As current augmented reality (AR) smart glasses are self-contained, powerful computers that project 3-dimensional holograms that can maintain their position in physical space, they could theoretically be used as a low-cost, stand-alone neuronavigation system.

van Doormaal et al., programmed a fully functioning neuronavigation system on commercially available smart glasses (HoloLens®, Microsoft, Redmond, Washington) and tested its accuracy and feasibility in the operating room. The fiducial registration error (FRE) was measured for both HN and conventional neuronavigation (CN) (Brainlab, Munich, Germany) by using point-based registration on a plastic head model. Subsequently, we measured HN and CN FRE on 3 patients.

A stereoscopic view of the holograms was successfully achieved in all experiments. In plastic head measurements, the mean HN FRE was 7.2 ± 1.8 mm compared to the mean CN FRE of 1.9 ± 0.45 (mean difference: -5.3 mm; 95% confidence interval [CI]: -6.7 to -3.9). In the 3 patients, the mean HN FRE was 4.4 ± 2.5 mm compared to the mean CN FRE of 3.6 ± 0.5 (mean difference: -0.8 mm; 95% CI: -3.0 to 4.6).

Owing to the potential benefits and promising results, we believe that HN could eventually find application in operating rooms. However, several improvements will have to be made before the device can be used in clinical practice [1)].

1)
van Doormaal TPC, van Doormaal JAM, Mensink T. Clinical Accuracy of Holographic Navigation Using Point-Based Registration on Augmented-Reality Glasses. Oper Neurosurg (Hagerstown). 2019 May 13. pii: opz094. doi: 10.1093/ons/opz094. [Epub ahead of print] PubMed PMID: 31081883.