

CASE REPORT

Characterization of the Nasal Dermoid Sinus in A Rhodesian Ridgeback Dog with Computerized Tomography and Magnetic Resonance Imaging

Nihan DİKBAŞ¹  Ebru ERAVCI YALIN^{2(*)} ¹ Istanbul University- Cerrahpaşa, Institute of Graduate Studies, TR-34320 Avcılar, Istanbul - TÜRKİYE² Istanbul University- Cerrahpaşa Faculty of Veterinary Medicine, Department of Surgery, TR-34320 Avcılar, Istanbul - TÜRKİYE

ORCID: N.D. 0000-0002-6676-0788; E.E.Y. 0000-0002-0941-6745

Article ID: KVFD-2022-28663 Received: 18.10.2022 Accepted: 22.03.2023 Published Online: 23.03.2023

Abstract: Dermoid sinus is a congenital defect that develops during embryonic development when the skin cannot be completely separated from the ectodermal neural tube. It extends ventrally at different levels under the skin. It has been reported in many different breeds, but is most common in Rhodesian Ridgeback dogs. In this case, the dermoid sinus in the nasal region of a Rhodesian Ridgeback dog was characterized by computed tomography and magnetic resonance imaging. In this presentation, it is aimed to emphasize the importance of introducing the lesion and race and characterization using advanced imaging techniques in determining the treatment method.

Keywords: *Computed tomography, Dermoid sinus, Dog, Magnetic resonance imaging*

Rhodesian Ridgeback Irkı Bir Köpekte Nazal Dermoid Sinüsün Bilgisayarlı Tomografi ve Manyetik Rezonans Görüntüleme İle Karakterizasyonu

Öz: Dermoid sinüs embriyonik gelişim aşamasında, derinin ektodermal nöral tüpten tamamen ayrılamamasıyla gelişen bir kongenital kusurdur. Deri altında farklı seviyelerde ventrale doğru uzanır. Bir çok farklı ırkta da bildirilmiştir ancak en çok Rhodesian Ridgeback ırkı köpeklerde görülür. Bu olguda Rhodesian Ridgeback ırkı bir köpekte nazal bölgedeki dermoid kist, bilgisayarlı tomografi ve manyetik rezonans görüntüleme ile karakterize edilmiştir. Bu sunumda, lezyonun ve ırkın tanıtılması ile ileri görüntüleme teknikleri kullanılarak karakterizasyonun tedavi yönteminin belirlenmesindeki önemini vurgulamak amaçlanmıştır.

Anahtar Sözcükler: *Bilgisayarlı tomografi, Dermoid sinüs, Köpek, Manyetik rezonans görüntüleme*

INTRODUCTION

The dermoid sinus is a congenital defect in which the skin cannot be completely separated from the ectodermal neural tube during embryonic development^[1]. The result of this developmental disruption may also be called a pilonidal sinus, pilonidal cyst, or dermoid cyst^[2]. Located along the dorsal midline, these tubular blind sacs extend ventrally to the skin and underlying tissues^[1]. Nasal dermoid sinus cysts are extremely rare in dogs and occur when the ectoderm in the prenasal cavity is not completely

closed^[3]. There may be neurologic problems, ranging from aberrant motor function to posterior paresis and hyperesthesia, if the sinus interacts with the subarachnoid area through a lamina defect. The location of the lesion and the presence or absence of myelitis or encephalitis owing to sinus infection determine the presence and severity of neurologic symptoms. Rarely, spinal abnormalities such as hemivertebrae, vertebral body fusions, and lesions that resemble spina bifida may be related to dermoid sinuses^[1]. Although many different methods have been proposed to identify dermoid sinuses in dogs, including

How to cite this article?

Dikbas N, Eravci Yalin E: Characterization of the nasal dermoid sinus in A rhodesian ridgeback dog with computerized tomography and magnetic resonance imaging. *Kafkas Univ Vet Fak Derg*, 29 (2): 207-211, 2023.
DOI: 10.9775/kvfd.2022.28663

(*) Corresponding author: Ebru ERAVCI YALIN

Phone: +90 212 866 3700 Cellular phone: +90 537 572 9679 Fax: +90 212 866 3851

E-mail: ebrueravci@gmail.com



This article is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)



Fig 1. Cystic lesion on the dorsal line between the orbits

computed tomography (CT), magnetic resonance imaging (MRI), fistulography, and myelography, there is no consensus on optimal imaging, and each technique has distinct advantages and disadvantages [4]. If the sinus is not causing symptoms and is not connected to the dura mater, treatment may not be necessary. The lesion should be surgically removed if the sinus becomes infected, is draining or inflamed, or is presenting clinical symptoms. If the sinus extends down to the dura, a dorsal laminectomy or hemilaminectomy may be necessary [1].

The Rhodesian ridgeback is a dog breed of African origin with a characteristic dorsal hair ridge with backward-growing hair [5,6]. The dorsal hair ridge in these dogs has been suggested to be caused by a dominant mutation that predisposes them to dermoid sinus, which is also a congenital developmental disorder [7]. Dermoid sinuses were reported as a prevalent congenital condition in ridged dogs and as a sporadic finding in other dog breeds [2,5,6], exemplary Chow Chow [8], Golden Retriever, Cocker Spaniel, Springer Spaniel [3], German Shepherd [9], Cane Corso [10] and Shiba Inu [11]. For the dermoid sinus in Rhodesian Ridgebacks, various inheritance patterns have been hypothesized, including autosomal recessive, autosomal incomplete dominant, two recessive loci, or complete [6]. No gender predisposition has been previously noted. It has been suggested that dogs with dermoid sinuses be excluded from breeding [7].

This report describes the characterization and diagnostic significance of a dermoid cyst by computed tomography and magnetic resonance imaging in a Rhodesian Ridgeback dog.

CASE HISTORY

For this case report, informed consent was obtained from the patient owner.

The case is an 8-month-old, intact male Rhodesian Ridgeback dog brought to Istanbul University Cerrahpaşa Veterinary Faculty Research and Practice Animal Hospital Department of Surgery with the complaint of swelling on the nose (Fig. 1). In the anamnesis, it was stated that the patient did not have any complaints other than the difference in his physical appearance. In the clinical examination, a cystic lesion about one cm diameter was palpated under the skin on the dorsal line between the orbits. The patient did not show any sensitivity or pain response in the area. It was also observed that the patient had a dorsal hair ridge (Fig. 2) known to cause dermoid sinus predisposition. The patient's mental status and behavior, gait and postural reactions, cranial reflexes and spinal reflexes were evaluated and all neurological examination findings were healthy. Hemogram and biochemistry values (ALP, ALT, BUN, GLU, TP) are within the normal range. Advanced imaging was recommended for the diagnosis of the lesion. After eight hours of fasting, the patient was taken to general anesthesia for MRI and CT. Propofol (Propofol®, Abbott, Turkey) (6-8 mg/kg IV)

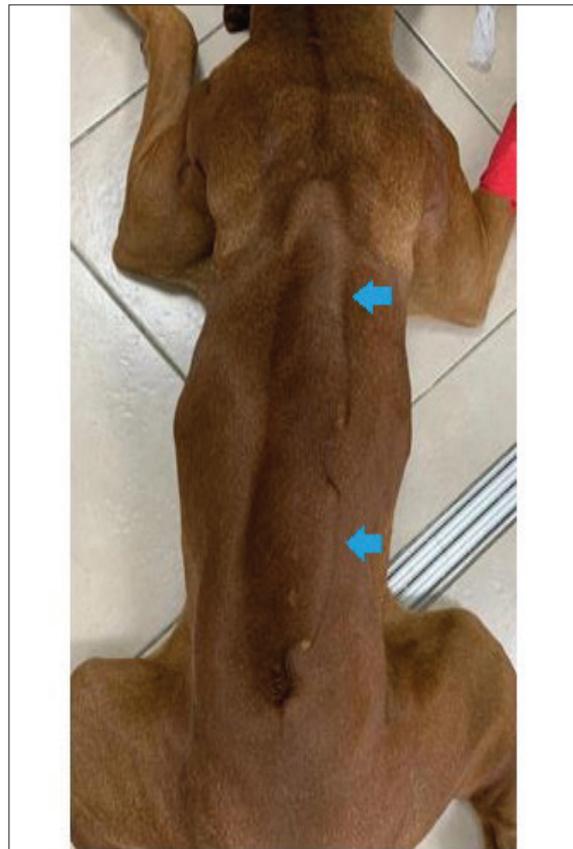


Fig 2. Dorsal hair ridge typical of the Rhodesian Ridgeback breed

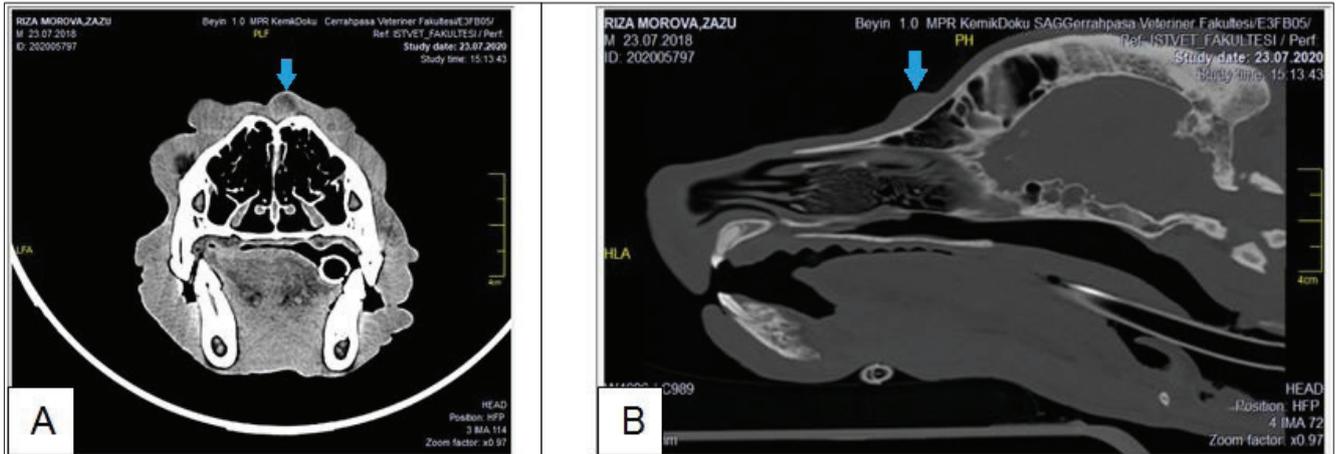


Fig 3. CT image of dermoid cyst. A- transverse plane; B- Sagittal plane. No destruction was observed in the bone tissue adjacent to the dermoid cyst and it was seen that it was not associated with the nasal cavity

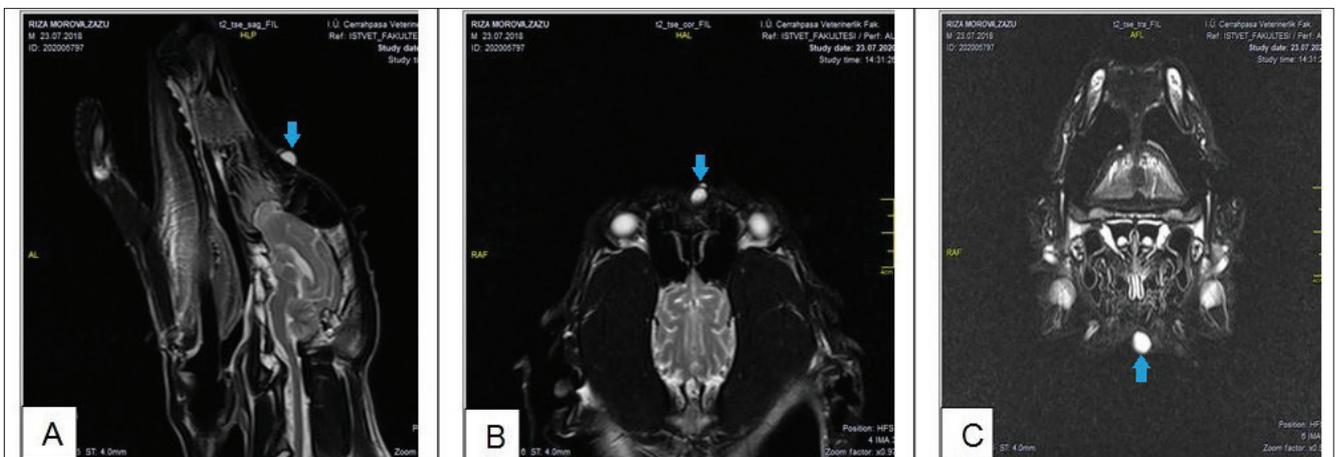


Fig 4. MR images of dermoid cyst. A- T2-weighted sagittal sequence; B- T1-weighted transversal sequence; C- T2-weighted dorsal sequence. An oval-shaped cystic lesion of 12.1x8.2x9.4 mm in size, located on the right of the midline, on the nasal bone adjacent to the frontal bone, was observed hyperintense on T2-weighted images and hypointense on T1-weighted images

was used for induction and anesthesia was continued with isoflurane (Forane®, Abbott, UK) (initially 4%, then 2%) after endotracheal intubation.

Suspecting that the lesion might be dermoid sinus due to the patient's breed predisposition, the paranasal sinuses were evaluated with CT (Fig. 3) and MRI (Fig. 4). The line with the dorsal hair ridge was evaluated with MRI to detect the presence of a sinus associated with the nervous system (Fig. 5).

When the patient's images were evaluated, it was determined that the lesion was dermoid sinus due to the structure of the lesion, the patient's breed, and the high predisposition created by the hair ridge on the back. As a result of imaging, the lesion was defined and it was seen that it was not associated with the nervous system. It was determined that it was type V according to the previous typing [1,5,12], and subtype c according to the classification according to the anatomical location [13].

Removal of the cyst by excisional surgery was recommended to the patient's relatives, but it was not accepted because it did not affect the patient's quality of life. It was also notified that breeding the dog was not advised due to the genetic transmission of the disease. The patient has been in our follow-up for 2 years, and there has been no change in his condition during this period. The size, consistency and shape of the cyst are constant and do not cause any discomfort.

DISCUSSION

An animal may have one or more dermoid sinuses. Even if a dermoid sinus is present, soft tissue edema, or vertebral abnormalities are evident, radiographs may still be unremarkable. The extent of the tract has been visualized using myelography or fistulography, although it has been advised against injecting contrast material or probing the tract due to the possibility of causing meningitis or damaging underlying structures. Also, if there is debris

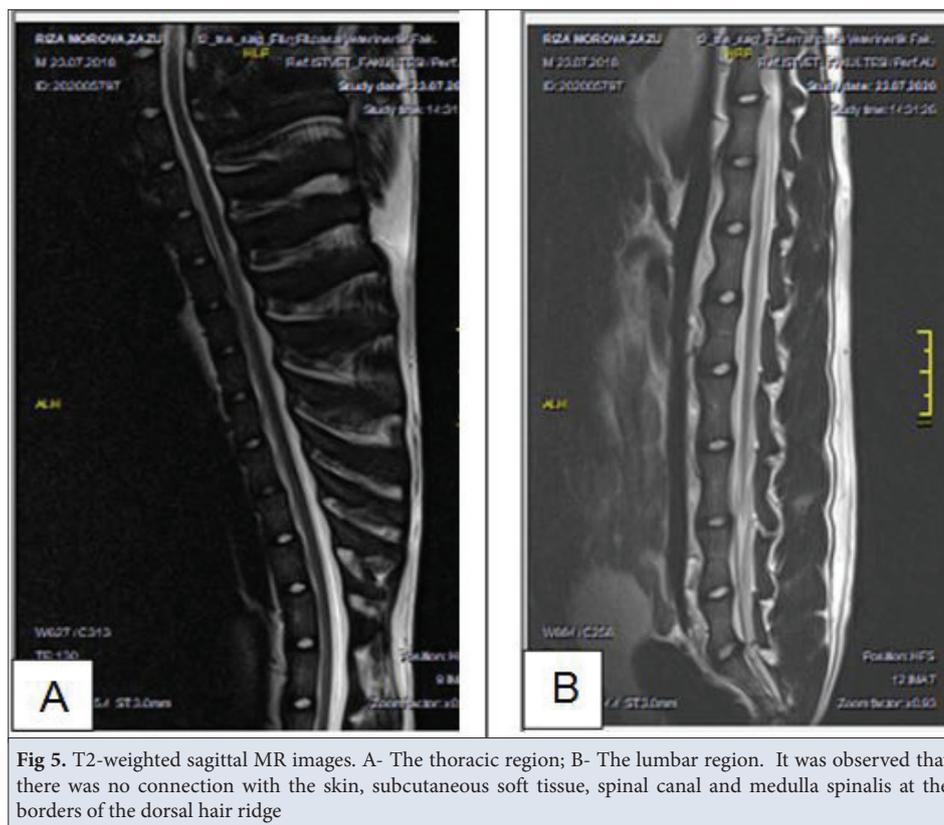


Fig 5. T2-weighted sagittal MR images. A- The thoracic region; B- The lumbar region. It was observed that there was no connection with the skin, subcutaneous soft tissue, spinal canal and medulla spinalis at the borders of the dorsal hair ridge

present, fistulography may not demonstrate the complete depth of the sinus tract. Because they outline the tract and display cross-sectional pictures, MRI and CT are the diagnostics that are most useful in identifying the depth of the dermoid sinus and diagnosing it [5]. Therefore, in our case, the dorsal line was imaged with MRI and no other sinus associated with the nervous system was found. As a result of imaging of the nasal dermoid sinus cyst in the dorsal line between the two eyes with CT, it was determined that it was limited only under the skin and in one region.

According to the penetration into the subcutaneous tissues, primarily 4 types of dermoid sinus have been defined. Type I extends ventrally as a cylindrical sac attached to the supraspinous ligament, Type II consists of a sac-like portion that does not extend to the supraspinous ligament but is attached by a fibrous band, type III does not extend to and is not associated with the supraspinous ligament, type IV extends into the spinal canal and dura mater it is linked with [1,5]. After these definitions, type V; defined as a true cyst consisting of a closed, epithelial-lined sac, and type VI as an open cyst extending to the level of the supraspinous ligament with a distal line of attachment with the dura mater [12].

The nasal dermoid sinus in our case was defined as type V because it was in the form of a completely closed cyst that is not related to other tissues.

Nasal dermoid sinus cysts in humans have been classified according to the depth of penetration into the craniofacial structures [3], but in dogs the classification is based on anatomical location. These dermoid sinus types are classified into three subtypes: subtype a for dorsal midline, subtype b for head excluding nose and subtype c for nose [13]. In this case, the dermoid sinus was classified as subtype c because it was located in the nasal region.

In Ridgebacks, dermoid sinuses are most commonly encountered in the cervical or craniothoracic regions, but they can be found in the sacrococcygeal region or head, and they usually occur cranially or caudally rather than in the characteristic hair ridge on their back [1,14]. Characterization has previously been reported in the thoracolumbal and dorsal cervical regions of Ridgeback dogs and crosses [15]. Contrary to previous reports, in this case the dermoid sinus was in the nasal region.

Dermoid sinuses may cause different symptoms depending on their location and relationship with the nervous system [10,11]. In this case, no neurological finding was observed as the dermoid sinus was not associated with the nervous system. However, operating without imaging and characterization of the lesion is very risky since the lesion may be associated with the nervous system and may cause various neurological symptoms. In addition, removal of a dermoid sinus cyst that is limited to the subcutaneous tissue is not vital, and follow-up of the lesion may be

recommended instead.

Few cases have been reported of rostral and cervicooccipital dermoid cysts in the veterinary literature [3,13], but dermoid sinuses on the bridge of the nose in humans have been described since 1817 [15]. Embryological analysis of nasal and frontal bones in humans shows that the embryonic origin of nasal dermoid cysts is unique compared to that of the dorsal midline dermoid sinuses [16]. However, lesions at or above the nasofrontal suture have much lower rates of intracranial extension in humans [17].

Removal of the cyst by excisional surgery was recommended to the patient's relatives, but it was not accepted because it did not affect the patient's quality of life. It was also notified that breeding the dog was not advised due to the genetic transmission of the disease. The patient has been in our follow-up for 2 years, and there has been no change in his condition during this period. The size, consistency and shape of the cyst are constant and do not cause any discomfort. In conclusion, this report demonstrates the recognition and characterization of dermoid sinus lesions and the clinical significance of imaging with CT and MRI.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author (E. Eravcı Yalın) upon reasonable request.

Conflict of Interest

The authors declared that there is no conflict of interest.

Author Contributions

Case examination and evaluation of clinical findings were done by ND and EEY. EEY interpreted MRI and CT images. ND and EEY contributed to the discussion. ND made the article writing and submission of the article.

REFERENCES

1. Miller L, Tobias K: Dermoid sinuses: Description, diagnosis, and treatment. *Compend Contin Educ Vet*, 25 (4): 295-300, 2003.
2. Tshamala M, Moen Y: True dermoid cyst in a Rhodesian ridgeback.

J Small Anim Pract, 41, 352-353, 2000. DOI: 10.1111/j.1748-5827.2000.tb03217.x

3. Anderson DM, White RAS: Nasal dermoid sinus cysts in the dog. *Vet Surg*, 31 (4): 303-308, 2002. DOI: 10.1053/jvet.2002.33597

4. Jones S, Adin C, Thompson E, Robertson I, Rivas R: Computed tomography for the diagnosis and characterization of dermoid sinuses in two dogs. *J Am Anim Hosp Assoc*, 55 (4):e55403, 2019. DOI: 10.5326/JAAHA-MS-6891

5. Mann GE, Stratton J: Dermoid sinus in the Rhodesian Ridgeback. *J Small Anim Pract*, 7, 631-642, 1966. DOI: 10.1111/j.1748-5827.1966.tb04388.x

6. Distl O: Prevalence and segregation analysis of dermoid sinus in Rhodesian Ridgebacks. *Vet J*, 280:105803, 2022. DOI: 10.1016/j.tvjl.2022.105803

7. Salmon Hillbertz NHC, Isaksson M, Karlsson EK, Hellmén E, Pielberg GR, Savolainen P, Andersson G: Duplication of FGF3, FGF4, FGF19 and ORAOV1 causes hair ridge and predisposition to dermoid sinus in Ridgeback dogs. *Nat Genet*, 39 (11): 1318-1320, 2007. DOI: 10.1038/ng.2007.4

8. Booth B J: Atypical dermoid sinus in a chow chow dog. *J S Afr Vet Med Assoc*, 69 (3): 102-104, 1998. DOI: 10.4102/jsava.v69i3.827

9. Elangovan K, Maiti SK, Shivaramu S, Kamdak Y, Banu A, Mohan D, Kumar N: Gross morpho-histological diagnosis and surgical treatment of pilonidal cyst in a German shepherd. *J Pharm Innov*, 10 (4): 459-462, 2021.

10. Blondel M, Deprey J, Moissonnier P: Type IV dermoid sinus, intramedullary dermoid cyst and spina bifida in a Cane Corso. *J Small Anim Pract*, 62 (9): 810-815, 2021. DOI: 10.1111/jsap.13240

11. Takahashi K, Kimura S, Chambers JK, Nakano Y, Ishikawa T, Maeda S, Kamishina H: Case report: Surgical treatment of type IV spinal dermoid sinus in a Shiba Inu. *Front Vet Sci*, 9:849025, 2022. DOI: 10.3389/fvets.2022.849025

12. Barrios N, Gómez M, Mieres M, Vera F, Alvia G: Spinal dermoid sinus in a Dachshund with vertebral and thoracic limb malformations. *BMC Vet Res*, 10 (1): 1-7, 2014. DOI: 10.1186/1746-6148-10-54, 2014

13. Perazzi A, Berlanda M, Bucci M, Ferro S, Rasotto R, Busetto R, Iacopetti I: Multiple dermoid sinuses of type Vb and IIIb on the head of a Saint Bernard dog. *Acta Vet Scand*, 55, 1-7, 2013. DOI: 10.1186/1751-0147-55:62, 2013

14. Appelgrein C, Hosgood G, Reese SL: Computed tomography findings and surgical outcomes of dermoid sinuses: A case series. *Aust Vet J*, 94 (12): 461-466, 2016. DOI: 10.1111/avj.12521

15. Jones S, Adin C, Thompson E, Robertson I, Rivas R: Computed tomography for the diagnosis and characterization of dermoid sinuses in two dogs. *J Am Anim Hosp Assoc*, 55 (4):e55403, 2019. DOI: 10.5326/JAAHA-MS-6891

16. Sessions RB: Nasal dermal sinuses - New concepts and explanations. *Laryngoscope*, 92 (29): 1-28, 1982. DOI: 10.1288/00005537-198208001-00001

17. Overland J, Hall C, Holmes A, Burge J: Risk of intracranial extension of craniofacial dermoid cysts. *Plast Reconstr Surg*, 145 (4): 779-787, 2020. DOI: 10.1097/PRS.0000000000000665

