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The localization, treatment, and complications of dermoid cysts in the eyebrow region

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ABSTRACT

Dermoid cysts are congenital lesions characterized by skin appendages and surrounding epithelial tissue with a well-defined cyst wall, accounting 40% of all pediatric lesions. The most common location is frontotemporal, orbital and Nas glabellar region. Diagnosis is based on physical examination and imaging in selected cases. Surgical excision is recommended as the preferred course of treatment. Presentation, classification, differential diagnosis, imaging methods and algorithms, surgical techniques and complications are discussed based on the recent literature.

Keywords: Dermoid cyst, eyebrows, surgery

DERMOID CYST

Dermoid cysts, which are congenital lesions (choristomas), arise from the inclusion of ectodermal tissue during the closure of the neural tube. These cysts predominantly manifest along the midline and at the fusion lines of the epithelium. During cranial bone development, the periosteum and embryonic ectoderm align at the definitive suture lines. It is hypothesized that ectodermal fragments may become entrapped as these suture lines close, subsequently developing into dermoid cysts in this ectopic location.[1,2]

Dermoid cysts are characterized by the presence of skin appendages and epithelial tissue, and they possess a well-defined cyst wall. Dermoid cysts typically present in early infancy as asymptomatic, soft, and slowly growing masses with limited mobility. In a retrospective analysis of 280 cases conducted by Pushkar et al., it was noted that 6% of the lesions were present at birth, of which 4% manifested with proptosis, and 70% were diagnosed within the first year of life. As they increase in size, they can become challenging to excise in older individuals.[2,3]

LOCALIZATION, CLASSIFICATION AND PRESENTATION

Dermoid cysts account for 40% of all pediatric orbital lesions and 89% of all pediatric cystic orbital lesions, establishing them as the most predominant form of orbital cysts. The majority of these lesions manifest within the initial three months of life or are present at birth, slow-growing and do not transilluminate.[4–6]

There are reports indicating that 7-80% of all dermoid's occur in the head and neck region, primarily in the orbital and periorbital areas.[7,8] Bartlett identified three clinical groupings of orbitofacial dermoid's after reviewing 84 cases: frontotemporal (64%), orbital (25%), and Nas glabellar (11%).[9] The majority of periorbital lesions are located at the external angle of the brow in the lateral brow region, are extra orbital, and originate in the frontozygomatic suture area.[4,10,11]

The frontotemporal group typically presents as distinct, slowly growing masses that are superficially located, anterior to the orbital rim, and do not extend deeply. They typically manifest early in life as mobile, well-defined, soft-tissue masses. These masses can be excised directly, eliminating the need for an extensive diagnostic work-up.[9] Deeper orbital dermoid's, situated posterior to the orbital rim, tend to grow slowly and may not be recognized until later in life, potentially leading to bone erosion. In the retrospective analysis conducted by Pushkar et al.,[2] 71% of the cysts were found to be superficial, while 29% were deeply located. In some patients, a superficial brow mass may become less clinically apparent over time. In these cases, suspicion of transcranial extension should be considered.[7]

Cysts may adhere to the periosteum or be subperiosteal, and they can extend through the bone into the orbit. The simultaneous occurrence of infraorbital and extra orbital locations is possible. This circumstance often leads to delayed diagnosis and increased surgical complexity. In cases of infraorbital cysts, proptosis or abnormal ocular motility may manifest.[10] They can also extend intracranially.[12] Periorbital dermoid cysts that extend across a bone suture line are commonly referred to as "dumbbell dermoids".[13]

The ectopic placement of neuroectoderm results in the formation of nasal dermoid's. Nazoglabellar dermoids arise early in embryonic development during the closure of either the anterior neuropore, the fonticulus nasofrontal is, or during the development of the frontonasal process. The final theory, first described by Grunwald in 1910 and later termed the "prenatal theory" by Pratt and the "cranial theory" by Bradley, proposes that as the neuroectodermal tract recedes, it may drag dermal attachments along.[14–16] The failure of the dura to properly separate from the dermis results in retraction of nasal cutaneous elements by the retracting dura. Consequently, as the dura withdraws from the prenatal space, the nasal ectoderm is drawn upwards and inwards, the nasal cutaneous elements can become trapped anywhere along the path from the dura to the skin, forming an epithelium-lined sinus or cyst. Consequently, nasal dermoid's can arise from the columella to the glabella and present as a midline nasal mass, pit, or sinus. Midline dermoid cysts may distort nasal growth.[12,17,18] Half of children may present hypertelorism and a broadened nasal bridge.[19]

Periorbital dermoid cysts can exhibit a wide range of locations. There is a reported case of an inferonasally located dermoid cyst that was previously believed to originate from the lacrimomaxillary suture line and was bisected by the inferior oblique muscle.13 Dermoid cysts can also present in the upper eyelid, often resembling a chalazion.[20,21]

Rare presentations include dimple formation, visible sinus opening in the brow region, lacrimal drainage obstruction symptoms, proptosis, abscess or fistula formation, periorbital or preseptal cellulitis, osteomyelitis and bone defect.[1,6,7,17]

DIAGNOSIS AND IMAGING

In the preoperative assessment, radiography may be employed. Intracranial extension or bony destruction is less commonly reported in association with non-midline dermoid cysts, such as those located in the lateral brow region.[5] However, there are also studies reporting that bony changes accompany in 75% of the cases.[2] Radiography is advised if the cyst is immobile upon examination. If anomalies are detected on plain film, a CT or MRI scan may be warranted. Ultrasound is not considered a highly useful method for diagnosing and planning surgery for dermoid cysts, it generally identifies a cyst that is ovoid, hypoechogenic, and heterogeneous, with well-demarcated outer margins and positive posterior acoustic enhancement.[22] In cases where the mass lacks mobility during physical examination or for orbital dermoid cysts with indistinct borders, consideration should be given to the possibility of bone adherence or deeper extension, necessitating a CT or MRI scan.[1,10] For cysts located more than 1 cm away from the brow margin, imaging with CT or MRI is recommended to assess for intracranial extension, considering that they may originate from the pterional region (the point where the temporal, frontal, parietal, and sphenoid bones meet).[4] Lesions typically remain unchanged in size with Valsavla maneuver; however, those that exhibit growth are believed to possess an intracranial extension component.[5]

According to a retrospective review conducted in 2019 at Bernard and Millie Duker Children's Hospital at Albany Medical Center involving 28 patients, surgical excision without preoperative imaging is recommended for patients who exhibit no orbital symptoms and have superficial, mobile lesions that do not change with the Valsalva maneuver. Conversely, for deep lesions with limited mobility, surrounding bony hypersclerosis, orbital symptoms, or changes with the Valsalva maneuver, preoperative CT or MRI is recommended to assess for intracranial extension.[5] In pediatric cases, MRI is recommended to eliminate the radiation exposure.[2]

A meta-analysis of several studies indicates that nasal dermoids may be associated with cerebral extension, with an incidence rate of 20%, but ranges from 4% to %57 in different studies, and it is impossible to determine clinically.[19] It is imperative that all individuals presenting with midline nasal tumors undergo imaging to ensure an accurate diagnosis and to exclude the possibility of cerebral extension.[5,7,12,23] In a retrospective study conducted by Amin et al.[24] in 2024, involving 129 patients with frontonasal dermoids, CT and MRI were concordant in predicting intracranial extension.

Dermoid cysts and epidermoid cysts are occasionally conflated. Histologically, dermoid cysts consist of stratified squamous epithelium (ectoderm) with accompanying skin appendages surrounding a cavity containing keratin, sebaceous glands, calcium, cholesterol crystals or lipid debris, smooth muscle, and hair (adnexae, mesoderm).[4,7,17,25] The term "epidermoid cyst" is more suitable when the cyst is lined with keratinizing squamous epithelium but lacks skin appendages.[10] Differential diagnoses also include hemangioma, teratoma, neurofibroma, lipoma, epithelial inclusion cyst, hydatid cyst, cold absess, encephalocele, meningocele, meningoencephalocele, cystic schwannoma, glioma. A nasal dermoid is a non-expansile and non-pulsatile mass that is not compressible and does not transilluminate. A hair visible in the skin ostium is considered to be pathognomonic for nasal dermoids. Differentiation from hemangiomas and teratomas can be achieved using gadolinium contrast-enhanced MRI imaging. Contrast-enhanced CT can be utilized to differentiate meningocele, cystic schwannoma, or abscesses. Unlike encephaloceles, the mass does not exhibit enlargement either during spontaneous crying or consequent to jugular vein compression (negative Furstenberg's sign) and the Valsalva maneuver.[2,6,12,19]

TREATMENT

All orbitofacial dermoids are managed through total surgical excision. Complete cystic wall removal are the gold standard of treatment. Despite their histologically benign nature, these lesions have a propensity for growth, which can lead to fascial asymmetry, orbital displacement or bone erosion. Therefore, surgical excision is recommended as the preferred

course of treatment.[4,11,26] Beyond cosmetic concerns, removal is necessary to prevent infection and its associated complications, such as local abscesses, periorbital cellulitis, osteomyelitis, meningitis, cavernous sinus thrombosis, intracranial abscesses, and malignant transformation. In cases of nasal dermoids, the annual incidence rate of infection is estimated at 7% throughout childhood. Owusu-Aim et al.[1] observed that by the age of 4, half of the children with nasal dermoids experience at least one localized infection, with over 90% experiencing infections before reaching their 9th year.[6,10,17,19,27]

To ensure that a dermoid cyst does not recur, complete surgical excision must include the removal of the entire epithelial lining. If the cyst ruptures during surgery, the surgical field should be irrigated with a solution containing antibiotics and saline. Irrigation with corticosteroids has also been reported.[6] Cysts adherent to the periosteum should be excised en bloc with the periosteum. Sclerosing agents offer a minimally invasive alternative. These methods, including needle aspiration for decompression, methylene blue for wall delineation, or preemptive removal of a nearby small bone fragment, are also described in the literature to assist the surgeon.[28] It is crucial to bear in mind that intracranial extension can occur even in the presence of a fibrous cord lacking dermal elements during excision.[1,4] If a pit is present externally, it should be excised using an elliptical incision.[12]

The incisions used to access lateral eyebrow dermoid cysts can be placed directly over the lesion, above or below it, or through the eyebrow. To reduce visible scarring, some authors recommend an incision along the upper lid crease. The upper eyelid crease incision principle was first described in 1988. If an incision along the upper eyelid crease is to be used, the dissection plane should be below the orbicularis oculi muscle and above the orbital septum. This approach ensures the preservation of the lacrimal gland, levator aponeurosis, and extraocular muscles.[4,10,29]

In 2006, Park et al. published a case report which includes a modification of an upper eyelid crease incision. In this method, the authors advanced through an upper eyelid crease incision, navigating in the plane superior to the orbicularis oculi muscle to access the superior surface of the mass. By splitting the orbicularis oculi muscle immediately above the mass, they minimized the risk of inadvertently damaging the orbital septum and reduced potential harm to the underlying levator aponeurosis and lacrimal gland. Furthermore, the authors posited that this approach would mitigate postoperative swelling and ecchymosis.[11]

Approaches through the orbitonasal crease (Lynch incision) and the lateral canthus have also been documented in the literature. For midline nasoglabellar dermoids; midline vertical incision, transverse incision, inverted "U" incision and medial paracanthal incision has been described. Lateral rhinotomy, external rhinoplasty and endoscopic approaches can be used in selected cases.[11,12,30] In 2022, Diab et al. published a study comparing three different incision techniques for the removal of internal angular cysts: lid crease, sub-brow, and direct mini-incision. According to the results of this study, both the lid crease and direct mini-incision approaches result in superior scar quality with minimal visibility compared to the sub-brow technique. However, the lid crease technique is associated with a prolonged operation time, particularly for cysts located outside the orbital rim.[31] In 2023, Pushker et al. described the transconjunctival excision of external angular dermoid cysts as a treatment option for patients presenting with a mobile cyst confined to the eyelid and lacking an evident bony fossa. Nevertheless, this approach demands surgical expertize, affords limited surgical access, and entails a gradual learning curve.[32]

The endoscopic technique may be favored due to its minimally invasive nature and the resulting reduced visibility of scarring. This method was first described in the English literature for the treatment of dermoid cysts in 2004 by Chen and Lachica in two separate publications. Chen et al. accessed and excised the masses through two 1.5 cm incisions along the anterior hairline. No recurrence was observed during the seven-month follow-up period.[33,34] Senchenkov et al. published a case series in 2005 detailing the successful surgical management of eight patients utilizing the endoscopic approach.[3] In 2006, a case series involving nine patients was published by general surgeons, who utilized the endoscopic method. No intraoperative or postoperative complications were reported.[35] In 2016, Lopez et al. published a case series involving 23 pediatric patients with dermoid cysts of the brow underwent excision by endoscopy. The dissection was carried out through the subgaleal plane, no complications were reported. A thorough understanding of the local neural structures, the temporal branch of the facial nerve, the supratrochlear nerve, and the supraorbital nerve, is essential for performing endoscopic surgery on the forehead. The dissection plane can be either subgaleal or subperiosteal. The subgaleal plane is preferred for its bloodless nature and offers a more direct approach to soft tissue.[25]

Foster et al. presented a review article contrasting open and endoscopic methods in 2018. In the endoscopic approach, a subgaleal plane was utilized, whereas for patients with a direct incision, the approach was made directly over the mass. The authors observed hypopigmentation in the scar of one patient who underwent the open approach. Consequently, despite the absence of a statistically significant difference, they opted to adopt the endoscopic approach. They also stated that they do not prefer preoperative imaging unless the mass is immobile or located in the midline. Furthermore, they indicated that although the endoscopic approach could utilize 2, 3, or 4 ports, they chose to employ a single port to reduce postoperative scarring. Only one case of recurrence was observed, which necessitated reoperation. The text indicates that the endoscopic approach carries a risk, albeit low, of sensory or motor nerve damage. Temporary eyebrow ptosis was observed in two patients from the endoscopic group and one patient from the direct approach group. This phenomenon was attributed to postoperative edema or nerve stretching. It is suggested that adhering to the appropriate plane can reduce this risk. Additionally, the study notes that despite similar complication rates, overall patient and surgeon satisfaction tends to be higher with the endoscopic approach without a facial scar.[26]

Despite the absence of transosseous penetration of the dermoid cyst into the orbit, the incidence of bone anomalies remains high. Consequently, subperiosteal dissection to

liberate the deeper portion of the cyst is recommended. This approach serves to prevent cyst perforation or the inadvertent retention of residual lesions.[10]

In cases of intraorbital extension, accessing the orbital roof through a subperiosteal plane via an incision at the superior orbital rim periosteum can minimize inadvertent trauma to the intraorbital contents, thereby facilitating the excision of the cyst.10 Lateral or medial orbitotomy approaches have also been described.[6]

If no intracranial extension is observed, an external approach can be employed. However, in cases of intracranial extension, a combined intra- and extracranial approach involving craniotomy, orbitotomy, or rhinotomy may be necessary.[1] The traditional technique necessitates the removal of any extension that traditionally required a frontal craniotomy and bicoronal incision, procedures that are associated with a significant risk of morbidity. In 2007, Heywood et al. published a retrospective study detailing a novel minimally invasive technique for the excision of the intracranial component of dermoid cysts with a brow incision and small window craniotomy.[12] In 2020, Hidalgo et al. described a method for excising nasocranial dermoids that involves the combination of a small frontal craniotomy with an inverted-V open rhinoplasty approach through the columella.[36]

COMPLICATIONS

Early postoperative swelling, erythema and mechanical ptosis may be observed after surgery.[4,10] Protracted swelling, bruising or bleeding, infection, wound dehiscence, pain, dry eye or conjunctivitis, keloid or hypertrophic scarring, ptosis and theoretical risk of blindness are the complications of the surgery. Patients who undergo brow incisions may experience brow alopecia and deformity. In endoscopic procedures, there is a potential risk of damage to the facial nerve. The endoscopic approach may be constrained by the pronounced curvature of the skull in certain infants.[4]

Incomplete excision can lead to recurrence, and recurrences may present as chronic lipogranulomatous inflammation, cutaneous fistulas or discharging sinuses.[1,2] The probability of recurrence is significantly increased if any dermal components are left behind.[12]

Excision of nasal dermoids using conventional techniques can result in complications such as meningitis, hyposmia, cerebrospinal fluid leakage, damage to the frontal and sagittal sinuses, and, in some cases, intracerebral hemorrhage, cerebral edema, epilepsy, memory and concentration deficits, and osteomyelitis of the frontal bone flap. To prevent these complications, if dural damage occurs during surgery, it should be repaired using a periosteal patch, temporal fascia, or fascia lata. Hair loss along the incision line can be seen.[12]

DISCUSSION

An analysis of current literature, integrated with the author's clinical experience, underscores the importance of early total excision with complete cyst wall removal in preventing recurrence and minimizing complications in dermoid cysts. Effective preoperative planning is essential to mitigate the risk of recurrence. Imaging should not be omitted if there is suspicion of bony changes, intraorbital or intracranial extension. While external excision may appear straightforward, achieving total excision, particularly in cases with bony involvement, necessitates subperiosteal extirpation and potentially the shaving of the underlying bone.[2,6] In instances of intracranial extension, collaboration with neurosurgeons is imperative, and intraorbital extension requires the involvement of ophthalmologists. A multidisciplinary approach is crucial. Early excision is pivotal in minimizing future bony erosions and reducing preoperative, intraoperative, and postoperative complications.

When evaluating surgical techniques, the upper eyelid incision is recognized as the method that results in the least scarring among direct excision techniques. However, for patients with significant concerns about scarring, endoscopic methods may be preferable. Although incisions made directly over the lesion provide convenient access, they tend to result in more conspicuous scarring compared to other approaches. If the upper eyelid incision is employed, maintaining the dissection above the orbital septum ensures a safe surgical plane. In endoscopic procedures, a subgaleal or subperiosteal plane is recommended to avoid damage to motor and sensory nerves.[6] Novel approaches like the transconjunctival approach may be considered in suitable cases.[32]

In our study, we aimed to summarize the epidemiological characteristics, localization, presentation, classification, imaging modalities, differential diagnosis, treatment strategies, and complications associated with dermoid cysts in the eyebrow region through a comprehensive review of the contemporary literature. It is important to note that our study represents a review of existing literature and does not encompass a meta-analysis incorporating statistical methodologies. While the largest study we encountered in our review comprised 280 cases, there remains potential for further research with broader sample sizes in this domain.

Our study underscores the critical necessity of meticulous preoperative planning and thorough imaging in the excision of dermoid cysts, particularly prevalent in pediatric populations. Additionally, we emphasize the imperative for a meticulous surgical approach and the significance of not trivializing the complications associated with this procedure. It is recommended to stay abreast of current approaches and literature in this field.

CONCLUSION

Dermoid cysts located in the brow region necessitate surgical excision due to cosmetic concerns and potential complications. Preoperative physical examination and imaging are crucial for surgical planning. Multiple direct and endoscopic excision methods are available for surgical intervention. Masses with intracranial and intraorbital extensions require a multidisciplinary approach.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Hong SW. Deep frontotemporal dermoid cyst presenting as a discharging sinus : a case report and review of literature. *Br J Plast Surg*. 1998;51:255-257.
2. Pushker N, Meel R, Kumar A, Kashyap S, Sen S. Orbital and periorbital dermoid / epidermoid cyst: a series of 280 cases and a brief review. *Can J Ophthalmol*. 2020;55(2):167-171. doi:10.1016/j.jcjo.2019.08.005
3. Senchenkov A, Clay RP. Endoscopic removal of dermoid cysts of the eyebrow in pediatric patients. *Ann Plast Surg*. 2005;55(6):595-598. doi:10.1097/01.sap.0000186462.29557.8b
4. Nelson KE, Mishra A, Duncan C. Upper blepharoplasty approach to frontozygomatic dermoid cysts. *J Craniofac Surg*. 2011;22(6):41-44. doi:10.1097/SCS.0b013e318231e151
5. Van Kouwenberg E, Kanth AM, Mountziaris P, Adetayo OA. Cranial Erosion Associated With Non-Midline Dermoid Cysts in the Pediatric Population. *J Craniofac Surg*. 2019;30(6):1760-1763. doi:10.1097/SCS.0000000000005317
6. Montolío-Marzo S, González-Valdivia H, Casas-Gimeno E, Sebastian-Chapman L PBJ. Dermoid Cyst: Outcome Analysis in a Pediatric Referral Hospital. *Ophthalmic Plast Reconstr Surg*. 2020;36(5):478-480. doi:10.1097/IOP.0000000000001608
7. Maurice SM, Burstein FD. Disappearing dermoid: fact or fiction? J *Craniofac Surg*. 2012;23(1):e31-e33. doi:10.1097/scs.0b013e3182420981
8. Bansal R, Honavar SG, Talloju SS MK. Orbital dermoid cyst. *Indian J Ophthalmol*. 2022;70(2):709. doi:doi:10.4103/ijo.IJO_145_22
9. Bartlett, S. P., Lin, K. Y., Grossman, R., & Katowitz J. The surgical management of orbitofacial dermoids in the pediatric patient. *Plast Reconstr Surg*. 1993;91(7):1208-1215.
10. Ruszkowski A, Caouette-Laberge L, Bortoluzzi P, Egerszegi PE. Superior eyelid incision: an alternative approach for frontozygomatic dermoid cyst excision. Annals of plastic Surgery. 2000;44(6):591-595.
11. Park AH, Siddiqi F. An approach to pediatric brow dermoids: an upper eyelid crease incision. *Int J Pediatr Otorhinolaryngol*. 2006;70(2):349-351. doi:10.1016/j.ijporl.2005.06.018
12. Heywood RL, Lyons MJ, Cochrane LA, Hayward R, Hartley BEJ. Excision of nasal dermoids with intracranial extension –— Anterior small window craniotomy approach. *Int J Pediatr Otorhinolaryngol*. 2007;71:1193-1196. doi:10.1016/j.ijporl.2007.04.013
13. Artymowicz A, Homer N, Bratton E. Bilobed dermoid cyst in unique location. *Ophthalmic Plast Reconstr Surg*. 2021;37(2):e82. doi:10.1097/IOP.0000000000001668
14. Grunwald L. Beitrage zur kenntnis kongenitaler geschwulste und missbildungen an ohr und nase. *Ohrenheilkunde*. 1910;60:270-279.
15. Pratt LW. Midline cyst of the nasal dorsum: embryologic origin and treatment. *Laryngoscope*. 1985;75:968-975. doi:doi:10.1002/lary.25201
16. Bradley PJ. The complex nasal dermoid. *Head Neck Surg*. 1983;5(6):469-473.
17. Hartley BEJ, Eze N, Trozzi M, et al. Nasal dermoids in children: a proposal for a new classification based on 103 cases at Great Ormond Street Hospital. Int J Pediatr Otorhinolaryngol. 2015;79(1):18-22. doi:10.1016/jijporl.2014.10.020
18. Lee S, Kim SI, Kim MS KJ. Dermoid cyst of nasal tip with a sinus tract extending to the intracranium: a case report. *Arch Plast Surg*. 2022;49(5):648-651.
19. M. K. The differential diagnosis of congenital developmental midline nasal masses: histopathological, clinical, and radiological aspects. *Diagnostics* (Basel). 2023;13(17):2796.
20. Wadhwani M, Kursange S, Singh L KS. An Unusual Presentation of a dermoid cyst mimicking a chalazion. *J Pediatr Ophthalmol Strabismus*. 2020;57:e41-e42.
21. KG. A. Surgical surprise: Dermoid cyst presenting as an upper lid chalazion. *J Fr Ophtalmol*. 2023;46(5):e140.
22. Ha DL, Kim TR, Shin K et al. Ultrasonographic findings of pediatric dermoid cyst. *Pediatr Int*. 2021;63(4):436-441.
23. Naina P, Jonathan GE, Prabhakar M et al. Pediatric nasal dermoid- a decade's experience from a South Indian tertiary care centre. *Int J Pediatr Otorhinolaryngol*. 2020;139:110418.
24. Amin SN, Siu JM, Purcell PL et al. Preoperative imaging and surgical findings in pediatric frontonasal dermoids. *Laryngoscope*. 2024;134(4):1961-1966.
25. Lopez M, Vermersch S, Varlet F. Endoscopic excision of forehead and eyebrow benign tumors in children. *J Laparoendosc Adv Surg Tech*. 2016;26(3):226-230. doi:10.1089/lap.2015.0498
26. Foster D, Sinclair TJ, Taylor JS, Dutta S, Lorenz HP, Bruzoni M. Endoscopic excision of benign facial masses in children: a review of Outcomes. *J Laparoendosc Adv Surg Tech*. 2018;28(5):617-621. doi:10.1089/lap.2017.0168
27. Owusu-Ayim M, Locke R, Clement WA KH. Quantifying the annual risk of infection in congenital midline nasal dermoid cysts in children. *Clin Otolaryngol*. 2023;48(2):254-258.
28. Lin PH, Kitaguchi Y, Mupas-Uy J, Takahashi Y KH. Rescue technique for complete removal of an accidentally ruptured orbital dumbbell deep dermoid cyst: A case report. *Am J Ophthalmol Case Rep*. 2018;10:55-58.
29. RC. K. The eyelid crease approach to superficial lateral dermoid cysts. *J Pediatr Ophthalmol Strabismus*. 1988;25:48-51.
30. A.S. Grove CDMJ. Orbital Disorders and diagnosis and management, in: c.d. mccord, m. tanenbaum (Eds.), *Oculoplastic Surgery, Raven Press,* New York.; 1987.
31. Diab MM, Allen RC, Abdel Ghafar AE, Elessawy KB. Comparison of three surgical techniques for internal angular dermoid cysts: a randomized controlled trial. *Eye*. 2022;36(12):2253-2259. doi:10.1038/s41433-021-01851-0
32. Pushker N, Agrawal S, Meel R, Kashyap S, Sen S BM. Transconjunctival excision of external angular dermoid cyst: A novel approach. *J Plast Reconstr Aesthet Surg*. 2023;83:431-437.
33. Chen CT, Huang F, Lin YT, Chen YR, Lin CH, Feng GM. endoscopically assisted removal of tumors in the frontal region. *Chang Gung Med J*. 2004;27(10):718-725.
34. Lachica RD, Wallace RD, Tsujimura RB. Case Report: Endoscopic excision of a nasoglabellar dermoid. *J Craniofac Surg*. 2004;15(3):473-477. doi:10.1097/00001665-200405000-00026
35. Dutta S, Lorenz HP, Albanese CT. Endoscopic excision of benign forehead masses: a novel approach for pediatric general surgeons. *J Pediatr Surg*. 2006;41(11):1874-1878. doi:10.1016/j.jpedsurg.2006.06.047
36. Hidalgo J, Redett RJ 3rd, Soares BP CA. Meet in the middle: a technique for resecting nasocranial dermoids-technical note and review of the literature. *Childs Nerv Syst*. 2020;36(3):477-484.