ANTHROPOMETRIC STUDY OF THE NASOLACRIMAL SYSTEM FROM AN ENDOSCOPIST'S PERSPECTIVE: A CADAVERIC STUDY

Manish Munjal *, Amanjot Kaur, Hitant Vohra, Shubham Munjal.

Faculty of Otorhinolaryngology and Anatomy, Dayanand Medical College Ludhiana, Punjab, India.

ABSTRACT

Anthropometric study of 10 sagittal head sections in the Indian subjects was undertaken to provide the endoscopist embarking upon trans nasal endoscopic dacryocystorhinostomy in our institution, 41.20 ± 4.96 mm distance was measured between the nasolacrimal sac and the anterior nasal spine, 10.20 mm ± 2.89 mm between intranasal orifice of the nasolacrimal duct and the anterior attachment of the inferior turbinate. The length of the nasolacrimal duct was 21.75 ± 2.37 mm. Distance between the nasolacrimal duct and the maxillary sinus ostium was 4.15 mm ± 0.85 mm and between anterior nasal spine and axilla of the middle turbinate 46.6 ± 2.27 mm.

KEYWORDS: Nasolacrimal duct, Anterior nasal spine, Axilla of middle turbinate.

Corresponding Author: Prof. Dr. Manish Munjal, Faculty of Otorhinolaryngology and Anatomy, Dayanand Medical College Ludhiana, Punjab, India. **E-mail:** manishmunjal30@gmail.com

Access this Article online	Journal Information
Quick Response code DOI: 10.16965/ijar.2020.151	International Journal of Anatomy and Research RG Journal Impact: 0.21* ISSN (E) 2321-4287 ISSN (P) 2321-8967 https://www.ijmhr.org/ijar.htm DOI-Prefix: https://dx.doi.org/10.16965/ijar
	Article Information
	Received: 24 Mar 2020 Peer Review: 25 Mar 2020 Revised: None
	Accepted: 20 Apr 2020 Published (O): 05 May 2020 Published (P): 05 May 2020

INTRODUCTION

The naso-lacrimal duct is obstructed in a patient of epiphora, necessitating an endoscopic intra nasal intervention to elevate its bony covering i.e. the lacrimal bone and the lacrimal process of the inferior turbinate. Thereby the naso lacrimal duct inferiorly and the lacrimal sac superiorly is exposed in its entire extent. An intranasal procedure to circumvent the obstruction is performed. Whereby the lacrimal sac and the duct is opened inside the nasal cavity, proximal to the obstruction. This is the endoscopic dacryo-cysto-rhinostomy (Endodcr) which requires a precise knowledge of the bony landmarks and point to point measurements, to access the nasolacrimal system underneath. Callibrated metallic nasal suctions are utilized to measure the distance from the anterior nasal spine and guide the surgeon in the operative field lest he might inadvertently enter the

orbit laterally or the anterior cranial fossa superiorly.

MATERIALS AND METHODS

A cadaveric dissection of the naso-lacrimal system in 10 formalin preserved sagittal sections of the head was carried out. The research project was completed in a period of one year, i.e. June 2017 to June 2018, in the Anatomy dissection hall of Dayanand Medical College and hospital, Ludhiana, Punjab.

The orifice of the naso-lacrimal duct was cannulated with callibrated lacrimal probes. Under endoscopic visualization. To assess its approximate length. The mucosa over the lateral nasal wall was dissected off and reflected posteriorly and the landmarks studied along with the location of the lacrimal sac. The lacrimal bone was lifted off with a sharp Freer's elevator to expose the lacrimal sac. The position

of the lacrimal sac was confirmed by cannulating the inferior canaliculus

The following parameters were measured:

- A) Distance between nasolacrimal sac and the anterior nasal spine (A-B)
- B) Distance of the intranasal orifice of the nasolacrimal duct from the anterior attachment of the inferior turbinate (C-D)
- C) The length of the naso -lacrimal duct(E-F)
- D) Distance between the naso -lacrimal duct and the maxillary sinus ostium (G-H)
- E) Distance between anterior nasal spine and axilla of the middle turbinate(I-J)

All measurements were done with a calibrated scale or a notched metallic suction tube as the case maybe.

RESULTS

Table 1:Distance of Nasolacrimal Sac from the Anterior Nasal Spine (ANS)(A-B)(n=10).

Serial number of cadavers	Distance of nasolacrimal sac from anterior nasal spine (mm)
1	34
2	44
3	49
4	47
5	38
6	38
7	36
8	39
9	42
10	45
Mean /standard deviation	41.20 ±4.96

n: number of saggittal heads dissected

The mean distance of nasolacrimal sac from anterior nasal spine was 41.20mm with standard deviation of ±4.96mm, in freshly preserved cadavers.

Fig. 1:Distance of the nasolacrimal sac from theanterior nasal spine (A-B)

Table 2:Length of nasolacrimal duct (NLD)(E-F)(n=10).

Serial number of cadavers	Length of nasolacrimal duct (mm)
1	21
2	23
3	24.5
4	18
5	22
6	19
7	20
8	24
9	25
10	21
Mean/ standard deviation	21.75 ±2.37

n: number of saggittal heads dissected

The average length of nasolacrimal duct in our cadaveric study was 21.75mm with standard deviation of ± 2.37mm.

Fig. 2:Length of nasolacrimal duct(NLD)(E-F)

Table 3:Distance between nasolacrimal duct (NLD) and the maxillary sinus ostium (MO)(G-H) (n=10).

Serial number of cadavers	Distance between the nasolacrimal duct and maxillary sinus ostium (mm)
1	4
2	3.5
3	4
4	5
5	3
6	4.5
7	5.5
8	3
9	5
10	4
Mean/ standard deviation	4.15 ±0.85

n: number of sagittal heads dissected

The mean distance between the nasolacrimal duct and the maxillary sinus ostium was 4.15mm with standard deviation of ± 0.85 mm

Fig. 3:Distance between the nasolacrimal duct and maxillary sinus ostia(G-H).

Table 4: Distance between middle turbinate axilla and anterior nasal spine(ANS)(I-J) (n=10).

Serial number of cadavers	Distance between middle turbinate axilla and anterior nasal spine (mm)
1	45
2	51
3	44
4	47
5	45
6	46
7	47
8	50
9	45
10	46
Mean/ standard deviation	46.6 ±2.27

n: number of sagittal heads dissected

The mean distance between the middle turbinate axilla and the anterior nasal spine was 46.6 mm with a standard deviation of ± 2.27 mm

Fig. 5:Distance between middle turbinate axilla and anterior nasal spine(ANS) (I-J)

DISCUSSION

A precise knowhow of the position of the nasolacrimal system on the lateral wall of the nose is essential for a successful endonasal endoscopic dacryocystorhinostomy Kurihashi et al 1991 [1]; Unlu et al 2000 [2].

There are number of land marks that can be used to locate the nasolacrimal duct on the lateral nasal wall. The distance between the anterior nasal spine and anterior attachment of inferior turbinate can be used to estimate the position of nasolacrimal duct at the beginning of the endoscopic dacryocystorhinostomy. The intranasal orifice of nasolacrimal duct is located approximately 15 mm from the anterior attachment of inferior turbinate. Ascending with an inclination the duct traverses superior and anteriorly to the anterior attachment of the middle turbinate. This topographic intranasal anatomy dictates the osteotomies performed during endonasal dacryocystorhinostomy as well as during rhinoplasty to avoid a potential risk of iatrogenic trauma. Unlu et al. 1996 [3]; Yigit et al. 2004 [4].

In the present study by DMC, the mean distance between the nasolacrimal sac and anterior nasal spine was 41.20 ± 4.96 mm. In a study on Turkish cadavers by Ertugrul T. et al 2009 [5], the distance between naso-lacrimal sac and anterior nasal spine was 24.6 ± 3.56 mm.

However, the Iranian study by Seyyed MH et al 2014 [6], reported the mean distance to be 39.04 ± 4.92 mm. This can be due to anatomical difference between the various ethnic groups.

The distance between intranasal opening of the nasolacrimal duct and anterior attachment of inferior turbinate was in our study 10.20 mm with standard deviation of ± 2.89 mm. Ertugrul T. et al 2009 [5] found the mean distance to be 14.3 ± 2.05 mm.

The length of nasolacrimal duct was found to be 21.75 mm with standard deviation of ± 2.37 mm in our study. Ertugrul T. et al 2009 [5] found the mean length of naso-lacrimal duct to be 21.9 ± 2.03 mm in their study on 15 cadaveric half heads.

Uncinate process and maxillary sinus ostium are also important landmarks to determine the

location of nasolacrimal duct. The uncinate process is attached just posterior to the nasolacrimal duct which is 4mm anterior to the maxillary sinus ostium. There is 0.3-1.7% risk of injury to nasolacrimal duct during endoscopic sinus surgery Kennedy et al 1987 [7]; Serdahl et al 1990 [8]; Bolger et al 1992 [9]. In our study the distance between the nasolacrimal duct and maxillary sinus ostium was found to be 4.15mm with standard deviation of ± 0.85 mm in the study by Ertugrul et al 2009 [5] the mean distance was found to be 3.9 ± 0.88 mm.

In our study the distance between the anterior nasal spine and middle turbinate axilla was found to be 46.6 ± 2.27 mm. Ameen A. et al 2017 [10] found the mean distance to be 47.4 ± 3.0 mm

CONCLUSION

Distance between nasolacrimal sac and the anterior nasal spine was found to be 41.20 ± 4.96 mm and the Distance of intranasal orifice of the nasolacrimal duct from the anterior attachment of the inferior turbinate was $10.20 \text{ mm} \pm 2.89$ mm. The length of the nasolacrimal duct was 21.75 ± 2.37 mm. Distance between the nasolacrimal duct and the maxillary sinus ostium was $4.15 \text{ mm} \pm 0.85$ mm. Distance between anterior nasal spine and axilla of the middle turbinate was 46.6 ± 2.27 mm

ABBREVIATIONS

ANS -Anterior nasal spine

NLD - Nasolacrimal duct

MO -Maxillary ostium

Conflicts of Interests: None

REFERENCES

- [1]. Kurihashi K, Imada M, Yamashita A. Anatomical analysis of the human lacrimal drainage pathway under operating microscope. *Int Ophthalmol*. 1991;15:411–6.
- [2]. Unlu HH, Ozturk F, Mutlu C, Ilker SS, Tarhan S. Endoscopic dacryocystorhinostomy without stents. *Auris Nasus Larynx*. 2000;27:65–71.
- [3]. Unlu HH, Caylan R, Kutlu N, Imamoglu M, Unal M, Yuceturk AV. Active transport dacryocystography in evaluating lacrimal drainage system after rhinoplasty. *Am J Rhinol*. 1996;10:87–91.
- [4]. Yigit O, Cinar U, Coskun BU, Akgul G, Celik D, Celebi I, et al. The evaluation of the effects of lateral osteotomies on the lateral drainage system after rhinoplasty using active transport dacryocystography. *Rhinology*. 2004;42:19–22.
- [5]. Tatlisumak E, Aslan A, Cömert A, Ozlugedik S, Acar HI, Tekdemir I. Surgical anatomy of the nasolacrimal duct on the lateral nasal wall as revealed by serial dissections. *Anatomical Science International*. 2009;85:8–12.
- [6]. Hashemi SM, Berjis N, Eshaghian A, Nejadnic M, Fereidani Samani A. Applied Endoscopic Anatomical Evaluation of the Lacrimal Sac. *Iran J Otorhinolaryngol*. 2015;27:213–7.
- [7]. Kennedy DW, Zinreich SJ, Kuhn F. Endoscopic middle meatal antrostomy: theory, technique, and patency. *Laryngoscope*. 1987;97:1–9.
- [8]. Serdahl CL, Berris CE, Chole RA. Nasolacrimal duct obstruction after endoscopic sinus surgery. *Arch Ophthalmol*. 1990;108:391–2.
- [9]. Bolger WE, Parsons DS, Mair EA. Lacrimal drainage system injury in functional endoscopic sinus surgery. *Arch Otolaryngol Head Neck Surg*. 1992;118:1179–84.
- [10]. Alherabi A, Marglani O, Herzallah I, Shaibah H, Alaidarous T, Alkaff H, et al. Endoscopic anatomy of the lacrimal sac for dacryocystorhinostomy: A cadaveric study. *Saudi Med J*. 2017;38:245–50.

How to cite this article:

Manish Munjal, Amanjot Kaur, Hitant Vohra, Shubham Munjal. ANTHROPOMETRIC STUDY OF THE NASOLACRIMAL SYSTEM FROM AN ENDOSCOPIST'S PERSPECTIVE: A CADAVERIC STUDY. *Int J Anat Res* 2020;8(2.2):7526-7530. DOI: 10.16965/ijar.2020.151