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ADVANCING THROUGH INNOVATION

Impact of the COVID-19 pandemic on dental clinical training and future prospects

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1 | PROBLEM

The coronavirus disease (COVID-19) was declared a pandemic by the World Health Organization on March 11, 2020 and has since spread globally in a short span of time.[1] Because the primary mode of transmission of COVID-19 is via respiratory droplets and aerosols through close human contact,[2] most dental schools throughout the world either suspended or postponed their simulated and clinical skills training courses, including Tohoku University Hospital. However, dental students require training for their clinical skill development and need sufficient opportunities for practical application of these skills by attending to the hospital patients.

2 | SOLUTION

As a solution to this problem, we planned to use the SIM-ROID, which is a humanoid robot that simulates a patient for dental training (Figure 1). The SIMROID has a realistic human appearance and is equipped to interact with the students through expressions, movements, and speech. Moreover, it reacts to pressure on the body as physical pain[3] and can respond to the operator's voice in Japanese and English. Therefore, the SIMROID is not only a possible method of clinical training but can also be used to allow students to practice their patient communication skills.

FIGURE 1 Patient simulation system for dental education (SIMROID)
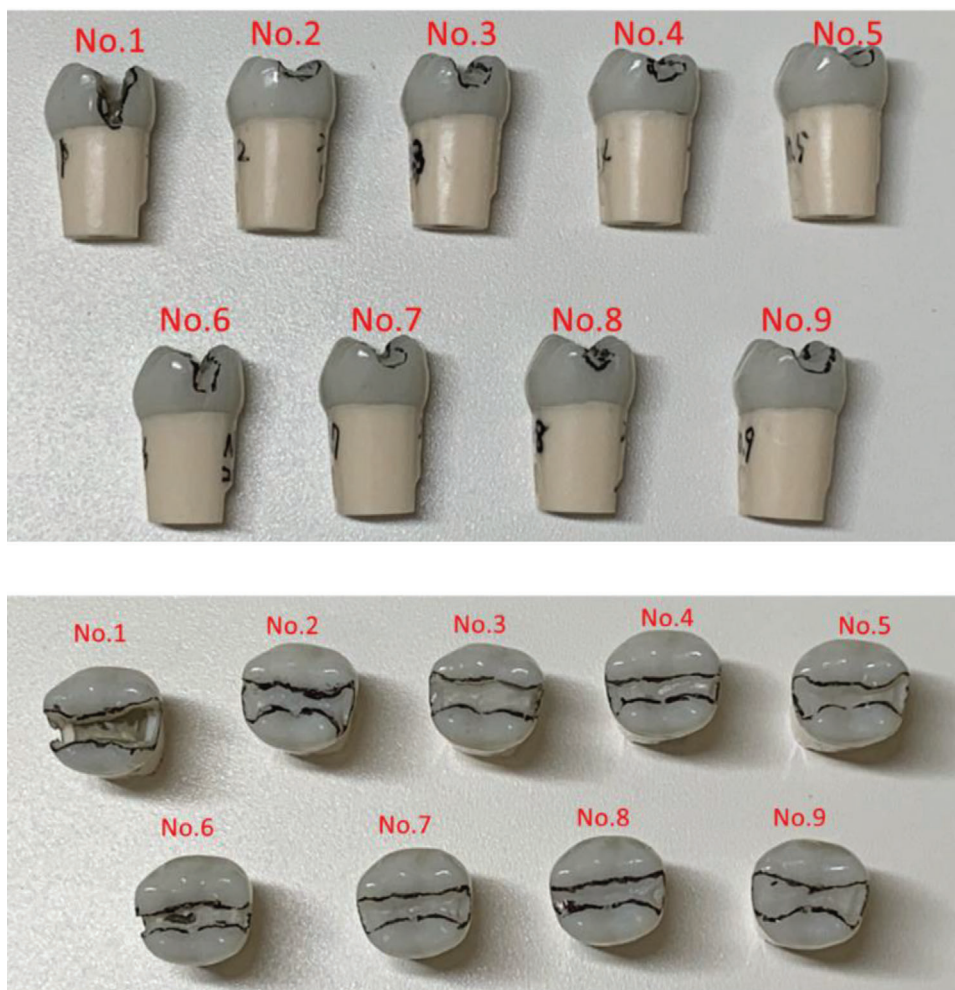
No. 1—Student 1 (predoctoral)
No. 2—Student 2 (postgraduate)
No. 3—Student 3 (postgraduate)
No. 4—Student 4 (postgraduate)
No. 5—Student 5 (postgraduate)
No. 6—Student 6 (predoctoral)
No. 7—Student 7 (predoctoral)
No. 8—Student 8 (predoctoral)
No. 9—Student 9 (predoctoral)

FIGURE 2 The tooth preparations by the international students on the left mandibular first molars

International students are not allowed to treat patients or set up a clinical practice in Japan, even if they have obtained a dental license in their own country. Therefore, we have provided clinical practice to international students using the SIMROID, and subsequently administered a questionnaire after its trial to preliminary evaluate its usability. These preliminarily evaluations provided some positive results, which perhaps suggest that this device can
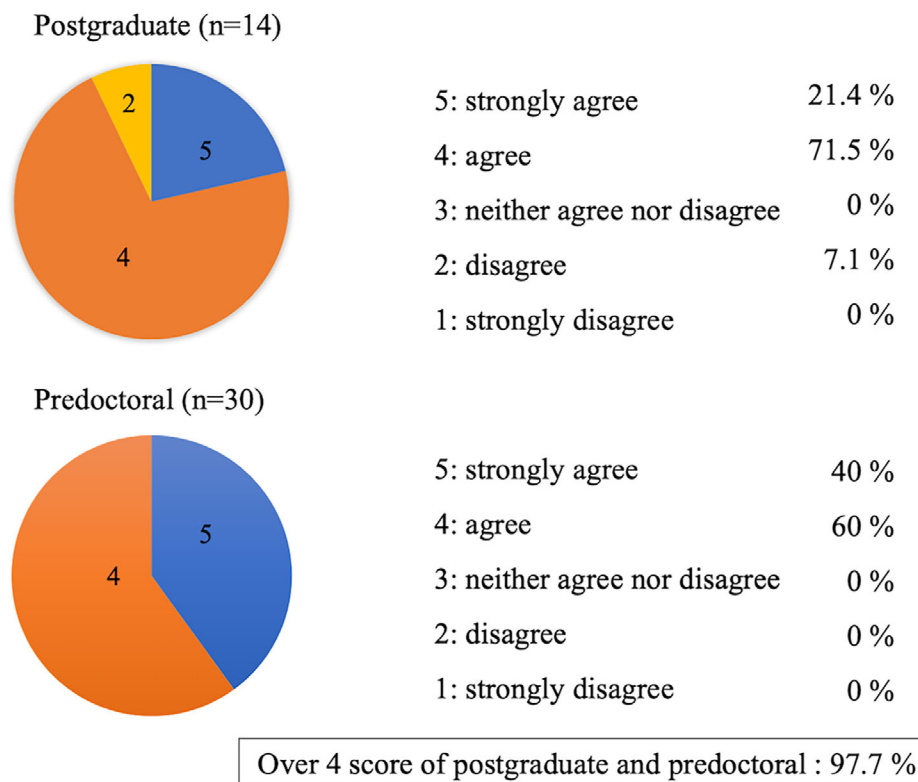
Postgraduate (n=14)

5: strongly agree	21.4 %
4: agree	71.5 %
3: neither agree nor disagree	0 %
2: disagree	7.1 %
1: strongly disagree	0 %

Predoctoral (n=30)

5: strongly agree	40 %
4: agree	60 %
3: neither agree nor disagree	0 %
2: disagree	0 %
1: strongly disagree	0 %

Over 4 score of postgraduate and predoctoral : 97.7 %

FIGURE 3   Results to the question "Was the Dental Training Robot effective for you?"

be useful for clinical skill training of students. Hence, we decided to use the SIMROID for clinical training in the current scenario.

3 | RESULTS

The results of the Class II tooth preparation for mesio-occluso-distal esthetic inlay on typodont teeth of SIMROID (Figure 2) demonstrated that postgraduate students (Figure 2; Nos. 1 and 6–9) were better at tooth preparation than predoctoral students (Figure 2; Nos. 2–5). Figure 3 shows the responses to the question "Was the Dental Training Robot effective for you?" A feedback form from the international students revealed that most (97.7%) answered that the SIMROID was "effective in dental training." The most common reason for this answer was due to "the robot's ability to mimic the patient's response, answer questions, open mouth more realistically, and respond to any uncomfortable procedure." These results showed that the SIMROID is useful in clinical training, especially preclinical training. Moreover, in comparison with the traditional simulation teaching techniques, it is expected to increase the sense of presence. Although the SIMROID has certain disadvantages, such as a high cost, time-consuming maintenance, requirement of a dedicated place for its installation, and the feasibility of only limited students practicing at

a time, it is still expected to be used as an alternative to the clinical trainings during future situations similar to the COVID-19 pandemic.

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