Artem Kuptsov

In a descriptive narrative review and proof-of-concept study on the integration of emerging technologies (3D virtual reality and 3D printing) in neurosurgical preoperative planning, González-López et al. [1] — from the Department of Neurosurgery, Hospital General Universitario de Alicante, Spain; the Department of Clinical Neurosciences, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, Switzerland; and the Department of Neurosurgery, National Hospital for Neurology and Neurosurgery, London, UK in the Journal of Personalized Medicine explore how this combination can enhance the preoperative planning process in neuro-oncology, going beyond conventional 2D imaging by improving spatial understanding, surgical preparation, and patient safety.

They conclude that traditional 2D imaging is limited in visualizing complex neuroanatomy. In contrast, the integration o3D VR]] and 3D printing allows for more intuitive and realistic preoperative planning. These technologies support virtual rehearsals and hands-on simulation, improving surgical preparedness and potentially enhancing patient safety.

This approach represents a paradigm shift in how neurosurgical interventions can be planned, especially in the field of neuro-oncology.

 Takeaway Message for Neurosurgeons The integration of 3D virtual reality and 3D printing provides neurosurgeons with highly realistic, patient-specific models for preoperative simulation. This enables better spatial orientation, practice of complex approaches, and ultimately, safer and more precise surgeries—especially valuable in tumor cases with delicate anatomical surroundings.

While González-López et al. attempt to portray the integration of 3D virtual reality and 3D printing in neurosurgical preoperative planning as a “paradigm shift”, the article falls short of offering any rigorous evidence to justify such a claim. What is presented as innovation is, in reality, a descriptive overview devoid of quantitative validation, comparative outcome data, or clinical impact metrics.

First and foremost, the study is not a study in the strict scientific sense—it is a narrative commentary masked as a proof-of-concept, without prospective data, cohort analysis, or even a structured methodology section. There is no control group, no patient series, no operative outcomes, and no statistical analysis. Claims about improved spatial understanding and patient safety are purely speculative and remain unsupported by empirical findings.

The authors recycle well-known ideas—that 2D imaging is cognitively demanding and that 3D reconstructions can aid comprehension—yet they offer no novel insights beyond these banalities. Moreover, the article fails to address critical limitations of these technologies, such as:

Cost-effectiveness in routine clinical practice

Learning curves for surgeons and residents

Limited reproducibility across centers with different infrastructures

The lack of clinical trials demonstrating improved morbidity or mortality rates

There is also a concerning technophilic bias: the assumption that newer technology inherently improves outcomes. The authors do not reflect on the risk of overreliance on VR or printed models, nor do they assess whether this "enhanced realism" translates to better decision-making in real-world settings.

Finally, the label of "paradigm shift" is overstated. A true paradigm shift in neurosurgery would require robust evidence of changed outcomes, altered standards of care, and widespread adoption—none of which are documented here.

 Verdict:

An aesthetic showcase of tools without scientific substance. Until these technologies are tested through well-designed studies demonstrating measurable benefits for patients and surgeons alike, this article belongs more in the realm of promotional material than serious academic literature.

In a retrospective cohort study, Artem Kuptsov et al. — from the Departments of Neurosurgery, Otorhinolaryngology, Endocrinology, and Epidemiology at the Hospital General Universitario de Alicante, Spain — published in the Journal of Neurological Surgery Part B Skull Base [2] aim to identify preoperative anatomical-radiological factors that influence:

The extent of tumor resection

The preservation of hormonal function following endoscopic endonasal surgery for pituitary adenomas

The authors found that:

Lower tumor extension, as classified by the SIPAP classification, was significantly associated with a greater degree of resection

The presence of a postoperative CSF leak was significantly associated with reduced hormonal preservation

They conclude that the SIPAP classification, easily assessed on preoperative MRI, may serve as a predictive tool for surgical outcomes.

The study is a retrospective analysis of 101 patients over a 5-year period — a sample size that borders on anecdotal when trying to draw predictive conclusions in a multifactorial pathology like pituitary adenomas. No control group. No blinding. No prospective validation. Retrospective bias and selective reporting are inevitable.

Moreover, the observational nature of the study makes any claim of "prediction" or "influence" inherently flawed. Correlation does not equal causation, but the authors walk a fine line, subtly suggesting that variables like SIPAP staging or CSF leak causally determine outcomes, without rigorous statistical modeling to support it.

 Purpose: Obvious and Redundant The main hypothesis — that radiological features like tumor extension affect resectability and CSF leak impacts hormonal outcome — is so obvious it borders on tautology. If a tumor grows into more compartments (SIPAP), resection is harder. If there's a CSF leak, the surgery went worse. This isn't scientific revelation; it's surgical common sense dressed up as a

finding.

There’s a total absence of novel radiological biomarkers, machine learning validation, or quantitative volumetric analysis. The authors simply confirmed what surgeons already know by eyeballing MRIs.

 Methodology: Lacks Rigor SIPAP and Knosp scales are ordinal and subjective. The study doesn’t clarify how interobserver variability was managed.

There is no multivariate analysis to control for confounders like tumor consistency, surgeon experience, or intraoperative tools used.

No data on how “hormonal preservation” was defined — was it biochemical, symptomatic, or merely descriptive?

The absence of hormonal panels, long-term follow-up, or detailed endocrinological profiling is a glaring limitation for a study that claims to assess endocrinological outcomes.

 Results: Underwhelming The only statistically significant findings are that less extension = better resection, and no CSF leak = better hormonal outcomes.

These are retrospective reconfirmations, not discoveries.

The article offers no intervention, no algorithm, and no tool for clinicians to change practice.

It adds nothing to existing classification systems or surgical protocols. There’s no ROC curve, no predictive model, no validated score — just p-values on known associations.

 Technological Blindness In 2023, failing to incorporate AI-assisted segmentation, radiomics, or automated volumetrics in a radiology-focused surgical study is indefensible. The authors lean on dated, manual interpretations of MRI, ignoring a decade of progress in radiological analysis.

 The Journal: Too Forgiving? Published in J Neurol Surg B Skull Base — a reputable but not high-impact journal — the editorial bar for novelty seems to have been lowered in favor of regional institutional publication. There is a subtle academic nepotism flavor here: all authors are from the same hospital, with no external validation or collaboration.

 Overall Impression This article reads more like a post-hoc justification of routine surgical practice than a scientific contribution. It presents predictable results, superficial analysis, and underwhelming conclusions while pretending to offer radiological insight.

If this is to guide future practice, it must be said: neurosurgery deserves better. The field needs predictive modeling, personalized imaging analytics, and biological correlates, not retrospective regurgitations of the obvious.

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González-López P, Kuptsov A, Gómez-Revuelta C, Fernández-Villa J, Abarca-Olivas J, Daniel RT, Meling TR, Nieto-Navarro J. The Integration of 3D Virtual Reality and 3D Printing Technology as Innovative Approaches to Preoperative Planning in Neuro-Oncology. J Pers Med. 2024 Feb 7;14(2):187. doi: 10.3390/jpm14020187. PMID: 38392620; PMCID: PMC10890029.
2)
Kuptsov A, Abarca-Olivas J, Monjas-Cánovas I, Argüello-Gordillo T, Picó-Alfonso A, Sánchez-Payá J, Nieto-Navarro JA. Anatomical-Radiological Aspects and Their Influence on the Results of Pituitary Adenomas Endoscopic Endonasal Surgery. J Neurol Surg B Skull Base. 2023 Jun 15;85(5):501–508. doi: 10.1055/a-2095-6442. PMID: 39228890; PMCID: PMC11368454.