Virtual teaching for medical students during SARS-CoV-2 pandemic

Sirs,

Medical schools are facing a major challenge in the course of the ongoing COVID-19 pandemic (1-3). In-person activity is restricted and teaching had to be converted from face-to-face lectures to online learning resources, mostly recorded video lectures. Recently, a new virtual reality (VR)-based teaching concept for medical students has been developed. The VR presents rheumatological cases in a virtual room including medical history, current medical problems, therapy options as well as imaging techniques (4). The strength of VR is the combination of real clinical patient data with high-resolution joint imaging (x-ray and high-resolution peripheral quantitative computed tomography [HR-pQCT]) and the possibility for the end user to interact with three-dimensional joint pathologies.

The aim of our study was to evaluate the practicability and acceptance of the VR as an alternative teaching tool during the corona virus pandemic.

We demonstrated the VR application (Rheumality©, v. 2.1, developed by Lilly Pharma Deutschland GmbH, Germany, details see Figure 1 and Supplementary file) after a short refresher lecture on rheumatic diseases during the curriculum at the University Hospital Jena. The refresher lecture focused on RMD (rheumatoid arthritis, psoriatic arthritis and spondyloarthritis) with the duration of 60 minutes. The students participated in the online training via Webex (Cisco Webex, California, USA). Owing to the chat function and audio transmission, students could ask questions and interact with the lecturer continuously. A live demonstration of the virtual patient was provided, using the VR technique and Webex as online platform. This VR teaching concept was evaluated through a survey. 237 medical students (163 female, 73 male, one diverse, age range 20–40 years) in their 8th semester of medicine filled out the evaluation form. For 84% of the students, the introductory lecture was a good revision of RMD. 72% rated the virtual teaching approach as "good" or "very good". From the students' point of view (87%), both diseases (RA and PsA) were sufficiently represented. Moreover, 91% reported that the lecture provided a deeper understanding of the pathological, clinical, and imaging findings of RMD. For 35% of students, the digital concept represented an alternative to traditional bedside-teaching, whereas 95% thought that the online course cannot replace the teaching in the presence of a "real" patient. 60% of the students required additional courses by VR.

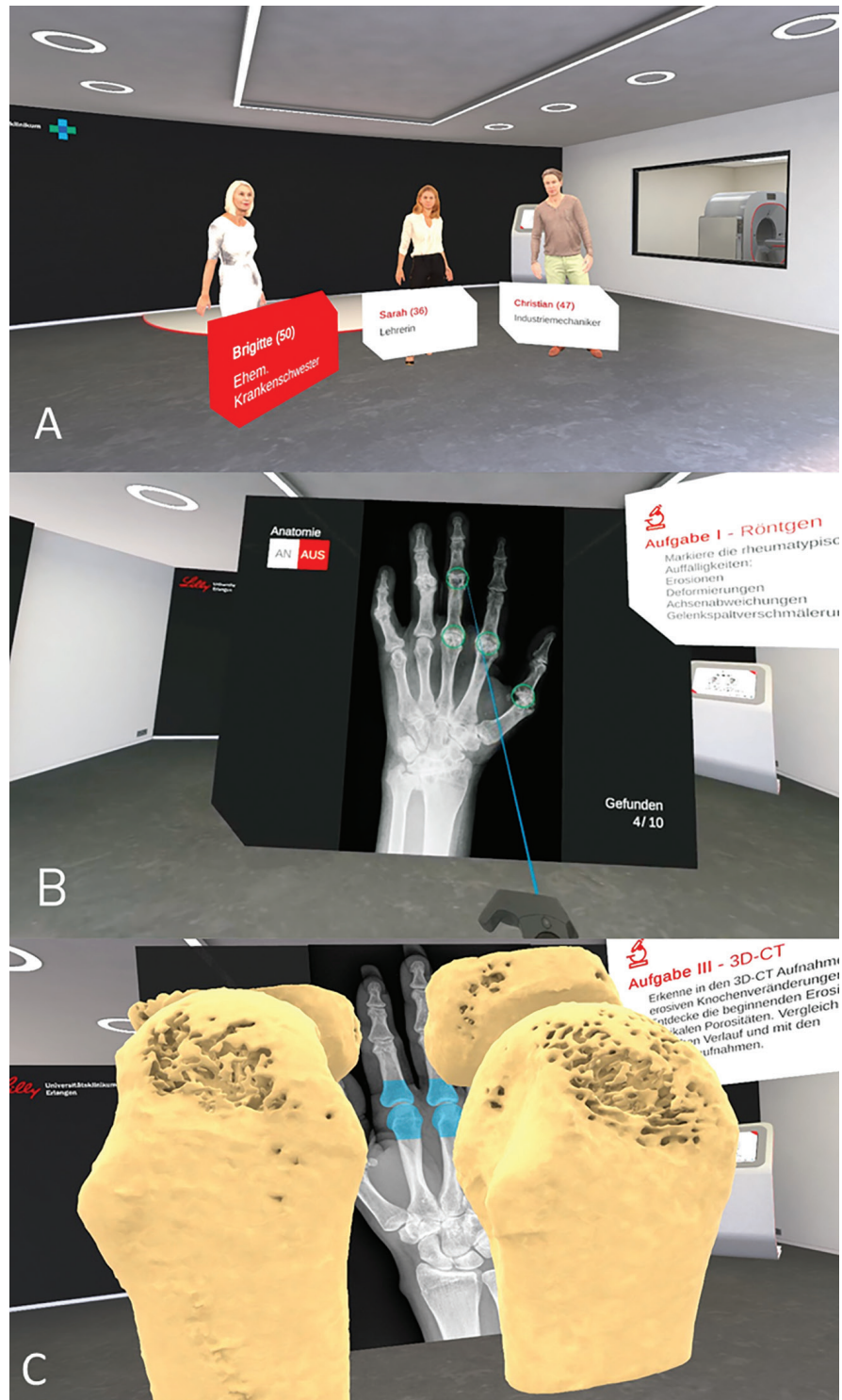Our study showed, that the new digital teaching concept VR seems to be particularly suitable in teaching RMD during the current pandemic. In addition, our data is also important for the future integration of this multifunctional technology into the teaching landscape in general (5). With respect to RMD, we could also demonstrate that novel forms of presentation of joint pathologies such as this virtual VR application can deepen the knowledge and understanding of RMD and could complement conventional RMD teaching even after the COVID-19 pandemic. Interestingly, our evaluation survey also clearly demonstrated that medical students consider these

Fig. 1. Screen view of virtual reality (VR).
A: VR included three virtual patients with early and established rheumatoid arthritis as well as psoriatic arthritis.
B: For the demonstration of structural damage hand x-rays were used.
C: For a deeper understanding HR-pQCT images were applied as VR.

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techniques as complementary teaching tools and term the traditional bedside teaching as essential.

In summary, VR is an excellent complementary teaching tool to familiarise with RMD diseases and to maintain rheumatology training in the midst of the global pandemic and enrich medical education in general.

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