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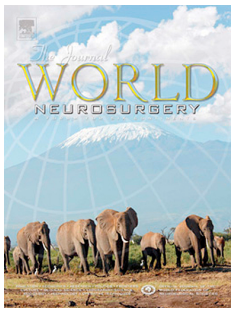

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The era of neuroendoscopy: Just how far can we go?

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Neuroendoscopy as a technique is a century old: in 1910, the urologist Victor Darwin Lespinasse became the first person to directly visualize the ventricles of the brain using a cystoscope.[1,2] A decade later, in 1922, Walter Dandy again used a cystoscope to visualize the lateral ventricles and perform choroid plexus cauterization (CPC). Although poor instrumentation and optics initially resulted in high rates of morbidity and mortality, neuroendoscopy continued to be used in the treatment of hydrocephalus with some regularity over the next three decades. In 1949, however, Nulsen and Spitz developed the valved shunt, and neuroendoscopy fell out of favor.[3] The landscape changed dramatically in the 1960s, when endoscopes were developed that allowed for a smaller system, a wider viewing angle, greater light transmission, and improved image and color resolution compared to conventional lenses.[4] Pioneered by neurosurgeons such as Griffith in England,[5] Fukushima in Japan,[6] and Jones in Australia, the 1970s and 80s saw an expansion of indications for neuroendoscopy well beyond the treatment of hydrocephalus.[7-10] For the last 20 years, neuroendoscopy has been increasingly utilized for a wide variety of indications including third ventriculostomy (ETV),[11-15] choroid plexus cauterization (CPC), septostomy,[16] cyst fenestration,[17] biopsy, drainage, or resection of intraventricular tumors,[18,19] colloid cysts,[20] hematoma evacuation,[21] pituitary surgery,[22-27] craniosynostosis surgery,[28-30] spine surgery, [31-33] and as an adjuvant in microsurgery, allowing the operating surgeon to "look around the corner."

There are two basic types of endoscopes: rigid and flexible. Common to all endoscopes are the basic components, which consist of a light source, a lens system, a camera, and a video monitor. Rigid scopes are most commonly used because they are easy to use and typically utilize a glass-based lens system that provides superior optics. In addition, they incorporate multiple working channels and ports, allowing the surgeon to use a variety of endoscopic instruments along with inflow and outflow of irrigation simultaneously. There are a number of rigid endoscopes on the market, including the Medtronic channel scope (Medtronic Neurosurgical, Goleta, California), the Wolf rod lens ventricular scope (Richard Wolf, Knittlingen, Germany), the Aesculap MINOP Modular Neuroendoscopy System (B. Braun/Aesculap, Center Valley, PA), and a number of different endoscopes offered by Storz, including the Storz Gaab, the Storz Schroeder LOTTA, the Storz Oi Handy Pro, and the Storz Bettag Schafer specifically designed for transnasal skull base work (Karl Storz, Tuttlingen, Germany).

The flexible endoscope, on the other hand, uses malleable fiberoptic cables, which allow the tip of the scope to be steered. This permits the operating surgeon to