pain and improving the functional status of patients. In addition, this type of treatment has shown great promise in treating patients who are not eligible for surgery. However, the increasing prevalence and economic burden should be addressed appropriately to make it easier for patients to obtain SCS treatment. Furthermore, spinal cord stimulation may significantly affect refractory low back pain treatment and benefit clinically considering its technology and mechanism of action. Thus, this therapy will occupy a special place in future, in multidisciplinary neuropathic pain management.

Nowadays the technology powering these devices continues to evolve and improve, as well with refining Patient Selection and the integration of new large scale, multicenter, randomized controlled trials currently ongoing, it is likely we will see much more robust and applicable cost-effectiveness analyses that would have greatly diminished if not absent confounders published in the coming years. These studies are also likely to include and differentiate the more novel high-frequency and burst devices as well as provide more encompassing costs of SCS compared to alternative treatments.

REFERENCES


Introduction the problem

Postdural puncture headache (PDPH) is a common iatrogenic complication of neuraxial anesthesia following dural puncture. It may occur after inadvertent dura mater puncture in epidural anaesthesia, after spinal anesthesia and after lumbar diagnostic or therapeutic procedures.

The overall incidence of PDPH after neuraxial procedures varies from 6 to 36%. It is more common in younger populations and is significantly higher in teenagers compared to those aged 20–45 years. The elderly may also develop postdural puncture headache. The incidence of unintentional dural puncture is estimated to be approximately 1.5%. Furthermore, up to 36% and in some reports as high as 76 to 85% of these patients may experience PDPH symptoms.

Etiology and clinical manifestations

PDPH is caused by leakage of cerebrospinal fluid through the dural hole created by the needle. It can be considered a clinical model of intracranial hypotension and is characterized by a headache that occurs within 5 days following the puncture, located in the frontal and/or occipital region. It is usually of postural nature and is accompanied by associated symptoms like neck stiffness, dizziness, nausea, hearing symptoms (tinnitus, hearing loss) and vision changes (diplopia, blurred vision, or photophobia).

PDPH Consequences

The occurrence of PDPH is problematic as it causes functional and socio-professional disability leading to increased patient morbidity, delayed discharge and increased readmission. It is also associated with increased risks of major neurological and long-lasting complications. Cases of persistent headache have been reported and chronic back pain as well. Hypoacusis and tinnitus have been seen after dural puncture and have been thought to stem from the loss of CSF leading to reduced intracranial CSF pressure. There is also increased risk of subdural hematoma (due to rupture of meningeal veins) and cerebral vein thrombosis. These complications underscore the importance of prophylaxis, early diagnosis, treatment and follow up of PDPH.

Risk Factors

The risk factors for PDPH are classified as non-modifiable and modifiable. Nonmodifiable factors include the female sex, young age, teenagers, lower body mass index (BMI), previous PDPH, and chronic headaches. Risk factors that are modifiable include needle size, needle shape, direction of the needle bevel, stylet replacement, and operator experience. The use ofatraumatic, noncutting needles is the most effective intervention for post-lumbar puncture headache prevention. Frequent attempts during lumbar puncture and increased cerebrospinal fluid leakage were associated with PDPH.

Neither bed rest nor fluid supplementation decreases the incidence of headache after dural puncture; bed rest may even worsen post-lumbar puncture headache. Insertion of an intrathecal catheter at the site of ADP significantly reduces the incidence and severity of PDPH. PDPH incidence after lumbar puncture using a 22 G Tuohy needle was higher than that after lumbar CSF drainage using an 18 G Tuohy needle, suggesting that catheter insertion may reduce PDPH risk.

Diagnosis

The diagnosis of PDPH is made clinically by identifying the typical headache within 5 days after a dural puncture.
puncture. Other causes may need to be excluded if symptoms are atypical.\textsuperscript{16} Serious and life-threatening etiologies (eg, hemorrhage, thrombosis, vasculopathy, meningitis), which may or may not be related to the dural puncture, must be ruled out in the presence of focal or worsening neurologic deficits. Neuroimaging is not indicated unless required to exclude differential diagnoses.\textsuperscript{7}

Treatment The treatment of PDPH depends upon the severity of headache and its impact on the patient's ability to function.\textsuperscript{7} Patients with mild PDPH may benefit from conservative treatment including bed rest as needed, caffeine and oral analgesics.\textsuperscript{8} Patients who are unable to tolerate sitting or standing are considered to have moderate to severe PDPH and the epidural blood patch continues to be the most widespread treatment. Though epidural blood patch is recognized as the gold standard in the treatment of severe PDPH it is not without risk. It may either fail or lead to another inadvertent dural puncture. Other potential adverse events/reactions that may occur during a blood patch are back pain, meningitis, subdural abscess, facial nerve paralysis, spastic paraparesis, and cauda equina syndrome.\textsuperscript{7} The safer alternative therapies for PDPH which are efficacious, easy to administer and with less risk are the bilateral greater occipital nerve block\textsuperscript{17,18} and transnasal sphenopalatine ganglion block.\textsuperscript{19,20}

In conclusion PDPH is a problematic complication and should not be left unattended and untreated. There is the potential for considerable morbidity, even death. Since lumbar puncture is very common in clinical practice, it is necessary for practitioners to have a holistic knowledge of the risk factors, pathophysiological, diagnostic, differential diagnostic and therapeutic aspects of PDPH. An evidence-based approach with written institutional protocols to the management of unintentional dural puncture and PDPH are important to ensure patients' safety and optimal care.

REFERENCES