

Letter to the Editor

The acceptance to germline gene therapy increased during COVID-19 pandemic among Japanese medical students

Germline gene therapy (GGT) and mitochondrial replacement therapy (MRT) has the potential to be a radical treatment approach for monogenic heritable diseases. The remaining technical issues for GGT would be solved year by year.¹ It was shown that the many of the responders accepted GGT in previous Japanese surveys.^{2,3} And more discussions are essential before application to human clinical therapy.

In March 2020, the pandemic of COVID-19 was declared, and the novel gene-editing technologies-based vaccines were developed rapidly. This progress was frequently shown via mass media. Therefore, we obtained the many opportunities to think about the genetical technologies. As reported before, a more detailed understanding of GGT would increase people's awareness of its acceptability.² This suggests daily thinking about COVID-19 vaccines might have worked as opportunities to deepen their understanding of gene editing technology.

A previous Japanese report showed well-educated medical students had mature opinions to new reproduction technologies.⁴ We conducted medical students questionnaire survey about the

clinical application of GGT and MRT from pre-pandemic 2019 to post-pandemic 2021, and determined the change of acceptance after pandemic.

We recruited third-grade medical students who took bio-ethics lecture about new reproductive technology in November 2019, 2020, and 2021. Each year the 81, 57, and 53 participants answered our anonymous questionnaires about the clinical use of GGT and MRT for life-threatening disease. This survey was conducted under the ethical review of Yokohama City University (Review number: A200200010). We collected valid answers about GGT from 185 students and valid answers about MRT from 184 students.

In result, the 72.4% (134/185) and 86.4% (159/184) of the students accepted clinical use of GGT and MRT for life-threatening disease with appropriate regulations (Figure 1). Next, as showed in Figure 2, although the rates of acceptance occupied the majority in all durations, they significantly increased after COVID-19 experience (2019 vs. 2020; $p < 0.01$) and the high rates were kept in 2021.

Our results indicate that the Japanese acceptance for the use of GGT and MRT can be changed under

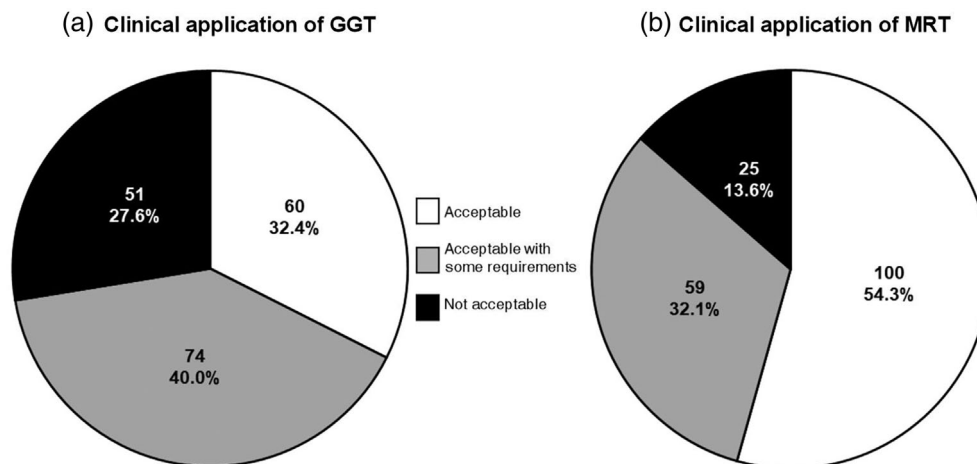


FIGURE 1 These are the rate of answers to each question. (a) The answer to “Can you accept clinical use of germline gene therapy for life-threatening disease.” (b) The answer to “Can you accept clinical use of mitochondria replacement therapy for life-threatening mitochondrial disease”

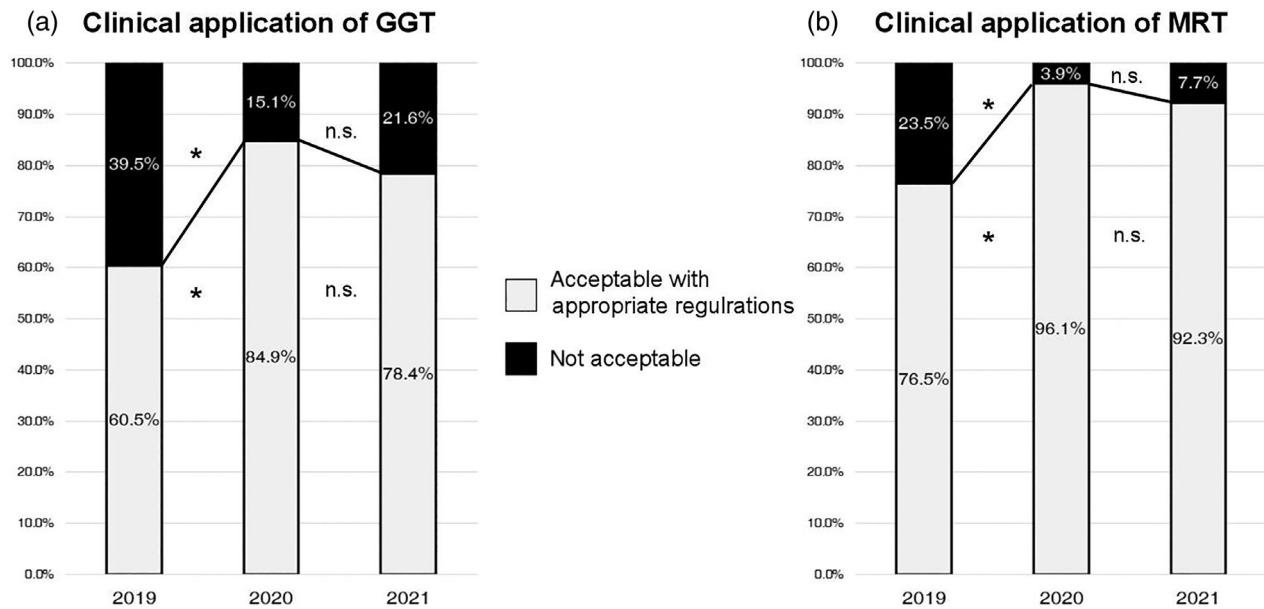



FIGURE 2 These are the change of answer rate in 3 years. (a) The answer to “Can you accept clinical use of germline gene therapy for life-threatening disease.” (b) The answer to “Can you accept clinical use of mitochondria replacement therapy for life-threatening mitochondrial disease.” “Asterisk” indicates statistical significance ($p < 0.01$). “N.s” indicates no statistical significance

the COVID-19 pandemic with novel vaccines. For the clinical use of GGT and MRT, the improvement of the regulations is essential for the next step. It is also important to monitor the change of acceptance in various people.

Disclosure

None declared.

Akifumi Ijuin^{1,2} , Tomonari Hayama^{1,3} and Hideya Sakakibara³

¹Center for Reproductive Medicine, Yokohama City University Medical Center, Yokohama-shi, Japan,

²Department of Obstetrics and Gynecology, Yokohama City University Graduate School of Medicine, Yokohama, Japan, and ³Department of Gynecology, Yokohama City University Medical Center, Yokohama-shi, Japan

Correspondence

Hideya Sakakibara, 4-57 Urafunecho Minami-ku, Yokohama-shi, Kanagawa-ken 232-0024, Japan.
Email: sakakih@yokohama-cu.ac.jp

References

- Zuccaro MV, Xu J, Mitchell C, Marin D, Zimmerman R, Rana B, et al. Allele-specific chromosome removal after Cas9 cleavage in human embryos. *Cell*. 2020;**183**(6):1650–64.e15.
- Uchiyama M, Nagai A, Muto K. Survey on the perception of germline genome editing among the general public in Japan. *J Hum Genet*. 2018;**63**(6):745–8.
- Taguchi I, Yamada T, Akaishi R, Imoto I, Kurosawa K, Nakatani K, et al. Attitudes of clinical geneticists and certified genetic counselors to genome editing and its clinical applications: a nation-wide questionnaire survey in Japan. *J Hum Genet*. 2019;**64**(9):945–54.
- Hosokawa R, Imai H, Muraoka K, Nakao H, Tsukino H, Katoh T. Comparison of ordinary people, medical doctors and medical students on ethical awareness and value regarding genetic medicine. *Seimeirinri*. 2003;**13**(1):105–12.