

UDC 611.846.4.013

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TOPOGRAPHIC AND ANATOMICAL FEATURES OF NASOLACRIMAL DUCT

Abstract. *The study was performed on 42 specimens of nasal area of people of various ages and series of histological sections. The formation and syntopy features of the nasolacrimal duct with the adjacent structures has been studied. It has been found out that the anlage and formation of the nasolacrimal duct begins in embryo of 12.0-14.0 mm parietal-coccygeal length, the shape and topographic location of the nasal duct orifice changes with age.*

Keywords: *nasolacrimal duct, human, ontogenesis, anatomy.*

Morphological studies of nasolacrimal duct are aimed at the disclosure of mechanisms and pathogenesis of diseases and the search for effective treatments. The study of the formation and morphology of nasolacrimal duct is of great practical value, because there are variations of its structure and defects that require treatment and surgical correction [1].

According to the World Health Organization, today there are more than 160 million people with serious visual impairment in the world. In most cases the visual impairment begin in childhood and is the result of congenitally-hereditary diseases, including the ones caused by complications of the prenatal period, fetal disorders or hereditary factors [2]. Dacryocystitis of newborns (congenital malformation of lacrimal paths) is a consequence of underdevelopment of lacrimal paths or delays in reverse development of gelatinous membrane that covers the hole of nasolacrimal duct during the prenatal period. About 35% of newborns are born with this membrane and if it is not pushed at the first respiratory movements the dacryocystitis of newborns appears. Also the nasolacrimal canal patency can be affected at the presence of multiple folds, diverticula, thickening of mucosa in the inferior turbinate, lacrimal ducts

strictures, due to irregular teeth anlage, at low altitude of nasal cavity, at the face damage during the childbirth with forceps and at hereditary predisposition to the disease [3,4]. From 5 to 10% of children are born with an inability of the lacrimal paths [5]. Despite the apparent simplicity of treatment frequency of relapses and complications according to different authors varies from 12 to 26% [6,7].

Now there is a need for a detailed study of the anatomical variability in the normal range in order at the presence of individual anatomical structure features or location of the organ surgeons can be based no longer on intuition but on scientific data [4, 7, 8].

Objective: to study the formation and topographic and anatomical interrelations of nasolacrimal duct with the adjacent structures during human ontogenesis.

Materials and methods. The formation and syntopy of nasolacrimal duct has been studied on 42 specimens of corpses of people of various ages and series of histological sections. The study was performed on corpses of people who died from causes unrelated to the ENT disorders in strict accordance with the Helsinki Declaration of the World Medical Association "Ethical Principles for Medical Research Involving Human Subjects" (1964-2000). The

study of the nasolacrimal duct was carried out in Chernivtsi regional forensic medical bureau and M.H. Turkevych department of human anatomy of SHEI of Ukraine "Bukovinian State Medical University". The side walls of the nose and formations adjacent to them were dissected consistently with surgical instruments, starting from their posterior.

Results and discussion. In embryos of 8.0-10.0 mm parietal-coccygeal length (PCL) in the area of the face the lateral nasal and maxillary processes limit the nasolacrimal groove that connects the beginnings of the eye and nasal chambers. The ectoderm lining the groove is thickened and deepened in the subjacent undifferentiated mesenchyme. In embryos of 12.0-14.0 mm PCL the lateral nasal processes are partly connected to the maxillary ones, resulting the nasolacrimal groove turns into the epithelial cord. It starts from the medial corner of the eye slit, immerses in the mesenchymal cells downwards and inwards, directing to the primary nasal cavity.

At the end of the pre-fetal stage the epithelial cord, which is lined with the multilayered epithelium, elongates toward the nasal cavity and gradually turns into the hollow channel, the wall of which is already the two-layer epithelium. On the 6-7th month of embryo development the nasolacrimal duct approaches the lower nasal passage, which ends blindly. They are separated with a small layer of connective tissue. In horizontal sections the duct has a rounded shape with a diameter of 1.4 mm. Its lumen is filled with gelatin-like substance. The nasolacrimal duct is almost straight and is topographically determined slightly ahead of the upper turbinate, it crosses the front edge of the middle turbinate, and crosses the inferior turbinate at a distance of 3.0-5.0 mm from the front edge. The duct is separated from the front wall of the maxillary sinus with a layer of connective tissue of small thickness. There are connections of the duct with the nasal cavity in 6 cases.

The nasolacrimal duct of newborns has a round shape with a diameter not exceeding 2.0 mm and length of 10.5-12.8 mm. In 6 specimens it forms a small bend to the entrance to the

nasal cavity. The part of the duct that bulges mostly, is located at the front edge of the middle turbinate. In other cases the duct has a straight course, it is situated at a small distance from the front edge of the upper turbinate, crosses the front edge of the middle turbinate and crosses the inferior turbinate at a distance of 6.0-7.5 mm inwards from its front edge. The maxillary sinus is located in 0.3 mm from the back surface of the duct. The front cells of ethmoidal labyrinth are separated from it with a layer of connective tissue. In 8 study cases the lateral folds of the mucosa are detected (4 – near the mouth, 2 – In the upper third and 2 – In the transition of the lacrimal sac to the duct). It should be noted that all folds are located at its side wall. The duct orifice has slit-like shape and is elongated in the anterior-posterior direction. When the duct orifice is in the lower end of the nasolacrimal canal, it is round or oval. In 4 specimens the nasal orifice is closed with the connective tissue membrane.

While studying the lower nasal passage a small round-shaped bladder with small diameter was detected. After its cut a small amount of clear liquid appears. The revealed membranes are the anomalies of the development of the area. It may be a cause of the dacryocystitis of newborns [3]. Therefore, the ENT examination is recommended for the diagnosis of the dacryocystitis in babies at the first month of life.

During the first years of life, structure and syntopy of the nasolacrimal duct barely changes. Only the front wall of the maxillary sinus is already near the duct. At the end of children age the length of the nasolacrimal duct increases almost twice. Its lumen diameter increases by 0.2-0.3 mm. The nasal duct orifice is located under the base of the inferior turbinate. In adulthood, depending on the shape of the skull the length of the nasolacrimal duct is from 14.0 to 26.0 mm. Its diameter increases almost twice. The nasal orifice in 5 of 10 cases has a slit-like shape, and in 6 cases it has almost round shape. In the medial wall of the maxillary sinus in the region of its anterosuperior angle is the longitudinal elevation of the nasolacrimal canal, which is directed down, laterally and back. Its length is equal to 14.0 ± 0.4 mm, its width is

equal to 8.0 ± 0.2 mm, the thickness of the bone in the elevation is 1.0 ± 0.02 mm. In elderly and senile age topographic and anatomical interrelations of nasolacrimal duct do not change. Its lumen increases slightly due to the mucosal atrophy.

Conclusions. 1. The anlage and formation of the nasolacrimal duct begins in the embryo of 12.0-14.0 mm PCL.

2. The shape and topographic location of nasal duct orifice changes with age.

Prospects for further research. It is planned to perform further studies of blood supply, innervation and lymph flow from these structures.

References:

1. Патент на корисну модель № 83418 (Україна), МПК (2013.01) А61В 5/00, Спосіб визначення морфологічних параметрів нососльозової протоки у плодів та новонароджених / Кузняк Н.Б., Бойчук О.М., Сикирицька Т.Б.; заявник і патентовл. Буковинський держ. мед. ун-тет. № заявки и 2013 02943; заявл. 11.03.2013; опубл. 10.09.2013, Бюл. № 17. – 4 с.
2. Логвінова О.В. Фізична реабілітація хворих на короткозорість / О.В. Логвінова, Г.В. Шищук, І.В. Нехаєнко // Актуальні питання теоретичної та клінічної медицини: Міжнар. наук.-практ. конф. (Суми, 10-12 квітня 2013 р.): матер. конференції. – Суми: СумДУ, 2013. – С. 213-214.
3. Черкунов Б.Ф. Болезни слезных органов / Черкунов Б.Ф. – Самара: Перспектива, 2001. – 296с.
4. Chaudhary M. Bacteriology and antimicrobial susceptibility of adult chronic dacryocystitis/ M. Chaudhary, A. Bhattarai, S.K. Adhikari // Nepal. J. Ophthalmol. 2010. -Vol. 4.- P. 105–113.
5. Тейлор Д. Слезные органы Детская офтальмология / Д. Тейлор, К. Хойт; пер.с англ. - М.: «Издательство БИНОМ», 2007. – С. 99-103.
6. Сайдашева Э.И. Инфекционные заболевания: Избранные лекции по неонатальной офтальмологии / Э.И.Сайдашева, Е.Е.Сомов, Н.В. Фомина – СПб.: Издательство «Нестор-История», 2006. – С. 188-201.
7. Razavi M.E Bacteriological evaluation of adult dacryocystitis in Iran / M.E. Razavi, Ansari–M.R. Astaneh, M. farzadnia // Orbit.- 2010.- Vol. 29.- P. 286–290.
8. Shah C.P comparative bacteriological profile and antibiogram of dacryocystitis / C.P. Shah, D.A. Santani // Nepal. J. Ophthalmol. – 2011. – Vol. 6. – P. 134–139.