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## **Practice pointer: Life with a CSF shunt**

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*A 30-year-old woman has recently had an uncomplicated insertion of a cerebrospinal fluid shunt. She is about to go back to work and wants to book a holiday. She asks whether she will still be able to have children in the future.*

Cerebrospinal fluid (CSF) shunts divert CSF from the brain, usually to the abdominal cavity. They can be used for a variety of conditions including hydrocephalus, idiopathic intracranial hypertension, syrinx, and pseudomeningocele. Cerebrospinal fluid can be drained directly from the ventricles of the brain, ventriculo-peritoneal (VP) shunts or, less commonly, from the spinal subarachnoid space, lumbo-peritoneal shunts. It is estimated that between 3,000 and 3,500 shunt operations are performed in the United Kingdom every year [1], affecting a wide range of patients with both congenital and acquired conditions.

### **What you should cover**

Patients will have different concerns about their shunt. Managing this population may seem challenging for the non-expert; however, advice on specific lifestyle alterations can come from non-specialists. Common areas of concern are described below:

#### **Driving**

UK guidance states that patients must not drive for six months following an operation involving the ventricular end of the shunt [2]. No driving restrictions apply if only the peritoneal part of the shunt is revised, although any associated conditions such as epilepsy should be regarded separately. Often patients will know when they are suffering from high pressure headaches (commonly described as being constant and made worse on lying or bending) [3] and in this case driving should be avoided until shunt malfunction is ruled out or the symptoms resolve.

#### **Travelling**

There is no evidence that flying is detrimental or dangerous [4], but some patients may be concerned about being a long way from their healthcare team. This can be mitigated where possible by choosing destinations within easy reach of neurosurgical centres. Certain conditions e.g. normal pressure hydrocephalus do not require urgent interventions, even if the shunt malfunctions, although this best be discussed with the treating neurosurgeon in advance as recommendations between individual practices vary. Advise patients to take out adequate international travel insurance – this should be discussed with the insurance company in detail, more so in the presence of associated conditions, e.g. epilepsy. Shunt alert cards (also known as wallet cards), containing information on the type of implanted shunt as well as medical background and contact details of the treating physician, are available free from charity organisations and provide rapid identification for medical personnel in the case of emergency. Other alerts such as bracelets, necklaces, dog tags, can also be purchased online.

#### **Sports**

Sports-related shunt complications are rare. A nationwide survey of American paediatric neurosurgeons named wrestling and soccer as the commonest sports associated with adverse events [5]. While participation in some contact sports (e.g. boxing) is prohibited, an increasing number of neurosurgeons in the UK are advising that the risks of football and rugby with a skull cap are acceptable. A recent literature review concludes that having a CSF shunt is not a contraindication to SCUBA diving [6].

#### **Sex**

There are no restrictions to sexual activity with a CSF shunt. Patients can have sex immediately

following surgery if no abdominal incision is made; otherwise, common advice given to post-laparotomy patients is to wait for six weeks.

#### Pregnancy

Pregnancy with a shunt may present unique and complex challenges; however, outcomes are favourable. A survey of 70 shunted mothers representing 138 pregnancies [7] suggested miscarriage rates comparable to those of the general population (21%), with higher rates in women with spina bifida. Of the pregnancies resulting in live births, 60% had vaginal delivery and 40% needed Caesarean section (only 4% due to shunt complications). Of 105 live births, only one child had hydrocephalus; this was from a mother whose hydrocephalus was acquired (encephalitis). There were 30 puerperal shunt revisions: 7 before and 23 in the first six months after delivery. Owing to this risk of shunt malfunction, and due to the possibility of other shunt-related problems such as headaches, seizures, and abdominal symptoms, a multidisciplinary approach including an obstetrician, neurologist, neurosurgeon, and anaesthetist is key.

#### Jobs

Having a shunt in itself is usually not a barrier when choosing a profession, with the exception of physically demanding jobs in, for example, the Royal Air Force, Royal Navy and Police Service, which in the United Kingdom specifically list hydrocephalus/CSF shunts among medical conditions that preclude entry.

#### Magnet safety

Programmable shunt valves can be adjusted with an external magnet to alter the rate of CSF drainage. This allows flexibility but risks interactions with background magnetic fields. Generally, domestic appliances (electrical shavers, hairdryers, earbud-type headphones, mobile phones) and walk-through metal detectors are safe. Particularly strong magnetic fields e.g. from the iPad 2, can inadvertently re-program some shunt valves; this can be prevented by keeping devices at sufficient distance from the implant site as specified in the valve manufacturers' information sheets (for example, Medtronic suggests a minimum of 5 cm as the safe distance for Strata valve). While all shunt valves are MRI compatible meaning that they will not cause damage to the surrounding structures due to over-heating or mechanical shear, exposure of a programmable valve to MRI will usually require a post-scan check to ensure the correct setting. This is facilitated by prior communication with the MRI and neurosciences departments.

#### Shunt length

Some parents are anxious that a VP shunt inserted in neonates and small children will require further extensions as the child grows. However, this is avoided by placing sufficient tubing in the abdomen so it essentially grows with the child.

### **What you should do**

Reinforce information about symptoms which may indicate a shunt problem. Some will represent neurosurgical emergencies [3]:

- Headache, vomiting, excessive drowsiness, double or blurred vision and unsteadiness may imply shunt malfunction
- Photophobia, fever, swelling or redness along the shunt tract may indicate shunt infection
- Localised or generalised abdominal swelling or pain, difficulty breathing, or fluid leak from the abdominal wound may be related to the peritoneal end of the shunt (superficial

migration into the subcutaneous tissues or infection)

In many instances, a member of the neurosurgical team, commonly a hydrocephalus nurse specialist in the UK will provide phone advice. For urgent concerns, some neurosurgical units have an “open door” policy, although some may prefer patients to be assessed in their local A&E. Check with the treating neurosurgeon if in doubt.

#### Body weight:

While minor fluctuations will not affect CSF drainage, caution the patient against marked body weight changes. An increase in body weight can alter CSF drainage dynamics through raised intra-abdominal pressure, potentially leading to under-drainage and recurrence of symptoms [8]. Furthermore, obesity is an established risk factor for distal (peritoneal) end dislodgement [9]. Conversely, there are reports in the literature of rapid weight loss (such as that seen with bariatric surgery or vigorous exercise) leading to over-drainage or even shunt protrusion through skin.

Direct patients to charity organisations (See box). These offer support to patients and their carers, provide specialist services, and represent excellent networking opportunities which will help to answer some of the questions patients might have:

- SHINE – charity involved with hydrocephalus, spina bifida, and related issues in England, Wales and Northern Ireland: <http://www.shinecharity.org.uk/>
- SBH Scotland – charity dealing with hydrocephalus and spina bifida in Scotland: <http://www.sbhscotland.org.uk/>
- Headway – charity supporting people with brain injury including post-traumatic hydrocephalus: <http://www.headway.org.uk/>

#### What you need to know

- Having a CSF shunt in itself places very few limitations on life.
- Once stable after the procedure the shunt should place no or few restrictions on driving, travel, sex intercourse, sports and pregnancy.
- Support for patients and networking opportunities are available from charity organisations such as SHINE, SBH Scotland, and Headway.

#### How patients were involved in the creation of this article

- We selected four patients with CSF shunts for a phone interview. We asked them about the influence that CSF shunts have on their lives. This has allowed us to address some of the issues, such as anxiety around travelling with a shunt, that do not routinely come up in clinical practice. The advice regarding not driving with a high pressure headache was suggested by a patient with previous multiple shunt revisions.

**Education into practice**

- Do you know if your patients with CSF shunts carry a shunt alert card?

## References

1. Jenkinson MD, Gamble C, Hartley JC, Hickey H, Hughes D, Blundell M, et al. The British antibiotic and silver-impregnated catheters for ventriculoperitoneal shunts multi-centre randomised controlled trial (the BASICS trial): study protocol. *Trials* 2014;15:4.
2. Neurological disorders: assessing fitness to drive [Internet]. Driver and Vehicle Licensing Agency c2016 [cited 2016 May 15]. Available from: <https://www.gov.uk/guidance/neurological-disorders-assessing-fitness-to-drive>.
3. Anderson I, Chumas P. Management of the patient with a ventriculoperitoneal shunt presenting with headache. *Br J Hosp Med* 2012;73:C170-3.
4. Amato-Watkins A, Rao VM, Leach P. Air travel after intracranial surgery: a survey of advice given to patients by consultant neurosurgeons in the UK. *BJ Neurosurg* 2013;27:9-11.
5. Blount JP, Severson M, Atkins V, Tubbs RS, Smyth MD, Wellons JC, et al. Sports and pediatric cerebrospinal fluid shunts: who can play? *Neurosurgery* 2004;54:1190-8.
6. Shastin D, Zaben M, Leach P. Can patients with a CSF shunt SCUBA dive? *Acta Neurochir (Wien)* 2016;158:1269-72.
7. Liakos AM, Bradley NK, Magram G, Muszynski C. Hydrocephalus and the reproductive health of women: the medical implications of maternal shunt dependency in 70 women and 138 pregnancies. *Neurol Res* 2000;22:69-88.
8. Sahuquillo J, Arikan F, Poca MA, Noguer M, Martinez-Ricarte F. Intra-abdominal pressure: the neglected variable in selecting the ventriculoperitoneal shunt for treating hydrocephalus. *Neurosurgery* 2008;62:143-50.
9. Abode-Iyamah KO, Khanna R, Rasmussen ZD, Flouty O, Dahdaleh NS, Greenlee J, et al. Risk factors associated with distal catheter migration following ventriculoperitoneal shunt placement. *J Clin Neurosci* 2016;25:46-9.