Lacrimal Endoscopy
and
Microendoscopic NLD Intubation

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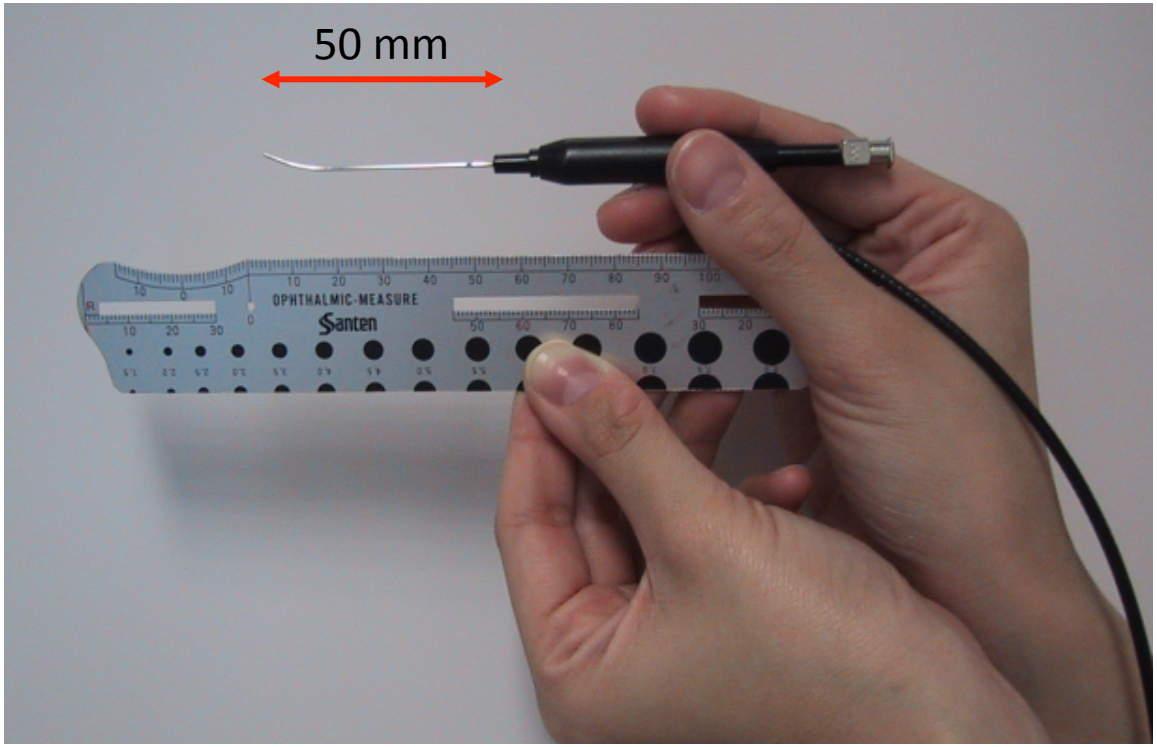
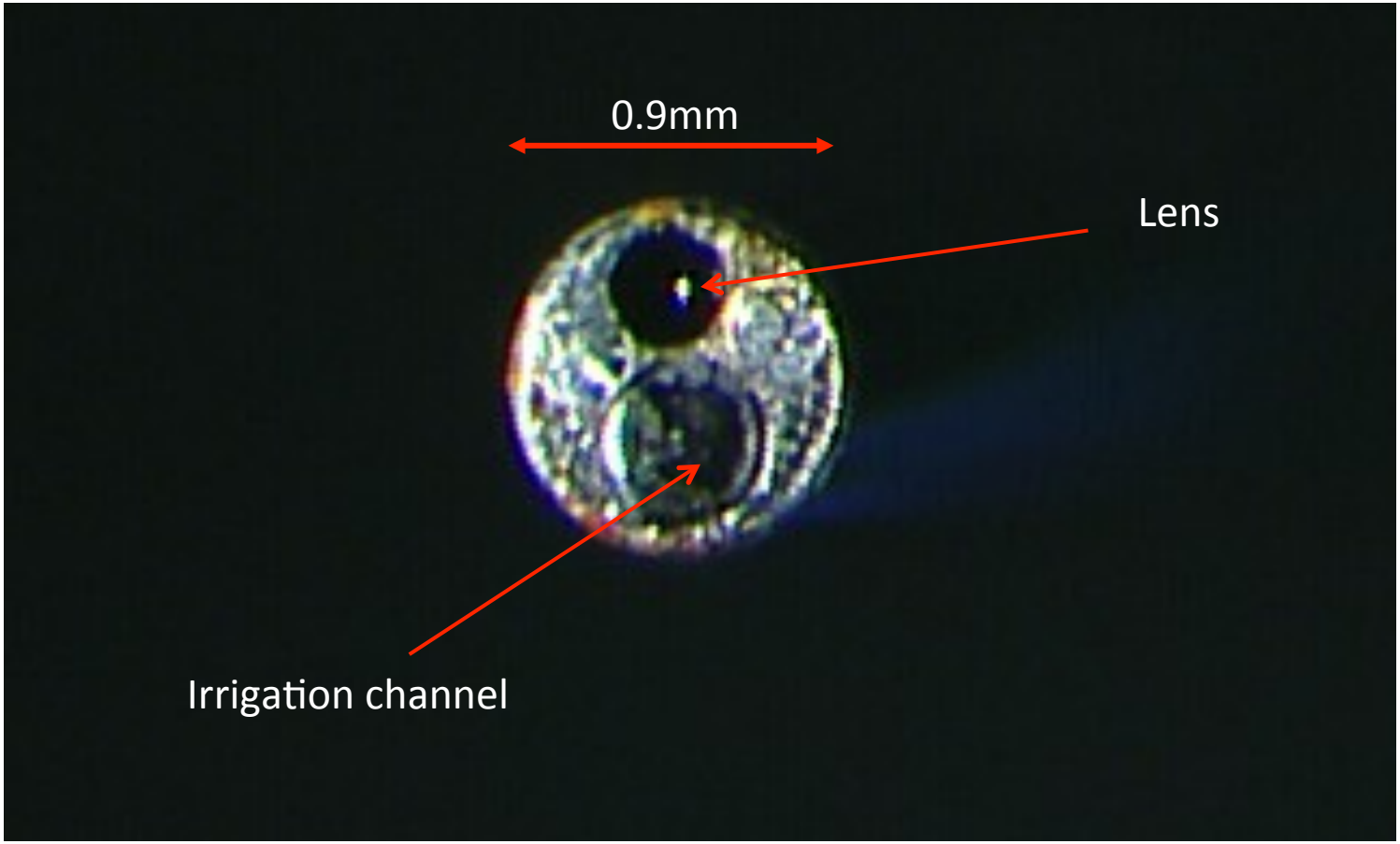
Ⅰ. ABOUT THE LACRIMAL ENDOSCOPE

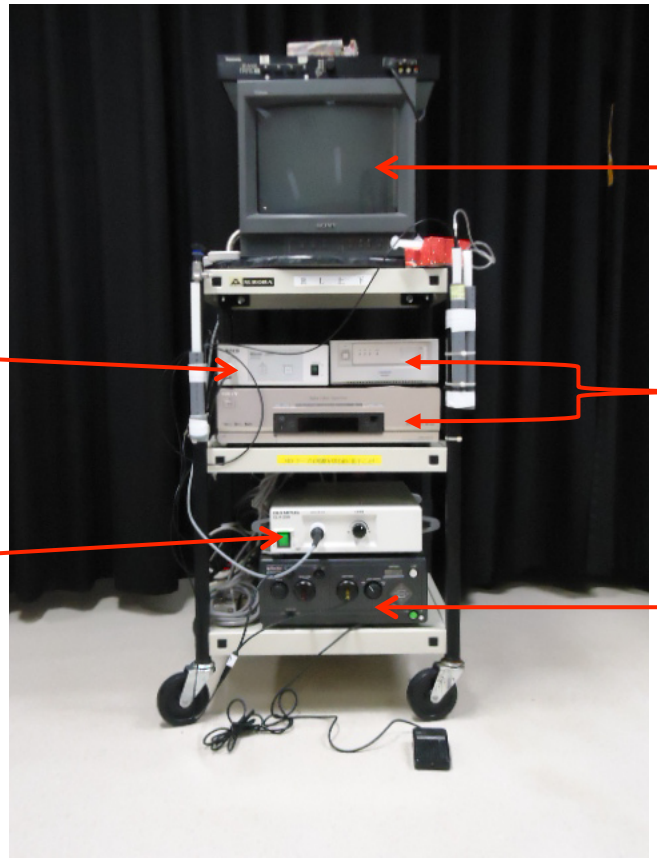
Lacrimal Endoscope



Endoscope Probe Tip



Endoscope System



Nasal endoscope + Lacrimal endoscope

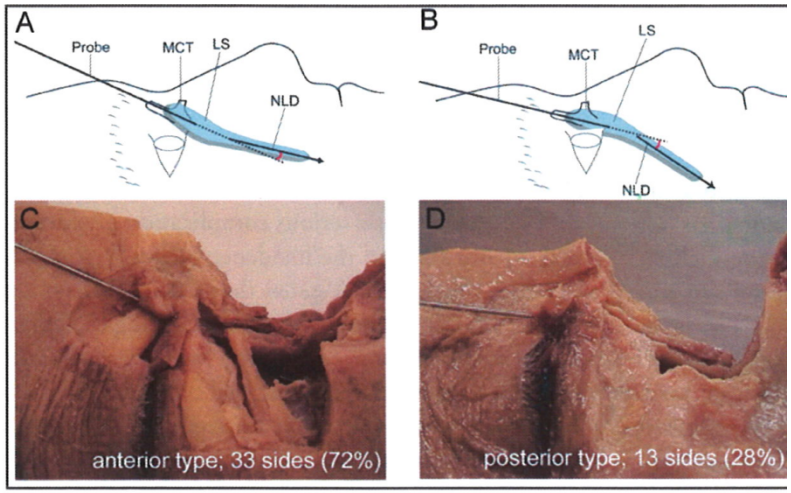
Ⅱ. ANATOMY

Anatomy: Canaliculus and Sac

NA Tucker et al : The anatomy of the common canaliculus.
Arch Ophthalmol 114(10) : 1231-1234,1996

Anatomy: NLD Inclination

Anterior type Posterior type



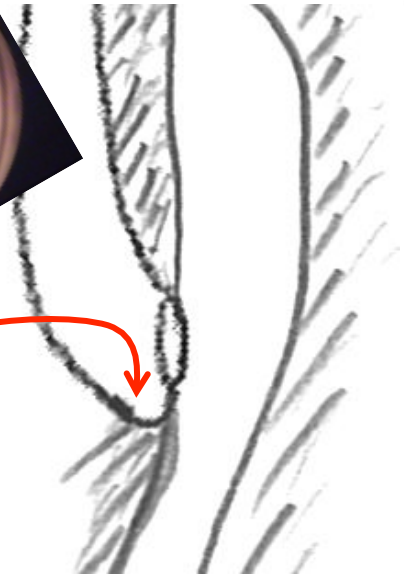
	Anterior Type	Posterior Type	Total
Women	19 (68)	9 (32)	28 (100)
Men	14 (78)	4 (22)	18 (100)
Total	33 (72)	13 (28)	46 (100)

Narioka J, Matsuda S, Ohashi Y. Inclination of the superomedial orbital rim in relation to that of the nasolacrimal drainage system. Ophthal surg, laser & imaging 2008;39:167-70

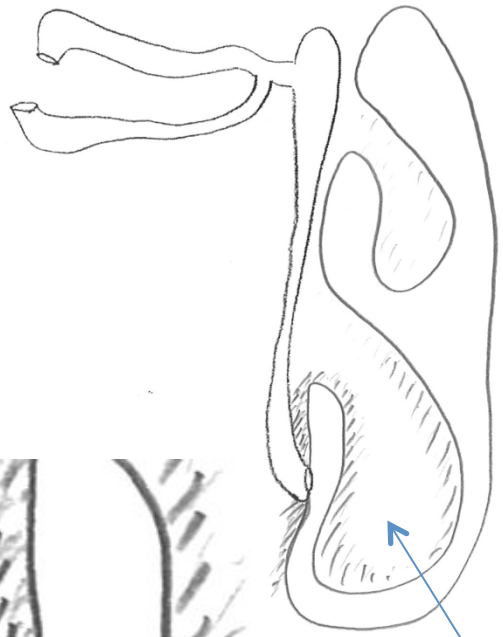
The anterior type is more common.

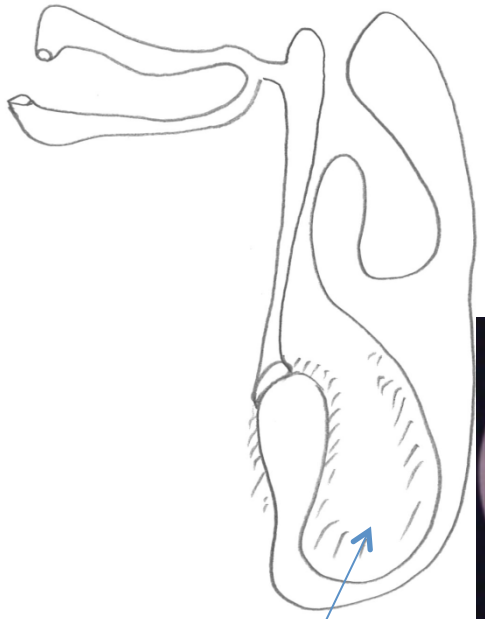
Anatomy: NLD ostium

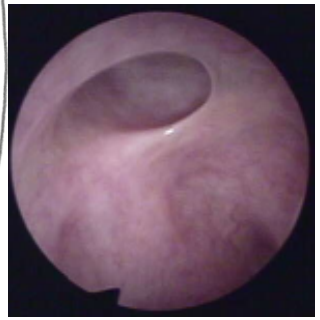
A lacrimal stent is lodged in the pocket.



Pocket!





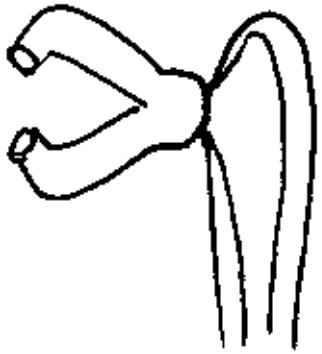


Inf. turbinate

Ⅲ. OBSTRUCTION PATHOLOGY

Obstruction Pathology

- Membranous
- Fibrosis



Distal cc membrane

NLDO (fibrosis)

Canalicular Obstruction Diagram

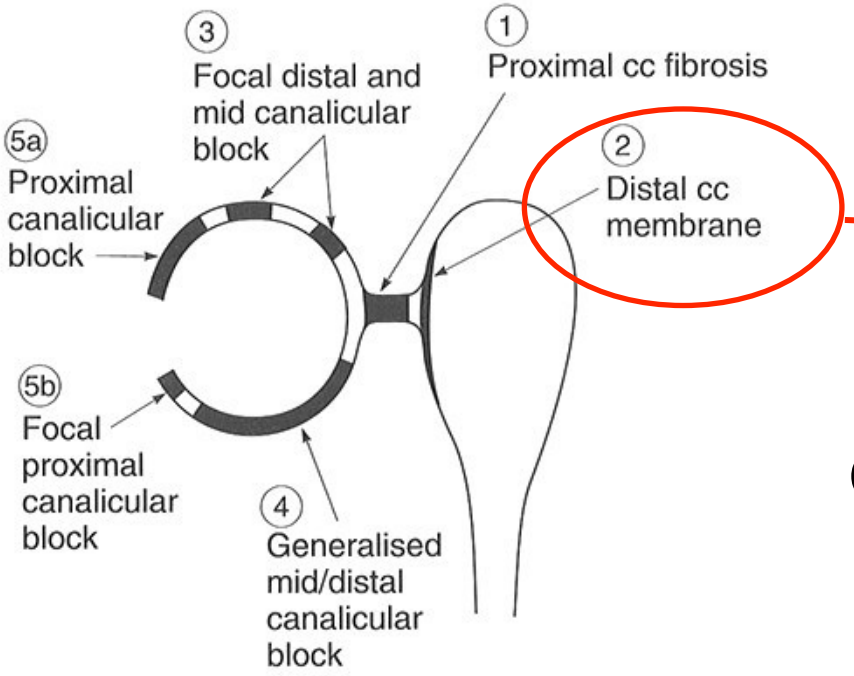


Figure 6.13

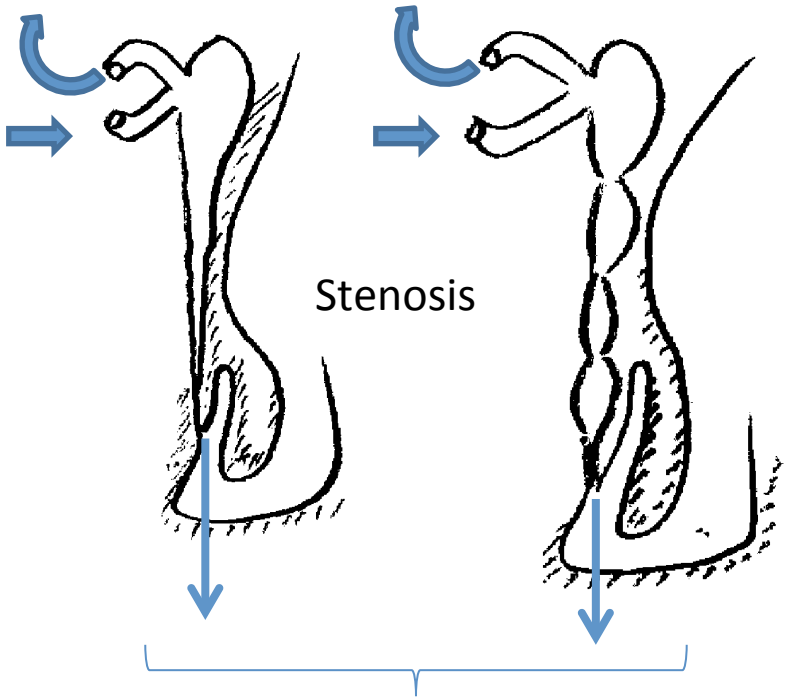
Diagram showing types of canalicular obstruction.

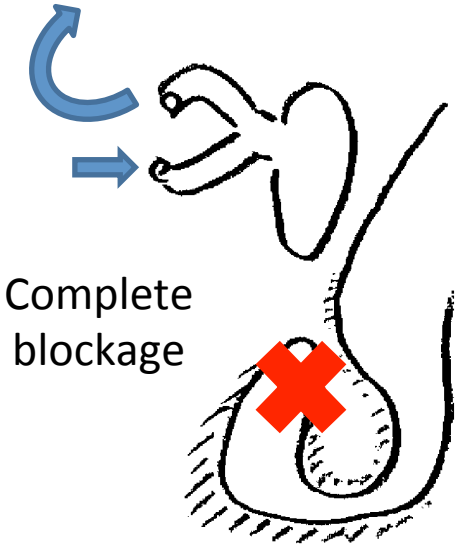
Good candidate for intubation

Color Atlas of Lacrimal Surgery, J Olver, 2002

Adult NLDO Diagram

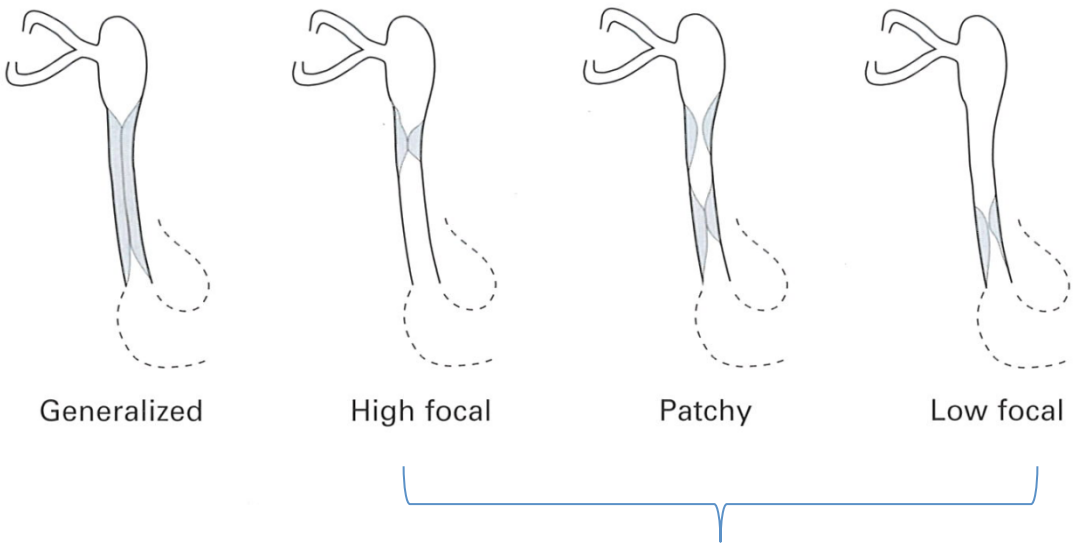
- Partial vs Total (complete)





Adult NLDO Diagram

- Generalized vs Focal



J Olver, 2002

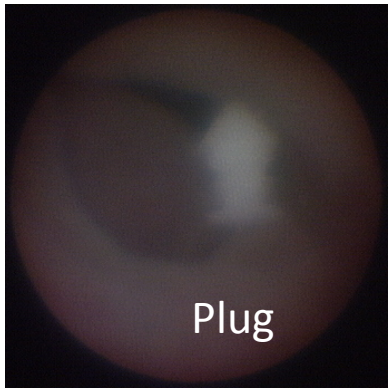
Focal blockage

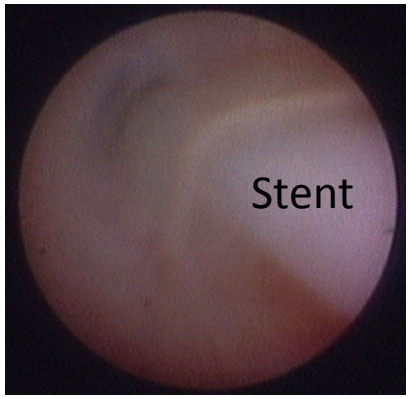
Candidates for intubation

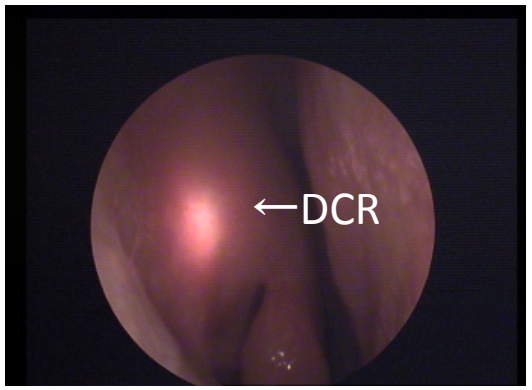
Ⅳ. LACRIMAL ENDOSCOPY

Reasons for Using the Lacrimal Endoscope

- To diagnose epiphora
- To examine obstruction pathology
- To determine treatment strategy
- To avoid causing a false passage while probing or intubating







The assistant and anesthesia

- The assistant is needed
  - to keep irrigating the lacrimal passage using saline in order to prevent collapse.
  - to keep adjusting the light for optimum visual quality.
- Anesthesia
  - 4% xylocaine irrigation and /or 1% xylocaine local injection

Lacrimal Endoscope Setup

- Connect fiberoptic guide and light guide to the 3-CCD camera box (FT203).
- Adjust the focus and orientation while holding the handpiece.
- Connect the handpiece and the syringe using an irrigating catheter.

Inserting Endoscope into Punctum

- Dilate the punctum
  - Punctum incision is not recommended.
- Hold the handpiece upside-down.
- Put the probe tip into the dilated punctum.
- Once you feel that the endoscope has entered the canaliculus, turn the handpiece.
- Start irrigating.
- Examine the canaliculus lumen.

Insertion

Examination

Canaliculus Examination Points

- Use your fingers to protect the endoscope probe.
- Use your fingers to stretch the medial part of the eye lid toward the lateral side in order to straighten the canaliculus.
- Adjust the light to avoid glare.

Inserting Probe into Lacrimal Sac

- Use the superior canaliculus for the sac and NLD endoscopy.
- Pass through the internal common punctum.
- Keep the probe tip inside the sac while rotating the handpiece inferiorly around the probe tip; protect the endoscope probe with your fingers.

Caution:

Do not damage the sac mucous membrane surface while turning to the inferior direction.

Before rotation

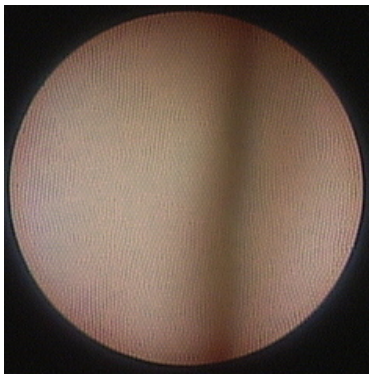
Rotation

Lacrimal Sac Examination Points

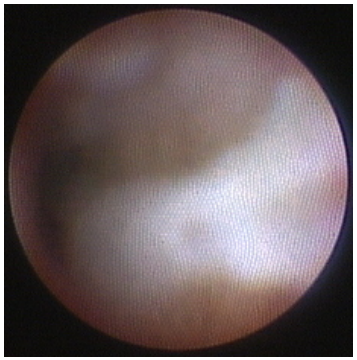
- Hold the handpiece with both hands.
- Adjust light (usually brighter).

Things to look for in Lacrimal Sac

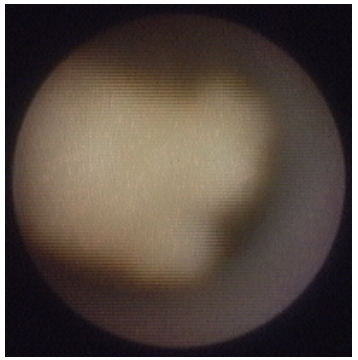
- Slit space indicates fully patent NLD.
- Air indicates fully patent NLD.
- Discharge
- Stone



Slit space



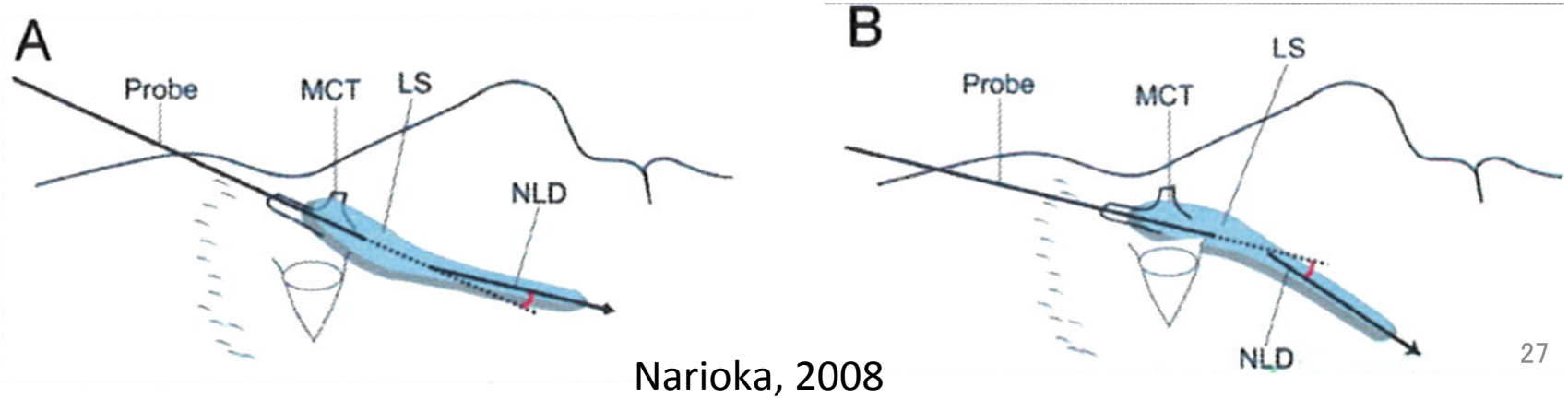
discharge



stone

NLD Examination Points

- Do not strike the posterior wall of anterior type NLD.
- Do not strike the anterior wall of posterior type NLD.
- About 30% of NLDs cannot be examined completely due to an extreme inclination.

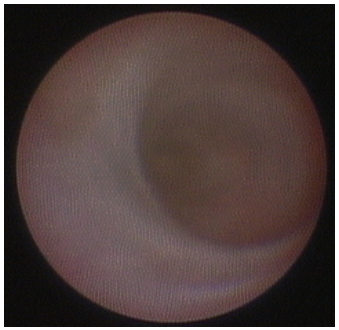


Narioka, 2008

Things to look for in NLD

- Stenosis, Obstruction
- Stone
- Ballooning NLD indicates lower focal stenosis.

Ballooning



Lower focal stenosis

No ballooning

Normal NLD
Normal Ostium

Ⅴ. EXPLORING OBSTRUCTION

Direct Endoscopic Probing (DEP)

- Use endoscope probe like a Bowman probe to examine pathology beyond the membrane.
- Diagnose
  - Distal cc membrane or sac fibrosis.
  - CCO with or w/o NLD stenosis.
  - Generalized NLDO or focal NLDO.

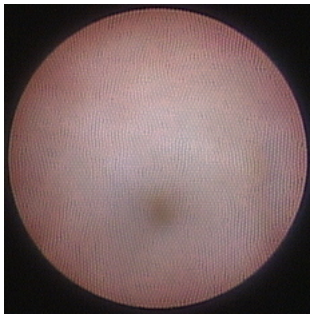
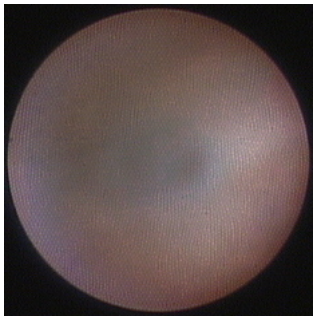
Caution:

Do not try to probe dense obstructions.

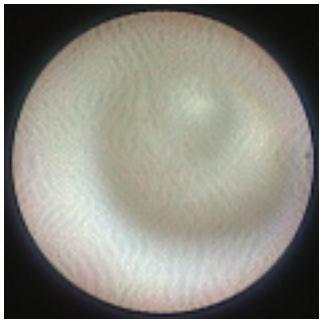
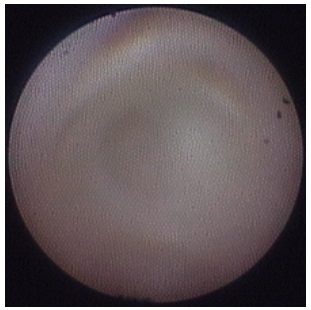
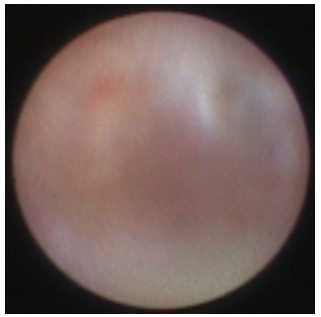
Probing can cause a false passage.

Significant Indications for DEP

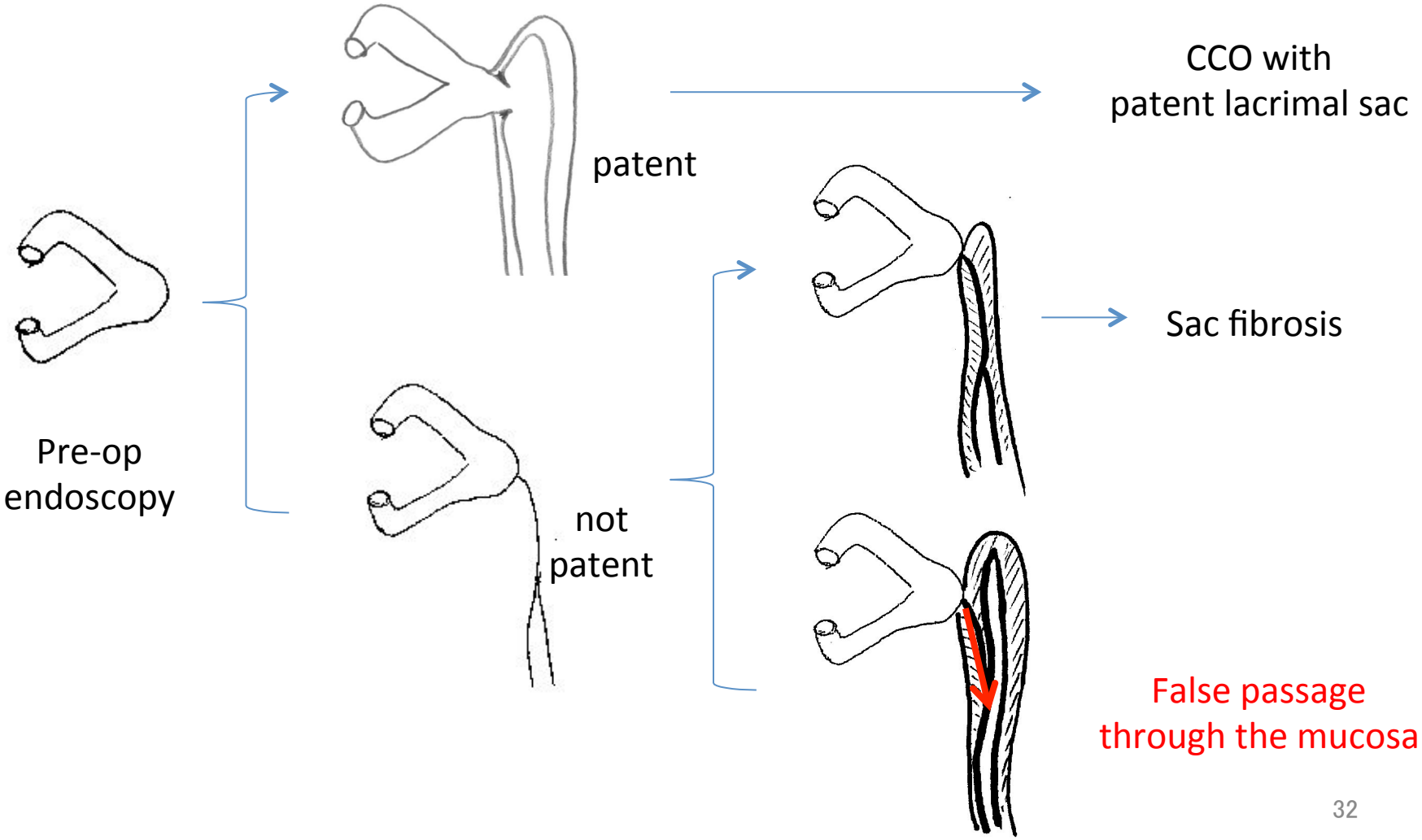
- Start probing toward a dimple on the surface of
  - CCO

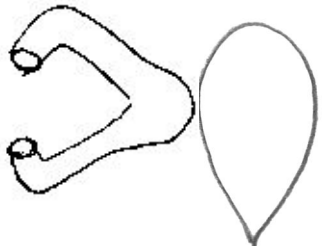
  - NLDO

False Passage in CCO

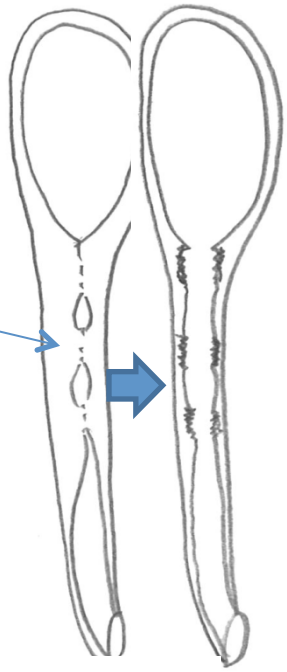


False Passage in NLDO



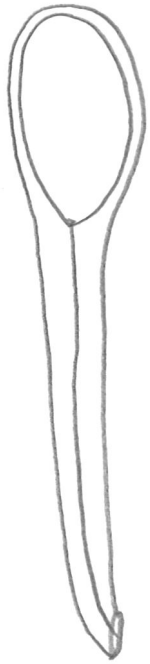
Pre-op endoscopy

Duct lumen remnant (see p.45)

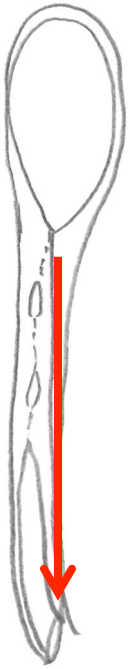


Focal blockage with a duct lumen remnant

No remnant



Generalized blockage



False passage through the mucosa

Ⅵ. SURGERY

Lacrimal Surgeries

- DCRs
- Canaliculoplasty with or w/o a DCR
- CDCR
- Intubation w/o a DCR

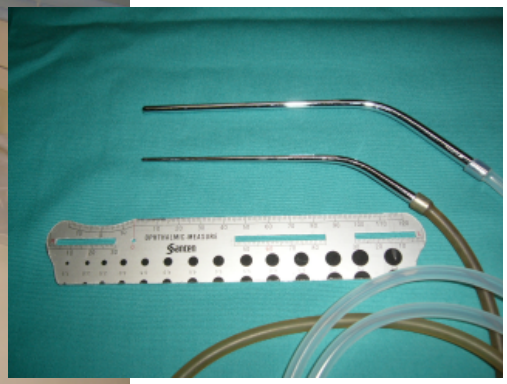
Intubation Techniques

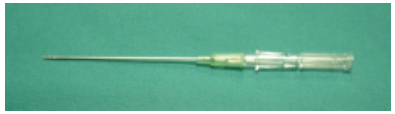
- 1968 Keith
- 1970 Quickert & Dryden
- 1977 Crawford
- 1993 Kurihashi (Direct Silicone Intubation)
- (Unpublished) Sugimoto & Inoue (SEP* & SGI**)

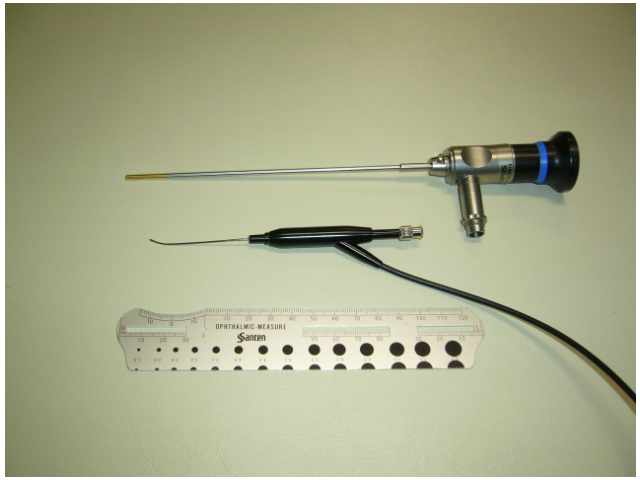
* Sheath-Guided Endoscopic Probing

** Sheath-Guided Intubation

Instrumentation for SEP & SGI







Preparation and Setup

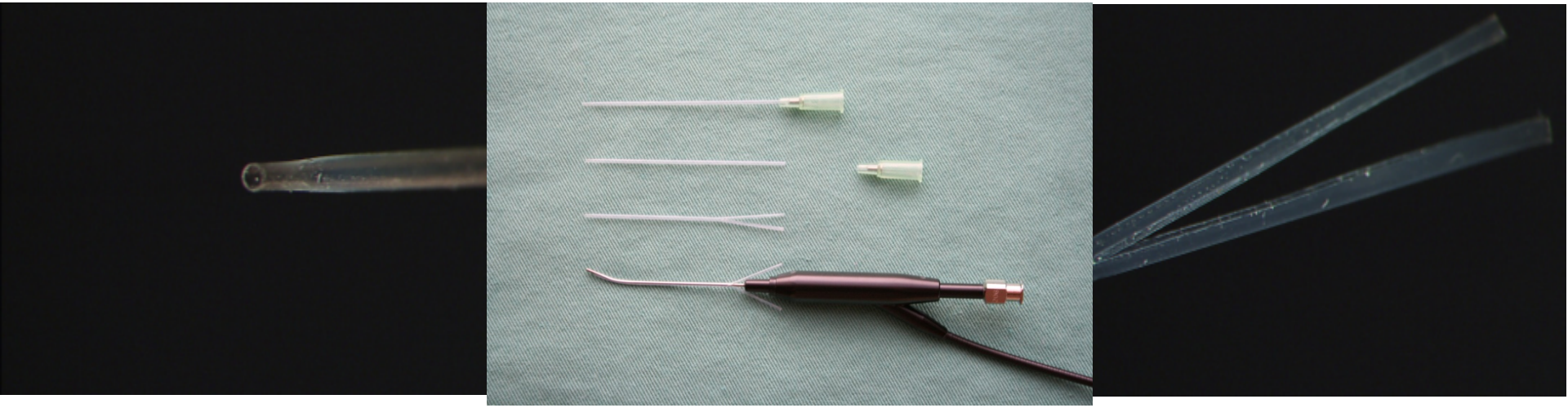
- Endoscopes (see p.19)
- Nasal mucosa decongestion and anesthesia
- Sheath
- Lacrimal passage anesthesia

Nasal Mucosa Decongestion

- Mixed solution of 4% xylocaine and 0.5% oxymedasoline (1:2)
  - Caution: Do not use yellow xylocaine.
- Application
  - Cotton swab
  - Cotton pledgets

Sheath Preparation

- Intravenous indwelling catheter
  - 18G x 2½”(>50mm).



Caution:

The sheath should be longer than 50mm, otherwise it could be lost in the lacrimal passage.

Lacrimal Passage Anesthesia

- Infratrochlear nerve block injection
  - 1% xylocaine 1.0ml
- Canalicular system irrigation
  - 4% xylocaine 0.5ml

Recanalizing Using Sheath (SEP)

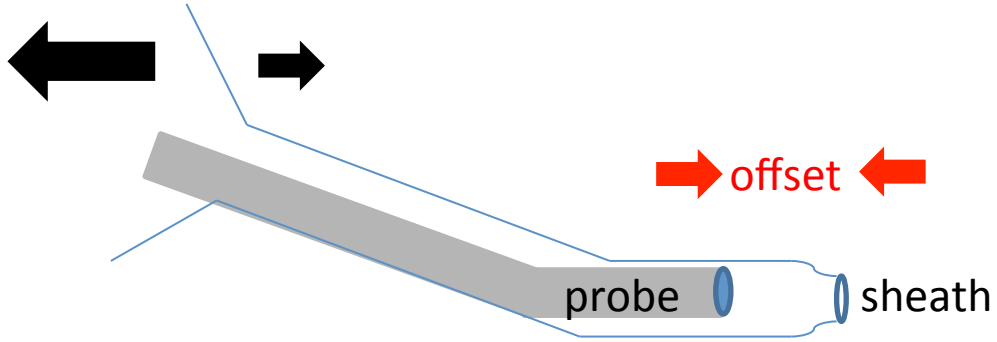
- Use a sheath as a trephine
  - to protect the endoscope tip.
  - to improve the endoscope image while probing.
- Leave the sheath in situ when removing the endoscope after recanalizing.
  - The sheath will be used as a guide to insert a stent.

Caution:

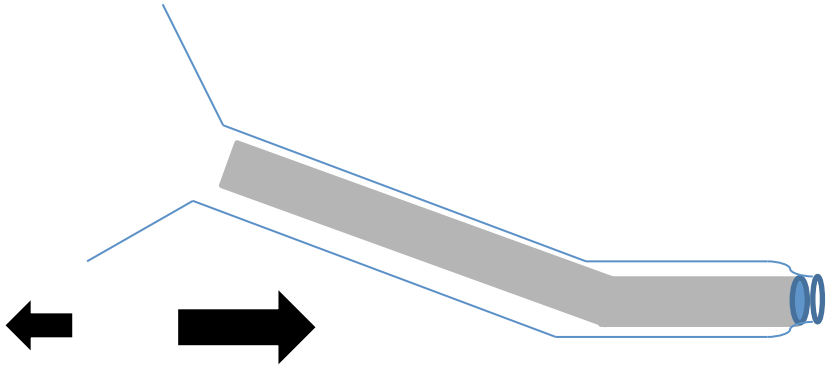
Do not lose the sheath in the lacrimal passage.

A sheath longer than 60mm is unlikely to be lost in the lacrimal passage.
A sheath shorter than 50mm can easily be lost.

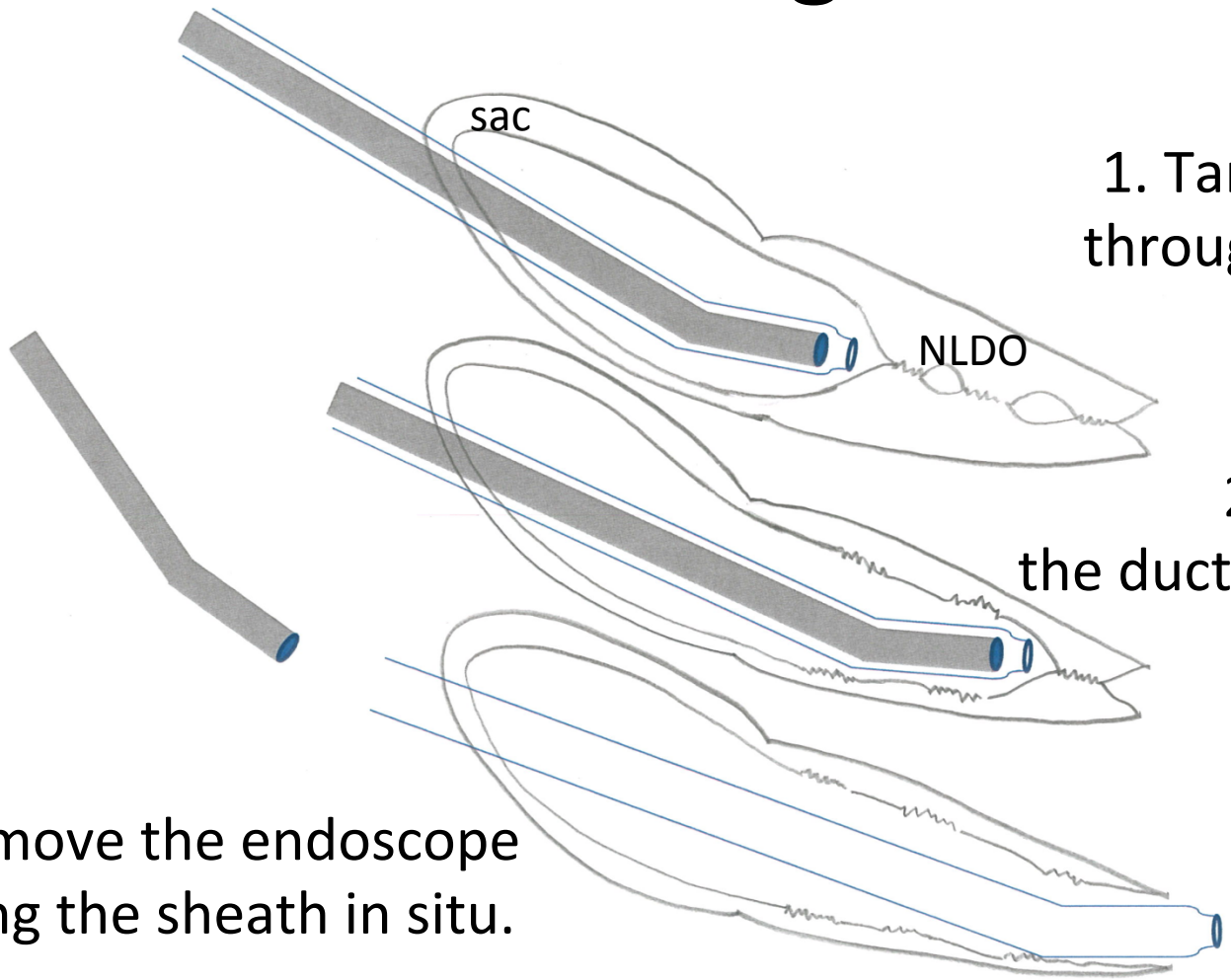
Sheath-Probe Offset



- Adjust and retain an offset between the probe tip and the sheath while performing SEP
  - to keep fibrous tissue away from the lens.
  - roughly 1.0mm is recommended.



SEP Diagram

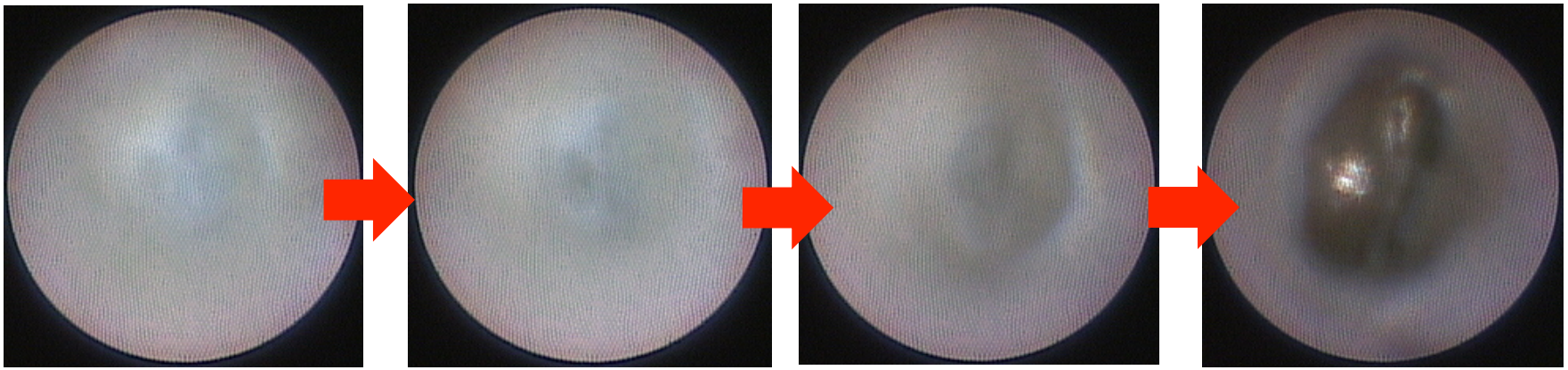


1. Target and push through the dimple.

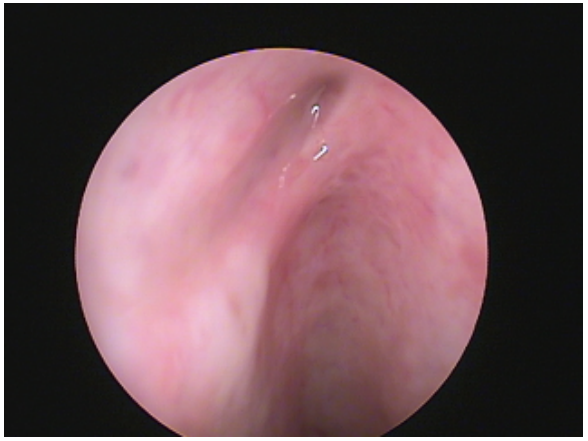
2. Follow the duct lumen remnant.

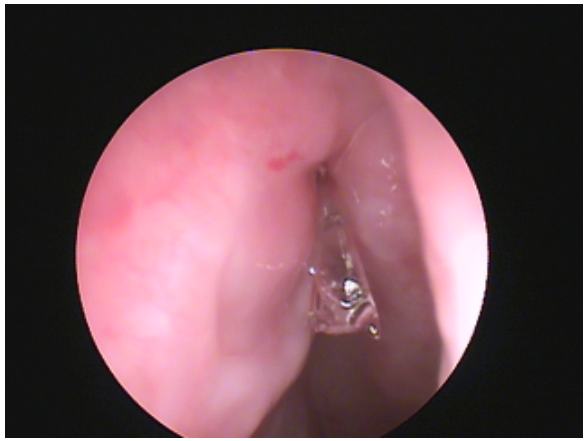
3. Remove the endoscope leaving the sheath in situ.

Following the Duct Lumen Remnant



During SEP

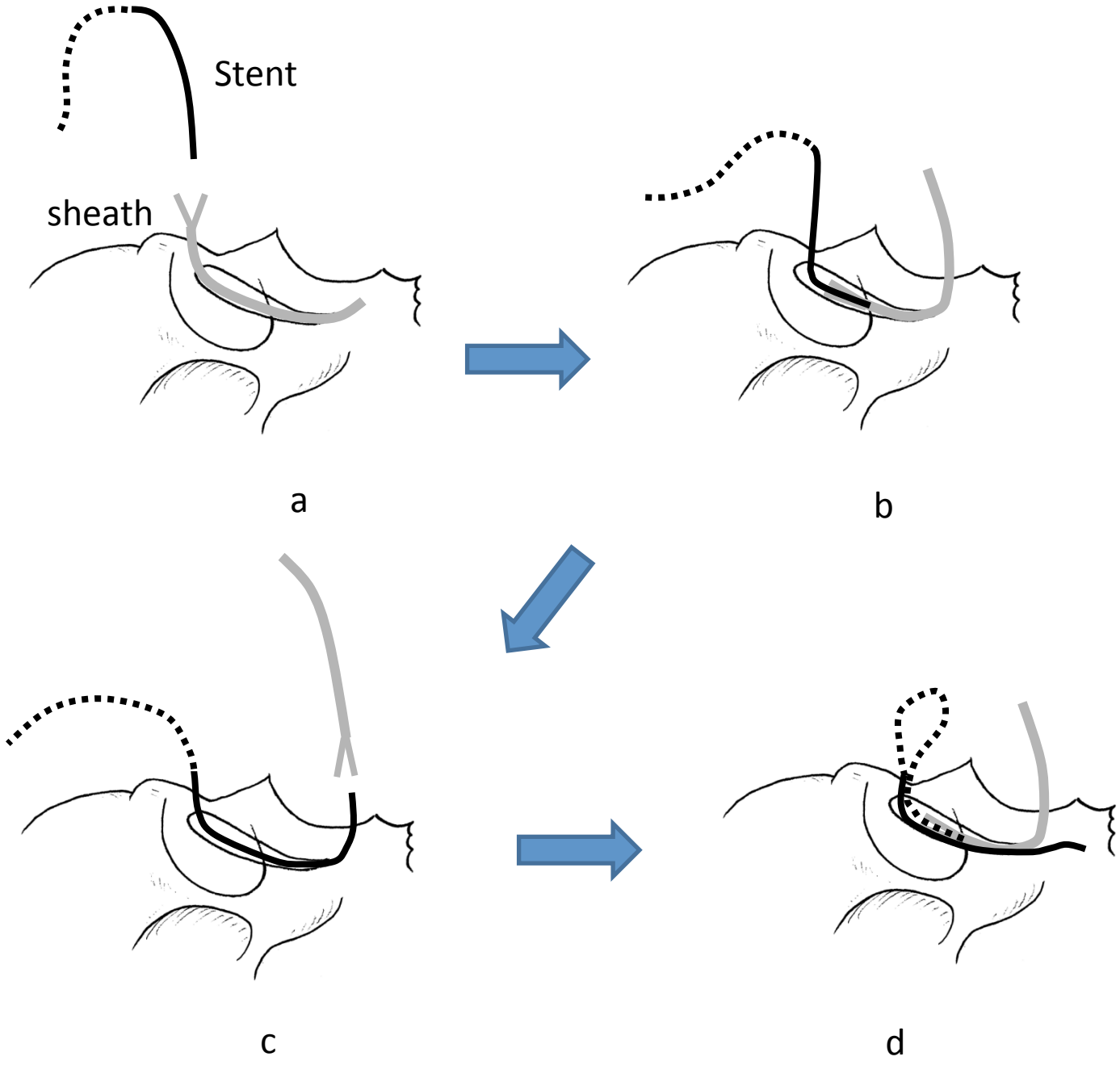




A sheath tip
protruding from the NLD ostium

Surgical Steps in SEP&SGI

- Recanalize the obstruction using a sheath fitted lacrimal endoscope (see p.44-1,2).
- Leave the sheath in situ (see p.44-3).
- Connect a stent to the sheath (a).
- Retrieve the sheath through the nasal cavity using a nasal endoscope, drawing the stent into the recanalized passage (b).
- Remove the sheath, leaving the stent in situ (c).
- Repeat the same steps at the other punctum (d).


Stent
sheath
a
b
c
d

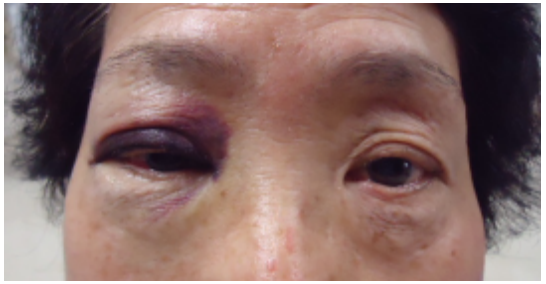
Post-op Care

- Use topical antibiotic and steroid during intubation.
- Repeat irrigation as needed, but usually not necessary.
- Perform lacrimal endoscopy after removing the stent.

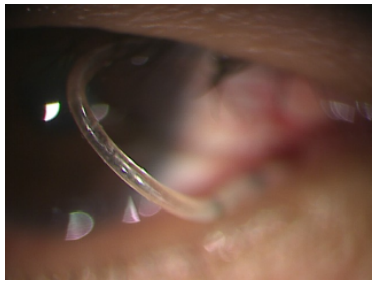
NLDO Post-op
5 years after SEP & SGI

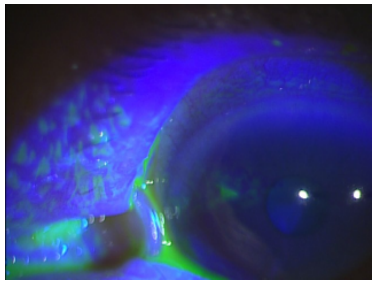
Complications

- Injection related complications
  - Eye lid hemorrhage
  - Transient diplopia



- Sheath related complication
  - Losing sheath in the lacrimal passage
- Stent related complications
  - Extrusion
  - Corneal erosion
  - Granuloma (see p.51)



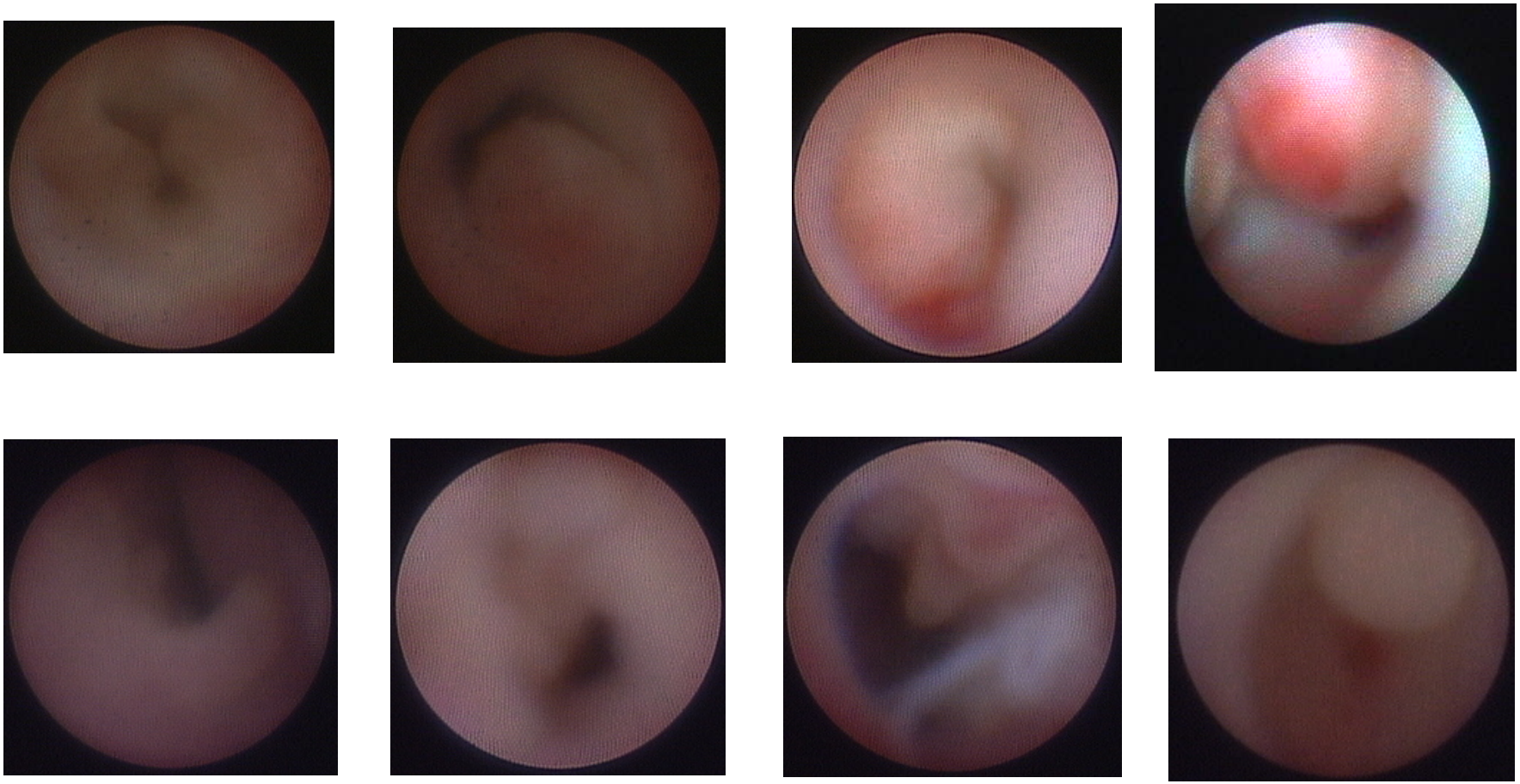


Stent-induced inflammatory reactions in the lacrimal passage during intubation

- More than 30% show granulomatous change mainly in the common canaliculus and sometimes in the sac, despite local corticosteroid administration.
- Reactions disappear after removing the stent.
- Long term intubation has an increased risk of large granuloma which can cause re-stenosis.

Endoscopic findings after removing stent

Granulomatous change



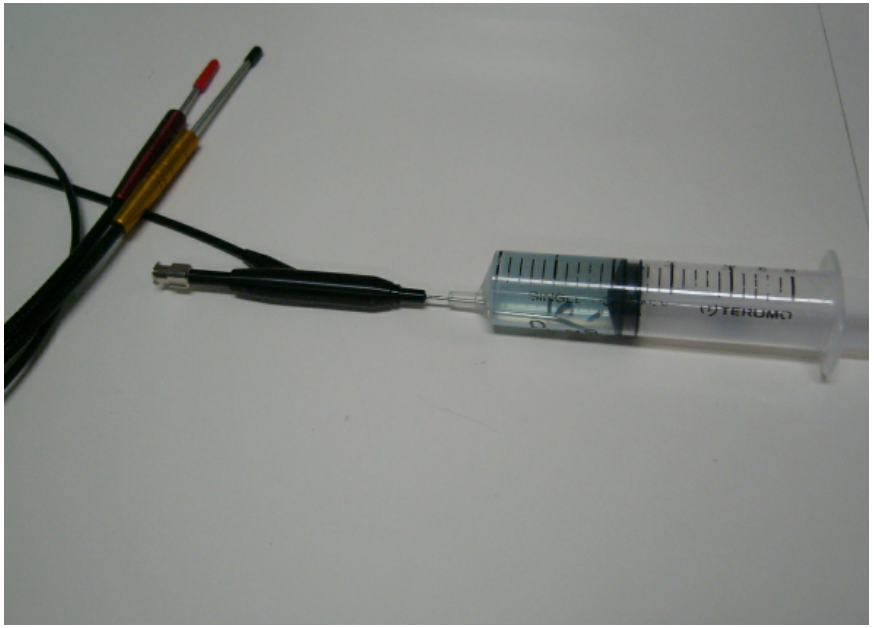
Ⅶ. MAINTENANCE

Lacrimal Endoscope Maintenance

- Wash the handpiece with tap water.
- Flush the irrigation channel using distilled water.
- Aspirate proteolytic enzyme agent solution into the irrigation channel and dip the handpiece in the solution for 5 minutes.
- Rinse off the solution.
- Flush the irrigation channel again using distilled water, followed by absolute ethanol, and finally air.
- Dry and Sterilize the endoscope using EOG gas at 40 degrees Celsius.

Proteolysis Example

Proteolytic enzyme agent



5 minutes

For consecutive endoscope use

- Wash the handpiece with tap water.
- Dip the handpiece in 3% glutaraldehyde.
- Rinse off the glutaraldehyde.
- Perform a blood test before endoscopy.

Caution:

Do not perform endoscopy to a patient with viral hepatitis before a patient w/o the virus.

Ⅷ. INDICATION FOR INTUBATION

Fundamentals

- Intubation w/o a DCR is a good alternative to a DCR for treating epiphora due to thin membranous obstruction in the lacrimal passage.

- Dense obstruction and severe dacryocystitis should be treated using a DCR.

- Neither intubation nor DCR should be considered as a universal solution.

Good Candidates for Intubation

- Canalicular system obstructions
  - Punctal membrane
  - Distal cc membrane

- NLDOs
  - Partial NLDO
  - Early phase NLDO: within 2 years after onset of epiphora
  - Focal blockage NLDO

Ⅸ. DOS AND DON'TS

Top 10 Dos and Don'ts

- Do perform a blood test before endoscopies.
- Do use superior canaliculus for easy probe insertion into the sac.
- Do use your fingers to protect endoscope probe.
- Do consider NLD inclination while examining the NLD.
- Don't attempt to examine the entire lacrimal passage for all patients.

Top 10 Dos and Don’ts

- Don’t use a sheath shorter than 50mm.
- Don’t continue probing if you encounter dense blockage.
- Do probe carefully so you don’t cause a false passage.
- Do lacrimal endoscopy after removing stent.
- Don’t forget that DCR is an option!