

■ Research Article

Video consultations for soft tissue and bone tumor pathology during the Covid-19 pandemic: A single center experience in a developing country.

COVID-19 salgını sırasında yumuşak doku ve kemik tümör patolojisi için video konsültasyonlar: Gelişmekte olan bir ülkedeki tek merkez deneyimi.

 Ayse Nur Toksoz Yildirim*¹,  Oguzhan Korkmaz²,  Korhan Ozkan³,  Muhlik Akyurek⁴,
 Deniz Tataroglu Ozyukseler⁵

¹Prof. Dr. Süleyman Yalçın City Hospital, Department of Pathology, İstanbul, Turkey,

²Istanbul Medipol University, Department of Orthopedics and Traumatology, İstanbul, Turkey,

³Istanbul Medeniyet University, Department of Orthopedics and Traumatology, İstanbul, Turkey,

⁴Maria Josef Hospital Greven Germany, Department of Trauma & Orthopedic Surgery, Greven, Almanya,

⁵Istanbul Kartal Training and Research Hospital Oncology Department, İstanbul, Turkey.

Abstract

Aim: Consultation in medical practice is an indispensable practice in all branches of medicine. In pathology in particular, it was mainly done face-to-face until the recent Covid-19 pandemic which necessitated physical distancing measures, lockdowns, and work-from-home arrangements.

We had to embrace consultation via videoconferencing using Zoom® in our hospital during the peak of lockdown and beyond. This study describes our experience in Istanbul Medeniyet University Training and Research Hospital Goztepe, Istanbul.

Material and Methods: One hundred bone and soft tissue slides received from the orthopedic oncology unit between March 2020 and January 2021 were reviewed by the hospital's musculoskeletal pathologist (hosts) with an external pathologist (consultant) via Zoom® video conferencing.

Results: Mean age of the patients was 32. 51 cases were male and 49 were female. Seventy cases were bone tissue lesions and 30 were soft tissue lesions. 36 specimens were resection materials, 42 of them were curettage materials and 22 of them were tru-cut biopsy materials. The number of slides examined per case ranged between 1 to 28.

Conclusion: The most important advantage of dynamic nonrobotic telemicroscopy is the simultaneous interaction between the consultant, host pathologist, and other participants, effectively serving as a medium for teaching.

Keywords: Consultation, Telepathology, Bone & Soft Tissue Tumors

Corresponding Author*: Ayse Nur Toksoz Yildirim, Prof. Dr. Süleyman Yalçın City Hospital, Department of Pathology, İstanbul, Turkey.

E-mail: anuryldrm@gmail.com

ORCID ID: 0000-0003-1708-0003

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Öz

Amaç: Tıp pratiğinde konsültasyon, tıbbın tüm dallarında vazgeçilmez bir uygulamadır. Özellikle patolojide, yakın zamana kadar genellikle yüz yüze yapılmıştır; ancak yakın zamandaki COVID-19 salgını, fiziksel mesafe önlemleri, karantinalar ve evden çalışma düzenlemelerini zorunlu kıldı.

Biz de hastanemizde kapanmanın ve sonrasının yoğun olduğu dönemde Zoom® video konferansı kullanarak konsültasyonu benimsemek zorunda kaldık. Bu çalışma ile İstanbul Medeniyet Üniversitesi Göztepe Eğitim ve Araştırma Hastanesi'ndeki deneyimimizi aktarmak istedik.

Gereç ve Yöntemler: Mart 2020 ile Ocak 2021 tarihleri arasında ortopedik onkoloji biriminden alınan 100 kemik ve yumuşak doku tümörü, hastanenin patoloğu ve konsültan patolog tarafından Zoom® video konferansı aracılığıyla gözden geçirildi.

Bulgular: Hastaların yaş ortalaması 32 idi. 51'i erkek, 49'u kadındı. 70 vaka kemik lezyonu, 30 vaka ise yumuşak doku lezyonları idi. Spesmenlerin 36'sı rezeksiyon materyali, 42'si küretaj materyali ve 22'si tru-cut biyopsi materyaliydi. Vaka başına incelenen kesit sayısı 1 ila 28 arasında değişmekteydi.

Sonuç: Dinamik olmayan robotik olmayan telemikroskopinin en önemli avantajı, danışman, ev sahibi patolog ve diğer katılımcılar arasında aynı anda gerçekleşen etkileşimdir; bu etkileşim, etkili bir şekilde öğretim aracı olarak hizmet etmektedir.

Anahtar kelimeler: Konsültasyon, Telepatoloji, Kemik ve Yumuşak Doku Tümörleri

Introduction

Consultation in medical practice can be described as an act of seeking assistance/opinion from other physicians or healthcare professionals for diagnostic studies, therapeutic interventions, or other services that may benefit the patient [1]. It is an indispensable practice in all branches of medicine including pathology. Until the pandemic, surgical pathology in our institution, mainly relies on the evaluation of physical glass slides, while consultations were mainly held face-to-face in the same physical environment.

During the recent COVID-19 pandemic, several lockdowns, work-from-home arrangements, and social distancing precautions largely eliminated the usual face-to-face consultation. We had to embrace Telepathology, which is a relatively new technology that is developing rapidly and is being widely used by pathologists, especially during the pandemic when face-to-face consultation is not available. It refers to the remote practice of pathology by utilizing telecommunication facilities to facilitate the transfer of pathology data between two different locations for the purpose of diagnosis, research, and education [2]. The term was first coined by Weinstein et al in 1986, who is also known by many as the 'Father of telepathology' [2,3]. Telepathology is defined as a form of communication between medical professionals that includes the transmission of pathology images and associated clinical information for various clinical applications including, but not limited to, primary diagnoses,

rapid cytology interpretation, intraoperative and second opinion consultations, ancillary study review, archiving, and quality activities [4].

Whole slide imaging (WSI) is a frequently used telepathology method for consultation in surgical pathology, however, it needs an advanced infrastructure for its deployment. It utilizes the use of a digital scanner for high resolution scanning of the glass slides [2,5,6]. Not all institutions can afford this massive investment in a short time, especially under the pandemic restrictions. Equipment cost emerges as another negative impediment. A cheaper option is static imaging (SI) of slides which is also widely used. It involves using a digital camera to capture multiple images from different but relevant areas of a glass slide and transmitting the same to the consulting pathologist for review. Its main drawback is the inability of the consultant to freely navigate the entire glass slide and overall dependence on only the captured images for interpretation. Therefore, static images should be taken by an experienced pathologist and must show critical parts relevant to diagnosis, or there should be numerous images of all parts of the slide. Both WSI and SI also generate lots of data load [2,5,6].

One of the most important factors that facilitate consultation in surgical pathology is to create an environment for mutual discussion and education through active participation. This is lacking in consultation through the traditional telepathology methods of WSI and SI, and the whole process becomes passive information transmission [5,6]. In our institution we

aimed to eliminate these handicaps by using the Zoom Cloud Meetings (Zoom Video Communications Inc. San Jose, CA) for consultation, effectively enjoying both slide-sharing ability as well as the opportunity for active discussion, effectively deploying dynamic nonrobotic telemicroscopy (DNTM) [5,6]. This study presents our experience in telepathology consultation via Zoom®.

Material and Methods

The study was conducted at Istanbul Medeniyet University Goztepe, Training & Research Hospital, Istanbul, a 758-bedded referral hospital with a fully functional orthopedic oncology unit among many other different subspecialties of medicine.

Equipment used for the consulting sessions was a microscope camera (DP72; Olympus®) mounted on a single-headed microscope (Bx-51; Olympus®). This microscope camera was attached to an internet-enabled computer via a HDMI cable. A computer program that could receive the view of the microscope camera (Olympus cell Sens standard), as well as the Zoom® Desktop Application (<https://zoom.us/download>), were installed on the internet-enabled computer. This would allow the glass slide seen through the microscope camera to be viewed on the computer screen, which would then be screen-shared on the Zoom® Desktop Application.

Only cases that were thought to be radiologically and clinically malignant or lesions with secondary changes due to coexisting bone fractures or had a preliminary diagnosis of benign lesion but also have a few atypical changes, were selected for the telepathology consultation. One hundred bone and soft tissue slides received from the orthopedic oncology unit between March 2020 and January 2021 were reviewed by two of the hospital's musculoskeletal pathologists (hosts) together with an external pathologist (consultant) via Zoom® video conferencing. Consultation sessions ranged from 2 to 3 hours, with the residents also as participants in the Zoom® sessions. The host would screen-share the Olympus cell Sens standard program, allowing the consultant to see the same microscope view as the host. The host usually would show the whole glass slide and highlight certain important areas for diagnosis. Since the Zoom® application provides an active interaction, the consultant pathologist can choose certain important areas to zoom in or to emphasize. The consultant, the host, and also the residents or other participants can share ideas simultaneously. The study has been approved by the Ethics Committee of Istanbul Medeniyet University Training and Research Hospital and conducted in accordance with the Helsinki Principles Declaration.

Results

Tissue specimens of 100 patients sent from the orthopedic oncology unit between March 2020 to January 2021 and reviewed with the consultant pathologist, who is experienced in the pathology of bone and soft tissue tumors, via Zoom® Desktop application were evaluated. The mean age of the patients was 32. 51% of the cases were male and 49% were female. Seventy cases were bone tissue lesions and thirty were soft tissue lesions. The final pathological diagnoses of the submitted tissue specimens are summarized in Table 1. Thirty-six of the consulted cases were resection materials, forty-two of them were curettage materials and twenty-two of them were tru-cut biopsy materials. The number of slides examined per case ranged between 1 to 28. Each slide showing similar morphological features for each case was marked. The relationships of bone lesions with bone and soft tissue were assessed. Due to the decalcification process and the nature of the curettage, a large number of serial sections were required for bone tissues. The relationship with surrounding tissues was evaluated in soft tissue tumors. The presence of mitosis and necrosis was marked by the host pathologist and presented during the consultation. Subsequent immunohistochemical stains were ordered for most of the cases and for certain cases, more than one round of immunostains was needed. For cases where immunohistochemistry or special stains were requested, the mean number of slides was 10. Patient information was shared via Zoom® during the consultation session and radiological images were evaluated by both the consultant and the host via screen sharing.

Table 1. Distribution of specimen tissue types

S/No	Tissue types	Percentage
	Bone lesions	70
1.	Undifferentiated round cell sarcoma	9
2.	Chondrogenic tumors	17
3.	Osteogenic tumors	11
4.	Osteoclastic giant cell rich tumors	9
5.	Other mesenchymal tumors of bone	19
6.	Hematopoietic neoplasms of bone	1
7.	Fibrogenic tumors	2
8.	Nontumoral infectious lesions	2
	Soft tissue lesions	30
1.	Adipocytic tumors	4
2.	Fibroblastic and myofibroblastic tumors	15
3.	Vascular tumors	4
4.	Tumors of uncertain differentiation	4
5.	Peripheral nerve sheath tumors	2
6.	Skeletal muscle tumors	1
	Totals	100 100

Discussion

With the COVID-19 pandemic, face-to-face consultation opportunities nearly vanished, and consultations became mostly via telepathology. Several studies were published that evaluated the different telepathologic methods and their adaptation to daily practice [7,8,9]. Through the peak of the COVID-19 pandemic, telepathology thrived in Turkey too. This study reports our experience in telepathology, a relatively new practice that we have started to implement frequently recently.

The challenges we encountered were similar to those in face-to-face consultations, such as macroscopically small tissues. This led to difficulty in evaluating atypical mitosis, necrosis, and increased mitotic index on small tissue size. However, the most challenging cases were the small round blue cell tumors, for which molecular tests are of great importance in the diagnosis (e.g., Ewing's Sarcomas).

Another challenge is with especially, the cartilage tumors in which the specimen was taken by curettage and providing many samples. Lipomas also may pose a challenge especially when atypical lipomatous tumors were included in the differential diagnosis, due to their diameter/localization and the need for large numbers of samples. Small round cell tumors were interpreted as malignant small round cell tumors without further differentiation, after rhabdomyosarcoma, lymphoma, synovial sarcoma, and mesenchymal chondrosarcoma were excluded by preliminary immunohistochemical examinations. Genetic tests were requested for these in accordance with the new World Health Organization (WHO) classification of soft tissue and bone tumors [10]. Since many samples were taken in the resections of lipomatous lesions larger than 10 cm in diameter or in deep localization, it was practically not possible to show all the slides via Zoom®. For this reason, slides were evaluated, and relevant areas were marked by two pathologists and these areas were selected for consultation. The diagnosis was supported immunohistochemically with MDM2 and CDK4 stains which were usually applied before the consultation. Since not all hematoxylin and eosin (H&E) stained glasses of such lesions can be presented for consultation, it was concluded that the host pathologist should have a certain experience with bone and soft tissue lesions.

One of the cases was a multifocal malignant mesenchymal tumor with permeative spread, in which atypical osteoblastic cells were observed microscopically, it was initially evaluated as osteosarcoma. A subsequent face-to-face consultation was requested for only this case when the diagnosis of synchronous osteosarcoma was confirmed.

For a successful telepathology, the following measures are important:

- Immunohistochemical/histochemical stains or molecular tests should be adequate.
- Radiologic findings and patient clinical history should be evaluated before the consultation session.
- In cases where a large number of samples are required (e.g. atypical lipomatous tumor, cartilaginous tumors), the host pathologist should be experienced.

However, these above items do not require to be as strict as in other telepathology arrangements.

The most important advantage of dynamic nonrobotic telemicroscopy is the simultaneous interaction between the consultant, the host pathologist, and other participants [5,6]. This advantage allows dynamic nonrobotic telemicroscopy to also be used for teaching since it supports real-time engagement from both ends.

Participants were able to actively participate during teaching sessions to formulate their own approach to the diagnosis or their differentials and to learn from each other's points of view. The consultant was able to give immediate feedback, point out the strength and weaknesses of any argument, and clarify any confusing points. A further benefit is the number of participants. Since the Zoom® application allows multiple participants, residents or other pathologists can actively participate in these consulting sessions. Simplicity is an added advantage as any smartphone with internet access can log in to Zoom®. Data load was also considerably reduced compared to WSI. There was usually a short turnaround time since this method is based on simultaneous interactions and can even be used for frozen section interpretation.

Another advantage was for cases requiring large numbers of sampling, dynamic nonrobotic telemicroscopy consultation provided the possibility to view more areas than static images.

One of the major weaknesses of this method of consultation is that it does not provide free navigation capability to the consultant like in WSI and dynamic robotic telemicroscopy [5,6]. Time constrain is another disadvantage, since the consultant should evaluate and interpret the lesions instantly during the session, which may result in diagnostic errors from oversight.

Today, this method can be used comfortably for diagnosis in centers that do not have digital slide-scanning systems. It also has the potential to be used as an adjunct to the usual physical face-to-face teaching, allowing the participation of residents



and a larger number of pathologists. Telepathology is a popular concept now and will probably become more popular over the next decades. Hence, it is important for all pathologists to be familiar with these methods as they may be the major development in the field of pathology in the 21st century.

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