3D Vitom

Exoscope conjugating 4K resolution view and three-dimensional technology.

The exoscope has been introduced as an alternative to microscopes or endoscopes. Barbagallo et al., used a 3D, HD exoscope (3D Vitom®, Karl Storz, Tuttlingen, Germany) in two patients undergoing two-level ACDF for cervical myelo-radiculopathy.

The exoscope was used during soft-tissue dissection, discectomy, osteophytectomy and cage insertion. Microsurgical drilling of posterior osteophytes, which usually requires adequate magnification and proper microscope angulation, was also performed with the exoscope.

Exoscope provided a 3D view of the surgical field similar to a microscope and allowed us to effectively and safely perform the above surgical steps. The main advantage of 3D exoscope-assisted surgery, compared to microscope-assisted surgery, is the possibility to generate videos with a similar view and image quality as perceived by the surgeon; therefore, the didactic capabilities of exoscopic videos are greater than those provided by microscopes. Exoscopes are also smaller compared to microscopes: this allows for comfortable use from early surgical steps to device implantation.

Barbagallo et al., think that exoscope-assisted surgery may become a safe and effective alternative to microscope-assisted surgery in ACDF [1)].

Five neurosurgical procedures for the removal of intradural extra-medullary tumors were performed with the VITOM®-3D. Patients' population, feasibility of surgery under the exoscope visualization, VITOM®-3D's technical and optical characteristics, and surgical outcome were analyzed.

All surgeries were performed following the common steps of spinal neurosurgical intradural procedures. The exoscope offered excellent, magnified and brilliantly illuminated high definition images of the surgical field in all the described cases. All the reported surgical operations were successfully completed under exoscope magnification from both the technical as well as the clinical points of view. No complications potentially related to the use of the exoscope occurred. Working environment ergonomics and trainees learning experience were the most relevant benefits associated with the use of exoscope.

VITOM®-3D may represent a valid visualization tool in spinal procedure for intradural extra-medullary tumors. This preliminary experience can be useful in better define the role of VITOM®-3D in neurosurgery [2)].

A video showed an exoscope-guided single-stage resection with 3-dimensional technology of a supratentorial cavernoma and a supratentorial hemangioblastoma during the same surgical procedure. The patient is a 42-yr-old man with a history of generalized tonico-clonic seizures. Contrast-enhanced magnetic resonance (MR) revealed the presence of a left frontal cavernoma and a left T1 non-enhancing hypointese temporal lesion (hemangioblastoma). The operation was carried out in the lateral position with the sole use of a 3D-exoscope (VITOM-3D, Karl Storz GmbH&Co, Tuttlingen, Germany). The operating room set-up included the surgeons standing at the head of the patients with the operating and navigator screens in the front of them and the exoscope arm entering from the left side. As recently highlighted, the 3D-exoscope carries several advantages: (1) it allows neurosurgeons to operate in a confortable and stable position; (2) it is less space-occupying in comparison to the microscope; (3) the optics and 3D-screen offer an optimal stereoscopic view in comparison to the 2D-exoscope, important for both surgical and training purposes; (4) although sharing with the endoscope, the image quality and confortable surgeon's position, there is no conflict between the surgical instruments and the scope in the surgical field. The adopted strategy enabled a complete resection of both lesions. The postoperative course was uneventful and the patient was seizure-free; the antiepileptic drugs were discontinued 3 mo after surgery. The 3D-exoscope represents a promising surgical tool, which may become part of the neurosurgical armamentarium. Nevertheless, the conceivable capability to improve neurosurgical results will have to be explored [3)].

Beez et al., described the first applications in pediatric neurosurgery. The VITOM 3D exoscope (Karl Storz GmbH, Tuttlingen, Germany) was used in pediatric microneurosurgical operations, along with an OPMI PENTERO operative microscope (Carl Zeiss AG, Jena, Germany). Experiences were retrospectively evaluated with five-level Likert items regarding ease of preparation, image definition, magnification, illumination, field of view, ergonomics, accessibility of the surgical field, and general user-friendliness. Three operations were performed: supratentorial open biopsy in the supine position, infratentorial brain tumor resection in the park bench position, and myelomeningocele closure in the prone position. While preparation and image definition were rated equal for microscope and exoscope, the microscope's field of view, illumination, and user-friendliness were considered superior, while the advantages of the exoscope were seen in ergonomics and the accessibility of the surgical field. No complications attributed to visualization mode occurred. In our experience, the VITOM 3D exoscope is an innovative visualization tool with advantages over the microscope in ergonomics and the accessibility of the surgical field. However, improvements were deemed necessary with regard to field of view, illumination, and user-friendliness. While the debate of a “perfect” visualization modality is influenced by personal preference, this novel visualization device has the potential to become a valuable tool in the neurosurgeon's armamentarium [4)].

Rossini et al., presented the first case report of cranial surgery in 2017 performed using the VITOM 3D, and discussed advantages and disadvantages compared with the operating microscope.

A 50-year-old patient with vertigo and headache linked to a petrous ridge meningioma underwent surgery using the VITOM 3D. Complete removal of the tumor and resolution of symptoms were achieved. The telescope was maintained over the surgical field for the duration of the procedure; a video monitor was placed at 2 m from the surgeons; and a control unit allowed focusing, magnification, and repositioning of the camera.

VITOM 3D is a video system that has overcome the lack of stereopsis, a major drawback of previous exoscope models. It has many advantages regarding ergonomics, versatility, and depth of field compared with the operating microscope, but the holder arm and the mechanism of repositioning, refocusing, and magnification need to be ameliorated. Surgeons should continue to use the technology they feel confident with, unless a distinct advantage with newer technologies can be demonstrated [5].

References

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