Neuropilot Manual Neural Navigation Device

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Abstract

We present a novel device designed to guide the trajectory of surgical instruments, such as shunts or needles, during cranial procedures. The device features two protractors mounted on a curved frame that conforms to, or attaches to, the skull of a patient. The protractors allow precise orientation control in circular and anterior-posterior/medio-lateral dimensions. This device facilitates accurate placement of surgical tools, improving outcomes in neurosurgical and other cranial procedures. A method for device application is also discussed, detailing its use in guiding needles, probes, and other instruments during surgery.

Introduction

Neurosurgical procedures often require precise insertion of needles or probes into the brain for biopsies, fluid drainage, ablations, and drug delivery. Such procedures rely heavily on preoperative imaging (CT, MRI) and neuro navigation to ensure accuracy, particularly for deep-seated or sensitive targets. Neuro navigation, aided by CT/MRI-based spatial mapping, enhances precision and reduces risks of complications like for example a bleeding that may cause an increase in the intracranial pressure (ICP) and tonsillar herniation. However, advanced neuron avigation is often unavailable in emergency or peripheral settings, resulting in multiple instrument passes and increased risks of bleeding or brain injury.

Field of Invention: Manual neuro navigation device for urgent and elective neurosurgery procedures.

Need: There is a critical need for a practical, portable device that improves accuracy in shunt placement, biopsies, and abscess drainage, especially where neuro navigation or real-time imaging is unavailable.

Motivation

Applications

Ventriculoperitoneal shunt placements, External ventricular drains, Ommaya reservoir, Brain biopsies, and Abscess and Cysts drainage.

Conclusion

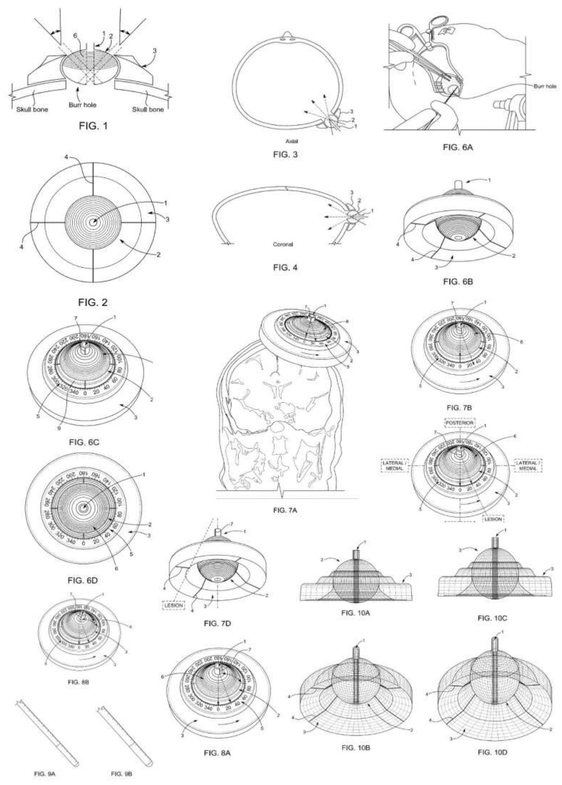
This manual neuro navigation device offers a practical, cost- effective solution for neurosurgery, allowing precise angle adjustments and with the option of adding ultrasound guidance on the tip of the probe to make it even more accurate. It overcomes limitations of conventional systems, enhancing accuracy and patient outcomes, particularly in emergencies and resource- limited settings.

Methodology

Design Overview

This manual neuro navigation device enables surgeons to guide instruments into the brain precisely, using preoperative imaging data (CT or MRI) to set two angles for accurate trajectory alignment. The device comprises a frame with circumferential protractor markings for setting a circumferential angle and a spherical ball with concentric markings for setting an anterior-posterior/medio-lateral angle. A cannula in the ball guides instruments toward the target site through a drilled burr hole. For added precision, an ultrasound tip can be used to adjust instrument depth intraoperatively. This device is designed to be cost-effective, user-friendly, and suitable for both emergency and routine neurosurgical procedures, particularly where complex neuro navigation is unavailable.

Applications



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