COMMENTARY

Potential Applications of Augmented Reality in Gynecological Surgery

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Abstract

Background: Augmented reality use has been attempted in other specialties and has the potential to impact gynecological surgery.

Objective: To make the readers aware of the use of augmented reality and its use in gynecological surgery.

Materials and methods: A comprehensive review of the literature was undertaken to compile instances wherein augmented reality was used in the surgical specialties.

Conclusion: Augmented reality has the potential to make gynecological surgery safer and change the way it is taught and practiced around the world. Its success will depend on the partnership between surgeons and technology scientists.

Keywords: Artificial intelligence, Augmented reality, Gynecologic surgery.

Journal of South Asian Federation of Obstetrics and Gynaecology (2021): 10.5005/jp-journals-10006-1957

Intelligence is the ability to acquire knowledge or skills. Attempts at demonstrating the capabilities of an artificial intelligence (AI) have been made.[1,2] Augmented reality by definition is an enhanced version of the real physical world through the use of digital visual elements, sound, or other sensory stimuli delivered via technology. Augmented reality has already been used in a number of clinical and surgical specialties. Pivotal to the development of the algorithm is acquisition of sufficient data of previous surgeries. Kitaguchi et al. collected numerous videos of colorectal surgeries for the use of a convolutional neural network (CNN).[3] Surgical videos can be used as a quantitative data source for research in intraoperative clinical decision support, risk prediction, and outcomes studies as demonstrated by Hashimoto et al.[4] They demonstrated that an AI algorithm can extract quantitative surgical data from video with 85.6% accuracy for sleeve gastrectomy.

Applications of augmented reality can be particularly useful in surgeries of rare anomalies or rare cases and also for training novice surgeons in advance techniques not commonly practiced.

The potential to define and document the surgical planes of dissection is particularly useful in cases of frozen pelvis and in endometriosis and oncology. The use of deep learning formulae can potentially be used to provide real-time guidance during a surgery thus reducing unforeseen complications. Madani et al. used deep learning algorithms to identify safe and dangerous zones of dissection and anatomical landmarks during laparoscopic cholecystectomy.[5] Mascagni et al. have done similar work in laparoscopic cholecystectomy to segment hepatocystic anatomy with algorithms and assess the criteria defining the critical view of safety.[6]

Differentiating benign from a malignant tissue can have far-reaching applications. From diagnosing benign and malignant polyps on hysteroscopy to characterizing lymph nodes on laparoscopic radical hysterectomy can potentially obviate indocyanine green dye injection and support histopathological examination. Use of AI has already been documented in colorectal polyp recognition on endoscopy by Hassan et al.[7] Singara et al. have also document similar work.[8] Esteva et al. have shown ability of AI in differentiating benign skin lesions and melanoma using a deep CNNs. They showed performance on par with all tested experts in dermatology.[9] They also stated that the use of mobile devices coupled with deep learning algorithms could extend the reach of their specialty thus improving healthcare standards at lower cost.

Use in gynecology is as of date limited. Bourdel et al. have attempted to use augmented reality during laparoscopy to localize myomas.[10] However, this is a limited number of patients and far greater numbers are required to streamline its use in gynecological surgery. Augmented reality has the potential to make gynecological surgery safer and change the way it is taught and practiced around the world. Its success will depend on the partnership between surgeons and technology scientists.

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How to cite this article: Desai GS, Mayadeo NM. Potential Applications of Augmented Reality in Gynecological Surgery. J South Asian Feder Obst Gynae 2021;13(5):362–363.

Source of support: Nil

Conflict of interest: None

References

1. Desai T, Kumari U, Vaidyanathan S. Suraksh—intrapartum monitoring application: In the era of distancing and digitalization. Journal of South Asian Federation of Obstetrics and Gynaecology 2020;12(5):271–276. DOI: 10.5005/jp-journals-10006-1816.
2. Dalal RJ, Gupta S, Mishra AP. Artificial intelligence in assisted reproductive technology: present and future. Int J Infertil Fetal Med 2020;11(3):61–64. DOI: 10.5005/jp-journals-10016-1208.
3. Kitaguchi D, Takeshita N, Matsuzaki H, et al. Automated laparoscopic colorectal surgery workflow recognition using artificial intelligence: experimental research. Int J Surg 2020;79:88–94. DOI: 10.1016/j.ijsu.2020.05.015.

4. Hashimoto DA, Rosman G, Witkowski ER, et al. Computer vision analysis of intraoperative video: automated recognition of operative steps in laparoscopic sleeve gastrectomy. Ann Surg 2019;270(3):414–421. DOI: 10.1097/SLA.0000000000003460.
5. Madani A, Namazi B, Altieri MS, et al. Artificial intelligence for intraoperative guidance: using semantic segmentation to identify surgical anatomy during laparoscopic cholecystectomy. Ann Surg 2020. DOI: 10.1097/SLA.0000000000004594.
6. Mascagni P, Vardazaryan A, Alapatt D, et al. Artificial intelligence for surgical safety: automatic assessment of the critical view of safety in laparoscopic cholecystectomy using deep learning. Ann Surg 2020. DOI: 10.1097/SLA.0000000000004351.
7. Hassan C, Wallace MB, Sharma P, et al. New artificial intelligence system: first validation study versus experienced endoscopists for colorectal polyp detection. Gut 2020;69(5):799–800. DOI: 10.1136/gutjnl-2019-319914.
8. Sinagra E, Badalamenti M, Maida M, et al. Use of artificial intelligence in improving adenoma detection rate during colonoscopy: might both endoscopists and pathologists be further helped. WorldJ Gastroenterol 2020;26(39):5911–5918. DOI: 10.3748/wjg.v26.i39.5911.
9. Esteva A, Kuprel B, Novoa RA, et al. Dermatologist-level classification of skin cancer with deep neural networks. Nature 2017;542(7639):115–118. DOI: 10.1038/nature21056.
10. Bourdel N, Collins T, Pizarro D, et al. Use of augmented reality in laparoscopic gynecology to visualize myomas. Fertil Steril 2017;107(3):737–739. DOI: 10.1016/j.fertnstert.2016.12.016.