Radiological Evaluation of Benign Bone Tumors of Sinonasal Region

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Öz

Sinonazal Bölge Benign Kemik Tümörlerinin Radyolojik Değerlendirmesi

Amaç: Sinonazal bölgedeki benign kemik kitlelerini, sinonazal bölge ve komşu yapılarla ilişkisinin radyolojik olarak değerlendirilmesi.
Yöntem: Sinonazal bölgeden 2010-2016 yılları arasında elde edilen çok kesitli bilgisayarlı tomografi (ÇKBT) ve manyetik rezonans görüntüleme (MRG) bulguları retrospektif olarak değerlendirildi. Radyolojik bulgulara dayanarak, büyüklükleri nedeniyle nadir görülen 41 olgu, histopatolojik özellikler ve lokalizasyonları çalışmaya dahil edildi.
Bulgular: Kırk bir olgunun 22'inde osteoma, 16'sında fibröz displazi, diğerlerinde anevrizmal kemik kisti, enkondrom ve brown tümör vardı.
Sonuç: Sinonazal bölgenin iyi huylu kemik tümörlerini görüntülerken, ÇKBT ve MRG en sık kullanılan yöntemlerdir. Radyografi, bazı durumlarda bir lezyonun varlığını gösterebilir, ancak lezyonun doğasını ve lezyon ile komşu yapılar arasındaki ilişkileri belirlemekte yetersizdir.
Anahtar Kelimeler: iyi huylu kemik kitlesi, radyolojik değerlendirme, sinonazal bölge

Abstract

Radiological Evaluation of Benign Bone Tumors of Sinonasal Region

Aim: To evaluate radiologically the benign bone masses in the sinonasal region and their relationship with adjacent structures.
Methods: Multidetector computed tomography (MDCT) and magnetic resonance imaging (MRI) of the sinonasal region were evaluated retrospectively between 2010-2016. Based on radiological findings, 41 cases rarely seen due to their size, histopathologic features and localizations were included in the study.
Results: Twenty-two of 41 cases had osteoma, sixteen had fibrous dysplasia, others had aneurysmal bone cyst, enchondroma and brown tumor.
Conclusion: When imaging benign bone tumours of sinonasal region, MDCT and MRI are the frequently used modalities. Radiography may show the presence of a lesion in some cases but is insufficient when it is aimed to determine the nature of the lesion as well as the relations between the lesion and the neighbouring structures.
Keywords: benign bone mass, radiological evaluation, sinonasal region

1. INTRODUCTION

Sinonasal region, anatomically localized at midline of the maxillofacial region, neighbours clinically important structures. It contains various types of tissues and therefore histological types of the related pathologies also differ. From epithelial tissue, squamous and neurological pathologies arise. Mesenchymal tissue gives rise to bony, cartilaginous, muscular or vascular pathologies. As a result of this diversity, more than 70 benign or malignant lesions were defined for this region. Osteomas are the most commonly diagnosed benign tumours of the bone. In order to diagnose, localize these lesions and also to identify their extensions and complications, to predict the histopathological nature in most of the cases, imaging techniques, particularly the multislice computerized tomography play a major role. Specifically, MRI can provide insight through better depiction of the anatomy of certain sinonasal sub-sites including the olfactory structures. It can aid in evaluating sinusitis, benign and malignant lesions, CSF leaks and pathology extending into sinonasal spaces (1, 2, 3).

We aimed to present in detail the radiological imaging features of very rarely seen benign masses, which originate from bone structures in the synonasal region and extend to peripheral structures and reach large and giant dimensions.

2. MATERIALS AND METHODS

Between 2010 and 2016, patients applied to different departments of your hospital with complaints such as headache, nasal obstruction, visual disturbance and swelling were included in the study. Based on radiological findings, 41 cases rarely seen due to their size, histopathologic features and localizations were included in the study MDCT was performed as the preferred imaging study. Magnetic Resonance Imaging (MRI), on the other hand, was performed when needed, in order to investigate the cystic structures and soft tissue components. Images were obtained via 64-detector CT (Toshiba Aquilon 64 MDCT) and 1.5 Tesla Philips MRI. MDCT and MRI images were then evaluated regarding the presence, localization, diameters, relation to neighbouring structures and extensions of the lesions. Moreover, the histopathological diagnosis was compared with the initial diagnosis for the patients operated.

Ethical Declaration

This study was conducted after obtaining approval from the Hatay Mustafa Kemal University Medical School Non Clinical Research Ethics Committee (Date: 17.01.2019 Decision No: 18) and Helsinki Declaration rules were followed to conduct this study.

Table 1. Abbrevations; Multidetector computed tomography (MDCT), Female (F), Male (M), Right (R), Left (Left), Frontal Sinus (FS), Ethmoidal Sinus (Eth. S), Frontal-Ethmoidal Sinus (F/Eth. S).

					OSTEOM		
No	Age	Gender	Localization	Size (MDCT)	Clinical findings	Extending into environmental spaces	Treatment
1	19	M	R-F/Eth. S	28x20	headache, mass in the medial canthus	Extending into right orbital fossa and right anterior cranial fossa	Operated
2	21	M	R-F/Eth. S	35x22	headache, mass in the medial canthus	Extending into right orbital fossa and anterior cranial fossa	Operated
3	22	M	R-Eth. S	12x10	Headache, sinusitis		—
4	29	F	R-F/Eth. S	43x30	Headache, sinusitis	Dural contact	—
5	33	M	R-Eth. S	14x8	Dizziness, nasal discharge	Right orbital contact	—
6	37	F	R-Eth. S	12x7	Headache, sinusitis		—
7	37	F	FS	16x11	Headache, sinusitis		Operated
8	38	M	R-FS	22x10	Headache, sinusitis,		—
9	40	F	R-FS	10x8	—		—
10	41	F	L-FS	19x16	Headache, sinusitis		—
11	42	F	L-F/Eth. S	46x41	Headache, nasal obstruction	Extending into bilateral nasal cavityn and right anterior cranial fossa	Operated (FESS)
12	45	F	L-Eth. S	18x16	Headache, sinusitis	Dural and orbital contact	Operated (FESS)
13	47	F	R-FS	11x9	Headache, sinusitis		—
14	49	F	L-FS	37x17	Headache, sinusitis	Extending into left orbital fossa	—
15	51	F	Bil. Eth. S	Right; 14x6 Left ; 17x7	Headache, sinusitis	Right orbital fossa contact, left orbital fossa and dural contact	—
16	53	M	FS	11x11	Headache, sinusitis		—
17	53	M	R-FS	32x16	Headeache	Dural contact	—
18	58	M	R-FS	23x12	_	Dural and orbital contact	—
19	59	F	L-FS	13x10	Headache, sinusitis		—
20	64	M	L-F/Eth.S	21x10	Headache, sinusitis		—
21	68	F	R-FS	17x9	Headache, otitis	Dural and orbital contact	—
22	68	M	L-Eth.S	27x15	Visual imparment, headache, exophtalms	Extending into left orbital fossa and dural contact	—

Table 2. Fibrous Displazia

			Fibrous Displazia				
No	Age	Gender	Clinical findings	Monocytotic FD	Polycytotic FD	Radiological findings	Histopath. diagnosis
1	10	F	Headache, dizziness and tinnitus, nasal polyps, swollen forehead		F, O, S, M, E, R-T, P,Z, PL	There is ground-glass appearence on the all bones, bones expanded and oblitrated sphenois sinüs, partial obliterated right maxillar, frontal sinuses and middle chonca affected by FD, narrowed right nasal cavity	-
2	53	F	Headache, sinusitis	F		There is ground-glass appearence on the frontal bone and oblitrated frontal sinus	-
3	55	F	Nasal Obstruction, Pain, Left maxillary region swelling		L-M, F, S, E		-
4	15	F	Head and aye pain	E		FD is containing of aneurysmal cyst. Extending to left anterio cranial fossa, narrowed left orbital fossa ve sfenoid sinus.	FD
5	16	F	Nasal Obstruction, headache,	E		FD is extending to posterior-inferior direction to nasopharynx. It contain the aneurysmal bone cyst	FD
6	16	F	Cronic sinusitis		S, E	FD has ground-glass appearence	-
7	55	M	Abdominal pain, acute pancreatitis	S, E		FD is oblitrated sphenoid sinus	-
8	53	F	Maxillary swelling	M		Maksiller bone is expanded and has ground-glass appearence	-
9	55	F	Headache, Nasal Obstruction		R-M, E	It has ground-glass appearence. Maxillar sinus oblitirated and has mucosel. partial obliterated right maxillar, frontal sinuses	FD
10	9	M	Headache, Chronic Sinusitis, Swelling, Epistaxis		L- M, E, S, L-Konka	Sphenoid sinus completely, left maxillary sinus large obliterated, left orbital fossa and optical channel narrowed	-
11	9	F	Headache	E		The left side ethmoidal celluler is oblitrated	-
12	47	F	Headache, Acromegalic Findings		Bil T, S, F,E	The sphenoid sinus, the right part of the frontal sinus and the right part ethmoid celluler are completely obliterated and partial obliterated the left side ethmoidal cellluler. Bilateral orbital fossa narrowed	-
13	14	M	Headache, Chronic Sinusitis, Swelling		M, S, E, F,	Frontal, Left side maxillar and ethmoidal, the sphenoid sinus large obliterated, the left orbital fossa narrowed	FD
14	16	F	Headache, dizziness	S		FD is oblitrated sphenoid sinus	-
15	28	F	Headache, dizziness Molar Swelling, Tooth Loss		M, PL, S, TP?	The left maxiller and sphenoid sinuses obliterated	FD
16	21	M	Facial swelling	M		The left maxillary sinus narrowed to large extent,	FD

Abrevations; Female (F), Male (M), Fibrous Displazia (FD), Right (R), Left (L), Frontal (F), Ocsipital (O), Sphenoid (S), Maxilla (M), Ethmoid (E), Temporal (T), Parietal (P), Zygomatic (Z), Palatine (PL) bones

3. RESULTS

Forty one cases who admitted to our hospital, either radiologically or histopathologically diagnosed with benign bone tumours, 22 had osteoma, 16 had fibrous dysplasia and the remaining three were aneurysmal bone cyst, enchondroma and Brown tumour.

During the study period, 46 cases of osteoma were detected and 22 cases with a diameter of over 10 mm and a giant diameter were included in the study. The average age of these cases is 44.27 (range: 19-68 years). Ten were male and 12 were female. The biggest among osteomas had 46 mm of diameter and the mean diameter was 21.66 mm. In 5 cases, the diameter was beyond 30 mm and therefore the lesions were defined as giant osteomas. As for the main complaint, the most common among all was headache, and is followed by symptoms of chronic sinusitis. The other clinical symptoms were nasal congestion, nasal drainage and exophthalmia. In two of our cases extension was only through the orbit. In other two there were both orbital as well as cranial extensions. In one of our cases, obstruction of nasal cavity and extension to intracranial cavity were evident (Figure 1). In 7 cases, pathology was originating from the bony structures of the base of cranial fossa and therefore is related closely to dura. Here to note, asymptomatic and small osteomas can solely be followed with MDCT images taken on a regular basis. The age, gender, clinical symptoms of the patients as well as the localization, diameter, radiological features and extension to surrounding structures of the lesions were thoroughly demonstrated in Table 1.

Figure 1 a-c, A 42 year old female patient, in axial and

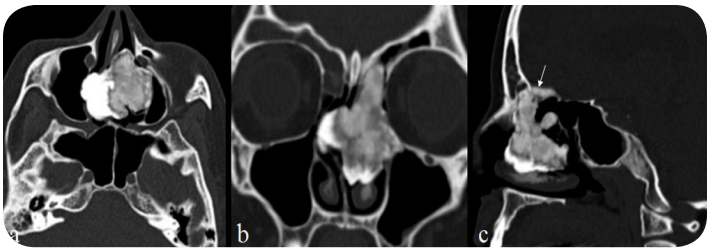

Figure 1 a-c, A 42 year old female patient, in axial, coronal and sagittal CT scans, mixt type osteoma that originates from the left part of the ethmoid bone, extending to the left frontal sinus and minimal left anterior cranial fossa, displacing the nasal septum to the right and reaching the right nasal cavity, obliterating the left ethmoidal celluloid and left nasal cavity and narrowing to large extent in the right nasal cavity.

coronal CT scans, mixt type osteoma that originates from the left part of the ethmoid bone, extending to the left frontal sinus and minimal left anterior cranial fossa, displacing the nasal septum to the right and reaching the right nasal cavity, obliterating the left ethmoidal celluloid and left nasal cavity and narrowing to large extent in the right nasal cavity.

In the study period, fibrous fibrosis (FD) was detected in 29 cases of localization to the craniofacial region. Among these 29, 16 patients were included into the study since the lesions were localized at the sinonasal region. The mean age of this group was 29.5 years (range: 9-55 years). Twelve of them were female and 4 were male. In our FD cases limited to sinonasal region the most commonly involved structure was the ethmoid bone, followed by sphenoid and maxillary bone, respectively (Figure 2). In most of the cases, MDCT images revealed ground glass appearance and significant expansion to bony structures were evident. Sclerotic or cystic appearances were observed in fewer cases, 3 having sclerotic while 4 having cystic changes and among these cases there were 2 with aneurysmatic bone cyst. The most common complaints of the patients were headache and symptoms of chronic sinusitis. Others were swelling at the maxillofacial region, nasal congestion, nasal drainage and epistaxis. Complete obstruction of sphenoid sinus was evident in 8 whereas maxillary sinus was completely obstructed in 4, ethmoid cellular in 4 and frontal sinus in 3. Moreover, ethmoid cellular in 2 cases, maxillary sinus in 2 and sphenoid sinus in 1 was severely obstructed. Partial narrowing of the cavity was evident in orbital fossa in 7 cases whereas in optic canal in 2.

In a male patient aged 11 who was diagnosed with Aneurysmal bone cyst (ABC), the lesion was localized at the right side of the ethmoid bone. Causing expansion to the related bone, the lesion significantly narrowed the right orbit and nasal cavity. It was reported on MRI that the lesion had calcifications, septations and fluid-debris levels inside (Figure 3).

Another male patient aged 43, who had the diagnosis of Brown Tumour (BT), there were two lesions of radioluscent nature at the ethmoid and numerous similar lesions throughout the skeletal system causing expansion to the neighbouring bone. Lesions were stained significantly with contrast material. The lesion localized at the ethmoid was prominently extending through the anterior cranial fossa. During the evaluations, it was reported that the lesion was originated from a parathyroid adenoma causing primary parathyroidism (Figure 4).

Seventy five year old male patient had nasal obstruction and complaints suggestive of chronic sinusitis, was diagnosed according to the imaging findings with a lesion seemed to be originating from nasal septum and is localized at the midline. Both nasal cavities were fully occupied by the lesion and the maxillary sinuses were compressed. The hard palate was eroded and the lesion was extending through the oral cavity. This lesion, heterogenously stained with contrast material during the MRI, having relatively fine borders and is of solid nature, was operated. The histopathological investigations revealed enchondroma (Figure 5).

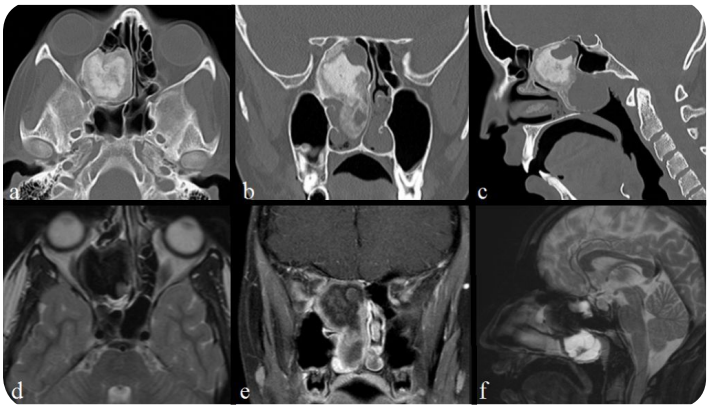

Figure 2 a-f, A 42 year old female patient, a-c. in axial, coronal sagittal CT scans, d-f. T2-weighted axial, contrast-enhanced T1-weighted coronal, T2-weighted sagittal MRI scans, fibrous dysplasia containing cystic and solid components, arising from the right posterior segment of the ethmoid bone substantially obliterates the right nasal cavity and the right orbital fossa . The lesion extends to the posterior and caudal , it is seen that largely obliterated the the nasopharynx cavity and the right choana.

4. DISCUSSION

Benign tumours are generally reported to have fine borders in the sinonasal region. Benign masses originating from bony structures can be of fibro-osseous, cartilaginous or vascular character. Osteoma, fibrous dysplasia, chondroma, aneurysmal bone cyst, Brown tumour are some examples to this entity. As a result of the localization of these lesions, sinonasal tumours may extend to neighbouring structures or cavities somewhat easily. Clinical symptoms, which are generally non-specific, are facial pain, nasal drainage of purulent character, epistaxis or nasal congestion (4-6). Radiological findings depend on the inner con-

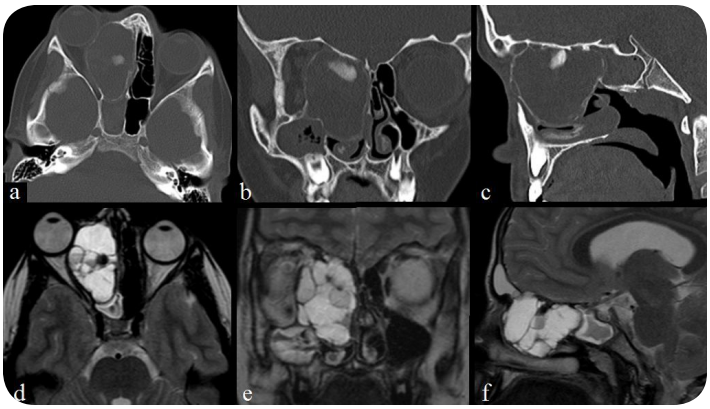

Figure 3 a-f, A 19-year-old male patient, a-c. axial, coronal, and sagittal CT scans, d-f. T2-weighted axial, coronal, and sagittal MRI scans, cystic mass lesion compatible with aneurysmal bone cyst, originating from the right side of EB that included calcification areas, septations, liquid-debris level, collapsing the right orbital fossa, debulking the bulbus oculi anterior and laterally, narrowing in the right nasal cavity,

tent of the lesions. In cases of a dense bone content it may represent as a sclerotic mass, whereas in lesions which contain fibrotic tissue it may seen as osteolytic lesions. There are cases in which these two materials are both present and therefore these cases are called mixed type. This inner structure of the lesions, as well as their exact localizations can be adequately estimated with the help of MDCT. The imaging findings, when evaluated in conjunction with the age and gender of the patients, the histopathological diagnosis can be predicted even more precisely. A timely diagnosis may help the patients reaching the appropriate therapy, and may avoid possible complications and unnecessary interventions. Not as effective as MDCT in this context, MRI takes role during the imaging of soft tissues (7-9).

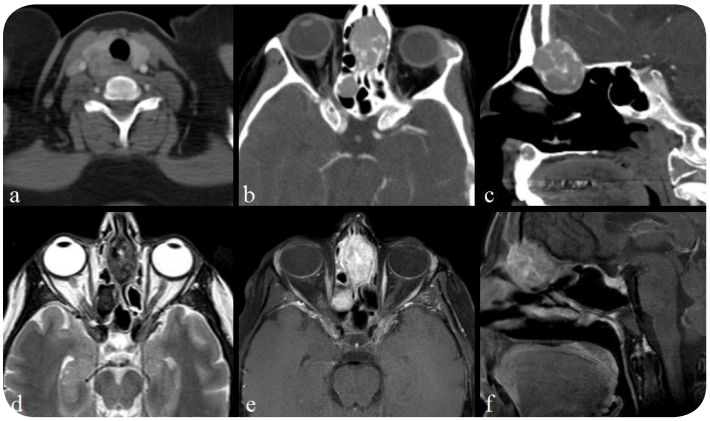

Figure 4 a-f, A 43-year-old male patient, a. Axial neck CT scans, Parathyroid adenoma on the posterior aspect of the right thyroid lobe, axial and paranasal sagittal CT and d-f in T2-weighted axial, T1-weighted axial and sagittal contrasted scans, The mass lesion compatible with Brown tumour in the midline and 2 other two lesions observed in the right portion of EB, The mass localized anterior and medial part of EB extending to the anterior cranial fossa are observed.

Osteomas are the most common benign bone tumours of paranasal sinuses and maxillofacial region. These lesions are characterized with fine borders, sclerotic architecture and in the way they are in contact with the neighbouring bone with a wide base or a pedicle. Typically more common at 5th and 6th decade of life, they are more common in male in comparison with female subjects. Osteomas typically grow slowly and they are generally smaller than 1 cm. There are some, on the other hand, extending 3 cm and are called giant osteomas. These lesions generally involve frontal or ethmoid sinuses. They can invade through the orbital fossa, nasal cavity or intracranial region through their extensions. Lesions localized at the frontal sinus usually extend through the intracranial cavity, while the ones at the ethmoid prefer the orbital fossa. Since the osteomas are usually asymptomatic, they are generally diagnosed incidentally. In symptomatic cases, the clinic depends on the

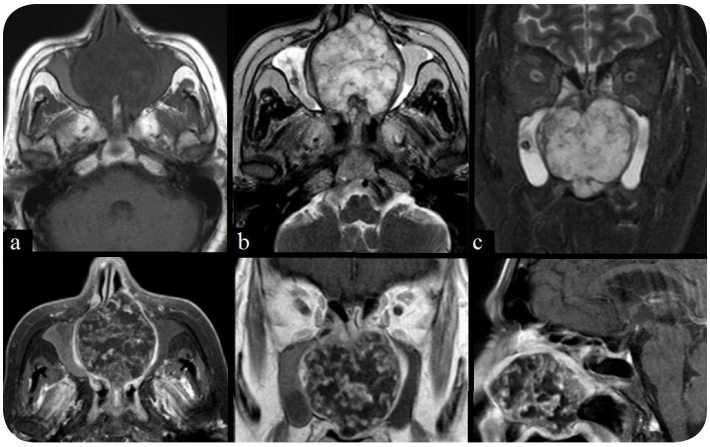

Figure 5 a-f, A 78-year-old female patient, a. T1-weighted axial, b-c. T2-weighted axial and coronal, d-f. T1-weighted contrasted axial, coronal, and sagittal MRI scans, the solid mass lesions originating from nasal septum is observed relatively smooth contour, heterogeneous hyperintense on T2-weighted, hyoerintense T1-weighted scans, showing heterogeneous contrasting pattern with noncontrasting hypointense and contrasting areas due to the internal structure of the endochondroma. It obliterates both nasal cavities and causes both maxillary sinus compression, It is seen eroding the hard palate and minimal extension to the oral cavity.

localization, diameter of the lesion or the region in which the lesion extends into. Some of these symptoms are headache, facial pain and difficulty breathing. The lesions extending through the intracranial cavity may be complicated with meningitis or cerebrospinal fluid fistula. As for the complications, the ones extending into the orbit may cause visual impairment, diplopia or proptosis. Surgical interventions are usually preserved for the symptomatic cases (4, 10). In our study, the mean age of the patients was similar with the previous studies, whereas there were slightly more female patients in our study when compared. Clinical symptoms reported in our study were also consistent with the previous knowledge. We reported that the lesions were more common at the frontal sinus and ethmoid, therefore this finding is also similar with the previous studies. We reported 5 cases of giant osteoma. In 4 of them there were extensions to the orbit and 1 was diffusely obliterating the nasal cavities. In 2 cases there were minimal extensions to the anterior cranial fossa. There were 7 cases in which there were close relation with dura and 5 cases with the walls of the orbit. In cases of symptomatic and rapidly progressing osteomas, surgery is the method of choice. Surgical meth-

ods for osteomas of paranasal sinuses are chosen with regards to the diameter and localization of the lesion, as well as the experience of the surgeon. These methods are either endoscopic interventions or performed with an external approach. External approach is preferred when the lesion is originated from frontal sinus and is located lateral or inferiorly, when the lesion fully occupies the frontal sinus, or intracranial/intraorbital extension is evident (11, 12). There are osteoplastic frontal sinusotomy, frontoetmoideectomy (Lynch procedure), lateral rhinotomy or Caldwell-Luc procedure are some methods of external approach and is chosen according to the localization of the lesion (13,14). Since the surgical instruments evolved and endoscopic interventions improved recently, endoscopic approaches are preferred over open surgeries while managing osteomas of paranasal region. Endoscopic approach is particularly used for infero-medial and small lesions. We operated 5 cases with proven osteomas and clinically symptomatic. In one of these cases Lynch procedure was performed since osteoma was localized at right frontoethmoid. Another case was operated using osteoplastic flep technique and frontal sinus surgery due to orbital extension and 1 was operated in neurosurgery clinic with unilateral craniotomy. These 3 cases constitutes the group in which external approach was chosen. The remaining 2 were operated with endoscopic approach. None of our patients experienced post-surgical complications.

Being one of the benign bone neoplasias, FD is most frequently seen at the long bones, followed by maxillofacial bones. During the pathogenesis, the osteoblasts differentiate abnormally. Natural bone matrix is replaced by immature bone and fibrous stroma. Mandible and maxilla are the most frequent sites of involvement at the craniofacial region. These tumours constitute the 5-7% of all benign bone tumours. Among these, 25% are localized at the maxillofacial region. The cases usually are diagnosed before the age of 30. Males and females are affected equally. There are 3 types: monocytotic, poliocytotic types and McCune-Albright syndrome. In cases of single bone involvement it is called monocytotic, when multiple bones are involved it is then called poliocytotic. In poliocytotic type, there is a 0.5% of malignant transformation. Since it causes expansion in bony structure it causes long lasting swelling and asymmetry, but aside from that, it does not cause any other symptoms. As the lesion grows it may compress the surroundings structures and may cause obstructions. Particularly when it extends to the orbit, it causes exophthalmos, limited eye movements, blindness, headache or paralysis of cranial nerves. Imaging findings depend on the content of FD, the proportion of oseous and fibrous material, presence of haemorrhage or cartilaginous tissue may alter the signals. It is typical for FD to see a ground glass appearance in MDCT. If loss of function is not expected, it can be preferred that the lesion is completely excised during a surgical intervention. However if the complete excision of a lesion is risky in terms of function, surgical intervention is generally performed in a way to remove the parts causing symptoms in small pieces (4, 15). In our study, the mean age was similar to previous studies; however we reported more female cases. Headache and the symptoms secondary to the obstruction caused by the lesion were the most common complaints in our study. As for the imaging findings, ground glass appearance were the most common and in 4 cases we reported cystic and in 3, sclerotic changes. Among the parts of the sinonasal region, ethmoid and sphenoid were the most commonly involved ones. Since there is a lack of evidence based curative management of FD, there are some clinical conditions which may require surgical interventions, namely progressive deformities, severe functional disturbances or malignant transformation (16). Surgical interventions vary widely on the basis of clinical findings. A simple biopsy and follow up might be a method of choice in a case, while another may require craniofacial resection (17). The most effective method on the other hand, is to totally excise the involved bone, although this may cause severe functional or cosmetic disadvantages and long-term post-operative complications. The benign nature of the disease necessitates staying on the conservative approach while avoiding radical surgical interventions which may cause wide defects or loss of function and this is the generally accepted protocol today. In most of the symptomatic cases, the excision of the head of the lesion which causes obstruction usually is adequate to reduce the symptoms. However, the risk of recurrences or malignant degeneration requires a vigorous follow-up (18). Again for the surgical excision, it is a matter of choice whether an external or endoscopic approach suits the localization of the lesion (19, 20). In our study among 7 cases operated, 2 underwent total excision of the lesion endoscopically. During this intervention, the defect caused at the cranial base was repaired using a concha mucosal graft. In one of our cases excision of the lesion was performed with external approach in Ear-Nose-Throat (ENT) operating room. On the other hand, one case with paranasal and craniofacial involvement first had an intervention in Neurosurgery room and excision from the forehead as well as the zygoma was performed. Following this intervention, the frontal region was operated by ENT surgeons with an endoscopic external approach. In addition, 1 case was operated in Neurosurgery and another in Dental Clinics. One of our cases was followed by Plastic Surgery. In Table 2 age, gender, clinical symptoms of the patients as well as the radiological features and histopathological diagnosis of the lesions were represented.

Aneurysmal bone cysts (ABCs) are vascular tumour like lesions of unknown etiology which causes expansion and

erosion in bones. It usually involves long or flat bones. Only 2% of all aneurysmal bone cysts involve the head and neck region. When they do so, mandible and maxilla are generally preferred. It is extremely rare that the ethmoid bone is involved and there are only a few case reports of ABCs located at ethmoid. These lesions have thin walls and are formed by blood filled cavities. They do not have endothelium or vascular lamina. It is of diagnostic value to report thin walls, inner septations with MDCT or MRI and fluid-debris level particularly with MRI. Since they easily invade to surrounding structures, it is very common that they cause compression. It causes symptoms associated with eye if it extends to the orbit. Radiologically it is important to differentiate these lesions from giant cell tumour, giant cell reparative granuloma, hemorrhagic cyst, plasmacytoma or fibrous dysplasia. The surgical method of choice is the complete excision of the lesion (4, 21, 22). Our case was 11 years old and this was similar to previous case reports although it was different from them with regards to gender. The lesion caused expansion at the bone and it was narrowing the surrounding structures, particularly the orbit. It was excised during the surgery almost completely.

Brown tumours are focal benign lesions of the bone and are formed as a result of primary or secondary hyperparathyroidism. It may originate from almost all bones. However it is not common to report them at the craniofacial region. It is 3 times more common in females than males. Osteoclastic activity increases as a result of elevated parathormone either primarily due to parathyroid adenoma or secondarily due to renal insufficiency. Accompanied by increased fibroblastic activity, bone destruction causes focal expansion of the bony structures and tumour like lesions, so-called Brown tumours, are formed. Lesions located at the maxillofacial region causes facial deformities, pain, nasal congestion, disturbances of chewing function. BTs must be differentiated from giant cell tumours, giant cell granulomas or aneurysmal bone cysts. Management is based on the reduction of parathormone levels; in some cases this is only possible with parathyroidectomy. The bony lesions regress once the parathormone levels are back to normal (4, 9, 23). Our case was a 43 year old male patient. There were radiolucent lesions at ethmoid, causing expansion. The lesion was invading into the intracranial cavity through the anterior cranial fossa. The lesions were monitored after the parathyroid adenoma was surgically excised.

Enchondroma is a benign bone tumour of intramedullary origin which has hyaline cartilage in it. It is possible that they can be reported as solitary lesions, there might be multiple lesions particularly in Ollier's disease and Maffucci syndrome. Solitary lesions usually involve the small tubular bones of the hand. They constitute the 12-24% of all benign bone tumours. They are usually seen between the age of 20 and 40. Gender preference was not reported for enchondroma. There are 4 distinct histological types: osteochondroma, enchondroma, chondroblastoma and chondromyxoid fibroma. Sinonasal localization for enchondroma is exceedingly rare; so far there are only a few case reports (24, 25). Unlike the previous case reports, our case was an older female patient. Our imaging findings were similar on the other hand; during the 7 years of follow up it was observed that the small pieces left during the surgical intervention progressed during the course and invade nasal and oral cavity eventually.

One of the limitations of our study is that no surgery is performed in patients without symptoms. Diagnosis was made according to MDCT and MRI findings. In addition, long-term radiological follow-up of the cases was not available in our data.

5. CONCLUSION

When imaging benign bone tumours of sinonasal region, MDCT and MRI are the frequently used modalities. Radiography may show the presence of a lesion in some cases but is insufficient when it is aimed to determine the nature of the lesion as well as the relations between the lesion and the neighbouring structures. MRI is useful when is used to image the soft tissue or cystic component as well as the septations or fluid-debris levels as seen in aneurysmal bone cysts. We state that MDCT is the most effective modality when imaging the bony structure, the content of the lesion, the extensions to the surrounding structures and calcifications. It is also superior while monitoring a post-operative case during the follow up period.

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