

Prevalence of fossa navicularis among cleft palate patients detected by cone beam computed tomography

Damak yarığı hastalarında fossa navicularis görülme sıklığının konik ışınli bilgisayarlı tomografi ile değerlendirilmesi

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SUMMARY

Aim: Fossa navicularis is an anatomic variation, radiographically demonstrating as a bony, notch-like dehiscence on the inferior aspect of the clivus. Even though, the prevalence of fossa navicularis was reported to be rare, there are no previous studies reporting the prevalence of fossa navicularis among cleft palate patients. The objective of this study is to determine the prevalence of fossa navicularis among cleft palate patients using cone beam computed tomography (CBCT).

Materials and Methods: The study group consisted of non-syndromic 45 cleft patients having a CBCT scan. On CBCT images, the presence of fossa navicularis was detected on sagittal plane. Age and gender of the patients were also recorded.

Results: Among 45 patients, 20 (44.4%) were female, whereas 25 (55.6%) were male. Mean age of the patients, with an age range of 10 - <40, was found as 18.5±7.6. Fossa navicularis was identified in 13 cleft patients (28.8%). Among these patients, 4 were female (8.9%), whereas 9 were male (20%), and their age ranged between 10 and 33 (mean age: 22.4±8.2).

Conclusion: The prevalence of fossa navicularis in cleft palate patients was found to be higher than previously reported in noncleft patients.

Key words: CBCT, radioanatomy, cleft palate, cranium, fossa navicularis.

ÖZET

Amaç: Fossa navicularis, radyografik olarak klivusun inferior tarafında bir kemik kavitesi şeklinde gözlenen anatomik bir varyasyondur. Daha önceki çalışmalarda fossa navicularisin görülme sıklığının ender olduğu ortaya konmuş olsa da damak yarığı olan hastalardaki görülme sıklığı ile ilgili daha önce yapılmış bir çalışma bulunmamaktadır. Bu çalışmada amaç, damak yarığı olan hastalarda fossa navicularis görülme sıklığının konik ışınli bilgisayarlı tomografi (KIBT) ile incelenmesidir.

Gereç ve Yöntem: Herhangi bir sendromu olmayan ve damak yarığı bulunan 45 hastaya ait KIBT görüntüleri bu çalışmaya dahil edilmiştir. KIBT görüntüleri üzerinde sagittal düzlemde fossa navicularis varlığı belirlenmiştir. Ayrıca bu hastalara ait yaş ve cinsiyet bilgileri kaydedilmiştir.

Bulgular: Çalışmaya dahil edilen 45 hastanın 20'si (%44,4) kadın, 25'i (%55,6) erkektir. Yaşları 10 - <40 arasında değişen hastaların ortalama yaşı 18,5±7,6 olarak bulunmuştur. Hastaların 13'ünde (28,8%) fossa navicularis varlığı belirlenmiştir. Fossa navicularis gözlenen hastalardan 4'ü (8,9%) kadın iken, 9'u erkektir (20%). Yaşları 10-33 arasında değişen bu hastalarda ortalama yaş 22,4±8,2 olarak bulunmuştur.

Sonuçlar: Damak yarığı olan hastalarda fossa navicularis görülme sıklığı, damak yarığı bulunmayan hastalar üzerinde yapılan daha önceki çalışmalarda rapor edildiğinden daha fazla bulunmuştur.

Anahtar kelimeler: KIBT, radyoanatomi, damak yarığı, kranyum, fossa navicularis.

INTRODUCTION

Since cone beam computed tomography (CBCT) was introduced in dentistry in 1997, it is being widely used for craniofacial imaging. In addition to implant planning, oral and dentomaxillofacial pathologies and temporomandibular disorders, cleft palate patients can also be subjected to a CBCT scan at some point during their treatment. These patients are known to have more ear, nose and throat problems and dental anomalies than noncleft patients, because of disturbed anatomy of this region.¹ CBCT imaging may be necessary for planning an alveolar bone graft procedure as well as for planning orthognathic surgery in cleft palate patients.

Fossa navicularis is an anatomic variation, radiographically demonstrating as a notch-like dehiscence on the inferior aspect of the clivus. Mostly, fossa navicularis is discovered in radiological examination as an incidental finding.² It was reported that anatomical structure of the fossa navicularis can be studied effectively using CBCT.³ Even though, the prevalence of fossa navicularis was reported to be rare, there are no previous studies reporting the prevalence of fossa navicularis among cleft palate patients. The objective of this study is to determine the prevalence of fossa navicularis among cleft palate patients using cone beam computed tomography (CBCT).

MATERIALS AND METHODS

This retrospective study was conducted according to the principles of the Declaration of Helsinki. CBCT images that were obtained between the years of 2010-2016 and revealed both cranial base and maxilla clearly, were included in the study. The study group consisted of 45 subjects, who underwent CBCT examination for dentomaxillofacial indications. Individuals had no syndrome, history of neurological diseases or surgery in the cranial base region. Written informed consent was obtained from all patients/legal guardians prior to imaging with CBCT.

CBCT imaging was conducted using either an ILUMA CBCT device (Imtec Corporation, Oberursel, Germany) or iCAT CBCT scanner (Imaging Sciences International, Hatfield, Pa). The image analysis was performed on *In-vivo*⁵ dental software (Anatomage, San Jose, CA). Fossa navicularis, if present, was detected on sagittal plane by scrolling through the image around the midsagittal area of inferior side of clivus. Demonstration of the cleft palate patients with and without a fossa navicularis is shown on Figures 1a-b.

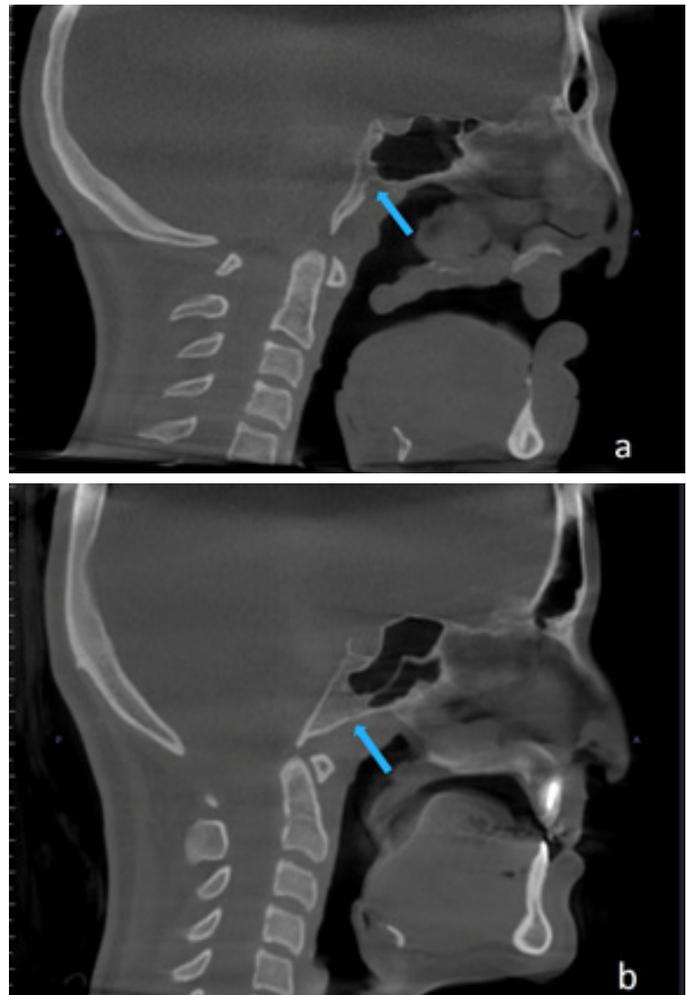


Figure 1. (a-b) Cone beam computed tomography (CBCT) sections of cleft palate patients on sagittal plane demonstrating the inferior aspect of the clivus indicated with a blue arrow a) with and b) without a fossa navicularis.

RESULTS

Among 45 patients with cleft palate, 20 (44.4%) were female, whereas 25 (55.6%) were male. Mean age of the patients, with an age range of 10-<40, was found as 18.5 ± 7.6 .

CBCT images of 13 patients (28.8%) demonstrated a fossa navicularis. Among these patients, 4 were female (8.9%), whereas 9 were male (20%), and their age ranged between 10 and 33 (mean age: 22.4 ± 8.2). Distribution of the cleft palate patients according to the presence of fossa navicularis, age groups and gender was shown on Table 1.

Table 1: Distribution of cleft palate patients according to the presence of fossa navicularis.

	Age Groups						Total
	10 – 19		20 – 29		30 – 39		
	Female	Male	Female	Male	Female	Male	
Cleft palate patients with FN	2 (4.4%)	4 (8.9%)	0 (0.0%)	4 (8.9%)	2 (4.4%)	1 (2.2%)	13 (28.9%)
Cleft palate patients without FN	11 (24.4%)	9 (20%)	5 (11.1%)	5 (11.1%)	0 (0.0%)	2 (4.4%)	32 (71.1%)
Total	13 (28.9%)	13 (28.9%)	5 (11.1%)	9 (20%)	2 (4.4%)	3 (6.7%)	45 (100%)

DISCUSSION

This is the first study that demonstrated the prevalence of fossa navicularis among cleft palate patients using a CBCT device. Prevalence of fossa navicularis was reported by several researchers, ranging between 0.9-5.3% on dried skulls^{4,7}, 3% on CT images⁴ and 6.6% on CBCT images³. The percentage of fossa navicularis identified in this study (28.8%), was found to be higher than the percentage reported in previous studies performed on dry skulls, CT or CBCT images of the noncleft patients.

Cleft lip and/or cleft palate is a common birth defect, which was found to be associated with other malformations, with a reported frequency between 3%-63%⁸. Establishing the relationship between cleft lip and/or palate and other malformations is important that evidence demonstrating this association may result in a better understanding of the embryonic phenomena underlying the malformation process.

In the literature, there is a lack of information regarding fossa navicularis and the formation of fossa navicularis is still controversial. It was suggested that it might be related to notochord remnant in the roof of the pharynx, which prevents complete ossification of the basiocciput.² Revealing the fossa navicularis associated defects in the craniofacial region, if any, may lead to a greater understanding in this defect of the skull base.

CBCT images demonstrate regions of the skull base, which are not within the area of interest. Although fossa navicularis does not require an intervention, it may lead to the spread of an infection to the base of the skull.⁹⁻¹¹

Therefore, anatomy of this defect, which can be indicated by typically well-corticated margins, should be identified and reported by the dentomaxillofacial radiologists.

CONCLUSION

The prevalence of fossa navicularis in cleft palate patients was found to be higher than previously reported in noncleft patients. The findings of this study suggested that there might be a relationship between these defects of the craniofacial region. Future studies on larger scales and with the subgroups of cleft lip and palate patients are needed.

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