which hampered visualization during surgery. The other minor complications like accidental trauma to uncinate was seen in Endonasal DCR.The post operative complications in both the groups were very few and occurred at a very low rate.Post operatively almost all the patients in Endonsasal DCR underwent nasal endoscopic examination for intranasal cleaning of mucus, debris.Success rate for External DCR was 100% and for Endonasal DCR, it was 91.3%. The failed cases showed synechiae formation between the lacrimal sac flap and nasal mucosal flap in Endonasal DCR .The failed cases were advised to undergo external DCR again.

Conclusion:

In the these results, we concluded that External DCR had higher success rate than the endonasal DCR. An endonasal procedure has the advantage of dealing with associated deviated nasal septum, avoidance of cutaneous scar. But the disadvantages and limitations include the need for costly and sophisticated equipment, the training in the usage of those instruments and steep learning curve. Both the surgical procedures have a minimal risk of intra and postoperative complications.

Key Words: Chronic Dacryocystitis, External Dacryocystorhinostomy, Endoscopic Endonasal Dacryocystorhinostomy

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INTRODUCTION

Epiphora is an imperfect drainage of tears through the lacrimal passages[1]. The most common cause being chronic dacryocystitis where the obstruction of nasolacrimal duct occurs which manifests as the inflammation of the lacrimal sac and nasolacrimal duct causing epiphora.

It generally affects two age groups, infants and adult females over 40 years of age. Congenital dacryocystitis is almost always chronic, while acquired dacryocystitis may be acute or chronic. Chronic dacryocystitis is more common. Dacryocystitis affects both sexes but more commonly seen in females over 40 years of age[2]. It is more common in people from lower socioeconomic status.

Cardinal symptoms of chronic dacryocystitis are watering and discharge from the eye. This has got little tendency to resolve completely and has to be dealt properly. Otherwise, this leads tocomplications like acute dacryocystitis, corneal ulcer and chronic conjunctivitis. Acute dacryocystitis further can cause complications like lacrimal abscess, lacrimal fistula, orbital cellulitis, osteomyelitis and cavernous sinus thrombosis which can be life threatening. Its treatment aims at creating a new passage for drainage of tears from conjunctival sac into the nasal cavity, bypassing the blocked nasolacrimal duct.

The external dacryocystorhinostomy (DCR) is the gold standard procedure for treatment of chronic dacryocystitis till today by which all other newer methods of dacryocystorhinostomy procedures are assessed[3]. **AddeoToti**[1]**(1904)**described a procedure in which a passage for tear flow could be created between the nose and the lacrimal sac by resecting portions of the lacrimal sac mucosa, bone, and nasal mucosa. A mucosal anastomosis with suturing of mucosal flaps was later described by **Dupuy-**

Dutemps and **Bourguet**[1] **(1921)**. As the technique has developed, so the success rate for the external procedure improved until today in the hands of properly trained oculoplastic surgeons success rate of between 90 to 95% can be expected.

With the recent introduction of endoscopes and microscopes, the original procedure of external dacryocystorhinostomy with extensive dissection have been questioned by some surgeons which has led to interest in less invasive procedures like endonasal endoscopic dacryocystorhinostomy. **Mc Donogh and Meiring**[4]**(1989)**,were the first to describe the technique of endoscopic intranasal dacryocystorhinostomy. The major advantages being avoidance of cutaneous wound, and limited tissue dissection and co-existing nasal pathology can be dealt simultaneously in the same operation. However, complete visualization, removing of lacrimal bone and control of excessive bleeding were the major problems unsolved with endonasal endoscopic dacryocystorhinostomy.

The future of lacrimal surgery is certainly changing and though external dacryocystorhinostomy still remains the gold standard by which other methods is measured, endonasal dacryocystorhinostomy has been gaining popularity as the preferred procedure over the last few years.

There are very few prospective studies comparing the outcome of the two techniques. Therefore, this study "Comparative study of external dacryocystorhinostomy surgery with endonasal dacryocystorhinostomy surgery" was undertaken.

AIMS AND OBJECTIVES

1) To compare the success and complication rate in external DCR and endonasal DCR surgery among the rural population.

REVIEW OF LITRETURE

ANATOMY OF LACRIMAL DRAINAGE SYSTEM[5]

Lacrimal drainage system consists of following parts:

1) Lacrimal punctum
2) Lacrimal canaliculi
3) Common canaliculus
4) Lacrimal sac
5) Nasolacrimal duct

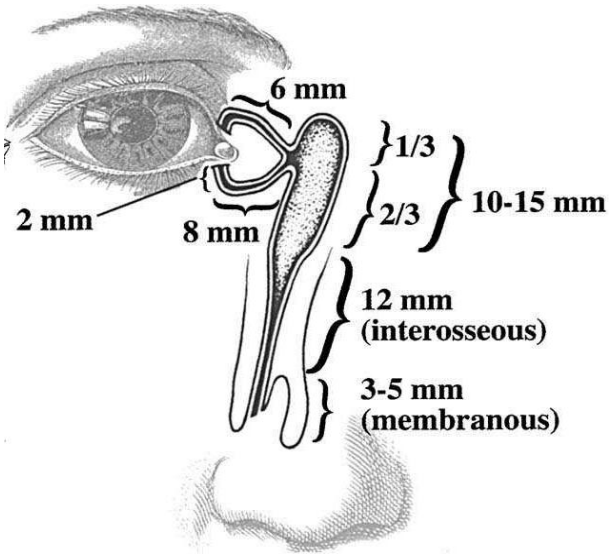


Fig 1: Lacrimal Drainage System[6]

THE LACRIMAL PUNCTUM:

The lacrimal passages commence at the lacrimal papillae. The two prominences are directed slightly inwards towards the conjunctival sac. These have been situated one on the posterior edge of the margin of each lid at the junction of its ciliary and lacrimal portions; on the summit of each of these is a tiny opening, the lacrimal punctum. The puncta are 0.2 to 0.3 mm in diameter. The superior punctum is placed 6 mm lateral to the medial canthus and inferior is 6.5 mm lateral to the medial

canthus so that they lie side by side when the lids are closed. The superior punctum dips backwards into the groove between the plica and the caruncle, while the inferior is directed backwards into the groove between the plica and the globe. Because of their directions they are clearly visible only when the lids are slightly everted.

THE LACRIMAL CANALICULI:

From the puncta, the lacrimal canaliculi lead into the lacrimal sac, each is a tube about 10 mm long divided into two parts namely vertical and horizontal by a right angled bend where the lumen widens into an ampulla. The first vertical part (1.5-2mm) runs perpendicularly in the thickness of the lid margin, the second or horizontal part runs from the ampulla in a medial direction with a downward inclination of the medial canthus. Each canaliculus pierces the lacrimal fascia and open in close apposition with its fellow into diverticulum of the lacrimal sac a little above and a little behind the middle of its lateral wall almost opposite to the midpoint of the medial palpebral ligament.

THE COMMON CANALICULUS:[7]

In 90% of the individuals, both the upper and lower canaliculi join to form a common canaliculus, which is 3-5 mm in length prior to entering the sac. A fold of mucous membrane at the junction between common canaliculus and lacrimal sac forms the valve of Rosen Muller.

THE LACRIMAL SAC:

The lacrimal sac is situated at the lower part of medial orbital margin in the lacrimal fossa, which rests in an oval shaped fossa that measures approximately 15 mm in height 10 mm in width. Thick bone from the frontal process of the maxilla forms the anterior lacrimal crest, which marks the anterior end of the fossa. In

contrast, a thin lacrimal bone forms the posterior lacrimal crest. This marks the posterior boundary of the fossa. These two bones fuse at a suture line that transverse the lacrimal fossa in a vertical direction. Sac is completely surrounded by periosteum and is always adherent to the periosteum at the upper part; sac is separated from the lacrimal fascia anteriorly by areolar tissue containing fine venous plexus, which drains into the lacrimal vein.

The lacrimal sac is divided into 3 parts:

1. Fundus
2. Body
3. Neck.

The upper end of the sac is usually flattened from side to side it is closed above and is directly continued as the nasolacrimal duct below. About the middle of its lateral wall a diverticulum is formed known as “SINUS OF MAIER” into which the canaliculi open either together or separately. Above this, the upper part of the sac forms the fundus, below this level, it is called body of the sac and this body continues downwards as nasolacrimal duct. The lower part of sac where it joins the nasolacrimal duct is called the neck of sac. The average length of the sac is 12 mm, its breadth is 4 to 8 mm, and 2 to 3mm in anteroposterior thickness, the potential capacity of the sac is about 20 cu mm although it can hold up to 120 cu mm.

RELATIONS:

Medially, the lower half of the lacrimal sac is in relation with middle meatus of the nose and the upper half is in relation with anterior ethmoidal cells. Laterally, sac is related to the bony origin of inferior oblique muscle, few fibers of inferior oblique may take origin from the lateral part of lacrimal fascia.

THE NASOLACRIMAL DUCT:

The nasolacrimal duct (NLD) is the downward continuation of the sac to the inferior meatus of the nose. It is divided into two parts.

1. Intraosseous part (12.4mm) - lying in the nasolacrimal canal.
2. Intrameatal part (5.32mm) - lying within the mucous membrane of the lateral wall of the nose below the termination of the bony canal.

The inferior opening known as the ostium lacrimale varies in position and form. It is found almost invariably on the more anterior part of the lateral wall in the inferior meatus. The ostium is usually placed about 30mm – 40mm behind the lateral margin of the anterior nares.

The opening is very variable in shape and size. It may be circular, oval or slit like. It may be small, medium or large. The ostium is usually single, but it may be double. The lower nasolacrimal fossa and the duct are narrower in females, which may account for the female predominance of nasolacrimal obstruction.

THE VALVES IN THE COURSE OF NASOLACRIMAL DUCT:[8]

In the course of the nasolacrimal duct numerous valves have been described. Almost all of them are simply folds of mucous membrane, which have no valvular function, most of these folds are of little significance, but a few occur with sufficient regularity namely,

- Valve of Bochdalek
- Valve of Foltz
- Valve of Rosenmuller (Huschke)
- Spiral valve of Hyrtl
- Valve of Beroud or Krause
- Valve of Taillefer
- Valve of Hasner (Horner, Bianchi, or Plica lacrimalis)

The most constant of these is the “Valve of Hasner or Plica Lacrimalis, at the lower end of the duct which represents the remains of the foetal septum. The valve may function as a barrier to the passage of air or nasal discharge from the nose into the nasolacrimal duct during forcible blowing of the nose.

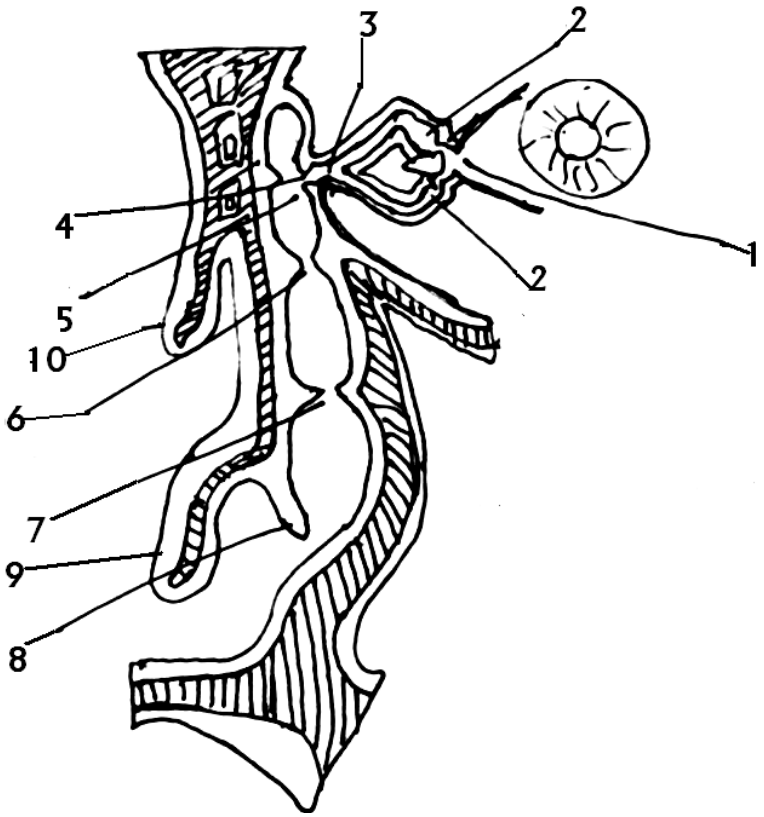


Fig 2: Valves in the course of Nasolacrimal Duct[8]

Numbers indicate the name of the structures as follows-

1. Valve of Bochdalek
2. Valve of Foltz
3. Valve of Huschke
4. Valve of Rosen Muller
5. Valve of medial palpebral ligament
6. Valve of Beraud or of Krause
7. Valve of Taillefer
8. Valve of Hasner, Cruveilhier, or Bianchi
9. Inferior conchae
10. Middle conchae

THE VASCULAR SUPPLY OF THE LACRIMAL PASSAGES:[5]

Arterial supply of the lacrimal sac:

The arterial supply of the lacrimal passages is derived from three sources:

1. From the ophthalmic artery:

a. The medial superior palpebral artery, supplying the sac.

b. The medial inferior palpebral artery, supplying the duct.

2. **From the angular branch of the facial artery** - Supplying both the sac and the duct.

3. **From the internal maxillary artery**

a. The infra-orbital artery which supplies the lower part of the sac and upper partof duct.

b. The nasal branch of spheno-palatine artery which supplies the lower part of theduct.

The Venous Plexus:

It lies underneath the mucous membrane, drains above into the angular and inferior orbital veins and below through the spheno-palatine veins into the pterygoid plexus and the internal maxillary vein.

THE LYMPHATIC DRAINAGE:

From the sac follow the facial vein to the sub maxillary lymph nodes; those from the duct join the lymphatic vessels of the nose running anteriorly with the drainage system of the lip to end in the sub maxillary nodes, and posteriorly through retropharyngeal system to end in the deep cervical nodes.

THE NERVE SUPPLY OF THE LACRIMAL PASSAGES:[5]

3 distinct types of nerves supply the lacrimal passages -

1) **Sensory nerves:**These are derived from the trigeminal nerve. From ophthalmic division of the trigeminal, the infratrochlear branch of the nasociliary nerve supplies the canaliculi, the sac and upper part of the duct. From the maxillary division of the trigeminal the anterior superior alveolar nerve supplies the lower part of the duct.
2) **Motor nerves:** These are derived from the branches of the facial nerve that supply the orbicularis oculi; they are medullated fibers, which terminate within the neighbouring muscles.
3) **Sympathetic nerves:** These are derived from the sympathetic outflow to the orbit from the superior cervical ganglion, and are non-medullated fibers.

PHYSIOLOGY OF LACRIMAL PASSAGE:[9]

The optical integrity and normal function of the eye are dependent upon adequate supply of tear fluid covering its surface. The maintenance of such a moist layer is dependent upon proper secretion, distribution and drainage of tear fluid. It has been pointed out that 25% of tears secreted is lost by evaporation. The remainder leaves the conjunctival sac through the lacrimonasal excretory system.

The tears secreted through the upper temporal fornix are conducted to the lacrimal puncta in three ways:

1) At the lateral canthus, tears fall by gravity to form the lower tear strip. The lower canaliculus is said to collect four times as much of tear flow as the upper canaliculus. However studies suggest that as many as 45% of patients have greater outflow through upper canaliculus.

2) Capillary attraction plays a role in conducting the tears into the punctum and the vertical limb of canaliculus.

3) Lid movements play an important mechanism in the transport of tears to the puncta by an act of blinking. Blinking spreads the tear strips over the eye as a film and also moves the tears towards the puncta with each blink. The nasally directed movement of the tears results from the fact that the orbicularis muscle is more firmly fixed at its nasal attachment, thus moving the temporal part of the orbicularis ring in a nasal direction during the act of blinking; also, the temporal end of the palpebral aperture closes more rapidly in blinking.

As the tears enter the lacrimal puncta, they are propelled through the canaliculi into the tear sac by the same blinking movements. Each canaliculus has a short vertical and a longer horizontal segment. At the junction of the two segments the

canaliculus widens in an ampulla. Orbicularis fibers are intimately disposed around the punctum and the canaliculus, so when this muscle contracts in blinking, the punctum is drawn nasally, the ampulla is compressed, and the horizontal limb of the canaliculus is shortened, thus driving tears into the lacrimal sac.

Jones demonstrated that fibers of the upper preseptal portion of the muscle insert into the fascia overlaying the muscle of the lacrimal sac. He concluded that in blinking contraction of orbicularis draws the lateral wall of the sac laterally, thus creating a negative pressure and aspirating tears into the sac, which are forced along the canaliculus by the same orbicularis contraction. When the orbicularis relaxes, the sac collapses and drives the accumulated tears into the nasolacrimal duct. This mechanism of pumping action due to alternate negative and positive pressure in the lacrimal sac is described by Jones as "lacrimal pump".

Finally, the contraction of orbicularis also tends to invert the lower lid, thus ensuring that the punctum dips into lacus lacrimalis. Negative pressure in the nose during inhalation and gravity also matters in emptying the sac.

ANATOMY OF LATERAL NASAL WALL:[10]

It is marked by 3 scrolls like bony projections called turbinates or conchae, from below upwards they are inferior, middle, and superior, sometimes a fourth turbinate concha suprema is also present. Below and lateral to each turbinate is the corresponding meatus.

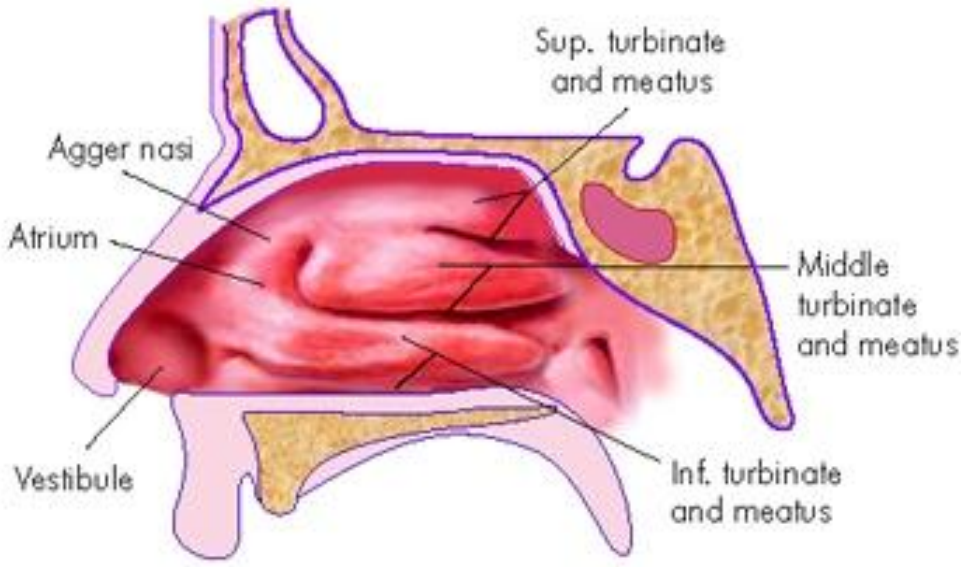


Fig 3: Anatomy of lateral nasal wall[10]

1. **Inferior meatus:** It runs along the whole length of the lateral wall, it is the largest meatus, which ranges from 1.6 to 2.3 cm in adults. The nasolacrimal duct opens into the inferior meatus just anterior to its highest point. It can be identified in life by gentle massage of the lacrimal sac at the medial canthus.

2. **Middle meatus:** It runs only in posterior half of the lateral wall. It shows a rounded bulge called bulla ethmoidalis which is the largest anterior ethmoidal air cell. In front, there is a sickle shaped 'uncinate process'. Between uncinate process and bulla ethmoidalis, there is a semilunar gap called hiatus semilunaris which leads into a funnel shaped space called ethmoidal infundibulum.

3. **Superior meatus:** It is limited to only the posterior third of the lateral wall; Posterior ethmoidal sinuses open into it.

4. **Sphenoethmoidal recess:** It lies above the superior turbinate and receives the opening of sphenoid sinus.

BLOOD SUPPLY OF THE LATERAL NASAL WALL:[11]

From the internal carotid system, the two branches of ophthalmic artery arises,

a) Anterior ethmoidal artery

b) Posterior ethmoidal artery

From external carotid system, the two branches of the spheno-palatine artery arises,

a) Posterior nasal lateral branches

b) Greater palatine artery

The other two branches are from infra orbital branch of maxillary artery namely,

a) Nasal branch of anterior superior dental artery

b) Branches of facial artery to nasal vestibule

ETIOLOGY OF LOWER LACRIMAL PASSAGE OBSTRUCTION:

Epiphora is most common mode of clinical presentation in patients with lower lacrimal passage obstruction, where the site of obstruction being lacrimal sac and nasolacrimal duct. Any pathology involving these structures can lead to obstruction of nasolacrimal duct. The conditions can either be primary or secondary to some other conditions. The causes of the lower lacrimal passage obstruction can be classified in to those involving sac and nasolacrimal duct.[12,13]

1) Lacrimal sac obstruction[13] include

- Trauma
- Tumors in the sac or skin involving sac
- Dacryoliths
- Granuloma
- Fibrosis Secondary to infection
- Lymphoma and Leukemia

2) Nasolacrimal duct obstruction[13]

A) Congenital obstruction

B) Acquired causes

a) Primary Acquired Nasolacrimal duct obstruction

b) Infection

c) Trauma-mid facial fractures

d) Sinus surgeries

e) Nasal polyps

f) Hypertrophied inferior turbinate

g) Atrophic rhinitis

h) Radiation therapy

Clinically, chronic dacryocystitis remains the most common cause for obstruction of the lower lacrimal passage system, where the obstruction site is at the bony rim where sac joins the nasolacrimal duct.

Classification of Dacryocystitis:[1]

Dacryocystitis can be classified as follows-

1) Dacryocystitis in infants
2) Primary or Idiopathic Dacryocystitis in adults
3) Secondary dacryocystitis or acquired obstruction at any time of life due totrauma or disease

Also clinically it is classified as:

I) Chronic Dacryocystitis

a) Catarrhal Dacryocystitis

b) Lacrimal Mucocele

c) Lacrimal Haematocele

d) Chronic Suppurative dacryocystitis (pyocele)

e) Chronic Pericystitis

II) Acute Dacryocystitis

a) Acute Suppurative Pericystitis

b) Acute gangrenous Pericystitis

III) Dacryocystitis neonatorum

IV) Specific infections

a) Tuberculous Dacryocystitis

b) Trachomatous Dacryocystitis

c) Syphilitic Dacryocystitis

d) Diphtheritic Dacryocystitis

e) Mycotic Dacryocystitis

f) Viral Dacryocystitis

g) Parasitic Dacryocystitis

Pathologically, it is classified into

I) Suppurative dacryocystitis

II) Non Suppurative dacryocystitis

a. Granulomatous type

b. Non Granulomatous type

INVESTIGATIONS OF THE LACRIMAL PASSAGES:

Epiphora is an excessive and abnormal flow of tears due to imperfect drainage through the lacrimal passages. Epiphora can be because of obstruction in the lacrimal passages or can be because of non-obstructive causes.

According to the site of obstruction[1] in the lacrimal drainage system it is divided into,

a) High level: Canaliculi

   Ampulla

b) Mid level: Neck of the sac

   Bony rim of the canal

c) Low level: Nasal end of the Nasolacrimal duct.

To know the exact location in a case of obstructive epiphora and to differentiate it fromnon-obstructive cause the following investigations[1,14] can be done.

1) Regurgitation test
2) Fluorescein dye disappearance test (FDDT)
3) Lacrimal sac syringing
4) Jones dye tests
    a. Jones primary test (Jones Test I)
    b. Jones secondary test (Jones Test II)
5) Endoscopy-Dacryoscopy
6) Radiological investigation
    a. Plain X ray of bony canal
    b. Dacryocystography (DCG)

i. Plane Dacryocystography
ii. Distention Dacryocystography
iii. Macrodacryocystography

iv. Intubation macrodacryocystography

v. Subtraction Dacryocystography

vi. Digital Subtraction Dacryocystography

vii. Tomography Dacryocystography

viii. Lacrimal Scintillography

1) Regurgitation Test:

A steady pressure is applied over the lacrimal sac area; reflux of mucopurulent discharge indicates chronic dacryocystitis with obstruction at the lower end of the sac or the nasolacrimal duct.

2) Fluorescein Dye Disappearance Test (FDDT):

A drop of fluorescein dye is instilled in the conjunctival sac and observations are made after 15 minutes. The color intensity after residual dye on bulbar conjunctiva is graded on scale of 0-4, this test however does not distinguish between impairment of upper and lower segments of the lacrimal system.

0 or 1+ indicates- positive FDD test

2 - 4+ indicates inadequate lacrimal excretion and negative FDD test.

3) Lacrimal Sac Syringing:

After instillation of topical anesthetic drops, patient's lower lid is slightly everted by surgeons thumb and the lower punctum is dilated with a Nettleship's punctum dilator. A syringe fitted with lacrimal canula and filled with normal saline is inserted vertically into punctum and then directed horizontally, then the plunger is pushed slowly and the following observations are made, keeping pulp of finger over the lacrimal sac area.

If the fluid appears in the nostril it indicates passages are patent. If regurgitation occurs with use of considerable force in syringing it indicates the

presence of stricture. If no fluid gets through and fluid outflows through upper punctum it indicates the presence of blockage below the common canaliculus. If regurgitation occurs from the same punctum, indicates the presence of obstruction in the same canaliculi. If the syringing is done from the upper punctum and the fluid regurgitates from the same punctum it indicates that the obstruction is at the junction of two canaliculi.

4) Jones Dye test:

Primary Jones test: The inferior turbinate is sprayed with 4% lignocaine before the test is begun. One drop of 2% fluorescein is instilled into conjunctival cul de-sac and patient is asked not to blink if possible if one drop disappears in less than1 min the permeability is good, if it does not disappear within 1-2 min. The patient is asked to blink forcefully or to blow the nose lightly into a white tissue. The most efficient method to seek dye is with a probe tipped with cotton wool kept under the anterior end of inferior nasal turbinate .If no dye is recovered in 5 minutes it is considered as a negative test. This implies impaired outflow function.

Secondary Jones Test: Following negative primary Jones test the conjunctival sac is washed with normal saline to remove remaining dye. The lacrimal syringing is done with normal saline, if the irrigated fluid emerging is clear, it indicates none of the dye has passed through the system, if it is partially stained it indicates impaired outflow function.

5) Dacryoscopy: It is done using a miniature endoscope having the caliber of a Bowman's Probe, it provide a 61^0 field of view with 30X magnification of the image. Internal illumination is provided by a 0.5m m fiber optic probe which is inserted into the free canaliculus into the sac.

6) Dacryocystography:

This procedure makes use of radio opaque contrast media for visualization of membranous lacrimal passages.

Various contrast media have been used in the study of dacryocystography, two main groups being lipid soluble dyes and water soluble dyes.

Ewing (1909)[15] used Bismuth subnitrate solution. Subsequently it was replaced by barium and thorium.

Bollack (1924)[16] used lipoidol. Lipoidol is a 40% iodised poppy seed oil. Being a fat soluble dye, lipoidol requires forceful injection through the lacrimal passages to obtain good visualization. This has the disadvantage of giving false positive results in case of functional block.

Spackman (1938)[17] replaced this dye with a mixture of equal parts of lipoidol and olive oil. Olive oil acted as a diluent and reduced viscosity of lipoidol thereby making the injection easier.

Water soluble contrast media have also been used for classical cannulation dacryocystography. Isopaque, Renographin and Conray 280 are some of them. They have the advantage of being in the range of viscosity comparable to that of tears (viscosity of tears in between 1.312 to 5.875 centipoises, mean 2.916). The film exposure with these dyes has to be taken speedily as there is movement of tears with every blink towards the sac. Various contrast media used for dacryocystography were discarded due to moderate local discomfort in the eye. **Bansal R. K, Jain A.L** and **Om Prakash**[18] used Dianosil Acqueous. Dianosil and micropaque are non transparent and alarming to the patient when they flood the conjunctival fornices. **Milder** and **Demorest**[19] described normal dacryocystogram using ethyl iodophenylundecylate (pantopaque).

Various types of Dacryocystography Methods:

A) **Distention Dacryocystography:** It involves plain radiographs obtained during injection of the contrast media to better fill the nasolacrimal duct.

B) **Macrodacryocystography:** This uses magnification (2½ diameters optimum) technique after Vander plaat's description of radiographic magnification procedures.

C) **Intubation macrodacryocystography:** It combines distention dacryocystography and macrodacryocystography.

D) **Substraction Dacryocystography:** It combines intubations Macrodacryocystography with a standard photographic substraction technique.

E) **Digital Substraction Dacryocystography:** It combines the technique of dacryocystography with digital Substraction fluoroscopic capabilities.

F) **Tomography Dacryocystography.** It uses complex motion tomography to offer finer details of the nasolacrimal apparatus. Thin section images can be obtained in the frontal and lateral planes with improved details.

G) **Lacrimal Scintillography (Radio nucleotide DCG):** It is a non-invasive technique in which a single drop of Technetium containing 100 ci of Tc99 is instilled into the sac with the patient seated in front of a gamma camera; serial photographs are taken at 2 sec intervals for first 20 seconds and every 40 sec thereafter.

Film exposure:

For radiographic viewing, **Campbell**[20] and his co-workers have advised 3 positions of the patients.

1) The water waldenstrom sinus position with the chin resting on the plate and the nose raised slightly above the plate to obviate the superimposition of radio

opaque shadows over that of maxillae. If in addition, the head is tilted through 10 degrees towards the affected side, it gives a better contrast because the shadows lie over the ethmoidal air cells.

2) The posterior-anterior view with the forehead and the nose against the film and tilting of the head through 15 degrees towards the side of affection.

3) A lateral view with the interpupillary line perpendicular to the plane and the central ray focused perpendicularly at the outer canthus.

Technique:

The punctum is dilated. The lacrimal syringe with a cannula or a catheter is used to inject 0.5 ml of contrast material into the lower canaliculus. When this is impossible it should be made via upper canaliculus. If the sac contains mucus or pus, it should be flushed with normal saline solution prior to injection of dye. The picture should be taken at 1,5,10 minute's interval and an estimate made from these individual exposures and the final picture after 30 minutes is helpful. The picture may show canaliculi, the sac, the duct, and spillage of dye into the nose or nasopharynx.

For canalicular pathology, the pictures are best taken while injecting the dye through canaliculus and a radiological enlargement can be done by placing the patients head halfway between X' ray film and tube, using a focal spot of 0.3mm on the latter to allow an enlargement of approximately 2x without producing radiographic blur. This procedure is called Macrodacryocystography **(Campbell 1964)**[20].

Normal dacryocystogram:

Canaliculi:

In a normal dacryocystogram, canaliculi are usually not visualized **(Henderson, 1973)**[21], so also it is unusual for any significant amount of dye to find its way into the cupola of the sac above the confluence of the canaliculi. **Bansal et al**[18] in their study of 50 normal dacryocystogram could not visualize the canaliculi in 90% of cases.

Lacrimal sac:

The lacrimal sac in a normal dacryocystogram is seen as a smooth regular slender radiopaque shadow with its concavity directed laterally. A small constriction is usually noted at the junction of the lacrimal sac and the nasolacrimal duct, possibly due to mucosal folds forming a valvular structure.

Nasolacrimal duct:

The nasolacrimal duct is visualized irregularly as a thin tubular structure of varying dimensions probably due to sinuous course and mucosal folds. The middle portion sometimes may not be filled with the dye. In the lower part, a broader, irregular accumulation of the dye marks the ostium at the level of inferior meatus. In the lateral view, especially in normal dacryocystogram, the dye may be seen in the floor of the nose or nasopharynx. In the normal dacryocystogram, the sac-duct junction can be localized by projecting a horizontal line along the inferior orbital margin touching the radiopaque shadow.

Transit time:

The time taken for the appearance of the dye at the different parts of the lacrimal passages after injection is difficult to estimate and depends mainly on two factors.

1) The type of dye used and its viscosity bearing a direct relationship to the time taken for its appearance.

2) The mechanical force applied in injecting the dye through the canaliculus having an indirect relationship.

Dacryocystogram in lacrimal pathology:

Demorest and Milder (1955)[19] described functional and anatomical blocks of lacrimal passages as demonstrated by dacryocystography and recommended its routine use in all cases of epiphora.

The various abnormalities of lacrimal passages as evidenced by dacryocystography are complete or incomplete obstructions, functional blocks, tumors of lacrimal sac, lacrimal fistula or diverticuli, dacryoliths.

Lacrimal obstruction:

Obstruction to lacrimal passages at various levels is the commonest cause of epiphora. The commonest site of obstruction is at the junction of the lacrimal sac and duct, the other chief site being common canaliculus and nasolacrimal duct.

The possible causes for obstruction at this site listed by them are:

1) No scope for expanding due to non yielding fascia of orbicularis oculi in this region.

2) Presence of mucosal folds called valve of Krause.

3) Alignment of sac and duct has a slight angulation.

Duke Elder (1974)[1] has mentioned two more causes.

1) Hormonal disturbances leading to congestion of venous plexus around this region.

2) Anatomical constriction at this site, where the sac enters bony canal.

The criteria for diagnosing lacrimal obstruction in dacryocystography are:

a) Distension of sac outline.

b) Absence of contrast medium in the nose.

c) A well defined level of block outlined by the dye.

Functional block:

The criteria for the diagnosis of functional blocks of lacimal passages is the substantial residue of the dye at 30 minute film exposure, through the dacryocystogram in earlier film may not reveal any abnormality except for a slightly dilated sac or upper part of the duct. It is not surprising that 30% of dacryocystogram taken in patients with epiphora reveal functional block. Most common cause of functional block is the failure in the lacrimal pump with a dilated atonic sac.

IMAGES OF INVESTIGATIONS

Fig 4: Pre-op DCG showing block at sac-NLD junction (A-P view)

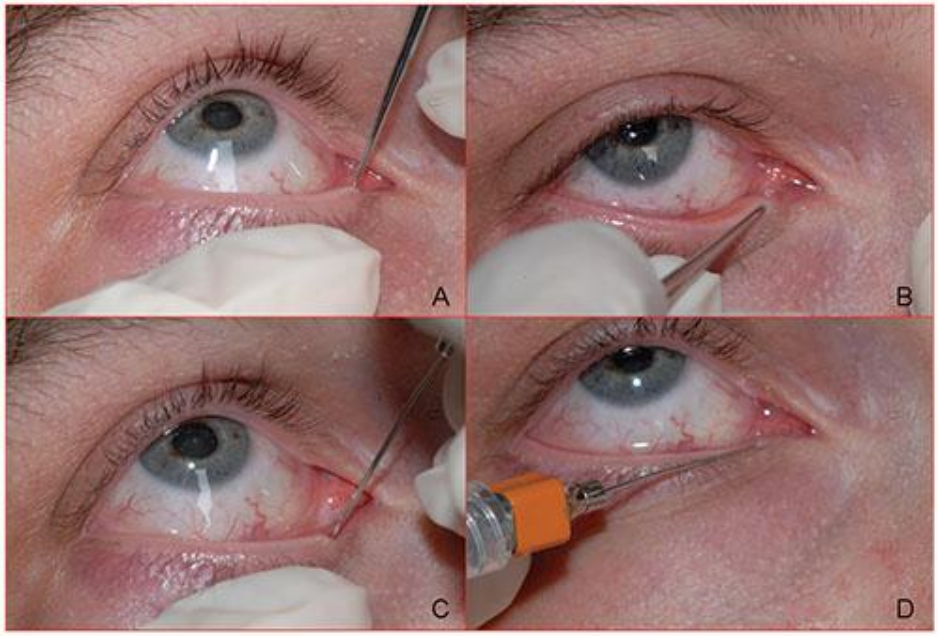


Fig 5 : Lacrimal sac syringing

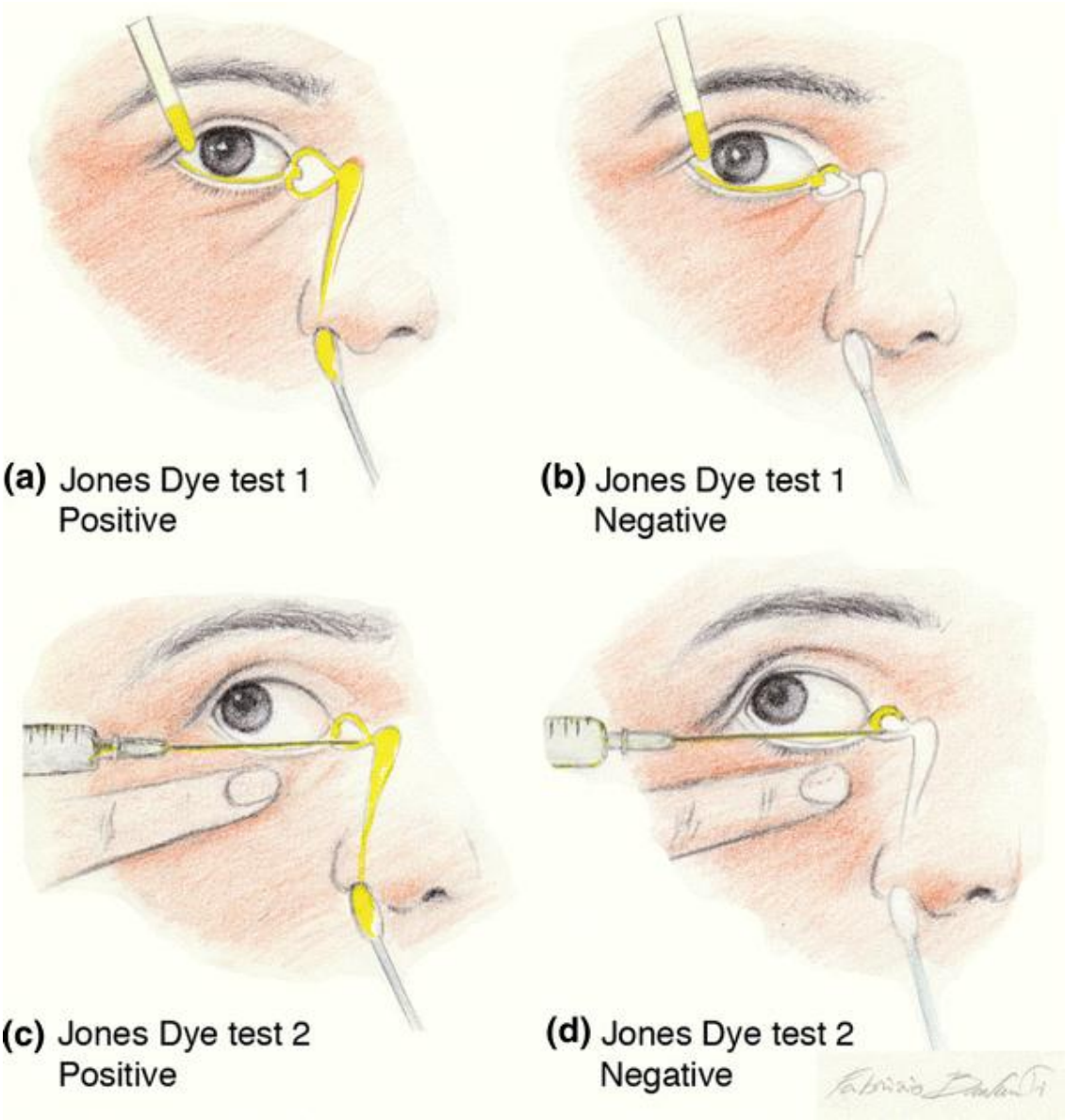


Fig 6 : JONES DYE TEST

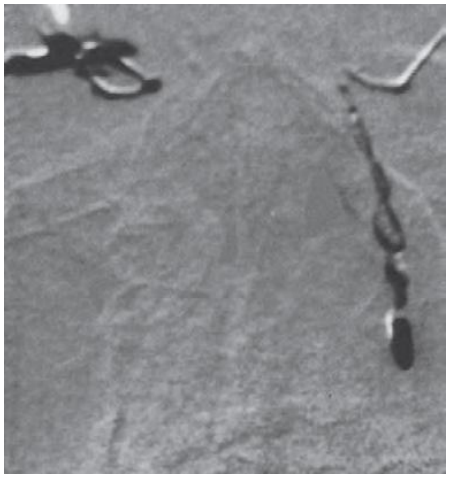
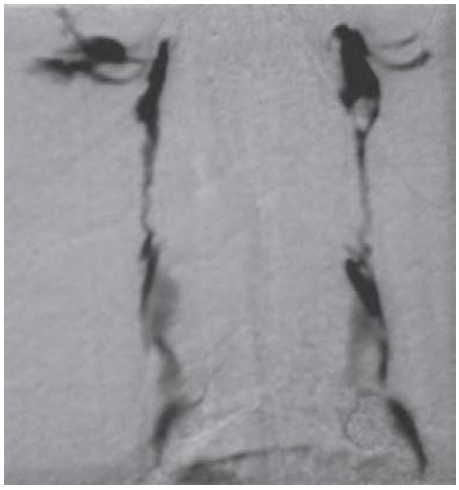
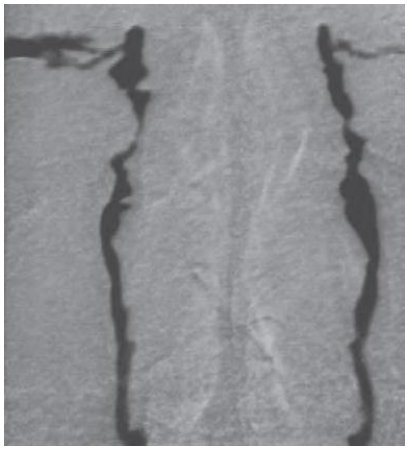


Fig 7 : Dacryocystogram.Complete obstruction ofthe lacrimal drainagepathways at the medialcommon canalicular levelon the right side.



Dacryocystogram.Stenosis at the sac-ductjunction is greater on theleft side than on the right.



Dacryocystogram.Medial deflection ofcontrast material withinthe right sac indicates sacstones.

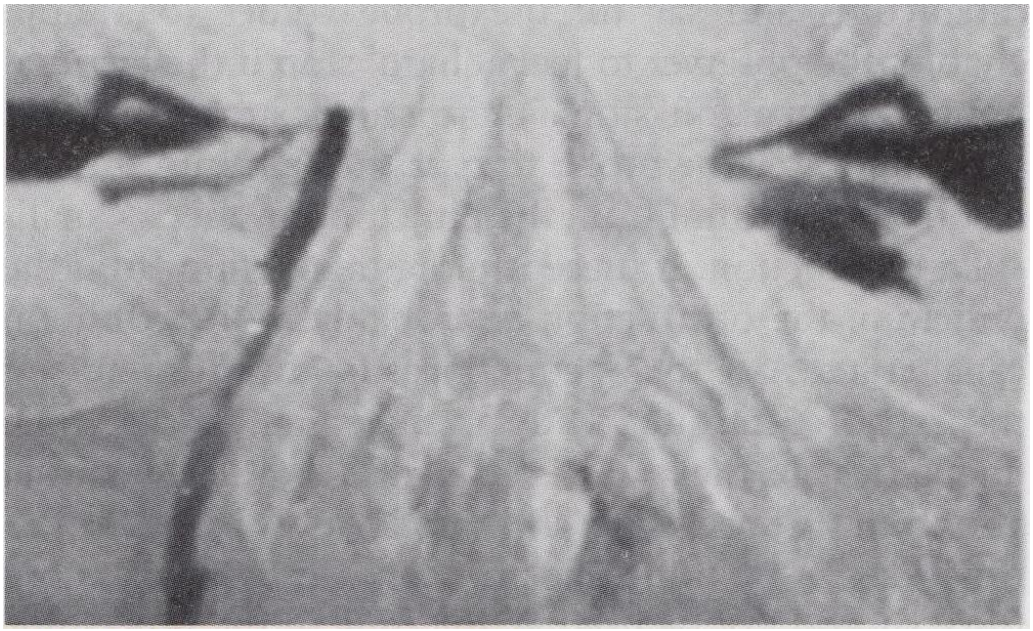


Fig8 : Bilateral subtraction macrodacryocystography. Normal rightlacrimal duct system. On the left side there is a block at the proximalend of the common canaliculus.

TREATMENT OF LOWER NASOLACRIMAL DUCT OBSTRUCTION:

The treatment of lower nasolacrimal duct obstruction is essentially surgical. However, in cases where the presentation is acute like abscesses or acute dacryocystitis, it should first be controlled with systemic antibiotics. Once the infection is controlled, surgery can be planned.

As chronic dacryocystitis is the most common cause for the lower nasolacrimal duct obstruction, the gold standard surgical procedure done is dacryocystorhinostomy where the connection is made between medial sac wall and lateral nasal wall. This can be done either through external or nasal or combined approaches which are respectively called as external dacryocystorhinostomy, endonasal endoscopic dacryocystorhinostomy and combined dacryocystorhinostomy.

HISTORICAL REVIEW OF DACRYOCYSTORHINOSTOMY

Correcting the blockage of tear flow and subsequent infection dates back to **Celsus** (25 BC), who excised the involved tissue down to the bone and burned it with a hot iron[1].

In 2nd century, **A.D. Galen** did chemical destruction of sac mucosa[1].

Archigenes (2nd century AD) destroyed the lacrimal sac with caustics and bored several holes in the nose[1].

Anel (1713) first did probing and syringing of lacrimal sac[22].

Woolhouse (1724), an English surgeon practicing in Paris, performed a short circuit from the lacrimal sac to the nose by excising the sac, piercing the lacrimal bone with trocar and inserting a drain[22].

Monro (1735) exposed the lacrimal sac and passed a shoemakers awl down the nasolacrimal duct and left a seton in place[22].

In 1851, **Bowman** introduced graduated lacrimal probes and showed that the passage could be dilated with probes and graduated size through the canaliculi to nasolarcrimal duct[22].

In 1868, **Berlin** treated epiphora by excision of lacrimal sac, which until the beginning of twentieth century was considered to be the best operation and was widely performed for a period of 20 to 30 years[22].

The twentieth century saw a major stride towards perfection. With specialization in instrumentation, better understanding of methods of asepsis and refinement of surgical skills, the success rates were further improved.

The original external DCR was described by **Toti**, an Italian rhinologist in 1904[1]. This involved the placement of external skin incision that exposed the lacrimal sac. The sac was then opened and its medial wall excised; the nasal bone was removed with hammer and chisel; and the adjacent nasal mucosa was excised. The skin incision was then closed. The lateral wall of the sac pressed by bandages over the opening in the bone, thus became the lateral wall of the nose into which the canaliculi opened directly so that the sac itself ceased to exist. Success depended on extensiveness of resection. Formation of granulation or presence of extensive disease of the wall of the sac subsequently resulted in failure from the subsequent cicatrisation. Toti's success rate was 50%[23].

In 1910, **West** improved on Caldwell's operation by making a larger opening into nasolacrimal duct and enlarging this upwards in the lacrimal fossa. The mucous membrane of the duct and lower part of the sac were resected. Later West removed most of the sac[1].

In 1912, **Blaskovics** excised the sac and implanted the canaliculi into the nose after removing bone of lacrimal fossa[1].

Kuhnt (1920) sutured the flaps of nasal mucosa to the periosteum to limit the formation of granulation tissue[1].

Ohm (1920) sutured the margins of nasal mucosa to the sac[1].

In 1921, **Mosher** modified Toti's procedure by enlarging the lacrimal sac opening, excising the nasal mucosa to the edge of the ostium and intranasal removal of anterior portion of middle turbinate. Flaps were not used. Anterior margin of lacrimal sac was sutured to tissue above the bony ostium[24].

In 1922, **Dupuy-Dutemps** and **Bourgnet** (1921) incised the posterior wall of the sac and sutured nasal and sac mucosal membrane together over the bony margins. The success rate was between 94.8- 96%[1].

The debate about use of the flaps continues today with success rate of 90%. Lacrimal sac transplantation; in which the sac is excised from the nasolacrimal duct, rotated into a bony ostium; and secured with nasal sutures, has also been successfully performed, but is not a common practice[25].

The bony ostium has been created in many ways such as by dental burrs, bone chisels, longeurs, oscillating saws and trephines (Iliff's trephine)[26].

Arruga (1929) used trephine instead of hammer and chisel[1].

Soria (1944) sutured single flap of nasal mucosa to the posterior flap of the sac and the anterior flap to bony opening[1].

Iliff (1954) used oscillating stryker's trephine saw[1].

Krasnov (1971) used USG to create the ostium[1].

As the success rates improved, surgeons gained insight into the causes of failures. Attempts were made to prevent obstruction of the newly established ostium by granulation tissue and scar contraction.

In 1952, **Summerskill** advocated DCR by intubation using polyethylene tube but reported complications like foreign body sensation, chronic inflammation, sloughing of medial wall of the sac, excessive cicatrisation and closure of the opening[27].

In 1954, **Romanes** used Jacques catheter no.3. The funnel shaped end of the catheter was sutured in the opening over the posterior flaps and the anterior flaps were connected across the front of the catheter. The catheter was removed after a week. He reported 90% success rate[28].

Iliff (1954-1970) sutured the rubber catheter into the sac with chromic catgut and later removed it within 6-7 days. He reported success rate of 90%[29].

Lester Jones (1957) described the use of a pyrex tube from conjunctival sac to nasal cavity for cases of total canalicular block[30].

Bedrossian (1965-1967) used transcanalicular route for rhinostomy using 16 veirs trocar and polyethylene tube with a success rate of 61%. In 1965, Mirabile and Tucker used a tapered plastic sponge extending from the nostril into lacrimal sac being held in place with silk sutures[31].

In 1972, **Singh and Garg** did polyethylene intubation of nasolacrimal duct and left it permanently in situ and obtained a success rate of 90%[32].

In 1974, **Thorton** and **Batchelor** did intubation with 30mm long polyethylene nasolacrimal duct prosthesis with tapered funnel top in failed DCR cases. He dilated the nasolacrimal canal with no.6 Bowmans probe and placed prosthesis with no.4

probe. The funnel shaped top of prosthesis rested in the bottom of the sac and lower end projected well in the inferior meatus of the nose[33].

Silicone tubing later on became more popular than polyethylene tubes. Complications like punctual erosion, corneal irritation from kinking of tube and even slitting of canaliculi were less with silicone tubes. In 1979 **Pashby** and **Ratbum**[34] used silicone tubing for conjunctivo-dacryocystorhinostomy.

Anderson and **Edwards**[35] (1979) showed up to 68% success rate with closed silicone intubation. **Older**[36] (1982) placed a silicone stent in a dacryocystorhinostomy ostium and left it in place for 3 months. Success rate was 94%.

In 1985, **Pawar** and **Sutaria**[37] introduced a new technique of intracystic intubation in dacryocystorhinostomy. The silicone implants comprised of left over pieces of Denevers hydrocephalic shunts. The implants had a length of 12-15mm and inner and outer diameter of 2mm and 3 mm respectively with multiples holes. Success rate was 98%.

In 1992 **Dikker** and **Pawar**[38] has done the study on etiology and management of failed DCR and they found 14% failure rate amongst both flap DCR and implant DCR. Dacryocystorhinostomy via the endonasal route is not a new concept. First described in 1893 by **Caldwell**[39], the procedure did not gain the popularity because of difficult visualization and complications associated with endonasal surgery.

Jokinen and **Karja**[40] (1974) published their results of endonasal dacryocystorhinostomy with a success rate of 83%, for the primary operations with the great majority of operations performed by resident surgeons. They concluded that the importance of the experience of the surgeon and careful operative technique should be stressed.

Lindberg et al[41] (1982) found no statistically significant correlation between the size of the bony opening and the final healed intra nasal ostium. The author questioned the need for the extensive dissection required in external dacryocystorhinostomy and suggested the advantages of smaller ostium made in a more direct manner.

Metson R[42] (1991) used the endoscopic technique to treat recurrent lacrimal obstruction after failed external dacryocystorhinostomy with a success rate of 75% whereas **Welham RA**, **Wulc AE**[43] (1987) quoted a success rate of second external dacryocystorhinostomy of 85% cases.

Botek AA et al[44] (1993) in his study attempted to classify the anatomic relationship of lacrimal sac by performing standard orbital dissection to expose the lacrimal canaliculi, lacrimal sac, the ethmoid air cells, nasal septum, frontal sinus and the cribriform plate in five human cadaver heads. He then measured the distance between the internal common punctum and five key structures, which helps to classify osteotomy placement for dacryocystorhinostomy.

The use of a laser to create an intranasal nasolacrimal fistula was first described in 1990 using a high powered cryon laser. The holmium YAG laser was first used by **Woog et al**[45] (1993), reported on overall ostium patency rate of 82%.

Burger (1993)[46] used the endonasal approach to restore lacrimal drainage in the both primary and secondary obstructions. He concluded that for primary obstructions, the approach proved highly successful. In secondary obstruction repair, the endonasal approach allowed direct visualization and repair of both nasal and lacrimal causes of failure, which remained the author's preference. He further stated that in the primary group, endonasal instrumentation had no advantage over a conventional external operation, other than avoiding a scar.

H.B.Whittet et al[47] (1993) in his study described an endoscopic intranasal approach for performing a dacryocystorhinostomy as the initial surgical approach with a success rate of 94.7%.The author who emphasized on the value of pre-operative computer tomographic dacryocystography in revealing anatomical variants and co-existent sinus disease that may be corrected either at the same operation or at an earlier stage.

Another study by **Weidenbecher M. et al**[48] (1994) stated in his results that 86% of patients were free from symptoms and 9% felt they had improved. Post operatively surgical revision was successful in 82% of patients with an idiopathic stenosis. The success rate with post-traumatic stenosis was 92%. Author concluded that endoscopic direct surgery is a highly successful procedure with a low complication rate, the worst complication being persistence of symptoms.

Tarbet K. J and **Custer**[49] (1995) study reviews the demographic success, cost, efficiency and patient satisfaction in external dacryocystorhinostomy. Author states that this information will be useful as comparison criteria for evaluating new surgical techniques. The results were 92% of success, concluded that external dacryocystorhinostomy is highly successful, requires limited follow ups, is a cost-effective procedure, complications are uncommon and patients satisfaction is high. New lacrimal surgical techniques must be evaluated against the long proven success of external approach.

S. A. Sadiq[50] (1996) published their early results in primary holmium YAG laser assisted dacryocystorhinostomy with 70% experience relief in symptoms of epiphora.

Another study by **Jouko Hartkainen et al**[51] (1998) showed success rate of 91% for external dacryocystorhinostomy and 63% for endonasal laser dacryocystorhinostomy after primary surgery. The difference was statistically significant (p=0.016). The surgical duration of endonasal endoscopic dacryocystorhinostomy was three times shorter than for external dacryocystorhinostomy, the average being 23 minutes and 78 minutes respectively. The conclusion was external dacryocystorhinostomy when compared with endonasal endoscopic dacryocystorhinostomy seems to provide superior operation results in primary acquired naso-lacrimal duct obstruction.

A recent study by **Shine C. S. Kao et al**[52] (1997) examining the effect of mitomycin C in external dacryocystorhinostomy showed a 100% success rate in the mitomycin groups compared with 81.5% in the control group. Intraoperative mitomycin C is effective in maintaining a larger osteotomy size. So, author concluded this modification may possibly improve success rates over the traditional dacryocystorhinostomy procedures.

Jouko-Hartikainen M. D. et al[53] (1998) had success rate at one year after surgery of 75% for endonasal endoscopic dacryocystorhinostomy and 91% for external dacryocystorhinostomy after primary surgery. The difference was not statistically significant (p= 0.18). The success rate after secondary surgery was 97.22% in both study groups. They concluded that external dacryocystorhinostomy gives a higher enough, not statistically significant, primary success rate. But the secondary success rates were equal indicating that these two different dacryocystorhinostomy techniques represent good alternatives for the treatment of primary acquired nasolacrimal duct or sac obstruction.

Shun-Shin and **Thurairajan**[54] (1998) had mentioned about advantages and disadvantages of external dacryocystorhinostomy and endonasal endoscopic dacryocystorhinostomy. In the former, postoperative morbidity including periorbital bruising, epistaxis and late external dacryocystorhinostomy failure have led to the search for a less invasive approach to the operation. Functional endoscopic sinus surgery is well established for diagnosis and treatment of a wide variety of nasal and sinus diseases.

Cokkeser Y, Evereklioglu C, Er H[55], in his study "comparative external versus endoscopic dacrycystorhinostomy ,in 115 patients (130 eyes)".showed success rate of external and endoscopic hammer- chisel DCR were found to be 89.8% and 88.2% respectively. And he concluded that hammer-chisel endoscopic DCR is practical, less traumatic, less time-consuming, and cosmetically more convenient than the external approach.

Venkatachalam and Agarwal[56], had done endoscopic dacrycystorhino-stomy in 30 patients during 1998-1999, they showed success rate of about 30% and concluded that endoscopic DCR in experienced hands has excellent results with no or very minor complications.

Ibrahim HA et al[57]in his comparative retrospective study, Endonasal laser dacryocystorhinostomy and external dacryocystorhinostomy outcome profile in a general ophthalmic service unit showed a success rate of 82% in 110 patients who have undergone external DCR, 58% in 53 patients who have underwent endonasal laser DCR. So they concluded that standard external DCR technique has a higher anatomical success rate than the endoscopic laser DCR.

Zilelioglu G et al[58], in his article "Results of endoscopic endonasal non laser dacryocystorhinostomy" with a data of 64 procedures which included 34 case had primary endonasal DCR and 30 cases had revision endonasal DCR secondary to previously failed external DCR. The success rate was 79.4% for primary endonasal DCR cases and in 80% for revision endonasal DCR cases. The overall success rate was 79.6%.

Mirza S et al[59], "A Retrospective comparison of endonasal potassium titanyl phosphate (KTP) laser dacryocystorhinostomy versus external dacryocystorhinostomy". They retrospectively reviewed 49 patients who had undergone an external approach and 76 endonasal laser procedures. The success rate of the external group was 94%; in contrast, the endonasal group success rate was 64%. This difference reached statistically significance (P=0.0002). However, when including revision procedures, the success rate in the endonasal group increased from 64% to 82%.

Tsirbas A, Davis G, Wormald PJ[60], "Mechanical endonasal dacryocystorhinostomy versus external dacryocystorhinostomy". In a prospective nonrandomized case series of 31 mechanical endonasal dacryocystorhinostomy cases and 24 external DCR cases, the success rate of mechanical endonasal dacryocystorhinostomy was 93.5% and for external DCR was 95.8%. So they have concluded that mechanical endonasal dacryocystorhinostomy compares favorably with that of standard external DCR.

Tsirbas A, Davis G, Wormald PJ[61], "Revision dacryocystorhinostomy: a comparison of endoscopic and external technique". They performed 17 revision endoscopic DCR and 13 revision external DCRs during Jan1999- Dec 2000, the results were revision endoscopic DCR was successful in 76.5 %(13 of 17 cases) and

external DCR surgery was successful in 84.6% (11 of 13 cases) .This was not statistically significant (P=0.64).

Ben Simon GJ et al[62] in a study titled "External versus endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction in a tertiary referral centre". A review of records of 143 patients who underwent 176 surgeries, of them 86 cases had undergone endoscopic DCR and 90 cases had external DCR. The success rate was 84% in endoscopic DCR and 70% in external DCR. The conclusion was endoscopic surgery results were better than those of external DCR.

EXTERNAL DACRYOCYSTORHINOSTOMY

Indications:[22]

1) Occlusion of nasolacrimal duct in young and middle aged persons, which is obstructed by dense fibrous tissue or bone as to be impermeable
2) Lacrimal mucocele
3) Lacrimal pyocele
4) Mucosal sac wall is distended and atonic

Contraindications:

1) Acute dacryocystitis
2) Lacrimal abscess
3) Obstruction at pre-sac level
4) Atrophic rhinitis
5) Fibrosed sac

TECHNIQUE:[22]

The operation of dacryocystorhinostomy is designed to affect the drainage of tears and infected secretion from the lacrimal sac into the middle meatus of the nose through a short circuit made in the lacrimal bone and nasal mucosa.

1. Anaesthesia for DCR:

The operation can be carried out under general or local anesthesia.

2. Local anaesthesia:

Swab sticks dipped in 4% lignocaine with adrenaline is placed deep into the ipsilateral nasal cavity for 10 min to anesthetize the nasal mucosa. After removal of swab stick, half meter of roller gauze is soaked in 5cc of 4% lignocaine with 0.5cc of adrenaline in a kidney tray. One end of roller gauze is held with nasal forceps and inserted into the nasal cavity with the help of nasal speculum; the nasal forceps

direction is aimed at medial canthus and inserted gently. Two drops of proparacaine 0.5% are instilled into the conjunctival sac at the medial canthus. Lignocaine 2% with 1:2,00,000adrenaline is injected at the following sites:

1. At the junction of the inferior orbital margin with the beginning of the anterior lacrimal crest. The needle is passed subcutaneously along the anterior crest to a point 3mm above the medial palpebral tendon where 0.5 ml is injected. It is then withdrawn along this course and from its original point of entry it is passed up towards the lower punctum and canaliculus and an injection of 0.5ml is made.
2. The second injection is made at a point 3mm above the centre of the medial palpebral tendon through the area of skin, which has been anaesthetized by the first injection. The needle is directed posteriorly for about 8mm and tissues around the fundus of the sac are injected with about 0.5 ml. the needle is then carried down and backwards to the upper half of the posterior lacrimal crest, then slightly withdrawn directed temporally and an injection is made along the upper canaliculus to the upper punctum about 0.5ml being used for these areas.
3. An injection of about 0.25ml is made into the skin 3mm above and below the centre of the upper and lower lid margins respectively.

   After anaesthesia, the puncta are dilated and the lacrimal sac is irrigated with 1% methylene blue through a lacrimal canula passed along the lower canaliculus into the lacrimal sac.

3. Incision:

After the lacrimal sac area is painted with betadine and draping is done. A curved incision, conforming with the anterior lacrimal crest, begins at the upper limit of the medial palpebral tendon and about 2 mm above and 3 mm nasal side of the

inner canthus is made and is carried vertically downwards for 4mm and then outwards along the line of the anterior lacrimal crest to a spot 2 mm below the inferior orbital margin, care is taken to avoid the angular vein.

4. Exposure of the lacrimal sac:

The incision is deepened through the orbicularis muscle so that the whole of the anterior lacrimal crest is well exposed to view; Rake retractors are inserted into each side of the incision. Check the oozing of blood and if any bleeding points are present they are clamped or sealed by bipolar coagulation. The lacrimal fascia is incised 1mm lateral to the anterior lacrimal crest and bony attachment of the medial canthal ligament is divided with a blunt dissector, the sac is separated from the lacrimal fossa down to the opening of the nasolacrimal duct and posteriorly to the posterior lacrimal crest. The periosteum is dissected from the lacrimal fossa.

5. Preparation of the bony opening:

The ideal ostium is one which leaves at least 5 mm around the canaliculus free of bone i.e. at least 1cm in diameter, it should also allow for gravitational flow of tears and no possibility of stagnation. It is necessary to remove the anterior lacrimal crest down to the entrance of the nasolacrimal duct. This may be done with bone nibbling forceps or some surgeons use an oscillating saw to make a circular 7 mm bony window, the opening can then be widened with nibbling forceps and it is important to preserve the nasal mucous membrane intact.

6. Preparation of mucosal flaps:

A probe passed through the upper canaliculus indicates the position of the common canaliculus and the related part of the medial sac wall. A vertical cut is made with knife or scissors through the anterior wall of the sac so as to form small anterior

and large posterior panels of the lacrimal sac. The nasal mucosa is incised horizontally in the upper and then the lower limit of the oval opening for its full diameter. These horizontal incisions are joined by a vertical incision which is made 4mm anterior to the posterior lacrimal crest. In this manner two flaps or panels of mucous membrane are formed. Bleeding may be controlled by a temporary pack or suction through nose and wound.

7. Suturing of the mucosal panel flaps:

The posterior flaps of the nasal mucosa and the lacrimal sac respectively are united by interrupted sutures of 6/0 polyglactin, ½ circle needle. The transverse upper incision in the lacrimal sac and nasal mucosa is also sutured. 3-4 interrupted sutures are inserted to oppose the edges of the anterior panels, after tying these sutures, the needles may be passed through the adjacent periosteum and the sutures are again tied.

8. Closure of the incision:

The incision is sprayed with antibiotic, the incision in the orbicularis muscle is closed with three interrupted 1.5 metric (5/0) absorbable sutures, the skin incision is closed by interrupted sutures of 0.5metric (7/0) black braided silk and a firm pressure dressing is applied.

Advantages of external DCR -

1) High success rate (over 90%)[49,51]
2) Less expensive and short duration of surgery[63]
3) Good exposure, as anatomy seen directly rather than through a endoscope

Disadvantages of external DCR - [63]

1) Cutaneous scar marks
2) Injury to medial canthus structure

3) Haemorrhage, cellulitis, cerebrospinal fluid rhinorrhoea if the subarachnoid space is inadvertently entered.
4) Delay in rehabilitation post operatively.

Complications:

Intra-operative:

1) Haemorrhage from angular vessels, the nasal mucosa and occasionally from the anterior ethmoidal artery.
2) Corneal abrasion
3) Perforation of nasal mucosa
4) Damage to anterior ethmoidal cells

Post-operative:

1) Late haemorrhage from nasal mucosa and rarely from skin incision
2) Suture infection
3) Canalicular stenosis
4) Closure of anastomosis
5) Scarring of the incision line

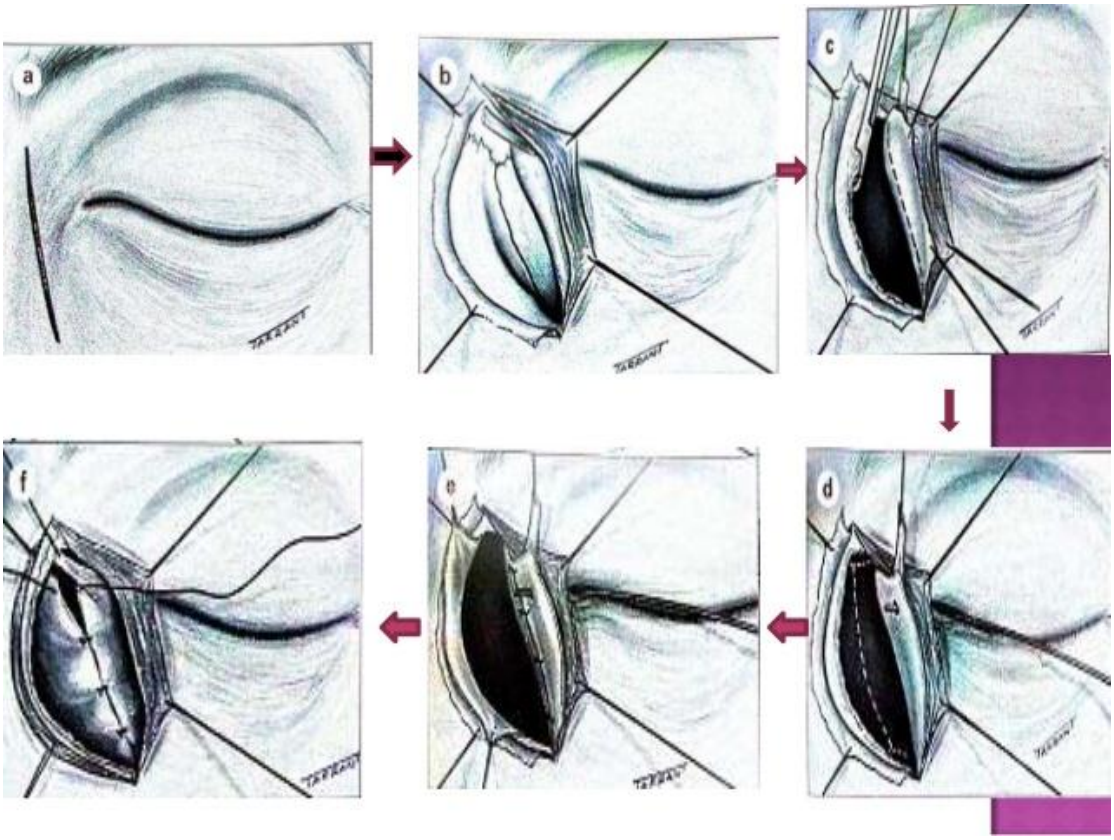


FIG 9 : <u>EXTERNAL DCR PROCEDURE :</u>a.**A typical curvilinear** incisionb**. Sac dissected laterally to expose the bony lacrimal fossa, a large bony osteum exposing the nasal mucosac**. Lacrimal sac incision being taken by an 11 number blade using the probe as a guide,**d,e,f .Raising a large nasal mucosal flap, Taut flap anastomosis, Sutured surgical wound**

ENDONASAL DACRYOCYSTORHINOSTOMY

Indications:[64]

1) Intrasaccal/ postsaccal stenosis of the lacrimal sac
2) Reoperation after failed procedure of external/endonasal DCR
3) Acute dacryocystitis
4) Lacrimal abscess
5) Young patients
6) Cosmetic factor
7) Lacrimal mucocele
8) Lacrimal pyocele
9) Mucosal sac wall is distended and atonic

TECHNIQUE:[65]

1) Anaesthesia:

It can be performed either under general or local anaesthesia.

2) Nasal packing:

Gauze soaked in 4% lignocaine with 1:1, 00,000 adrenaline solution is packed in area of middle turbinate for 5 min. After removal of the gauze, local anaesthesia using 50:50 mixture of 2% lignocaine with 1:1,00,000 epinephrine and 0.75% bupivacaine with 1:2,00,000 epinephrine is injected into the submucosa of the anterior middle turbinate, uncinate process and lateral wall. With the endoscope, another strip of lignocaine with 1:1, 00,000 adrenaline soaked gauze is replaced between the lateral wall and middle turbinate for at least 5 more minute again which further shrinks the mucosa providing more field for operation. The medial canthus, canaliculi and sac

region are infiltrated with 2% lidocaine with 1:1,00,000 epinephrine.The nasal pack is removed and the endoscope is placed within the nose.

3) Location of the sac:

The most important step in the successful performance of the endoscopic dacryocystorhinostomy is proper intranasal identification of the lacrimal sac. The main intranasal landmark for identifying is the attachment of middle turbinate to the lateral nasal wall. The sac is consistently present at the junction of the superior anterior attachment of the middle turbinate to the lateral nasal wall. This consistent anatomy of the lacrimal sac makes the surgeon easy to identify sac during the procedure.

4) Elevation of the mucosal flap:

The superior mucosal incision is made with a scalpel and starts 8mm above the inferior incision which is made approximately at the midpoint of the middle turbinate, vertical incision is made with round knife; finally the flap is tucked away around the middle turbinate.

5) Removal of the bone overlying the lacrimal sac:

After removal of nasal mucosa, the thin lacrimal bone as well as thicker frontal process of the maxillary bone is removed using a curved or straight 2mm Kerrison Punch. Argon, carbon dioxide and potassium titanyl phosphate (KTP) Lasers have also been used for the same procedure.

6) Opening of lacrimal sac:

After passing Bowman's probe into the sac, the tented sac is then incised vertically with sickle blade and enlargement of the sac opening is performed with the same blade or by gently tearing the mucosa with Blakesey forceps.

Advantages of endonasal DCR-[64]

1) Lacrimal pump mechanism is intact
2) Direct access to rhinostomy site limits tissue injury
3) Avoidance of disfiguring scar
4) Co-existent and potentially predisposing nasal pathologies like DNS, polyposis or inflammatory conditions of ethmoid and middle meatus can be dealt with
5) Can be done in patients with acute dacryocystitis
6) Can be done in patients with atrophic rhinitis

Disadvantages of endonasal DCR-[66]

1) It requires specialized training in nasal endoscopic surgery.
2) The endoscopic instruments is expensive
3) Prolonged learning curve
4) Obstruction of viewing by fogging or local bleeding
5) Requires repeated follow up for post operative intra nasal cleaning of debris and mucus at the rhinostomy site.

Complications: [64]

Intra-operative:

1) Bleeding
2) Entry into orbits
3) Damage to anterior ethmoidal air cells

Post-operative:

1) Bleeding
2) Infection
3) Obstruction at rhinostomy site
4) Cerebrospinal fluid leakage

Reason for failure for both external and endonasal dacryocystorhinostomy: [43,64]

1) Errors in size or position of ostium
2) Scarring within the anastomosis
3) Intranasal adhesions
4) Fibrous closure at the surgical ostium
5) Post operative common canalicular obstruction

ENDOCANALICULAR DACRYOCYSTORHINOSTOMY

Endocanalicular lacrimal surgery was proposed in the early 1990s by Levin and Stormo-Gipson.[80]Separately, Silkiss et al discussed the use of fiberoptics to deliver laser energy via the canaliculus.[81] This was first clinically utilized by Michalos et al.[82] Proponents of endocanalicular dacryocystorhinostomy report greater simplicity and an equivalent success rate compared to endonasal dacryocystorhinostomy.[83]

For endocanalicular dacryocystorhinostomy, intranasal anesthesia is applied using sponges soaked in 4% Lidocaine and 0.05% omymetazoline hydrochloride. The medial canthal and anterior ethmoid areas are then infused with 2% lidocaine with epinephrine. Laser-protective corneoscleral shields are inserted over the operative eye.

The puncta are then dilated and the canaliculi probed to a hard stop. A laser fiber is introduced through either the upper or lower canaliculus and rotated until it rests against the medial lacrimal sac wall. A nasal endoscope is then used to find the aiming beam and to guide laser creation of an ostium through lacrimal sac mucosa, lacrimal bone, and nasal mucosa. The disk of tissue is then removed and silastic intubation performed in the usual manner.[83]

CANALICULODACRYOCYSTORHINOSTOMY :

Stricture or closure of the common canaliculus or the distal ends of the inferior and superior canaliculus can be surgically corrected by canaliculodacryocystorhinostomy.[84,85–87]

Preoperatively, strictures in the common canaliculus can be recognized by the 'soft' obstruction of a Bowman probe against the soft tissues of the medial canthus and deformation or movement of the medial canthal angle structures during attempts to pass the probe into the nasolacrimal sac. Intraoperatively, the Bowman probe does not 'tent' the medial wall of the nasolacrimal sac but instead causes the entire medial wall of the operative site to bulge.

TECHNIQUE:

Canaliculodacryocystorhinostomy involves reanastomosis of the canaliculi to the marsupialized nasolacrimal sac after excision of the intervening scar or stricture.

After the creation of the bony ostium, a Bowman probe is placed in a canaliculus to tent the nasolacrimal sac. The lateral wall of the operative site will bulge; the apex of the bulge is grasped with a forceps, and the lumen of the nasolacrimal sac, if present, is entered with a No. 11 blade.

Anterior and posterior flaps of the nasolacrimal sac are created in the usual fashion. Corresponding flaps in the nasal mucosa are created, and the posterior flaps of the tear sacand nasal mucosa are approximated.

With the assistance of a Bowman probe, the site of obstruction is observed by a bulge in the lateral wall of the nasolacrimal sac.

This bulge is grasped and a circular button of scarred tissue is removed. If visualization is difficult, the anterior flap may be bisected by dividing it in the horizontal plane to dissect down to the area of stricture.

The area of obstruction can be excised to expose the lumen of the lacrimal canaliculi. The canalicular epithelium is sutured to the nasolacrimal sac by multiple 7–0 gut or polyglactin sutures.

An alternative method may be employed using a canalicular trephine (BD Visitec, Franklin Lakes, NJ, USA) wherein a plug of obstructing tissue may be removed. In either method, bicanalicular silicone intubation is performed. The anterior flap is repaired with a 7–0 gut suture, if necessary, with subsequent flap approximation and soft tissue closure identical to that used with dacryocystorhinostomy. The silicone tube is left in position for 6 months or longer.

CONJUNCTIVODACRYOCYSTORHINOSTOMY WITH A JONES PYREX TUBE:

When the lacrimal canaliculi have been destroyed by disease or trauma and remnants of the canaliculi are not sufficient for satisfactory anastomosis to the intranasal cavity, a tear bypass operation with an artificial tear conduit is indicated.[88,89,90–93]

The bypass technique was well described by Jones as a conjunctivodacryocystorhinostomy.[90]Such a bypass operation is occasionally indicated when the lacrimal pump mechanism is ineffective in tear elimination or the patient has had multiple failed dacryocystorhinostomies.[94]

A Jones Pyrex tube is the preferred artificial conduit, althoughalternatives to this tube have been described (Reineke, Thorton); the latter tubes are fashioned from polyethylene81 or Teflon,[59] lack the wettability and capillary action of glass, and are to be avoided.

Venous83 and mucous membrane grafts84 have also been described but are less successful as a result of their gradual stenosis and ultimate failure.

In this operation, a dacryocystorhinostomy is performed in the usual manner to the point of suturing the posterior tear sac and nasal mucosal flaps. After closure of the posterior flaps, the caruncle, if prominent, is removed partially or entirely, although a small, flat caruncle needs not be resected.

A curved 23-gauge needle is inserted in the medial canthus just beneath the lower lid 2mm posterior to the cutaneous margin of the medial commissure and advanced in a direction that enables its point to emerge just posterior to the anterior

lacrimal sac flap midway between the tear sac fundus and the isthmus, but anterior to the body of the middle turbinate.

A Graefe cataract knife may be passed along the path of the needle to enlarge the path, or the Luer-Lok of the needle is removed, permitting a 2-mm dermal trephine to be placed over the needle to create a path.

The needle is removed and a Jones tube of the approximate correct length (average 18mm with a collar of 4mm) is threaded collar first over a Bowman probe, which is subsequently passed down the path previously created.

The Jones tube is pushed down the Bowman probe to its final resting position, and the probe is removed. The tube should clear the lateral wall of the nose by 2mm and should also clear all intranasal structures (i.e., the nasal septum and the turbinate). Anterior flap, soft tissue, and skin closure is performed.

An alternate method for the placement of a Jones tube employs a vascular access kit originally designed for the placement of central venous catheters. The kit contains a Tefloncoated angiocatheter, a guide wire, and a vascular dilator. The angiocatheter needle is bent to a gentle curve and is placed in the same manner as the 23-gauge needle described previously.

The metallic portion of the angiocatheter needle is withdrawn, leaving behind the Teflon catheter through which a guide wire is threaded and retrieved in the nose. The Teflon catheter is then removed.

The vascular dilator is threaded over the guide wire, advanced to the nose, and allowed to remain for several minutes to dilate the pathway for the Jones tube. The dilator is then removed, and the Jones tube is threaded over the guide wire followed

by the hub of the Teflon angiocatheter (from which the Teflon tip of the catheter has been removed).

The angiocatheter hub applies constant pressure on the Jones tube as it is maneuvered into position. Once the Jones tube is positioned, the guide wire and catheter hub are removed.

The Jones tube is checked for clearance of the lateral wall of the nose, the nasal septum, and the middle turbinate, with subsequent soft tissue closure. A 6–0 monofilament suture is wrapped around the collar of the tube and passed through fullthickness eyelid over a rubber or silicone pledget or dam. The suture, which fixates the tube in the medial canthus and allows the tissues to heal around the tube, is removed 10 days to 2 weeks postoperatively.

In the patient in whom a previous dacryocystorhinostomy has failed and cannot be repaired by a second dacryocystorhinostomy, or in the patient with canalicular injury in whom the medial maxilla has been removed, a Jones tube may be placed by a closed technique without the need for mucosal flap creation or bone removal. A needle or angiocatheter is introduced, as previously described, and a Graefe knife, trephine, or dilator is used to create a pathway for tube placement.

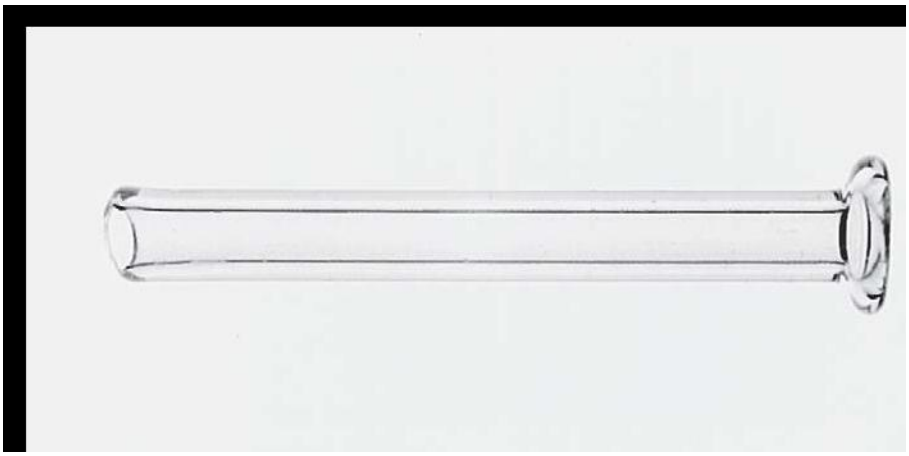
The Jones tube is temporarily fixed in the medial canthus with a 6–0 monofilament suture. The age of the patient and the presence of physical infirmities that may preclude adequate tube maintenance are concerns when considering Jones tube placement.

Periodic irrigation of Jones tubes is often required and may be easily done in the office in an adult patient; however, such irrigation may require general anesthesia in a young child.

Patients are instructed in the methods for maintaining tube patency by sucking air through the tube by an inspiratory effort against a closed soft palate and pinched nostrils. When sneezing or blowing the nose, the patient should close the eyes and hold a finger over the medial canthal region to prevent tube dislocation.

Jones tubes are easy to remove, but they should not be removed with the anticipation that continuous tear drainage will occur through a soft tissue fistula. Some surgeons suggest that an epithelialized tract will serve as a conduit for tear elimination, but most often, the tract closes. Thus, Jones tubes should be considered permanent.

Complications of Jones tubes may be reduced by the proper tube placement and adequate preoperative assessment. Correction of severe nasal septal deviation that may preclude adequate tube placement is best performed before tube placement. Middle turbinate resection can be performed at the time of tube placement if required to achieve adequate tube clearance. Complications of Jones tubes include failure to drain, tube migration, tube loss, and development of granulation tissue that may bleed or obstruct tear drainage.[84–86]



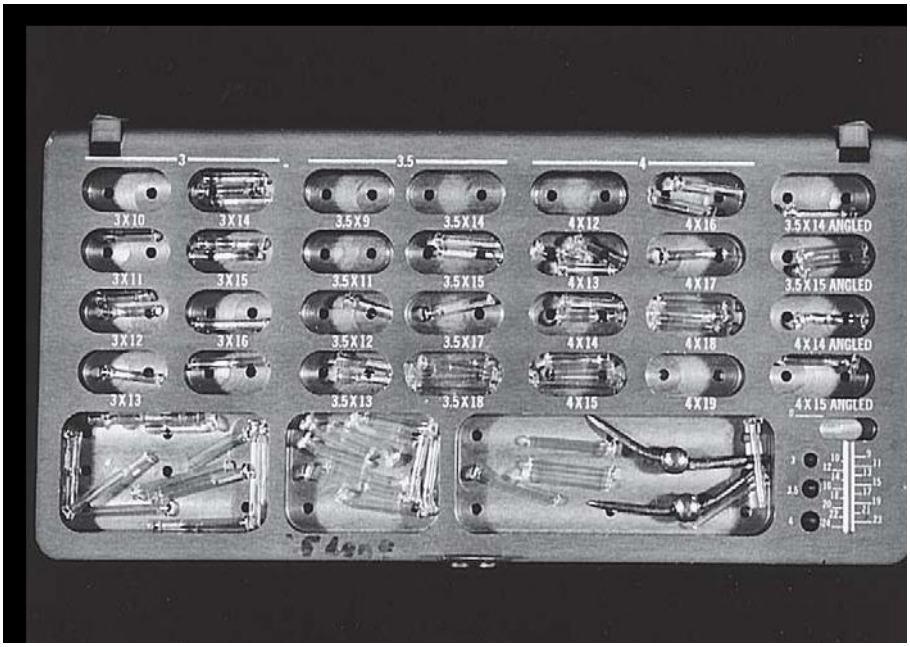


FIG 10 :Jones Pyrex tube. The size of the collared end of the tube and the tube length vary from 3 to 4 mm and from 12 to 24 mm, respectively. The 'nasal' end of the tube is slightly flared. (b) Jones tube set allows custom tube fitting

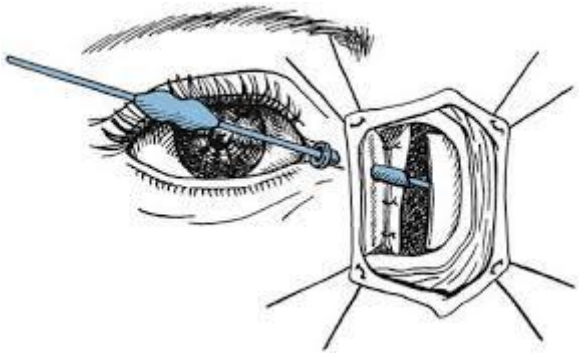


Fig 11:A Jones tube rests in the medial canthus at the medial commissure. The tube passes between the anterior and the posterior flaps and is directed medially, inferiorly, and slightly posteriorly.

MATERIALS AND METHODS

The present study of "Prospective comparative study of external Dacryocystorhinostomy surgery and endonasal Dacryocystorhinostomy surgery" was conducted in Department of Ophthalmology, SHRI B M PATIL MEDICAL COLLEGE,VIJAYAPURA, during Oct 2016 to April 2018.

Source of data:

Patients attending ophthalmology outpatient department at SHRI B M PATIL MEDICAL COLLEGE,VIJAYAPURA,for the symptom of epiphora and diagnosed as primary acquired nasolacrimal duct obstruction or chronic dacryocystitis.

Inclusion criteria

1. All the cases of acquired chronic dacryocytitis with established nasolacrimal duct obstruction.

2. Both male and female patients, 20-60 years of age are included in the study.

Exclusion criteria:

Following patients were excluded from study

1) Epiphora wih no signs of lacrimal drainage obstruction on sac syringing
2) Ectropion/ entropion/ lower lid laxity
3) Canalicular and punctual obstruction
4) Post traumatic bone deformity of lacrimal region
5) History of sino nasal malignancy and granulomatous conditions
6) Atrophic rhinitis and acute sinusitis
7) Previously failed DCR

Sample size:

The study included 46 cases that were diagnosed as nasolacrimal duct obstruction or chronic dacryocystitis and who were fulfilling inclusion criteria during the study period.

Data collection:

The patients were evaluated as follows:

1) Cases selected were subjected to a complete examination according to a defined proforma.

2) Detailed ocular and systemic history was taken. A detailed ocular examination and anterior rhinological examination was done. Anterior rhinoscopy was done by otorhinolaryngologist and looked for any significant deviation of nasal septum, polyposis and hypertrophy of turbinates. If they were having any co-existing disease, they were all dealt at the same sitting.

3) The patency of nasolacrimal duct was checked by lacrimal syringing. Mucoid/ mucopurulent regurgitation, presence or absence of mucous flakes and the punctum from which regurgitation occurred was noted.

   Syringing procedure:

   Topical proparacaine 0.5% is instilled into conjunctival sac. Lacrimal syringing is performed after dilatation of the lower punctum with a punctum dilator. A lacrimal cannula is then inserted into the lower punctum and vertical canaliculus. Pulling the lower lid temporarily straightens the ampulla allowing entry into the horizontal canaliculus. Sterile saline is injected slowly, looking for regurgitation through the same or opposite punctum and also asking the patients for any flow into the nose.

4) Routine blood investigations like complete blood count, bleeding time, clotting time were done along with HIV, HBsAg and blood sugar levels.

5) Pre-op topical moxifloxacin and nasal decongestant drops were given to patients for three days.

TECHNIQUE OF EXTERNAL DACRYOCYSTORHINOSTOMY

All external dacryocystorhinostomy operations were performed under local anaesthesia.

Nasal packing:

The nostril on affected side was packed with a roller pack soaked in a mixture of 4% lignocaine and 1 ampoule (2ml) of 1:1000 adrenaline. Packing was done half an hour before surgery.

Anaesthesia:

Under aseptic precautions, all patients were given local anaesthesia in the sac region consisting of 3-5 cc of 2% lignocaine with 1:2,00,000 adrenaline.

Surgery:

Lacrimal and periorbital area were painted with 5% betadine and parts are draped.

A curvilinear incision of 1 to 1.5cm in length was made 3-5 mm medial to the medial canthus starting 2mm above the level of the medial palpebral ligament.

The orbicularis muscle fibers were separated with artery forceps and then with blunt dissector. Rake retractors inserted into each side of the incision. The lacrimal fascia is incised 1mm lateral to the anterior lacrimal crest and the bony attachment of the medial canthal ligament was divided with a blunt dissector. The sac was separated

from the lacrimal fossa. The periosteum overlying and medial to the anterior lacrimal crest was exposed and elevated with the help of Traquair's periosteal elevator.

Lamina papyraceae, parchment like bone of the posterior half of the lacrimal fossa was fractured with smaller end of blunt dissector.

With the help of mucoperiosteal elevator, nasal mucosa was stripped from the lacrimal bone to avoid damage to the nasal mucosa.

Bony osteotomy approximately 10-12mm in diameter was created with successive size of Citelli's punch. Oozing of the blood was controlled by packing with the ribbon gauze moistened with 4% lignocaine with adrenaline or by suction tip.

After anesthetizing the eye with 4% lignocaine drops upper punctum was dilated with punctum dilator. Bowman's probe is passed through the upper canaliculus to confirm the position of common canaliculus and the related parts of the medial sac wall and tenting of the sac wall is noted.

With the help of a Bard Parker 11 number blade, first lacrimal sac and then nasal mucosa were opened in 'H' shaped fashion to form larger anterior and smaller posterior flaps and then Bowman's probe was removed.

In our present study only anterior flaps of nasal mucosa and lacrimal sac were sutured by interrupted sutures of 6/0 vicryl suture material and skin incision was closed with interrupted 6/0 silk.

Antibiotic drops were instilled into the eye, antibiotic ointment was applied to the operated site and dressing was done.

Any complications during the surgery were noted.

TECHNIQUE OF ENDONASAL DACRYOCYSTORHINOSTOMY

All endonasal dacryocystorhinostomy operations were performed under general anaesthesia.

Nasal packing:

Under aseptic precautions, ipsilateral nasal cavity was packed with half meter of roller gauze soaked in 4% lignocaine with 1 ampoule (2ml) of 1:1000 adrenaline.

Anaesthesia:

After thorough facial povidone iodine scrub, parts cleaned with spirit and draped.

Surgeon sat on the right side of the patient. Nasal pack was removed. Nasal endoscopy was done with 0 and 30 nasal endoscope and the nasolacrimal area was visualized. The mucosa of the lateral nasal wall was infiltrated with 5cc of 2% lignocaine with 1:2, 00,000 adrenaline at the axilla of the middle turbinate till the mucosal blanching was visualized in the entire nasolacrimal area.

Surgery:

The 1.5×2 cm piece of mucosa anterior to the uncinate process was either cauterized or peeled off after incision with sickle knife or punched with Kerrison's punch along with the lacrimal bone.

Mucosal membrane was dissected from the bone in posterior direction until base of the uncinate process was reached. Exposed bone behind the ridge was palpated from anterior to posterior with blunt spud or elevator.

At this junction, lacrimal bone, which is papery thin, was removed with sphenoidal punch. In some cases to remove the maxillary portion of the lacrimal fossa that has thick bone, a septal chisel or otologic burr was used.

Occasionally anterior end of the middle turbinate or uncinate process had been removed in order to expose sac area. Lacrimal part of the fossa was removed up to the base of uncinate process carefully in posterolateral part, thus about 7×8mm of bone was removed to expose medial wall of the sac completely.

In case of interference from blood or secretion separate suction tip was used. 5ml of 4% solution of lignocaine with 1:1, 00,000 adrenaline soaked rectangular cut cotton pieces used which were squeezed before placing into the nasal cavity to attain haemostasis and decongestion of the operative site.

Lacrimal sac was confirmed endoscopically by putting pressure over the lacrimal sac from outside at the medial canthus, bulging of sac was noticed intranasally, If still some doubt aroused about correct identification of the sac, externally eye was anesthetized with 4% lignocaine drops, upper punctum was dilated with punctum dilator. Bowman's probe was inserted into the superior canaliculus and directed against the medial wall of the lacrimal sac in order to tent it intranasally.

A sickle knife incised the tented mucosa of the sac immediately, and serous or mucopurulent discharge coming out of the sac was noticed .Then with a special right angled true cut forceps or with Blakesly's forceps, infero-medial wall of the sac was removed.

With the help of suction tip, mucopurulent discharge or blood was removed, then lacrimal sac syringing was done with diluted methylene blue dye from outside by the assistant and free flow of the methylene blue was observed endoscopically. Nasal packing was done.

Any complications during the surgery were noted.

Post operative care:

All patients were given systemic antibiotics and analgesics for 7 days. Antibiotics eye drops were advised for 4 times daily for 7 days.

Nasal pack was removed after 24 hours in most cases and if required it was kept for 48 hours.

Nasal decongestant drops were given after removal of the nasal pack, 2 drops 3 times a day for 7 days. In case of External DCR patients, first dressing was done after 24 hours. Sutures were removed on 7^{th} day.

In case of Endonasal DCR, after removing nasal packing after 24 hours, patients were advised to instill nasal decongestant drops, 2 drops 3 times a day for 7 days.

Lacrimal sac syringing was done on first postoperative day.

Patients were discharged after 3 days of hospitalization and called for regular follow up.

All patients were followed up at 1^{st} week, th week, 6^{th} week and 3 months post operatively.

In every follow up, patients were asked, about the presence or absence of discharge and about watering of the eye. The patency of the lacrimal passage was assessed by sac syringing.

In case of External DCR incision area was inspected for healthy healing. In case of Endonasal DCR patients anterior rhinoscopy was done in each visit and looked for any crusting, granulation, secretions and if found were removed immediately.

In some patients who complained of watering and having a block on sac syringing,

Rhinostomy site was visualized with endoscope and presence of any pathology was managed accordingly.

In all patients, at 1st week and at the end of 3 month endoscopic examination was done to check for any crusting, granulation tissue formation and size of ostium.

Statistical analysis

All characteristics were summarized descriptively. Chi-square (χ^2) test was used for association between two variables by following formula:

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

The subscript "c" are the degrees of freedom. "O" is observed value and E is expected value.

C= (number of rows-1)* (number of columns-1)

In cases of more than 30% cell frequency <5, Freeman-Halton Fisher exact test was employed to determine the significance of differences between groups for categorical data.

If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v.23.0. and Microsoft office 2007.

OBSERVATIONS AND RESULTS

In the present study, total 46 cases comprising 23 cases underwent externaldacryocystorhinostomy and 23 cases in endonasaldacryocystorhinostomy following observations were made:

1.Intra operative complications

In EXTERNAL DCR:

In our series, the most common intra operative complication was bleeding, which was Minimum bleeding in 4 cases (17.4%) Moderate bleeding in 2 cases(8.7%) and severe bleeding in 1 cases (4.3%).

In ENDONASAL DCR:

In this group the most common intra operative complication was bleeding, in 4 cases (17.4%) it was moderate bleeding and in 1 case (4.3%) it was severe bleeding.

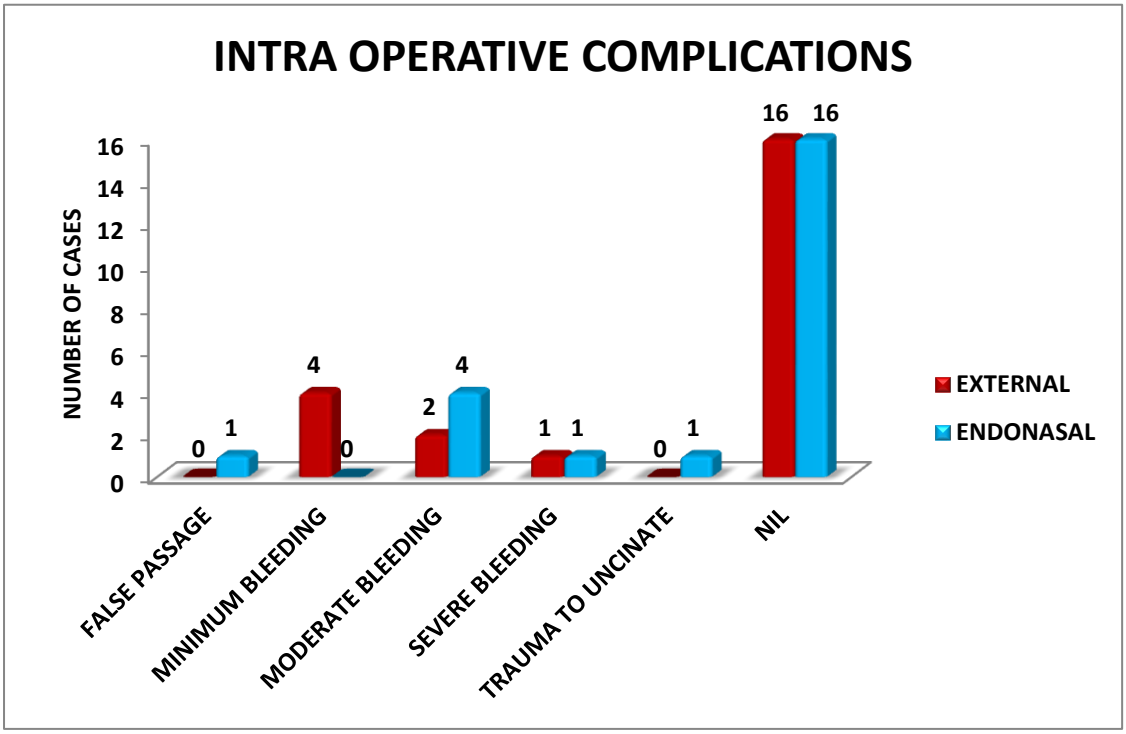
In 1 cases (4.3%) false passage was created.

In 1 cases (4.3%) there were accidental trauma to uncinate .

TABLE 1 : DISTRIBUTION OF INTRA OPERATIVE COMPLICATIONS BETWEEN STUDY GROUPS

INTRA OPERATIVE COMPLICATIONS	EXTERNAL		ENDONASAL		p value
	N	%	N	%	
FALSE PASSAGE	0	0.0	1	4.3	0.247
MINIMUM BLEEDING	4	17.4	0	0.0	
MODERATE BLEEDING	2	8.7	4	17.4	
SEVERE BLEEDING	1	4.3	1	4.3	
TRAUMA TO UNCINATE	0	0.0	1	4.3	
NIL	16	69.6	16	69.6	
TOTAL	23	100.0	23	100.0	

GRAPH 1 : DISTRIBUTION OF INTRA OPERATIVE COMPLICATIONS BETWEEN STUDY GROUPS



2) <u>Post operative complications</u>:

In External DCR:

In this group, epistaxis was noted in 2 cases (8.7%) , wound discharge in 2 cases (8.7%) on 1st post operative day.

In Endonasal DCR:

In this group, 6 cases (26.1%) had epistaxis and 4 cases (17.4%) had lid odema on 1st post operative day. On follow up, 1 cases (4.3%) had synechiae formation between the lacrimal sac flap and nasal mucosal flap on endoscopic examination.

TABLE 2 : DISTRIBUTION OF POST OPERATIVE COMPLICATIONS BETWEEN STUDY GROUPS

POST OPERATIVE COMPLICATIONS	EXTERNAL		ENDONASAL		p value
	N	%	N	%	
EPISTAXIS	2	8.7	6	26.1	0.032*
LID ODEMA	0	0.0	4	17.4	
SYNECHIAE	0	0.0	1	4.3	
WOUND DISCHARGE	2	8.7	0	0.0	
NIL	19	82.6	12	52.2	
TOTAL	23	100.0	23	100.0	

Note: * significant at 5% level of significance ($p<0.05$)

GRAPH 2 : DISTRIBUTION OF POST OPERATIVE COMPLICATIONS BETWEEN STUDY GROUPS

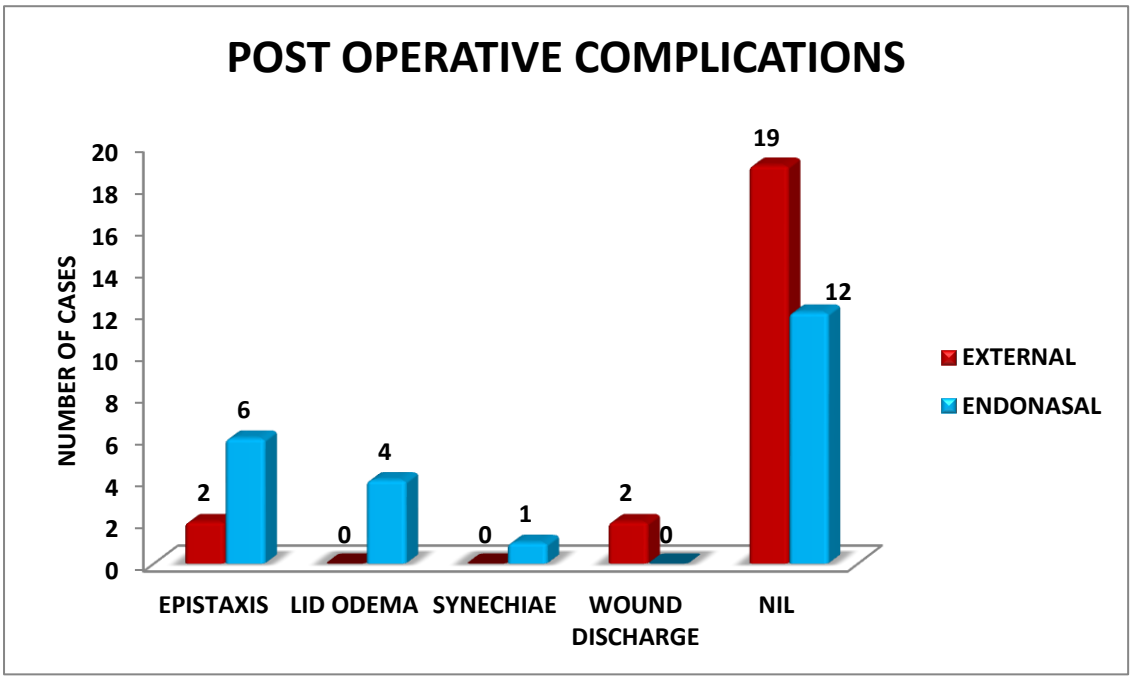
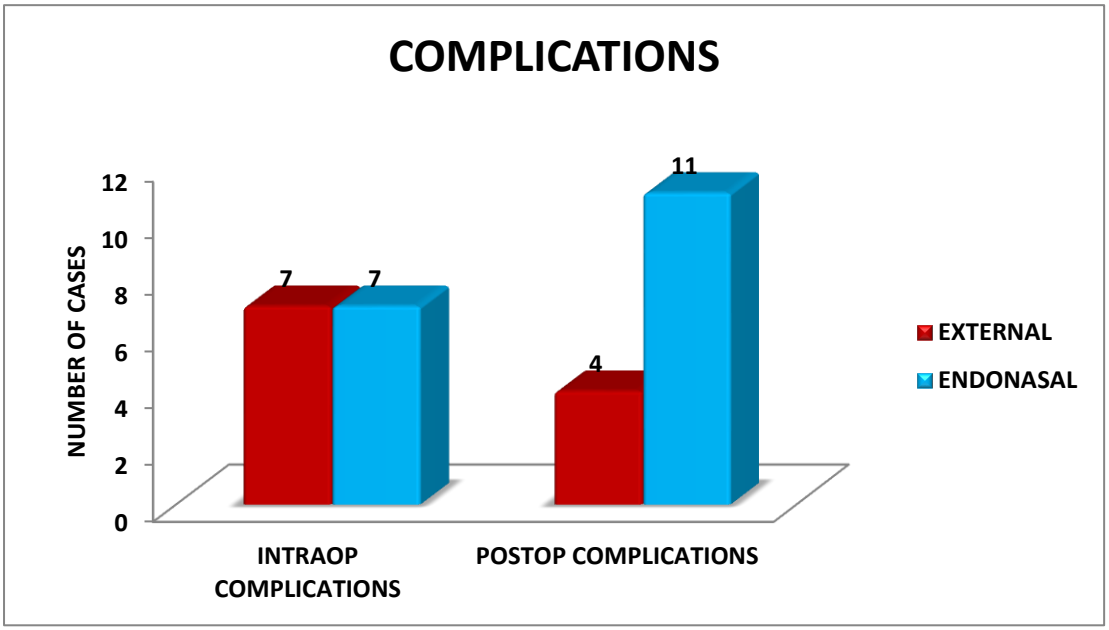


TABLE 3 : DISTRIBUTION OF COMPLICATIONS BETWEEN STUDY GROUPS

COMPLICATIONS	EXTERNAL		ENDONASAL		p value
	N	%	N	%	
INTRAOP COMPLICATIONS	7	30.4	7	30.4	1
POSTOP COMPLICATIONS	4	17.4	11	47.8	0.028*
TOTAL	23	100.0	23	100.0	

Note: * significant at 5% level of significance (p<0.05)

GRAPH 3 : DISTRIBUTION OF COMPLICATIONS BETWEEN STUDY GROUPS



3) <u>Post operative evaluation by sac syringing-</u>

Post operative evaluation was done by lacrimal sac syringing using normal saline. In most of the cases sac syringing was done on first post operative day but in patients who complained of tenderness and bleeding per nose, it was done after 3 to 4 days.

In External DCR:

In all 23 cases (100%) lacrimal passage were patent on the 1st week follow up. After 6th week and 3 months of follow up all 23 cases were patent.

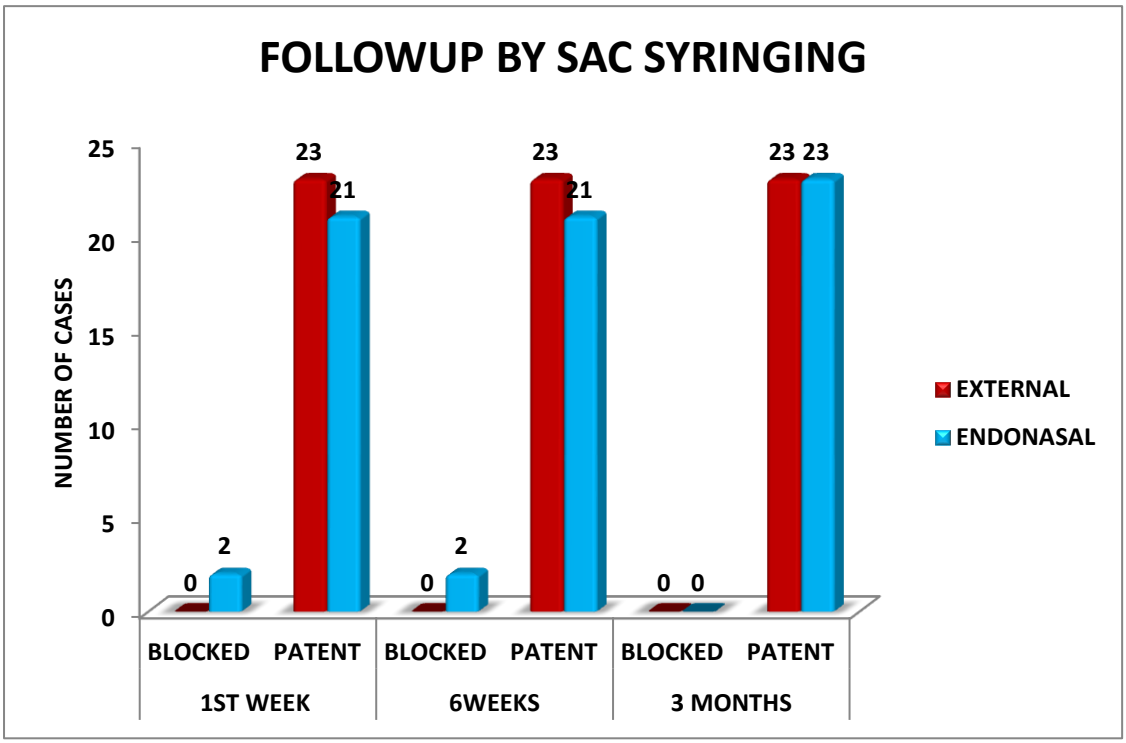
In Endonasal DCR:

In 21 cases (91.3%) lacrimal passage were patent and in 2 case (8.7%) it was blocked on the 1st week follow up. After 6th week of follow up only in 21 cases (91.3%) lacrimal passage were patent and block was present in 2 cases (8.7%). 2 cases in which lacrimal passage was blocked external DCR was done.

TABLE 4 : DISTRIBUTION OF FOLLOWUP BY SAC SYRINGING BETWEEN STUDY GROUPS

WEEK	FOLLOWUP BY SAC SYRINGING	EXTERNAL		ENDONASAL		p value
		N	%	N	%	
1ST WEEK	BLOCKED	0	0.0	2	8.7	0.296
	PATENT	23	100.0	21	91.3	
6WEEKS	BLOCKED	0	0.0	2	8.7	0.296
	PATENT	23	100.0	21	91.3	
3 MONTHS	BLOCKED	0	0.0	0	0.0	1
	PATENT	23	100.0	23	100.0	
TOTAL		23	100.0	23	100.0	

GRAPH 4 : DISTRIBUTION OF FOLLOWUP BY SAC SYRINGING BETWEEN STUDY GROUPS



9) <u>Success rate</u>:

The success rate was defined by the presence of patent lacrimal passage by lacrimal sac syringing at the end of complete follow up. In our study the success rate for group A was in 23 cases (100%) . In group B, the success rate was seen in 21 cases (91.3%) and failure was seen in 2 cases (8.7%).

Table 5: Comparison of Result in Group A and Group B:

Result	**External DCR**	**Endonasal DCR**
	No. (%)	**No. (%)**
Success	23(100%)	21 (91.3%)
Failure	0	2 (8.7%)
Total	23	23

DISCUSSION

In the present study "A prospective comparative study of external dacryocystorhinostomy surgery and endonasal dacryocystorhinostomy surgery", 46 cases of acquired nasolacrimal duct obstruction or chronic dacryocystitis were selected .

1) <u>Intra operative complications:</u>

External dacryocystorhinostomy:

In External DCR, it was minimum in 4 cases (17.4%), moderate in 2cases (8.7%) and was severe in 1 cases (4.3%).

Minimum and moderate bleeding was seen during the punching of the lacrimal bone as well as while making nasal mucosal flaps. The bleeding was stopped by packing the area with the ribbon gauze soaked in 4% lignocaine with adrenaline for some minutes.

1 patient had severe bleeding while making skin incision due to injury to angular vein, which may have been due to varied anatomical position. Haemostasis was achieved with clamping and ligating the vein and surgery was continued.

In external dacryocystorhinostomy, though majority of operative interventions go well, most of them are complicated by haemorrhage creating difficulties[71]. So it is clear from these words that the most common but major complication of external dacryocystorhinostomy surgery is bleeding.

Hartikainen et al[53] did not observe any intra-operative bleeding as troublesome in his study. However, he observed that there was accidental entry to anterior ethmoidal air cells in 6 cases (9%) while doing osteotomy. In our study, there was no such complication seen in group A.

Other minor complications in group A were damage to the lacrimal sac while making flaps and damage to nasal mucosa, while trephining the lacrimal bone.

Endonasal dacryocystorhinostomy:

Our study showed 4 cases (17.4%) with moderate bleeding and 1 case (4.3%) with severe bleeding. Haemostasis was achieved by packing the area with gauze soaked in 4% lignocaine with adrenaline for few minutes. Visualization was the problem in these cases.

In our study, 1 patient required resection of the anterior part of middle turbinate because it was hypertrophied and was obscuring the endoscopic view as the sac was located posteriorly.

Rebeiz et al[72], in his study, noticed that during the endonasal procedure, the removal of the anterior end of the middle turbinate was helpful to expose the sac area, to locate the sac and to decrease the risk of scarring and fibrosis after the operation.

In Endonasal DCR, the minor complications encountered was trauma to uncinate process in 1 cases (4.3%), which were related to the improper handling of the endoscopic instruments and creation of false passage was seen in 1 case (3.33%).

7) <u>Post operative complications:</u>

External dacryocystorhinostomy:

In , 2 cases (8.7%) had epistaxis on 1st post operative day and 4 cases (13.34%) which were resolved by nasal packing and medical treatment.

Patient was given antibiotics and anti-inflammatory and the patient responded very well.

Tarbet et al[49] have reported a rate of 2.6% for excessive scarring post operatively and a rate of 3.9% for post operative haemorrhage. In our study, post operative haemorrhage was seen in 7 cases (11.66%) which is higher as compared to the study done by Tarbet et al.

Walland et al[73] have reported 1.6% incidence of infection after open lacrimal surgeries. Our study correlates well with the study done by Walland et al.

Endonasal dacryocystorhinostomy:

6 cases (26.1%) had epistaxis on 1st post operative day and 4 cases (17.4%) had lid edema and tenderness which were resolved by nasal packing and medical treatment.

1 cases (4.3%) showed synechiae formation which were detected on nasal endoscopy post operatively.. No other complication was noticed.

Post operatively out of 16 cases **Nayak et al**[74] had 3 cases (18.75%) of synechiae formation and 2 cases (12.5%) had granulation tissue in the operated area which were successfully treated endoscopically as an office procedure. In our study the number of cases showing synechiae formation post operatively was very low (10%) as compared to this study.

8) <u>Success rate:</u>

In our study the success rate for External DCR was in 23 cases (100%) . In Endonasal DCR, the success rate was seen in 21 cases (91.3%) and failure was seen in 2 cases (8.7%).

Hartikainen et al[53]hadprimary success rate of 91% for external dacryocystorhinostomy and 75% for endonasal dacryocystorhinostomy.

Study done by **Cokkesser et al**[55] showed the success rate of 89.9% for external dacryocystorhinostomy and 88.2% for endonasal dacryocysto-rhinostomy.

Ibrahim et al[57] in their study had success rate of 82% for external dacryocystorhinostomy and 58% for endonasal dacryocystorhinostomy.

Mirza et al[59] in their study had success rate of 94% for external dacryocystorhinostomy and 64% for endonasal dacryocystorhinostomy.

Our study correlates well with the other studies.

SUMMARY

This study was conducted to evaluate the success and complication rates, presenting complaint in patients of chronic dacryocystitis.

- In 46cases , 23 cases - external DCR and 23 cases - endonasal DCR.
- The major intra operative complication in both the groups was haemorrhage, which hampered visualization during surgery. The other minor complications like accidental trauma to uncinate was seen in Endonasal DCR.
- The post operative complications in both the groups were very few and occurred at a very low rate.
- Post operatively almost all the patients in Endonsasal DCR underwent nasal endoscopic examination for intranasal cleaning of mucus, debris.
- Success rate for External DCR was 100% and for Endonasal DCR, it was 91.3%.
- The failed cases showed synechiae formation between the lacrimal sac flap and nasal mucosal flap in Endonasal DCR .
- The failed cases were advised to undergo external DCR again.

CONCLUSION

In the light of these results, we concluded that External DCR had higher success rate than the endonasal DCR. An endonasal procedure has the advantage of dealing with associated deviated nasal septum, avoidance of cutaneous scar. But the disadvantages and limitations include the need for costly and sophisticated equipment, the training in the usage of those instruments and steep learning curve. Both the surgical procedures have a minimal risk of intra and postoperative complications.

Therefore, after studying our observations and comparing with other studies we concluded that both the procedures represent good alternative for the treatment of lower lacrimal passage obstruction.

BIBLIOGRAPHY

1) Sir Stewart Duke Elder. System of Ophthalmology. Edited by S Duke Elder and Edward S Perkins, St. Louis C-V Company 1974; Vol XIII, Part II page 675-722.

2) Sihota Ramanjit, Tandon Radhika. Parson's diseases of the eye, Edited by Shihota Ramanjit and Tandon Radhika, Published by Elsevier, a division of Reed Elsevier India Private Limited New Delhi, 20th edition; Chapter 29: page 446 -52.

3) G Adrien Shun-Shin, Geetha Thurairajan, External Dacryocysto-rhinostomy—An end of an era? British Journal of Ophthalmology 1997;81: 716-717.

4) McDonough M, Meiring JH. Endoscopic Transnasal Dacryocysto-rhinostomy. JLaryngol Otol 1989; 103 (6):585-587.

5) Sir Stewart Duke Elder. System of Ophthalmology. Edited by S Duke Elder and Edward S Perkins, St. Louis C-V Company 1974; vol II, chapter VIII, page 568-580.

6) Albert and Jakobiec. Principles and practice of Ophthalmology, Published by Elsevier, third edition; Vol 3, chapter 243: page 3212.

7) American Academy of Ophthalmology, the Eye M.D. association, Section 7 Orbit, Eyelids and Lacrimal System, 2007-2008; chapter 13: page 262.

8) Wolff. Wolff's Anatomy of the Eye and the Orbit. Published by Chapman & Hall London, 8th edition 1997, section 2, chapter 2.9: page 80.

9) Adler. Adler's physiology of the Eye clinical application, edited by Robert A. Moses, Eight Edition, chapter 2: page no.25-27.

10) P.L. Dhingra. Diseases of Ear, Nose and Throat, published by Elsevier, fifth edition,section 2, chapter 23: page no.150-153.

11) P.L. Dhingra. Diseases of Ear, Nose and Throat, published by Elsevier, fifth edition, section 2, chapter 33: page no 190.

12) American Academy of Ophthalmology, the Eye M.D. association, Section 7 Orbit, Eyelids and Lacrimal System, 2007-2008; chapter 14: page 284-285.

13) Sunita Agarwal and Amar Agarwal. Textbook of Ophthalmology, published by Jaypee brothers medical publishers, New Delhi, 2002; Vol 2, section E, chapter 88: page 702.

14) American Academy of Ophthalmology, the Eye M.D. association, Section 7 Orbit, Eyelids and Lacrimal System, 2007-2008; chapter 14: page 275-280.

15) Ewing A.E. Roentgen ray demonstration of the lacrimal abscess cavity. Am J Ophthalmol 1909; 24:1-4.

16) Bollack J. Sur l'Exploration radiographique des voles lacrymales par l'Injection D'Hulle iodée. Ann Oculist 1924. 161321–335.335.

17) Spackman E.W. X-ray studies of the nasolacrymal duct. American Journal of Ophthalmology 1938; 21:518.

18) Bansal, R. K., A. L. Jain, and Om Parkash. Dacryocystography in normal Lacrimal Drainage System. Indian journal of radiology 1970; 24: 163.

19) Demorest B H, Milder B. Dacryocystography II The pathologic lacrimal apparatus. AMA Arch Ophthalmol. 1955 Sep;54(3):410–421.

20) Campbell W. The radiology of the lacrimal system. Br J Radiol. 1964 Jan;37:1–26.

21) Henderson P. N. Macrodacryocystography. Australian Journal of Ophthalmology 1973 Oct;1(3): 117-124.

22) M.J. Roper-hall. Stallard’s Eye Surgery, published by Butterworths, Seventh Edition 1989; chapter 4: 135-162.

23) Totoi A. Nuovo Metodo Conservatore di cura radicale delle soppurazioni croniche del sacco lacrimale (dacriocistorinostomia). Clin Moderna (Firenze) 1904; 10: 385-387.

24) Mosher H. Mosher-Toti operation on the lacrimal sac. Laryngoscope 1921; 31:284-6.

25) 25) Gifford H. J. Dacryocystitis, the transplant operation. Arch Ophthalmol 1944; 32: 485-487.

26) Iliff C E. A simplified dacryocystorhinostomy. Trans Am Acad Ophthalmol Otolaryngol. 1954 Jul-Aug; 58(4):590–592.

27) Summerskill W H. Dacryocystorhinostomy by intubation. British Journal of Ophthalmology 1952; 36 (5), 240-244.

28) Romanes G J. Dacryocystorhinostomy: Clinical Report of Fifty Cases. British Journal of Ophthalmology 1955; 39 (4), 237-240.

29) Iliff C E. A Simplified Dacryocystorhinostomy. Archives of Ophthalmology 1971; May; 85(5):586-9.

30) Lester Jones. Epiphora: It's relation to the anatomic structure and surgery of the medialCanthal region. Am J Ophthalmol1957 Feb; 43(2):203-12.

31) Bedrossian R H. Office Dacryocystorhinostomy. Arch Ophthalmol. 1965 Mar; 73: 356-8

32) Singh PS. and Garg RS. Polyethylene intubation of NLD in chronic dacryocystitis. British Journal of Ophthalmology 1972; 56:914-918.

33) Thorton S.P. et al. Dacryocystorhinostomy with nasolacrimal duct prosthesis. Ophthalmic Surg. 1975 Summer; 6(2):50-2.

34) Pashby R.C. and Ratbum J. E. Silicone tube intubation of lacrimal drainage system. Arch Ophthalmol. 1979 Jul; 97(7):1318-22.

35) Anderson R. L., Edwards J. J. Indications, complications and results with silicone stents. Ophthalmology. 1979 Aug; 86(8):1474-87

36) Older J. J. Routine use of a silicone stent in a dacryocystorhinostomy. Ophthalmic Surg. 1982 Nov; 13(11):911-5.

37) Pawar MD, Sutaria SN. Intra-cystic tube implantation in dacryocysto-rhinostomy. Proceedings of the Xth Congress of the Asia Pacific Academy of Ophthalmology; 1985 Jan; New Delhi. Asia Pacific Academy of Ophthalmology; 1985: 190-191.

38) Dikker PJ, Pawar MD. Etiology and management of failed DCR. Proceedings of AIOS conference 1992 page 529-532.

39) Caldwell GW. Two new operations for obstruction of the nasal duct, with preservation of the canaliculi. American Journal Of Ophthalmology 1893; 10: 189-192.

40) Jokinen K, Karja J. Endonasal dacryocystorhinostomy. Arch Otolaryngol1974 Jul; 100(1):41-4.

41) Linberg JV, Anderson RL, Bumsted RM, Barreras R. Study of intranasal ostium external dacryocystorhinostomy. Arch Ophthalmol 1982; 100:1758–1762.

42) Metson R. Endoscopic surgery for lacrimal obstruction. Otolaryngol Head Neck Surg; 1991 Apr; 104(4):473-9.

43) Welham R. A., Wulc A. E. Management of unsuccessful lacrimal surgery. British Journal of Ophthalmology 1987; 71:152-157.

44) Botek A A, Goldberg S. H. Margins of safety in Dacryocysto-rhinostomy. Ophthalmic surgery 1993 May; 24(5):320-2.

45) Woog JJ, Metson R, Puliafito CA. Holmium:YAG endonasal laser dacryocystorhinostomy. Am J Ophthalmol. 1993 Jul 15;116(1):1-10.

46) Burger R, Fover M. Endonasal DCR primary and secondary. Australian and New Zealand Journal of Ophthalmology 1993; 21(3):157-9.

47) Whittet HB, Shun-Shin GA, Awdry P. Functional Endoscopic Transnasal Dacryocystorhinostomy. Eye (Lond). 1993; 7 (Pt 4):545-9.

48) Weidenbecher M, Hosemann W, Buhr W. Endoscopic Endonasal Dacryocystorhinostomy: results in 56 patients. Ann Otol Rhinol Laryngol 1994; 103:363-367.

49) Tarbet K J, Custer PL. External Dacryocystorhinostomy. Surgical success, patient satisfaction and economic cost. Ophthalmology 1995; 102:1065-70.

50) Sadiq S A, Hugkulstone CE, Jones NS, Downes RN. Endoscopic Holmium: YAG laser Dacryocystorhinostomy. EYE 1996;10:43-46.

51) Hartkainen J, Grenman R, Puuka P, Seppa H. Prospective randomized comparison of external dacryocystorhinostomy and endonasal laser dacryocystorhinostomy. Ophthalmology 1998; 105:1106-1113.

52) Kao SC, Liao CL, Tseng JH, Chen MS, Hou PK. Dacryocysto-rhinostomy with intraoperative mitomycin C. Ophthalmology 1997 Jan;104(1):86-91.

53) Hartkainen J, Antila J, Varpula M, Puuka P, Seppa H, Grenman R. Prospective randomized comparison of endonasal endoscopic dacryocystorhinostomy and external dacryocystorhinostomy. Laryngoscope 1998; 108:1861-6.

54) Shun-Shin G A, Thurairajan G. External dacryocystorhinostomy- an end of an era? Br J Ophthalmology 1997; 81:716-717.

55) Cokkeser Y, Evereklioglu C, Er H. Comparative external versus endoscopic dacryocystorhinostomy: result in 115 patients (130 eyes). Otolaryngol Head Neck Surg 2000; 123:488-91.

56) V. P. Venkatachalam, Sanjay Agarwal. Endoscopic dacryocysto-rhinostomy. IndianJournal of Otolaryngology and Head and Neck Surgery October–December 2000; Vol 52(4): 371-372.

57) Ibrahim HA, Batterbury M, Banhegyi G, McGalliard J. Endonasal laser dacryocystorhinostomy and external dacryocystorhinostomy outcome profile in a general ophthalmic service unit: a comparative retrospective study. Ophthalmic Surg Lasers 2001 May-Jun; 32(3):220-7.

58) Zilelioglu G, Tekeli O, Ugurba SH. Results of endoscopic endonasal non laser dacryocystorhinostomy. Doc Ophthalmol 2002 Jul; 105(1):57-62.

59) Mirza S, Al-Barmani A, Douglas SA, et al. A Retrospective comparison of endonasal KTP laser dacryocystorhinostomy versus external dacryocystorhinostomy. Clin Otolaryngol 2002; 27(5):347-51.

60) Tsirbas A, Davis G, Wormald PJ. Mechanical endonasal dacryocystorhinostomy versus external dacryocystorhinostomy. Ophthal Plast and Reconstr Surg 2004 Jan; 20(1):50-6.

61) Tsirbas A, Davis G, Wormald PJ. Revision dacryocystorhinostomy: a comparison of endoscopic and external techniques. Am J Rhinol 2005;19(3):322-5.

62) Ben Simon GJ, Joseph J, Lee S, Schwarcz RM, McCann JD. External versus endoscopic dacryocystorhinostomy for acquired nasolacrimal duct obstruction in a tertiary referral center. Ophthalmology 2005 Aug; 112(8): 1463-8.

63) Jack J Kanski. Clinical Ophthalmology A Systemic Approach. Published by Butterworth Heinemann Elsevier, International Edition, Sixth edition 2007; Chapter 5: page 152-64.

64) Nishi Gupta. Endoscopic DCR: A Revolution. Published by Paragon International Publishers, New Delhi 2008, second edition.

65) Scott Brown. Otorhinolaryngology- Head and Neck Surgery. Edited by Michael Gleeson, Published by CRC Press 2008, Seventh edition; vol 3, chapter 133: page 1692.

66) Woog JJ, Kennedy RH, Custer PL et al. Endonasal dacryocystorhinostomy: A report by the American Academy of Ophthalmology. Ophthalmlogy 2001 Dec; 108(12):2369-77.

67) S.David, R. Raju, A Job, J.Richard. A Comparative study of External Dacryocystorhinostomy and Endonasal Endoscopic Dacryocysto-rhinostomy-A Preliminary Report. Indian J Otolaryngol and Head and Neck Surgery December 1999–March 2000; Vol 52 (1): 37-39.

68) Viers R. Lacrimal disorders diagnosis and treatment, St. Louis: C. V. Mosby Co. 1976; vol 3, part 2:72-78.

69) Nahata. Dacryocystography in diseases of the lacrimal sac. Am J Ophthalmol1964 Sep; 58:490-3.

70) Garfin SW. Etiology of dacryocystitis and epiphora. Arch ophthalmol 1942; 27: 167-188.

71) Robert M, Robert F, Hoffmann. Surgical Considerations for dacryocystorhinostomy with special emphasis on hemostasis techniques. Ophthalmic Surgeries 1983; 14: 317-321.

72) Rebeiz. Anatomic guidelines for dacryocystorhinostomy. Laryngoscope.1992; 102:72-79.

73) Walland MJ, Rose GE.Soft tissue infections after open lacrimal surgery. Ophthalmology 1994; 101:608-611.

74) Dipak Ranjan Nayak, K.R.Sathis,Parul Shah, Kailesh Pujary, R.Balakrishnan. Endoscopic DCR and retrograde nasolacrimal duct dilatation with cannulation: Our Experience. Indian J Otolaryngol, Head and Neck Surg 2000; Vol.52 (1) 23-27.

75) Kuldeep Moras, Mahesh Bhat, Shreyas C S et al. External Dacryocystorhinostomy versus Endoscopic Dacryocystorhinostomy: A Comparison. Journal of Clinical and Diagnostic research 2011 April; Vol 5 (2):182 – 186.

76) A Tsirbas and P J Wormald. Mechanical endonasal dacryocysto-rhinostomy with mucosal flaps. Br J Ophthalmol. 2003 January; 87(1): 43–47.

77) Passorn Preechawai. Results of nonendoscopic endonasal dacryocystorhinostomy. Clin Ophthalmol 2012; 6: 1297–1301.

78) Levin PS, StormoGipson DJ: Endocanalicular laser-assisted dacryocystorhinostomy. An anatomic study. Arch Ophthalmol 1992; 110:1488–1490.

79) Levin PS, StormoGipson DJ: Endocanalicular laser-assisted dacryocystorhinostomy. An anatomic study. Arch Ophthalmol 1992; 110:1488–1490.

80) Silkiss RZ, Axelrod RN, Iwach AG, et al: Transcanalicular THC:YAG dacryocystorhinostomy. Ophthalmic Surg 1992; 23:351–353

81) Silkiss RZ, Axelrod RN, Iwach AG, et al: Transcanalicular THC:YAG dacryocystorhinostomy. Ophthalmic Surg 1992; 23:351–353.

82) Michalos P, Pearlman SJ, Avila EN, Newton JC: Hemispherical tip contact Nd: YAG translacrimal-nasal dacryocystorhinostomy. Ocular Surg News 1995; 13:40.

83) Hong JE, Hatton MP, Leib ML, Fay AM: Endocanalicular laser dacryocystorhinostomy analysis of 118 consecutive surgeries. Ophthalmology 2005; 112:1629–1633.

84) Kong YT, Kim TI, Kong BW: A report of 131 cases of endoscopic laser lacrimal surgery. Ophthalmology 1994; 101:1793–1800

85) Busse H, Meyer-Rusenberg HW, Kroll P. Canaliculodacryocystorhinostomy. Orbit 1985; 4:69–72.

86) Doucet TW, Hurwitz JJ: Canaliculodacryocystorhinostomy in the management of unsuccessful lacrimal surgery. Arch Ophthalmol 1982; 100:619–621.

87) Steinkogler FJ: Canaliculocystostomy combining microsurgery and fibrin sealing of the anastomosis. Ophthalmic Surg 1992; 23:485–488.

88) Hornblass A, Jakobiec FA, Bosniak S, Flanagan J: The diagnosis and management of epithelial tumors of the lacrimal sac. Ophthalmology 1980; 87:476–490.

89) Leone CR Jr.: Gelfoam-thrombin dacryocystorhinostomy stent. Am J Ophthalmol 1982; 94:412–413

90) Jones LT: 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.

91) Kulwin DR, Tiradellis H, Levartovsky S, et al: The value of intranasal surgery in assuring the success of a conjunctivodacryocystorhinostomy. Ophthal Plast Reconstr Surg 1990; 6:54–59.

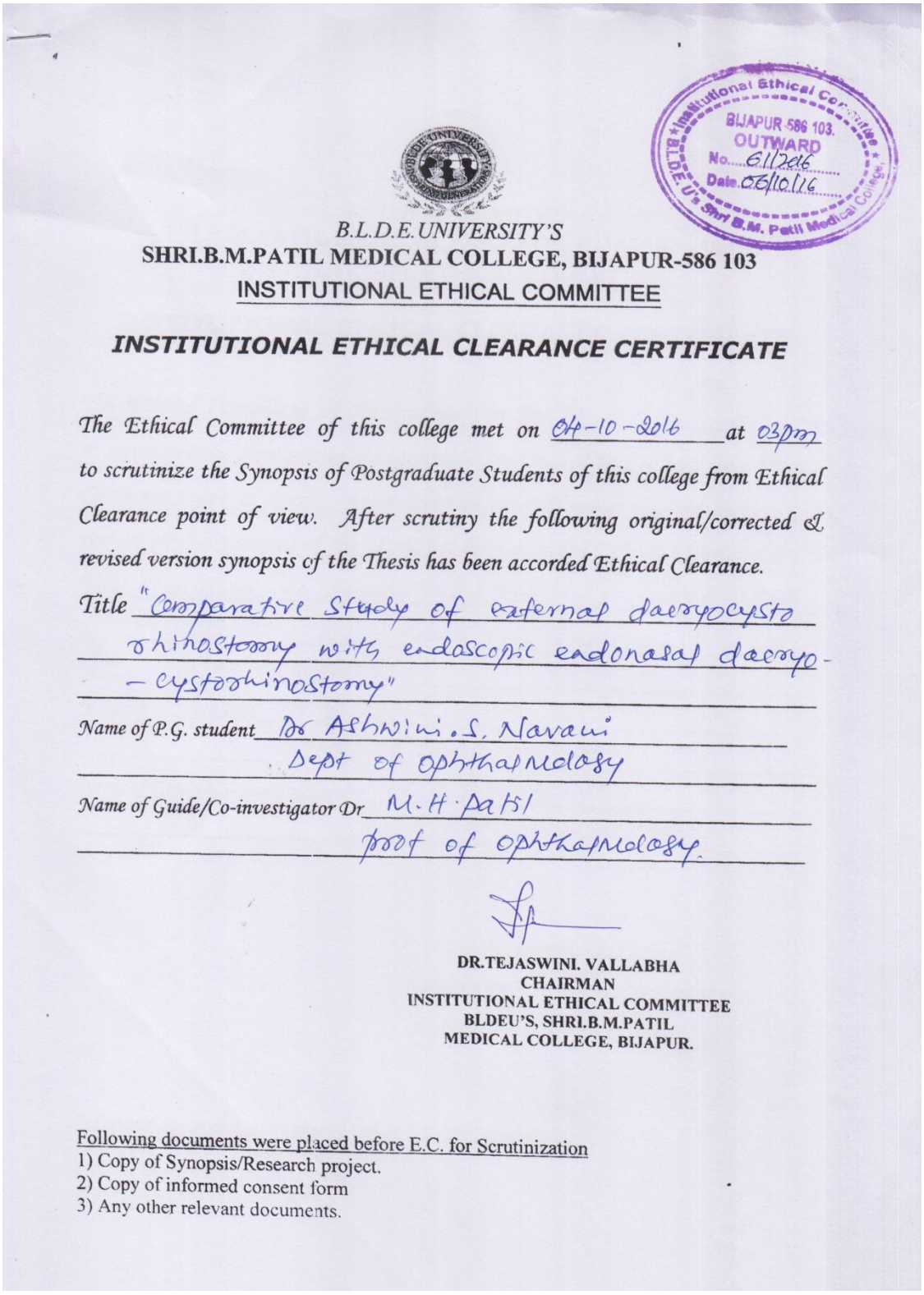
92) Putterman AM, Epstein G: Combined Jones tube-canalicular intubation and conjunctiva dacryocystorhinostomy. Am J Ophthalmol 1981; 91:513–521.

93) Steinsapir KD, Glatt HJ, Putterman AM: A 16-year study of conjunctival dacryocystorhinostomy. Am J Ophthalmol 1990; 109:387–393.

94) Jones LT, Wobig JL: Surgery of the Eyelids and Lacrimal System. Birmingham, Ala.: Aesculapius Pub. Co; 1976.

ANNEXURES

ETHICAL CLEARANCE CERTIFICATE



B.L.D.E. UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 04-10-2016 at 03pm to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.

Title "Comparative Study of external dacryocysto rhinostomy with endoscopic endonasal dacryo-cystorhinostomy"

Name of P.G. student Dr Ashwini. S. Navani
Dept of Ophthalmology

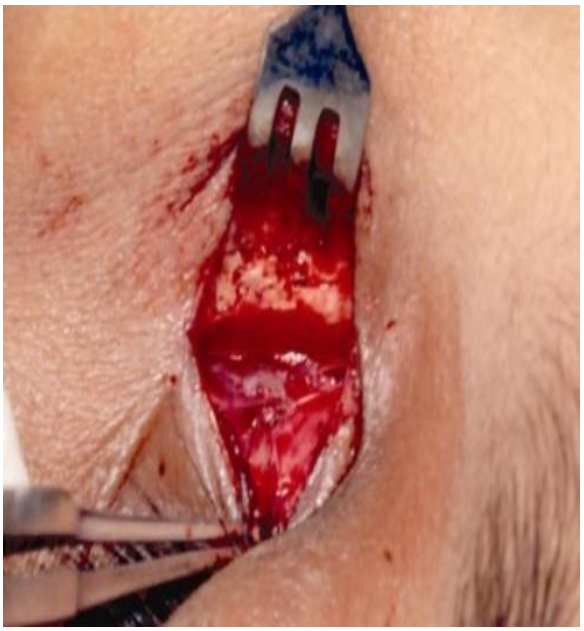
Name of Guide/Co-investigator Dr M. H. Patil
Prof of Ophthalmology.

DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDEU'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

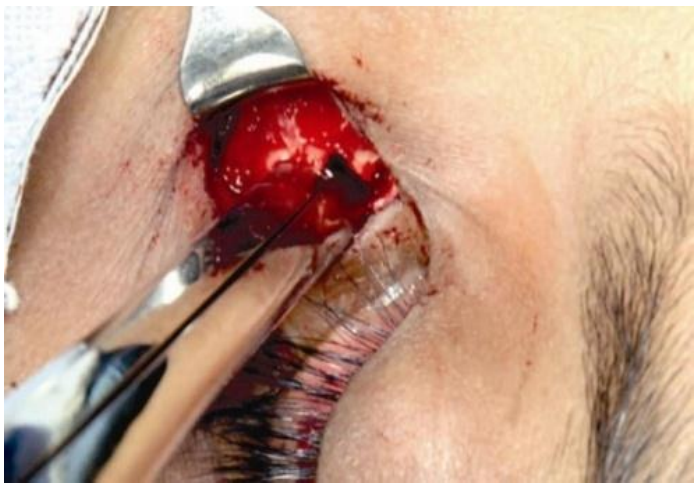
Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

PHOTOGRAPHS

IMAGES TAKEN DURING SURGERY

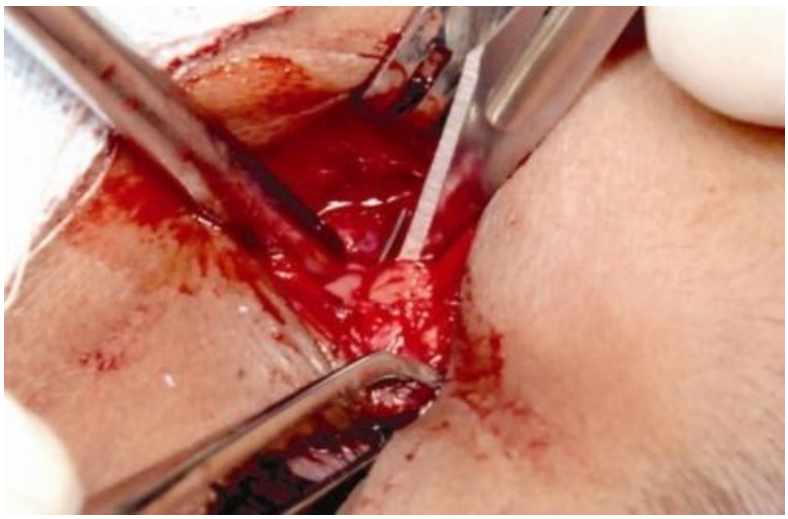


Sac dissected laterally to expose the bony lacrimal fossa

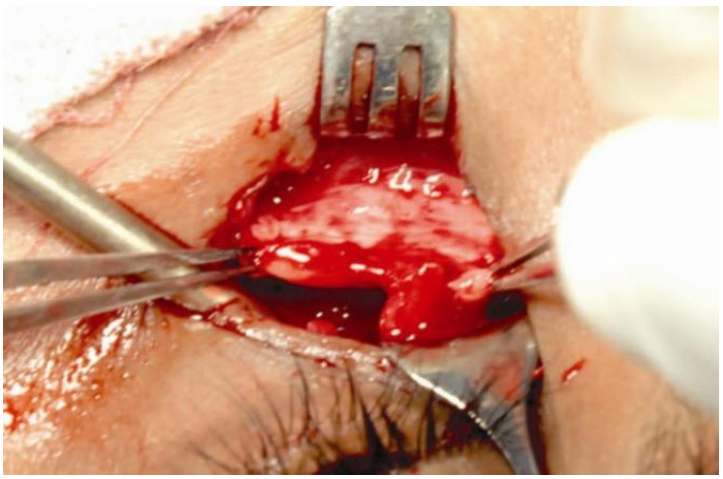


Kerrison punch being used to create a bony osteum

A large bony osteum exposing the nasal mucosa



Lacrimal sac incision being taken by an 11 number blade using the probe as a guide



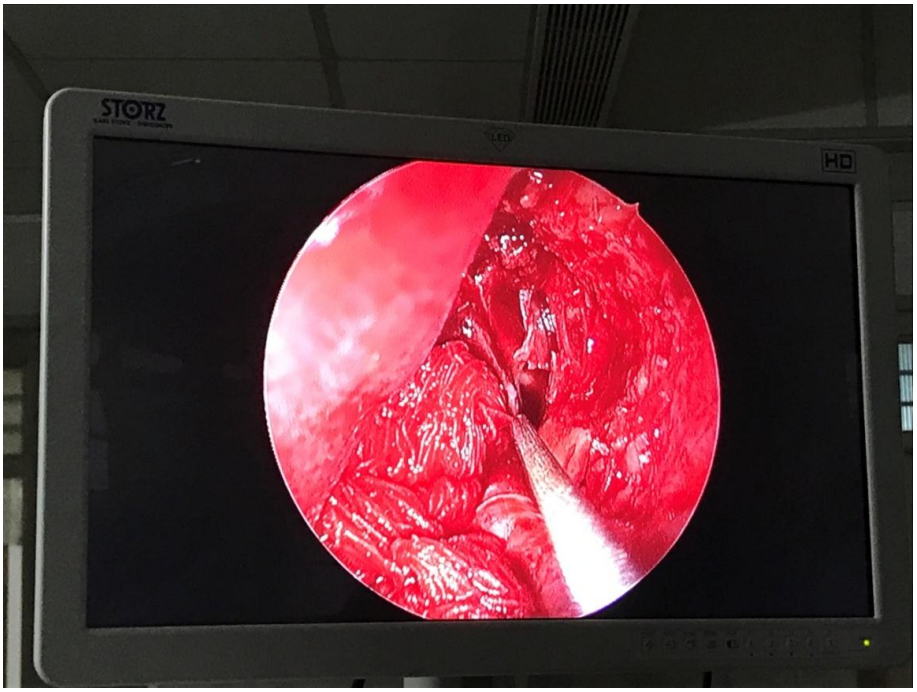
Raising a large nasal mucosal flap

Taut flap anastomosis

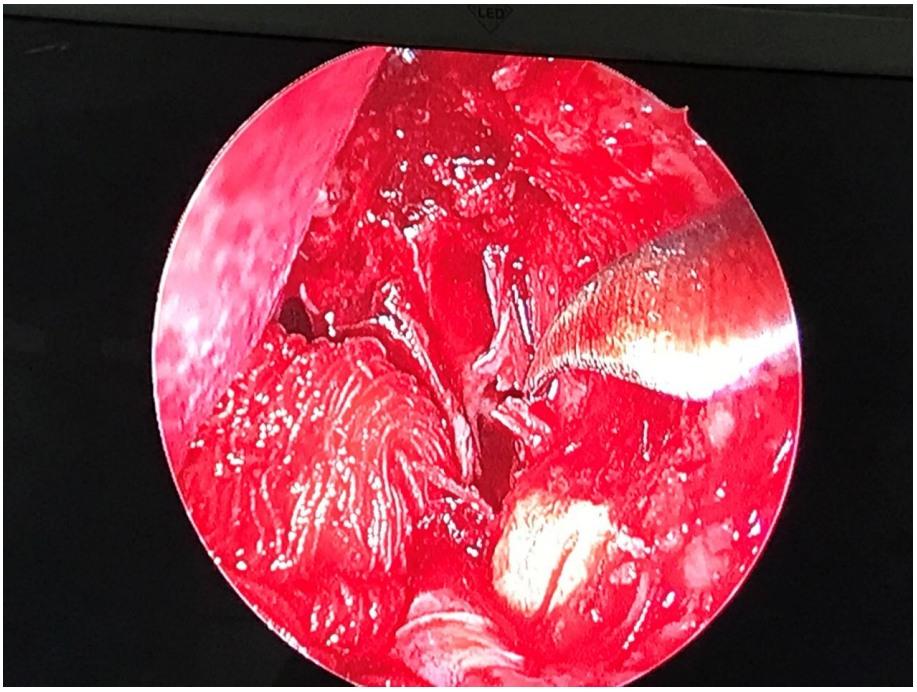
Post operative scar in external DCR

ENDONASAL DCR

DURING PROCEDURE



CREATION OF OPENING IN NASAL MUCOSA, BONES FORMING THE LACRIMAL FOSSA AND POST MEDIAL WALL OF SAC



SICKLE KNIFE USED FOR INCISION OF LACRIMAL SAC

POST OPERATIVE NO SCAR WAS PRESENT

RISK AND DISCOMFORTS:

I understand that I may experience some pain and discomforts during the examination or during my treatment. This is mainly the result of my condition and the procedures of this study are not expected to exaggerate these feelings which are associated with the usual course of treatment.

BENEFITS:

I understand that my participation in the comparative study of external dacryocystorhinostomy surgery and endonasal dacryocystorhinostomy surgery.will help to manage and treat epihora coming to the hospital .

CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of hospital records and will be subject to the confidentiality. Information of sensitive personal nature will not be part of the medical record, but will be stored in the investigations research file.

If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs will be used only with special written permission. I understand that I may see the photograph before giving the permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study to **Dr. M. H. Patil** in the Department of Ophthalmology who will be available to answer my questions or

concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. A copy of this consent form will be given to me to keep for careful reading.

REFUSAL FOR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice. I also understand that **Dr. ASHWINI S. NAVANI** may terminate my participation in the study after he has explained the reasons for doing so.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me. But, no further compensation would be provided by the hospital. I understand that by my agreements to participate in this study and not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks to the best of my ability.

_____ _____

Dr.ASHWINI S. NAVANI Date

(Investigator)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. ASHWINI.S.NAVANI has explained to me the purpose of research, the study procedure, that I will undergo and the possible discomforts as well as benefits that I may experience in my own language. I have been explained all the above in detail in my own language and I understand the same. Therefore I agree to give consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness to signature) Date

INFORMED CONSENT

I_____ d/o, w/o, s/o_____ hereby state that I involve myself voluntarily as a subject in the study conducted by Dr.Ashwini. S. Navani on one year prospective analytical study- A comparison of external and endonasal DCR for acquired nasolacrimal duct obstruction. I understand that I will undergo EXTERNAL DCR. The benefits of the surgery, the risks associated with the procedure like injury to medical canthal tendon/ hemorrhage/ cutaneous scarring/ CSF rhinorrhea have been explained to me to the best of my understanding in my own language. I am aware of the post operative tests that will be carried out for me and have been explained about the risks involving the same. By signing below, I agree that my physician has answered all of my questions and that I understand and accept the risks, benefits, and alternatives of DCR surgery, and understand the costs involved . I willingly give consent to take part in the study.

Any other risks involved_____

Date:

Signature of subject

Address:

Signature of Investigator

Dr. Ashwini S. Navani

INFORMED CONSENT

I _____ d/o, w/o,

s/o_____ hereby state that I involve myself voluntarily as a subject in the study conducted by Dr. Ashwini S. Navani on two year prospective analytical study- A comparison of external and endonasal DCR for acquired nasolacrimal duct obstruction. I understand that I will undergo ENDONASAL DCR. The benefits of the surgery, the risks associated with the procedure like injury to orbit/ hemorrhage/ post-operative infection/ re-stenosis of the opening have been explained to me to the best of my understanding in my own language. I am aware of the post operative tests that will be carried out for me and have been explained about the risks involving the same. By signing below, I agree that my physician has answered all of my questions and that I understand and accept the risks, benefits, and alternatives of DCR surgery, and understand the costs involved. I willingly give consent to take part in the study.

Any other risks involved _____

Date:

Signature of subject

Address:

Signature of Investigator

Dr. Ashwini S. Navani

PROFORMA

The proforma used for the evaluation of the patients was:

NAME-DATE:

AGE- IPD/OPD no -

SEX-

ADDRESS and CONTACT NUMBER:

EDUCATION:

SOCIOECONOMIC STATUS:

OCCUPATION:

Chief complaints -

1. Duration of symptom :

2. Eye affected: RE/ LE eye:

3.Typeofdischarge: WATERY/MUCOID/MUCOPURULENT/PURULENT

4. History of painful swelling over medial aspect of eye: Y/N

Past history-

1. History of naso-orbital trauma / sinus surgery

2. History of previous surgery to the eye: Y/N

3. History of connective tissue disorder: Y/N

4. History of radiation exposure to head/neck: Y/N

PRE OP EVALUATION:

BT- CT: RBS- HBsAg:

HIV:

1.Conjunctival swab /inferior meatus swab:

2.

SLITLAMP EXAMINATION	RIGHT EYE	LEFT EYE
Eyelids		
Lid margins		
Punctum		
Sac area		
Regurgitation test		

3.

	RIGHT EYE	LEFT EYE
Lacrimal syringing		
Fluorescein dye retention test		
Probing		
Functional endoscopic dye test/endoscopic inspection of ostium		
Presence of deviated nasal septum		

INTRA-OPERATIVE:

1. Type of procedure: EXTERNAL/ENDONASAL

2. Duration of surgery:

3. Intra-operative pain:

4. Any intra-operative complication:

Post-operative follow up:

1. 1 week post- op

	RIGHT EYE	LEFT EYE
Resolution of symptoms		
Status of surgical scar		
Lacrimal syringing		
Endoscopic inspection of ostium		
Any complications		

2. 6 weeks post- op:

	RIGHT EYE	LEFT EYE
Resolution of symptoms		
Status of surgical scar		
Lacrimal syringing		
Fluorescein dye retention test		
Functional endoscopic dye test/endoscopic inspection of ostium		
Any complications		

3.3 Months post-op:

Resolution of symptoms		
Status of surgical scar		
Lacrimal syringing		
Fluorescein dye retention test		
Functional endoscopic dye test/endoscopic inspection of ostium		
Any complications		

KEY TO MASTER CHART

L	**:**	Left
R	**:**	Right
M	**:**	Male
F	**:**	Female
D	**:**	Discharge
E	**:**	Epiphora
SAMCE	**:**	Swelling at medial canthus with epiphora
CBMRTUP	**:**	Complete block with mucoid regurgitation through upper punctum
DNS	**:**	Deviated nasal septum
Mid Tur Hyp	**:**	Middle turbinate hypertrophy
CD	**:**	Chronic dacryocystitis
Muc	**:**	Mucocoele
Min	**:**	Minimum
Mod	**:**	Moderate
Sev	**:**	Severe
Obs at rhi site	**:**	Obstruction at rhinostomy site
P	**:**	Patent
B	**:**	Block
Gr Ts	**:**	Granulation tissue
Sept	**:**	Septoplasty
Tr	**:**	Trauma
Tur	**:**	Turbinate
Res of mid turb	**:**	Resection of middle turbinate

MASTRE CHART

SL.NO	NAME	DATE	IP.NO	AGE	SEX	Surgery	intra op	POST-OPERATIVE	POST OP SAC SYRINGING	1 ST WEEK	6 WEEKS	3 MONTHS
1	Gangadhar	03-06-17	17701	58	F	1	nil	nil	patent	patent	patent	Patent
2	Shridevi	06-06-17	17974	56	F	1	minimum bleeding	epistaxis	patent	patent	patent	Patent
3	Sumitra	01-07-17	21370	55	F	1	nil	wound discharge	patent	patent	patent	Patent
4	Kallappa	15-07-17	23073	56	M	1	nil	nil	patent	patent	patent	Patent
5	Veeresh	05-09-17	29509	57	M	1	moderate bleeding	nil	patent	patent	patent	Patent
6	Kashibai	16-11-17	39455	55	F	1	nil	nil	patent	patent	patent	Patent
7	Sanju	29-11-17	41081	55	M	1	minimum bleeding	nil	patent	patent	patent	Patent
8	Suran	05-12-17	41760	57	M	1	nil	nil	patent	patent	patent	Patent
9	kashinath	16-12-17	43175	55	M	1	nil	nil	patent	patent	patent	Patent
10	Jagadish	04-01-18	352	55	M	1	moderate bleeding	nil	patent	patent	patent	Patent
11	Harish	04-01-18	349	57	M	1	nil	nil	patent	patent	patent	Patent
12	Nagappa	19-01-18	2215	55	M	1	minimum bleeding	nil	patent	patent	patent	Patent
13	Anita	02-02-18	3944	28	F	1	nil	nil	patent	patent	patent	Patent
14	Neelamma	06-02-18	4381	55	F	1	nil	wound discharge	patent	patent	patent	Patent
15	Mallamma	21-02-18	6304	55	F	1	nil	nil	patent	patent	patent	Patent
16	Nilamma	23-02-18	6625	55	F	1	nil	nil	patent	patent	patent	Patent
17	Gangadhar	14-03-18	8917	55	M	1	minimum bleeding	nil	patent	patent	patent	Patent

18	Sangayya	22-03-18	9911	55	M	1	nil	nil	patent	patent	patent	Patent
19	Tukaram	23-03-18	10074	55	M	1	nil	nil	patent	patent	patent	patent
20	kumar Hanamath	04-04-18	11446	55	M	1	severe bleeding	epistaxis	patent	patent	patent	patent
21	Rajeshwari	13-04-18	12361	56	F	1	nil	nil	patent	patent	patent	patent
22	sangawwa	02-01-17	123	40	F	1	nil	nil	patent	patent	patent	patent
23	bangarewwa	24-11-16	38722	50	F	1	nil	nil	patent	patent	patent	patent
24	sangamma	05-06-17	17864	35	F	2	nil	nil	patent	patent	patent	patent
25	Yamanappa	14-06-17	19017	60	M	2	severe bleeding	epistaxis	patent	patent	patent	patent
26	Mahadev	04-07-17	21657	58	M	2	nil	lid odema	patent	patent	patent	patent
27	Umesh	13-07-17	22834	60	M	2	false passage	epistaxis	patent	patent	patent	patent
28	Yallappa	26-07-17	24393	56	M	2	nil	nil	patent	patent	patent	patent
29	Aiyamma	31-08-17	28993	55	F	2	nil	lid odema	patent	blocked	dcr -patent	patent
30	Jayappa	21-11-17	40025	55	M	2	nil	nil	patent	patent	patent	patent
31	Arati	24-11-17	40514	58	F	2	moderate bleeding	epistaxis	patent	patent	patent	patent
32	Suresh	08-12-17	42213	55	M	2	nil	nil	patent	patent	patent	patent
33	Shashikumar	12-12-17	42672	57	M	2	nil	nil	patent	patent	patent	patent
34	Jayappa	27-12-17	44300	55	M	2	moderate bleeding	epistaxis	patent	patent	patent	patent
35	Fatima	28-12-17	44614	56	F	2	nil	nil	patent	patent	patent	patent
36	Sanju	05-01-18	478	56	M	2	nil	lid odema	patent	patent	patent	patent
37	Chanappa	17-01-18	1892	55	M	2	trauma to uncinate	epistaxis	patent	patent	patent	patent

38	Annapurna	26-01-18	3100	45	M	2	nil	nil	patent	patent	patent	patent
39	Janaki	30-01-18	3525	55	F	2	moderate bleeding	synechiae	patent	blocked	dcr -patent	patent
40	Chidanand	09-02-18	4825	55	M	2	nil	nil	patent	patent	patent	patent
41	rajakka	14-02-17	4887	35	F	2	nil	nil	patent	patent	patent	patent
42	Neha	01-03-18	7286	36	F	2	moderate bleeding	epistaxis	patent	patent	patent	patent
43	Venkatesh	07-03-18	8020	56	M	2	nil	nil	patent	patent	patent	patent
44	Siddamma	16-03-18	9159	55	M	2	nil	nil	patent	patent	patent	patent
45	Ramappa	20-03-18	9577	54	M	2	nil	lid odema	patent	patent	patent	patent
46	Mahantesh	11-04-18	12309	55	M	2	nil	nil	patent	patent	patent	patent