ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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Impact of the COVID-19 Pandemic on the Surgical Volume of Otolaryngology: Experience of a Tertiary Referral Center

COVID-19 Pandemisinin Kulak Burun Boğaz Cerrahi Hacimine Etkisi, Üçüncü Basamak Merkez Deneyimi

Fakih Cihat ERAVCI[a], Hamdi ARBAĞ[a], Erdem BAYRAKÇI[a], Mehmet Akif DÜNDAR[a]

[a]Department of Otorhinolaryngology, Necmettin Erbakan University Meram Faculty of Medicine, Konya, TURKEY

**This study was presented as an orally in 3. International Conference on Covid-19 Studies, 25-27 December 2020, Ankara, Turkey.*

ABSTRACT Objective: In order to prepare for the post-coronavirus disease era, the aim of this study was to analyze our surgical volume in otolaryngology (ORL) during the first 6 months of the pandemic compared with the equivalent period of the previous year. **Material and Methods:** A retrospective review of surgical archives was performed. Analysis was made both gross and in detail for each specific subdivision. **Results:** A total of 1,586 patients were identified. During the first time period (March-May) in 2019, 486 patients were operated, which declined to 173 in the same period of 2020 (65% reduction). In the second time period (June-August) this reduction was 39% (from 573 to 354 cases). The greatest decline was in pediatric ORL cases (75%). In the second three months of the pandemic, the decrease in surgical volume continued in functional surgeries except in the septorhinoplasty group. However, head and neck surgeries increased by 24% in the second time period and in spite of the decrease in the number of early stage tumors, advanced stage tumors increased 59%. **Conclusion:** All of the ORL subdivisions were affected in the first wave of the pandemic, with pediatric cases affected most profoundly. The delayed admissions of early stage head and neck tumors in the first 3 months resulted in an increase at the number of operations for advanced stage tumors surgery cases. A nationwide management strategy should be prepared to alleviate the acute and chronic consequences of the reduction in the number of ORL patient admissions and operations during the pandemic period.

Keywords: COVID-19; coronavirus; pandemic; otolaryngology; surgery

ÖZET Amaç: Koronavirüs hastalığı sonrası döneme hazırlanmak amacıyla pandeminin ilk 6 ayında (2020'de Mart ve Ağustos) kliniğimizdeki Kulak Burun Boğaz (KBB) ameliyat hacmimiz, bir önceki yılın aynı dönemine kıyas edilerek analiz edilmesi hedeflendi. **Gereç ve Yöntemler:** Cerrahi arşivlerin retrospektif bir incelemesi yapıldı. Analizler, her bir alt bölüm için hem kaba hem de ayrıntılı olarak yapıldı. **Bulgular:** Toplam 1.586 hasta tespit edildi. 2019 yılının ilk zaman diliminde (Mart-Mayıs) 486 hasta ameliyat edildi ve bu sayı, 2020'nin aynı döneminde 173'e geriledi (%65 azalma). İkinci zaman diliminde (Haziran-Ağustos) bu azalma %39 (573'ten 354'e) idi. En büyük düşüş, pediatrik KBB vakalarında (%75) oldu. Pandeminin 2. 3 ayında ise septorinoplasti grubu dışındaki fonksiyonel ameliyatlarda, cerrahi hacimdeki azalma devam etti. Ancak 2. dönemde baş ve boyun ameliyatları %24 artarken, erken evre tümör sayısındaki azalmaya rağmen ileri evre tümörlerde %59 artış görüldü. **Sonuç:** Pandeminin ilk dalgasından tüm KBB alt bölümleri etkilenirken, en ağır olarak pediatrik KBB vakaları etkilenmiştir. Pandeminin ilk 3 ayında geciken erken evre baş-boyun tümör başvuruları, ileri evre tümör cerrahisi vakalarının ameliyat sayısında artışa neden olmuştur. Pandemi döneminde KBB hasta kabullerinin ve ameliyatlarının sayısındaki azalmanın akut ve kronik sonuçlarını hafifletmek için ülke çapında bir yönetim stratejisi hazırlanmalıdır.

Anahtar Kelimeler: COVID-19; koronavirüs; pandemi; kulak burun boğaz hastalıkları; cerrahi

The coronavirus disease-2019 (COVID-19) pandemic has had a profound effect on healthcare systems throughout the world.[1] During the pandemic, the main focus concentrated on identification, surveillance, treatments and vaccination of COVID-19 patients. The greatest concern during this period was that the capacity of the healthcare system would be exceeded because of COVID-19 patients.[2] However, the capacity in Turkey and in our institution was never exceeded.[3] Nevertheless, admissions to hospitals for other illnesses dramatically decreased. Therefore, the treatment of patients suffering from other

Correspondence: Fakih Cihat ERAVCI
Department of Otorhinolaryngology, Necmettin Erbakan University Meram Faculty of Medicine, Konya, TURKEY/TÜRKİYE
E-mail: fceravci@gmail.com

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serious illnesses has been seriously diminished, and this can be expected to lead to an additional burden after the pandemic.

The first case of active COVID-19 in Turkey was recorded at the beginning of March 2020, which was approximately 3 months later than the first cases in China.[3] Therefore, Turkey had the opportunity to acquire the first information and experiences from the literature in this period. However, the detection and treatment strategies and exact management guidance were not yet available at that time and there were ambiguities in the information. Specific to the otolaryngology field, it was first reported that there was a high rate of infection spread after interventions because of aerosol transmission.[4] Such reports increased the concerns about contamination and resulted in more defensive management by healthcare workers. In addition, from the patient perspective, the fear of infection with the COVID-19 virus in pandemic hospitals caused delayed admissions for other serious illnesses. During these times, even though it was suggested to postpone elective and deferrable cases, we as a referral center and locally powerful university hospital in one of the biggest cities of Turkey did not fully suspend surgeries. Besides the reorganization of the healthcare facilities to be able to treat COVID-19 patients, we continued our health service without decreasing our capacity for surgeries, while taking all possible measures to protect both healthcare workers and patients. Nevertheless, there was a noticeable decline in the number of admissions to outpatient clinics and the number of surgeries performed.

In recent weeks, the expectation related to vaccines has risen. High effective rates from different vaccines have been shared and they are waiting for approval for general use.[5,6] Nevertheless, even in the best case scenario it will take months to extinguish the pandemic fire. This period of time has to be used both for COVID-19 vaccination, treatment management and for preparation of the management of other illness burdens. Therefore, in order to prepare for the post-COVID era, the aim of this study was to analyze our surgical volume in otolaryngology both grossly and in a detailed fashion for each specific subdivision during the first 6 months of the pandemic compared with the equivalent period of the previous year.

MATERIAL AND METHODS

A retrospective review was made of surgical archives for patient records and surgical volume. The study was approved by the local ethics committee (Necmettin Erbakan University, Meram Faculty of Medicine, Ethics Committee for Non-drug and Non-medical Device Researches; Approval Number and Date: 2020/2853, 23.10.2020). All procedures followed were in accordance with the Helsinki Declaration. The first six-month period examined was during the COVID-19 pandemic between March 11 and August 31, 2020 and this was compared with the same time period in 2019. Patients who underwent operations under general anesthesia during these periods were included in the study and patients who underwent interventions under local anesthesia were excluded from the study. A total of 1,586 patients were identified who had undergone surgery from a single, large regional university hospital, in Konya, Turkey. This center undertakes the main burden of the region except cochlear implantation procedures. The six-month time period for each year was divided into the first and second 3 months in order to analyze the early and late impacts of the pandemic and the results were presented according to this split.

Four groups of surgery were defined according to the major subdivisions of otorhinolaryngology (ORL); head and neck surgery, otology, rhinology and pediatric ORL. Each subdivision was then subcategorized to simplify the results and these are presented in Table 1. Otology surgeries were subcategorized as cholesteatoma, non-cholesteatoma chronic otitis media and others. Head and neck surgeries were subcategorized as tumors, benign lesions and others. Tumors were further subdivided as benign and malignant, and the malignant tumors were divided as early stage and advanced stage. In the pediatric ORL surgery category, adenoidectomy, tonsillectomy and ventilation tube insertion procedures and combinations of these constituted the adenotonsillectomy subcategorization and the rest were categorized as others. In the rhinology category, septoplasty and rhinoplasty procedures and a combination of these constituted the septorhinoplasty subcategory. The other subcategory was endonasal surgery for chronic sinusitis and the rest were categorized as others.

TABLE 1: The number of surgeries according to the type of surgery.

	2019 March-May (n)	2019 June-August (n)	2020 March-May (n)	2020 June-August (n)
Otology	64	80	21	35
Cholesteatoma	17	20	9	13
Non-cholesteatoma chronic otitis media	43	48	9	15
Others	4	12	3	7
● Tumor	1	2	0	1
● Emergency (foreign body, trauma)	0	1	0	2
● Otosclerosis	2	5	3	2
● Aural atresia	1	2	0	1
● Cochlear implantation	0	2	0	3
Head and neck surgery	132	114	67	142
Tumors	56	55	29	71
● Lip cancer	4	0	3	3
■ Early stage	3	0	2	1
■ Advanced stage	1	0	1	2
● Oral cavity-oropharynx cancer	5	10	2	12
■ Early stage	1	2	0	3
■ Advanced stage	4	8	2	9
● Larynx	12	16	8	19
■ Early stage	8	4	2	5
■ Advanced stage	4	12	6	14
● Hypopharynx	0	1	0	1
● Salivary gland	16	12	5	13
■ Benign	14	12	4	12
■ Malign	2	0	1	1
● Unknown primary	3	6	2	8
● Lymph node excision	12	5	7	10
● Skin cancer	1	2	1	3
● Sinus tumor (SCC)	1	0	0	0
● Glomus	1	2	1	0
● Mandible mass (osteom)	1	1	0	0
● Thyroid cancer	0	0	0	2
Benign lesions	37	30	17	44
● Laryngeal benign lesion	20	16	13	17
● Neck mass (thyroglossal duct cyst, branchial cleft cyst etc.)	17	14	6	19
Others	39	29	21	27
● Tracheotomy	11	16	13	17
● Adult tonsillectomy	18	9	4	8
● Emergency trauma, abscess	3	1	2	0
● Obstructive sleep apnea syndrome surgeries	6	2	2	1
● Laryngeal framework surgeries	1	1	0	1
Rhinology	128	175	45	128
Septorhinoplasty	96	137	23	98
Endoscopic sinus surgery for sinusitis	25	25	17	24
Others				
● Endoscopic sinus surgery for sinonasal mass	7	13	5	6
● Nasal fracture repair	4	4	0	0
● Septal perforation surgery	1	4	0	0
● Endoscopic dacryocystorhinostomy	2	2	2	4
● Endoscopic cerebrospinal fluid repair	0	0	3	1
Pediatric otolaryngology procedures	162	204	40	49
Adenotonsillectomy	151	186	28	25
Others				
● Emergency (trauma, abscess, foreign body removal etc.)	11	18	12	24
● Tracheotomy	5	13	6	15
● Choanal atresia surgery	5	5	5	8
Total	486	573	173	354

A descriptive analysis of these categories for each time period was performed. The change in the number of total operation cases and each subdivision category between 2019 and 2020 were presented as frequencies and percentages. These results are illustrated in the figures to simplify and clarify the results. All the study data were analyzed using SPSS version 22 software (SPSS, Chicago, IL, USA).

RESULTS

The patients comprised 925 (58%) males and 661 (42%) females with a mean age of 30.8±22.1 years (range, 0-93 years). During the first time period (March-May) of 2019, 486 patients underwent surgery, which declined to 173 patients in the same period of 2020. This represents a 65% reduction in the surgical volume for the first 3 months of the pandemic. In the second time period (June-August) this reduction was 39% (from 573 to 354 patients). The overall surgical volume for each period is shown in Figure 1. The decrease in numbers for each subdivision is demonstrated in Figure 2 and the greatest decline was seen to be in pediatric ORL cases (75%). In contrast to the 49% decrease in the first time period,

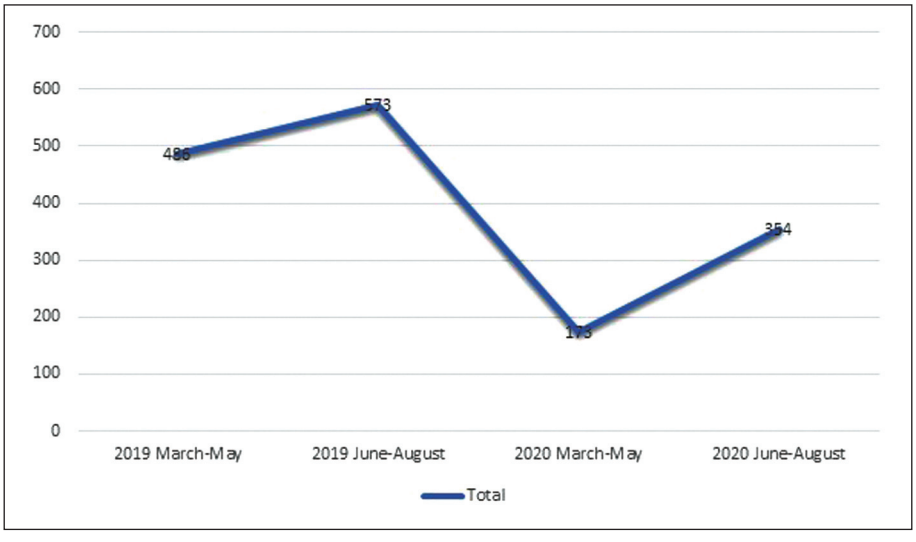

FIGURE 1: Surgical volume for each time period.

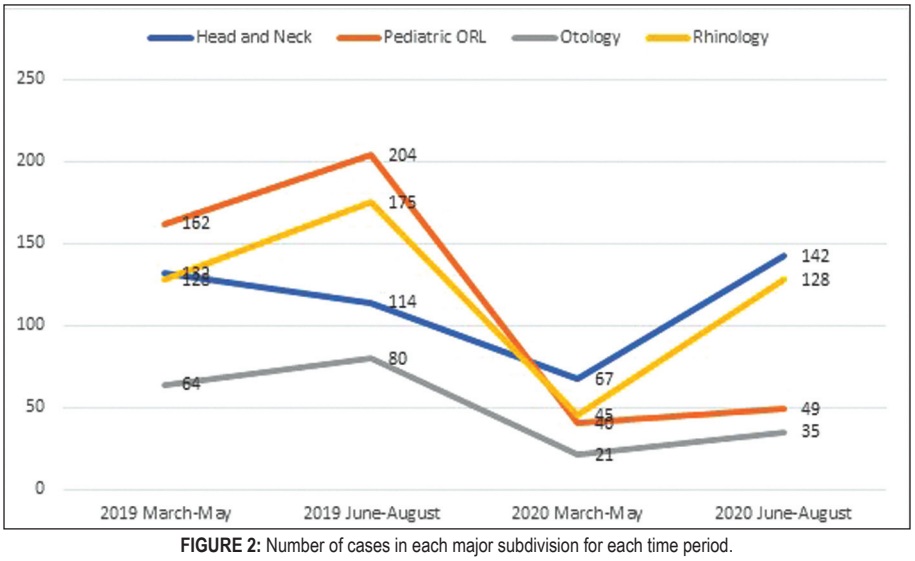

FIGURE 2: Number of cases in each major subdivision for each time period.
ORL: Otolaryngology.

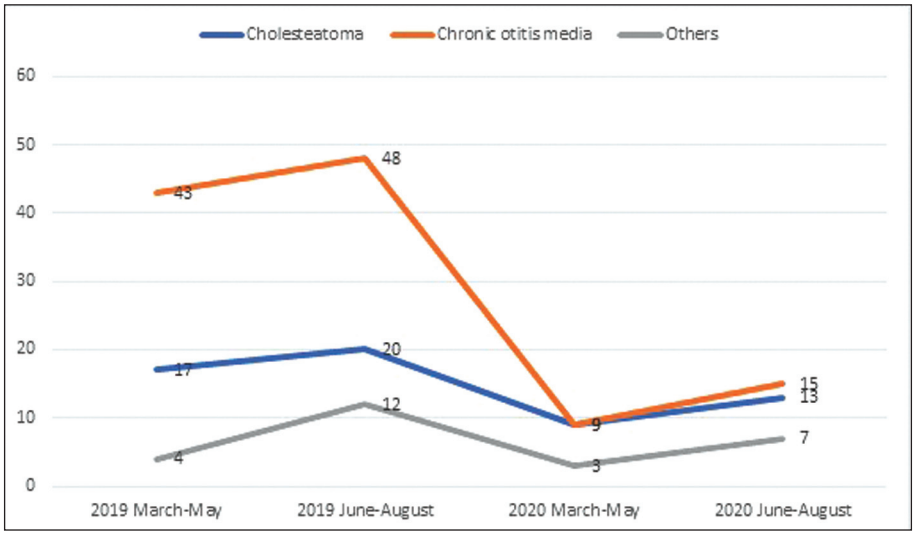

FIGURE 3: Number of otology cases for each time period.

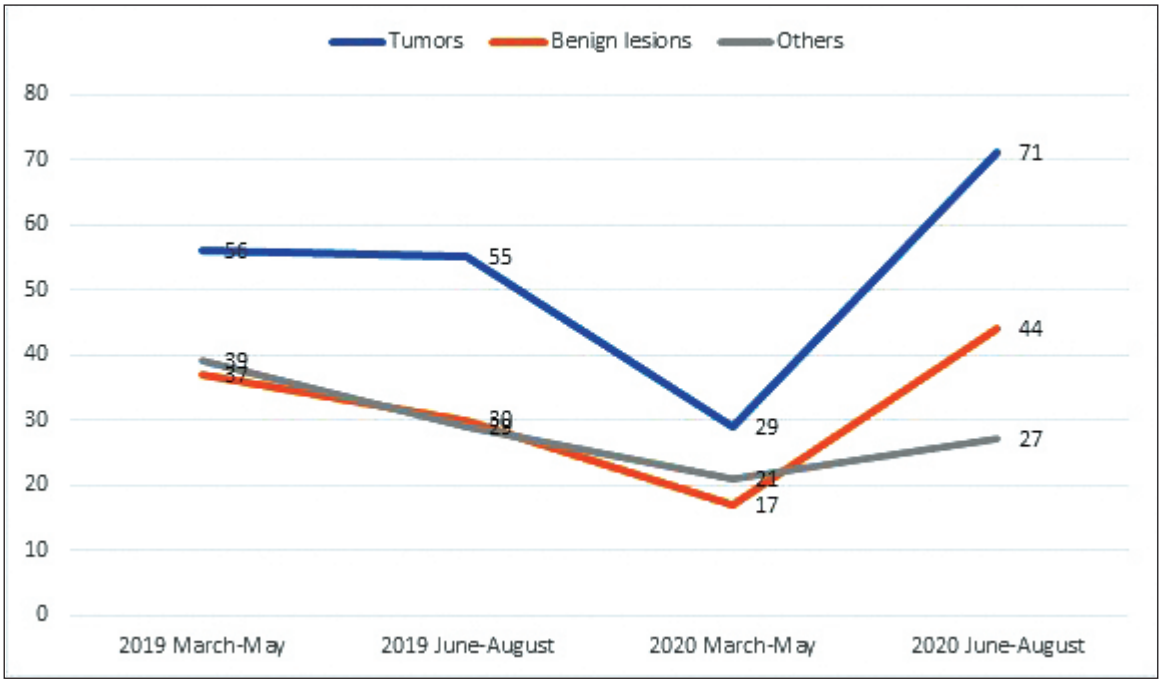

FIGURE 4: Number of head and neck surgery cases for each time period.

head and neck surgeries increased 24% in the second time period.

The decrease specific to otology is shown in Figure 3. The greatest declines were seen to be in non-cholesteatoma chronic otitis media surgeries, which decreased 80% in the first time period and 69% in the second time period. The decrease in cholesteatoma (48% and 35% in the first and second time periods, respectively) and other surgeries (25% and 42%) was observed to be less.

The head and neck surgery cases are shown in Figure 4. The decrease in volume during the first time period was 48% for tumors, 54% for benign lesions and 46% for other surgeries. In the second time period, there was a 4% decrease in other surgeries, but an increase in the number of tumor and benign lesion operations of 29% and 46% respectively.

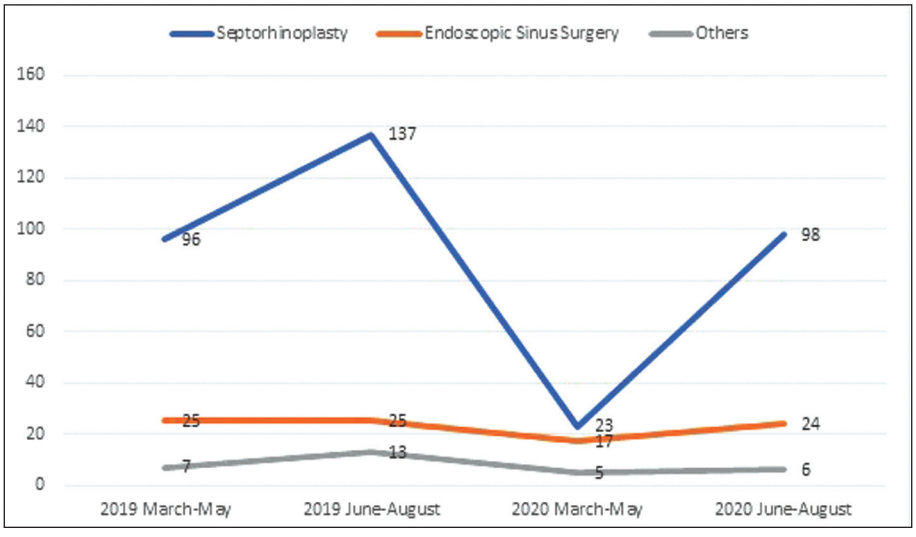

FIGURE 5: Number of rhinology cases for each time period.

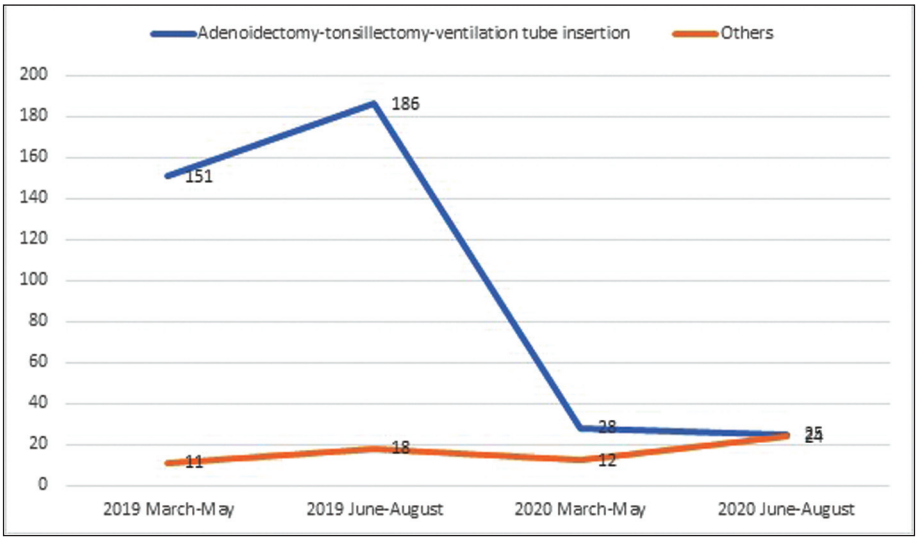

FIGURE 6: Number of pediatric otolaryngology cases for each time period.

The rhinology subdivisions are shown in Figure 5. The greatest decrease in surgical volume was seen in the septorhinoplasty category as 76% in the first time period and 28% in the second time period. The operation numbers of endonasal chronic sinusitis remained almost stable.

The decrease specific to pediatric ORL was profound as shown in Figure 6. The main reason for this dramatic reduction was the decrease in the adenotonsillectomy category which was 81% and 86% for each time period, respectively.

When the operation numbers for tumors in all subdivisions were analyzed overall, there was a 52% decrease in the first time period as shown in Figure 7. The number increased 14% in the second time period. The analysis of these tumors showed that early stage tumor surgery decreased 72% and 35% for each time period, respectively. In advanced stage tumors, a 19% decrease was observed in the first period, and a 59% increase in the second period. Benign tumor operations decreased in the first period (66%) and remained almost stable in the second time period.

DISCUSSION

This comparison of 2019 and 2020 surgical volumes at one of the largest regional hospitals in Turkey re-

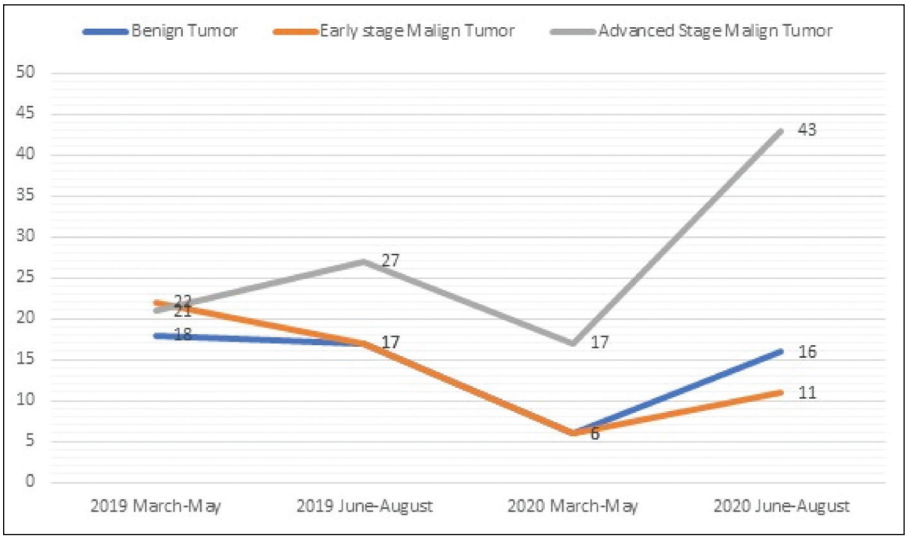

FIGURE 7: Number of all tumor cases for each time period.

vealed that the reduction in the number of operations was more severe in the early stage of the COVID-19 pandemic. All of the subdivisions were affected in the first wave of the pandemic, with pediatric ORL cases affected most profoundly. In the second three months, the reduction slowed down and surprisingly the number of head and neck surgery cases exceeded that of the previous year. In detail, it was seen that tumors cases in particular increased and advanced stage tumor cases exceeded the previous year numbers. In addition to head and neck surgeries, the only functional surgery that almost reached the same number as the previous year in the second time period was the septorhinoplasty group.

During the early phases of the COVID-19 pandemic, there was great ambiguity about the virus, its transmission, clinical severity, treatment approaches, mortality rates, etc. This resulted in a disproportional reaction in the management and strategies implemented. In general, all measurements were focused on minimizing the viral spread across the countries.[7] Quarantine for all positive and suspicious COVID-19 cases was the first strategy to isolate these cases from healthy people.[3] This was a misuse of the health institutions, which rapidly became full with patients who could have been treated in their own home. In addition, with the first shock of the pandemic, information pollution from the media and social media was extremely contagious and increased the fear of admissions to hospitals for illnesses other than COVID-19. However, what we know is that the incidence of cancers, cerebrovascular disorders, cardiovascular problems did not change and the morbidity and mortality of such serious illnesses are higher than COVID-19. From this perspective, the aim of this study was to analyze the admissions in our institution in order to prepare for the post-COVID era since these postponements will inevitably have a cost.

There are reports in literature in the otolaryngology field of the experience of some institutions related to the surgical volume in the first three months of the pandemic.[8-13] However, new updates have not been shared particularly due to raised expectations of the vaccine. Previous reports have revealed that there was a decline in all subdivisions of otolaryngology, with the greatest reductions seen in pediatric and functional surgeries, and although the number of head and neck surgery operations also decreased, it was the least affected subdivision.[10] In the present study, as the first six-month analysis, a reduction was also seen in the early phase of the pandemic. Conversely, in the second three-month period, the number of head and neck surgeries exceeded the number of the previous year and the detailed analysis showed that more cases of advanced stage tumor underwent surgery than in the previous year. This was probably the consequence of the postponement of admission in the first 3-month period. It can be seen from the results that the postponement of tumor cases resulted in more

advanced stage admissions. The late admission of tumor cases resulted in a burden with the potential of higher morbidity and mortality rates. This consequence (i.e. the increasing number of advanced tumor admissions) of lateness was seen within a very short time period and can be defined as an acute burden. Nonetheless, this burden can be expected to exponentially increase since in the present study the reduction was in the number of admissions of early stage of tumors and benign tumors, which have the potential to develop as malignant cases continuing in the second period. However, there can also be seen to be the potential for a chronic burden related to other subdivisions, since in the present study and in previous studies, the subdivision most affected by the pandemic was pediatric ORL cases. These cases included pediatric obstructive sleep apnea syndrome, recurrent infection of the upper respiratory tract, and chronic otitis media with effusion. The postponement of these cases will create a burden that will result in some possible morbidities such as hearing loss, and effects on the cardiovascular, central nervous, neurobehavioral, and metabolic systems.[14,15] These will be a serious issue after the pandemic and can be defined as a chronic burden. In order to alleviate these consequences of the reduction in such cases, a nationwide management strategy such as health screening programs could be established.

Specific to the otology subdivision, a decrease in the number of operations performed for non-cholesteatoma chronic otitis media was the major component of the decline. This was not just limited to the first time period but continued throughout the second time period. The reduction in surgical volume in pediatric ORL cases was also not limited to the first time period, but was seen to continue throughout the six months. However, in contrast to the dramatic decrease in functional procedures in other subdivisions such as non-cholesteatoma chronic otitis media, adenotonsillectomy etc, the number of rhinology cases, particularly septorhinoplasty cases, almost reached the same number as the previous year. These surprising results may be related to the increased demand for aesthetic procedures in recent years with the increased use of social media and even the pandemic could not halt this trend.[16] To support this hypothesis, it would be useful to analyze the numbers of interventions and surgeries during the pandemic in clinics only providing facial aesthetics services. In the rhinology field, the endoscopic sinus surgery numbers also remained nearly stable. This was thought to be due to having performed more surgeries for sinusitis complications because of late admissions for sinusitis. This can also be defined as an acute burden of the pandemic.

There were both strengths and limitations to this study. Strong aspects were that it was conducted in a large, regional referral center with sufficient numbers for analysis of head and neck, rhinology, otology (except cochlear implantation) and pediatric ORL cases. The number of surgeries were analyzed in detail over a broad time period split into two parts. However, limitations of the study could be said to be primarily that the study was retrospective in design. A further limitation was that cochlear implantation admissions are scarce in this centre and this patient group should be analyzed separately as delayed admissions could also create a chronic burden.

CONCLUSION

The surgical volume of otolaryngology has been affected by the pandemic and this was more profound in the early months. Pediatric ORL cases were the most affected subdivision. The delayed admissions of early stage head and neck tumors in the first 3 months resulted in an increase at the number of operations for advanced stage tumors surgery cases in the second 3 months which exceeded the number performed in the previous year. Furthermore, in the second three months of the pandemic, the reduction in functional surgeries cases continued exception of the septorhinoplasty group.

In conclusion, it can be recommended that a nationwide management strategy has to be prepared to alleviate the acute and chronic consequences of the reduction in the number of ORL patient admissions and operations during the pandemic period.

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During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct con-

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Fakih Cihat Eravcı, Erdem Bayrakçı;* ***Design:*** *Fakih Cihat Eravcı, Erdem Bayrakçı;* ***Control/Supervision:*** *Hamdi Arbağ;* ***Data Collection and/or Processing:*** *Fakih Cihat Eravcı, Erdem Bayrakçı, Mehmet Akif Dündar;* ***Analysis and/or Interpretation:*** *Erdem Bayrakçı, Mehmet Akif Dündar, Fakih cihat Eravcı;* ***Literature Review:*** *Fakih Cihat Eravcı, Mehmet Akif Dündar;* ***Writing the Article:*** *Fakih Cihat Eravcı;* ***Critical Review:*** *Hamdi Arbağ, Mehmet Akif Dündar.*

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