



## Nasolacrimal Duct Opening in Inferior Nasal Meatus

### KEYWORDS

Nasolacrimal duct opening, Inferior Nasal Meatus, Nasal cavity, Nasolacrimal duct.

#### \* Dr. S.B. Mane

Professor, Department of Anatomy, Krishna Institute of Medical Sciences University, Karad, Dist. Satara, Maharashtra, India.  
\* Corresponding author

#### Mr. S.V. Kakde

Statistian, , Department of PSM, Krishna Institute of Medical Sciences University, Karad, Dist. Satara, Maharashtra, India.

#### Dr. M.P. Ambali

Professor, Department of Anatomy, Krishna Institute of Medical Sciences University, Karad, Dist. Satara, Maharashtra, India.

#### Dr. Mrs. M.A. Doshi

Professor & HOD, Department of Anatomy, Krishna Institute of Medical Sciences University, Karad, Dist. Satara, Maharashtra, India.

#### Dr. R.J. Patil

Professor, Department of Anatomy, Krishna Institute of Medical Sciences University, Karad, Dist. Satara, Maharashtra, India.

**ABSTRACT** **Introduction:** Nasolacrimal duct starts from lacrimal sac and opens into the inferior meatus of the nasal cavity. It's opening in inferior meatus is hidden by inferior nasal concha. So to find out, where exactly is the opening, this study was undertaken.

**Methods :** Study was carried out on the cadaveric specimens in Krishna institute of medical sciences, Karad. Total 45 (forty five) specimens were studied. Out of that, 24 (twenty four) were from Left side, and 21 (twenty one) were from Right side. Measurements were taken by using Sliding Vernier Caliper of 30 cm length and having 0.01mm accuracy. Distance of nasolacrimal duct opening from Anterior and Posterior ends of hard palate was measured. Site and Shape of opening was noted. Diameter of opening was measured.

**Results:.** Average distance of Nasolacrimal duct opening from Anterior end of Hard palate on Right side was 2.33 cms & on Left side was 2.23 cms. Average distance of Nasolacrimal duct opening from Posterior end of Hard palate on Right side was 2.65 cms & on Left side was 2.93 cms. Average diameter of Nasolacrimal duct opening on Right side was 0.57 cms & on Left side was 0.60 cms. Distance from Post. End of Hard Palate of nasolacrimal duct opening, as compared to right & left side, was statistically significant ( $p=0.0484$ ). Most common shape of Nasolacrimal duct opening was Oval (67%).

**Discussion:** This study will basically help to Anatomists, to know where exactly is the opening of nasolacrimal duct in inferior nasal meatus. And secondarily it may be helpful to Oto-Rhinologists, when doing surgeries on Nasolacrimal duct.

### Introduction:

Tear fluid secreted by the lacrimal gland enters the conjunctival sac at its superolateral angle and, under the influence of capillarity aided by blinking movements of the eyelids, is carried across the sac to the lacus lacrimalis mainly along the groove between the lower lid margin and the eyeball. From the lacus it passes into the lacrimal canaliculi. Contraction of the orbicularis oculi tends to press the puncta lacrimalia more firmly into the lacus, and capillary attraction serves to draw the lacrimal secretion into the lacrimal sac. Lacrimal sac is the upper blind end of the nasolacrimal duct. The nasolacrimal duct is a membranous canal about 18mm long, which extends from the lower part of the lacrimal sac to the anterior part of the inferior meatus of the nose.<sup>1</sup>

Thus the Nasolacrimal duct drains the fluid from Lacrimal sac to the Inferior meatus of the Nasal cavity.

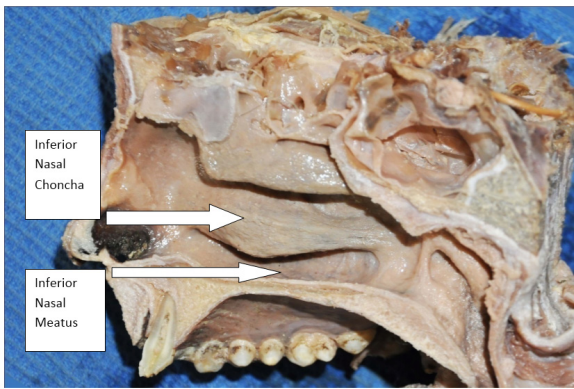
There are incidences of nasolacrimal injury.<sup>2</sup> There are cases of congenital nasolacrimal duct obstruction.<sup>3</sup> So there is need to note the patency of nasolacrimal duct opening. The Nasal cavity is divided into right and left halves by the nasal septum. Each half of the nasal cavity can be described as having a floor, a roof, a medial wall and a lateral wall. The lateral wall of the the

nasal cavity is marked by three elevations, the superior, middle and inferior nasal conchae. And, below and lateral to each concha is the corresponding nasal passage or meatus. The Inferior nasal meatus is below and lateral to the inferior nasal concha; the nasolacrimal duct opens into this meatus under cover of the anterior part of the inferior concha.<sup>4</sup>

The entire nasolacrimal apparatus viz. canaliculi, lacrimal sac, and nasolacrimal duct develop contemporaneously.<sup>5</sup> At 3 months' development, canalization of the nasolacrimal apparatus is purported to occur in a segmental manner. The final section of the nasolacrimal duct to become patent is the opening into the inferior meatus of the nose.

As nowadays more endoscopic sinus surgeries are happening,<sup>6</sup> the detail knowledge of the nasolacrimal duct is needed.

Inferior Nasal Meatus is situated below the Inferior Nasal Concha of the Nasal cavity and above the Hard palate. Inferior Nasal Concha hides the Opening of the Nasolacrimal duct. (Figure-1).



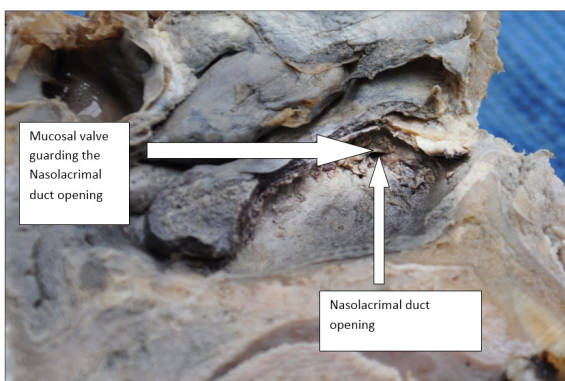
**Figure-1: Photograph of Lateral wall of Nasal cavity**

So, this study was undertaken to find out, where is the opening of the Nasolacrimal duct into the Inferior Nasal Meatus. Aim of this study was to Note the opening of Nasolacrimal duct, to Study the Shape of the opening, to Measure distance of opening from Ante. & Post. End of Hard palate and to Find difference between Right & Left side.

**Materials and Methods:**

This study was carried out on the cadaveric specimens in Krishna institute of medical sciences, Karad, Maharashtra, India.

Total 45 (forty five) specimens were studied. Out of that, 24 (twenty four) were from Left side, and 21 (twenty one) were from Right side. Formalin preserved cadaveric specimens were taken. Then they were first washed. Then by using Dissection instruments, Lateral wall of the Nasal cavity was nicely exposed. Inferior nasal concha is properly dissected, so as to expose the opening of the Nasolacrimal duct. Mucosal valve covering the opening of nasolacrimal duct was noted. (Figure-2)



**Figure-2: Photograph of Mucosal valve covering nasolacrimal duct opening.**

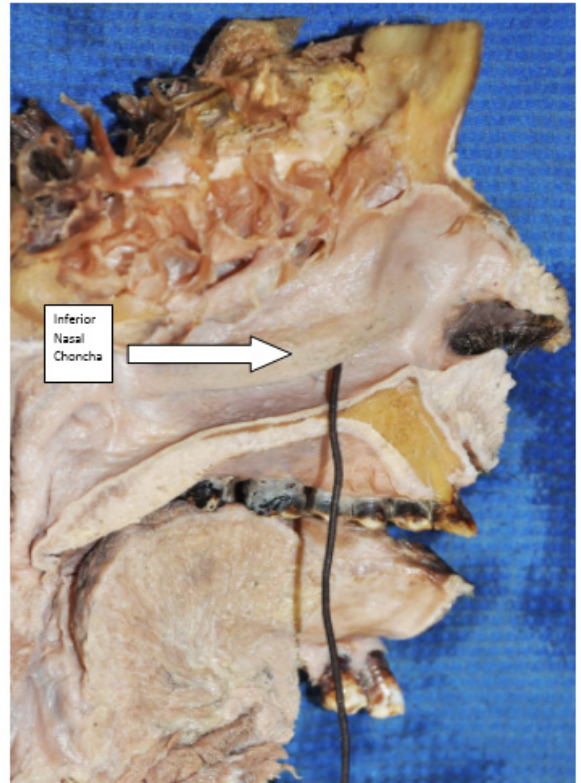
Site and Shape of opening was noted. Diameter of opening was measured.

Distance of nasolacrimal duct opening from Anterior end of hard palate was measured.

Distance of nasolacrimal duct opening from Posterior end of hard palate was also measured. Probe is inserted into

the nasolacrimal duct opening to know where is the opening; when Inferior nasal concha is still intact. (Figure-3) Then inferior nasal concha was dissected and the probe is inserted into the nasolacrimal duct opening. (Figure-4)

All measurements were taken by using Sliding Vernier Caliper of 30 cm length and having 0.01mm accuracy. Comparison of the study variables was done by applying Unpaired 't' test.



**Figure-3: Photograph showing Probe in the nasolacrimal duct opening, (Inferior nasal concha is intact)**



**Figure-4: Photograph of Probe into the nasolacrimal duct opening.**

Statistical analysis: Quantitative data was summarized into minimum, maximum, mean and Standard Deviation; while Qualitative data was summarized into number & percentages. Comparison of quantitative data was done by applying unpaired 't' test while chi-square test was used for qualitative data comparison. Correlation coefficient was determined by using Pearson's correlation method. Differ-

ence and Correlation was said to be significant if p was less than 0.05

#### Results:

Distance of Nasolacrimal duct opening from Anterior end of Hard palate was not significantly differing in right and left side ( $t=0.510$ ,  $p=0.6128$ ) (Table-1).

**Table-1: Side wise descriptive statistics of Distance of nasolacrimal duct opening (in cms) from Anterior end of Hard Palate**

	Right side	Left side
Minimum	1.07	0.73
Maximum	3.45	3.01
Mean	2.33	2.23
Standard Deviation	0.60	0.61

However, Distance of Nasolacrimal duct opening from Posterior end of Hard palate was significantly differing in right side ( $t=2.031$ ,  $p=0.0484$ ) (Table-2).

**Table-2: Side wise descriptive statistics of Distance of nasolacrimal duct opening (in cms) from Posterior end of Hard Palate**

	Right side	Left side
Minimum	1.67	2.23
Maximum	3.31	3.66
Mean	2.65	2.93
Standard Deviation	0.42	0.48

While diameter of nasolacrimal duct opening was not differing significantly in right & left side ( $t=0.634$ ,  $p=0.5297$ )

Correlation between Distance of nasolacrimal duct opening from Anterior end of Hard palate with Distance from Posterior end of Hard palate & Diameter of nasolacrimal duct opening in left side was not significant.

Similarly in right side correlation between Distance of nasolacrimal duct opening from Anterior end of Hard palate & Distance from posterior end of Hard palate was not significant,

But correlation between Distance of nasolacrimal duct opening from Anterior end of Hard palate & Diameter of nasolacrimal duct opening was significant. (Table-3)

**Table-3: Magnitude of correlation(r) between Right side study parameters**

	Dist. Posterior end	Diameter
Dist. Anterior end	-0.258 ( $p=0.259$ )	0.560 ( $p=0.008$ )

**Table-4: Shape of opening of nasolacrimal duct in Inferior nasal meatus.**

Shape of Opening of Nasolacrimal duct	Right side	Left side
Oval	15 (71.4%)	15 (62.5%)

Circular	0 (0%)	3 (12.5%)
Slit-like	6 (28.5%)	5 (20.8%)
Crescentic	0 (0%)	1 (4.1%)

There was no significant difference in the proportion of various shape of opening of nasolacrimal duct in right & left side ( $\chi^2=0.1004$ ,  $p=0.7513$ ). However, Oval shape was found in majority of cases.

In Present study the site of opening of Nasolacrimal duct in all cases was in the Anterior 1/3 of the Inferior Nasal Meatus

#### Discussion:

Nasolacrimal duct starts from lacrimal sac and opens into inferior meatus of the nasal cavity. According to Halis et al<sup>7</sup>, Opening of Nasolacrimal duct was in Anterior part of inferior nasal meatus. Paulsen<sup>8</sup> also says, „Nasolacrimal duct opens into Anterior part of inferior meatus of Nose. According to Gray's Anatomy<sup>4</sup>, „Nasolacrimal duct opens into inferior nasal meatus under cover of anterior part of inferior concha. George<sup>9</sup> states that „Opening of Nasolacrimal duct was Anteriorly. Our study correlates with all these workers.

In our study we observed, the distance from the anterior end of the hard palate to the nasolacrimal duct opening on Right side was 2.33 cms & on Left side was 2.23 cms. While the study conducted by Vrinda Hari Ankolelar et al<sup>14</sup> the distance from anterior nasal spine to nasolacrimal duct opening was 2.73cms on Right side & 2.4cm on Left side. This seems quite high; that may be due to study conducted in different zone of India. As study conducted by Tatlisumak et al<sup>12</sup> the distance from anterior nasal spine to nasolacrimal duct opening was 2.5cms; as well as study conducted by Kim YH et al<sup>15</sup> the distance from anterior nasal spine to nasolacrimal duct opening was 2.28cms, these values are close to the present study. According to Halis et al<sup>7</sup> the distance from anterior nasal spine to nasolacrimal duct opening was 2.3cms, which is similar to present study.

Regarding the shape of the opening of nasolacrimal duct into the inferior nasal meatus; Yanagisawa et al<sup>10</sup> observed that, Shape of opening varies considerably, from round to slit like. According to Orphan et al<sup>11</sup> Shape of opening was most commonly(70%) a vertical sulcus. According to Tatlisumak et al<sup>12</sup>, Shape of nasolacrimal duct opening has common three types: Pin-point, Triangular, & Slit like. Elshaarawy EA<sup>13</sup> found shape of the nasolacrimal duct opening was variable; either it was in the form of sulcus or in the form of fissure. According to Vrinda Hari Ankolelar et al<sup>14</sup> the commonest shape of the nasolacrimal duct opening was slit which was found in 76% of cases followed by oval (20%) and round(4%). Our study shows: Shape of Nasolacrimal duct opening in inferior nasal meatus was – Oval(67%), Slitlike(24.4), Circular(6.6%), & Crescentic(2.2%). Such a variability in shapes of opening of nasolacrimal duct might be due to studies done at different regions of the world. Tatlisumak et al<sup>12</sup> got slit-like openings of nasolacrimal duct in 40% of cases; While in present study, we got slit-like openings of nasolacrimal duct in 24.4%. This indicates that, even at such a low diameter, the nasolacrimal duct is equally patent.

**Conclusion:**

Nasolacrimal duct opening is in the Anterior part of Inferior nasal meatus.

Most common shape of opening of nasolacrimal duct is Oval.

Average diameter of Nasolacrimal duct opening on Right side is 0.57cm, while on Left side it is 0.60cm.

This study will basically help to Anatomists, to know where exactly is the opening of nasolacrimal duct in Inferior nasal meatus. And secondarily it may be helpful to Oto-Rhinologists, when doing surgeries on Nasolacrimal duct.

**Conflicts of interest:**

The authors have none to declare.

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