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Effect of magnetic fields from home-use magnetic induction therapy apparatuses on adjustable cerebrospinal fluid shunt valves

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Abstract:
OBJECTIVE: Cerebrospinal fluid (CSF) shunts are frequently used to treat hydrocephalus. The use of a programmable valve allows the operator to easily change the opening pressure. In Japan, many people use magnetic induction therapy apparatuses in their homes. However, exposing patients with adjustable CSF shunt valves to the permanent magnets included in these apparatuses may alter the shunt valve's programmed settings or permanently damage the device. Therefore, the goal of this study was to determine the health risk associated with magnetic induction therapy for patients using programmable CSF shunt valves.

METHODS: Five models of shunt valves from five different manufacturers, the Miethke proGAV (proGAV), the Codman Hakim programmable valve (CHPV), Sophysa Sophy model SM8 (Sophy valve), Sophysa Polaris model SPV (Polaris valve), and Strata II valve (Strata valve) were evaluated in this study. Magnetic field interactions were determined for the programmable valves by using magnetic stones with various magnetic flux densities. The maximum distance between the valve and the magnetic stone affecting the valve pressure setting was measured by X-ray.

RESULTS: The proGAV and Polaris valve were immune to unintentional reprogramming by the magnetic stones. The CHPV, Sophy valve and Strata valve, however, randomly changed settings by magnetic stones. CONCLUSIONS: Whereas the CHPV, Sophy valve and Strata valve were promptly reset by exposure to a magnetic stone with a similar strength to that used in magnetic induction therapy, proGAV and Polaris valve were resistant to inadvertent reprogramming when exposed to magnets up to 190 mT.

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