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# Improvement of Graphene Self-Assembly Induced Hydrocephalus, with Ventriculoperitoneal Shunt Malfunction Under the Radiofrequency Circumstance, by Graphene Exfoliator NaCl with KCl Solution

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## 1. Case Description

A 62-year-old woman admitted to our hospital because of a progressive disorder of consciousness within 2 days. Four months before admission, the patient underwent a laparoscopic repair of perforated gastric ulcer at a local hospital. The patient recovered well after the surgery and was successfully discharged. However, she experienced a deteriorated mentality with memory loss, and cranial computed tomography (CT) revealed communicating hydrocephalus. Subsequently, one month before admission, the patient received a Ventriculoperitoneal (VP) shunt at the local hospital with a good outcome. On physical examination at admission, the patient was drowsy. The rebound of the shunt reservoir was not abnormal (Codman valve pressure was 100 mmHg), and there was no subcutaneous swelling behind the ear. It was difficult to track the entire distal shunt catheter under the subcutaneous tunnel.

Vital signs: blood pressure 140 (systolic) / 80 (diastolic), heart rate 74, total leukocyte count of 4610/cmm, erythrocyte sedimentation rate (ESR) 50 mm in the first hour using Westergren method, C-reactive protein (CRP) 0.1 mg/dl, Blood urea nitrogen / Creatinine (BUN/Cr) 21.7/0.82 mg/dl and alkaline phosphatase 67 U/L.

The intravenous infusion of a solution consisting of 250 mL normal saline with potassium chloride (KCl) over 6 h, vitamin C intake resulted in recovery of memory with clear consciousness [1-7].

Cerebrospinal fluid (CSF) shunts, used primarily for treatment of hydrocephalus, are among the most commonly implanted neurosurgical devices. The typical shunt consists of 3 components - (1) a silastic catheter placed through a burr hole into a ventricle to suction out CSF, (2) a subcutaneous one-way valve mechanism for directing flow, and (3) a distal catheter to transport CSF to a distal absorption site. The distal site is typically the peritoneal cavity. In addition to these basic components, shunt systems may also incorporate a subcutaneous reservoir or “antechamber” with a silicone elastomer dome that can be manually pumped to test for shunt patency or used for needle aspiration/injection. Many systems also include an anti-siphon or “anti-gravity” device to reduce excess flow of CSF when the patient assumes the upright posture.

In homogeneous magnetic fields the adjustment of valve was changed [8].



**Initial**



**after VP shunt**



**after NaCl + KCl injection**

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