The Vague Differentiation between Artificial Reality Technologies in Plastic Surgery

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Many plastic surgery procedures demand perception of complex 3-dimensional anatomy, as well as accuracy. In the modern era, these aims are achieved with the aid of artificial reality technologies, including virtual, augmented (AR), and mixed reality (MR). However, have AR and MR been properly defined and differentiated by authors who implemented MR in plastic surgery?

Mitsuno et al defined MR as “AR technology that can interactively manipulate displayed information by adding virtual reality–like element.” Also, the authors defined AR as “the technology used to add information, including 3-dimensional models, to a real visual field,” citing the article by Azuma. However, according to Azuma, AR, apart from superimposing virtual objects on the real world, does enable users to interact with both real and virtual elements, whereas, according to Mitsuno et al, interaction is a characteristic of MR and not of AR. Thus, because this definition, which was given to AR by Azuma, is similar to that given to MR by Mitsuno et al, what is the difference between the 2 technologies?

Another point that attracts attention in the article by Mitsuno et al is that, because they defined HoloLens (Microsoft Corp., Redmond, Wash.) as an MR technology, they noted that there are already many reports of its use in the medical field, citing the article by Hanna et al. However, Hanna et al stated that HoloLens is an AR, and not MR, device. According to Brigham, who described the main characteristics of AR and MR, the basic difference between those 2 technologies is that AR does not allow for perception of depth and perspective of the virtual objects, while MR does.

Because many plastic surgery procedures demand perception of complex 3-dimensional anatomy, as well as accuracy, it is obvious that the aforementioned difference between MR and AR is important for their ability to contribute to plastic surgery practice. Furthermore, in an article by Tepper et al, it was stated that MR “merges many of the benefits of virtual reality and AR and as a result may be more useful for surgeons.” Also in that article, no further clarification was given about the aforementioned potential of MR. Moreover, Tepper et al stated that a significant limitation of AR is the inability of interaction with 3-dimensional data. However, this definition does not agree with the aforementioned one, given by Azuma. Thus, regardless of the fact that Mitsuno et al and Tepper et al may or may not have experienced a technology that enables users to perceive depth and perspective of virtual elements, a confusion can be remarked in the literature. This confusion does not permit surgeons to realize and investigate the different ability of AR and MR in illustrating anatomy in plastic surgery.

In conclusion, it is important for every author who explores MR to delineate its characteristics and explain its difference from AR, taking into account that the aforementioned confusion has a negative impact on plastic surgery research.

DISCLOSURE

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