There are various processes of CSF diversion surgery like external ventricular drain, VP shunt, VA shunt, LP shunt etc. Among them VP shunt is by far the most common technique for CSF diversion surgery. It is relatively simple, suitable for patient of all ages with hydrocephalus from any cause but complications related to VP shunts continue to occur and shunt malfunction remains a significant cause of morbidity and a main hurdle in the successful outcome of hydrocephalus.\textsuperscript{3,18,20} So the treatment of hydrocephalus patients with multiple VP shunt failure is still a neurosurgical challenge. The etiology of shunt malfunction are classified as shunt infection, proximal or distal shunt block, distal catheter migration, shunt disconnection, wound breakdown involving shunt, or any combination of these etiologies. VP shunt failure requires urgent management and surgical intervention.\textsuperscript{37} So VA shunt is another alternative for multiple VP shunt failure. VA shunt was first started by Spitz-Holter in 1952. VA shunt is indicated for patients with repeated VP shunt failures due to shunt block, recurrent peritonitis, local abdominal infection etc. VA shunt is infrequently placed because of potentially higher morbidity and mortality with

**VA shunt in Bir Hospital: Our Experience of 20 Years**

We are sharing our experience of ventriculoatrial shunt over 20 years. Ventriculoperitoneal shunt is a neurosurgical challenge and a neurosurgical emergency. We review outcome of 9 patients who had VP shunt converted to VA shunt after previous multiple VP shunt failures. We conducted a retrospective study of 9 patients with multiple VP shunt failures converted to VA shunt at Bir Hospital. In this study indications of VA shunt, outcome and complication were studied. Clinically all the patients presented to us with features of raised ICP and underwent VP shunt. After multiple VP shunt failures because of shunt infection/failure, VA shunt was done. The diagnosis of VP shunt failure/infection was confirmed by clinical presentation and CT findings.

This study is a small sized study. The result of VA shunt was good as shown by clinical improvement and reduction of ventricular size and functioning shunt in regular follow up. No serious complications occurred at immediate post operative and during the follow up. When VP shunt fails with various reasons like shunt block, infection, recurrent peritonitis, pseudocyst etc VA shunt is the another choice.

**Key Words:** Bir hospital, VA shunt, VP shunt
them and technical difficulties.11,18,20

**Materials and Methods**

**Patients and Surgical technique:** Nine patients underwent VA shunt over the period of 20 years. Clinically, most patients frequently presented with headache, nausea and vomiting, altered consciousness etc. All patients underwent CT scan of the head consistent with shunt failure. The diagnosis of VP shunt failure/infection was determined by physical, neurologic and neuroradiologic criteria.

**Surgical technique:** A transverse skin incision is made centered on the anterior border of the sternoclavomastoid muscle 2 to 4 cm below the angle of the mandible. The platysma is opened, and the anterior border of the sternoclavomastoid muscle is developed with sharp and blunt dissection to expose the internal jugular vein. With the facial vein identified and mobilized, the facial vein is ligated proximally (as shown in Figure 1) and secured with a vessel loop at its orifice. The vein is opened and atrial catheter is passed into the facial vein and then into the jugular vein. Then the tip of the catheter is positioned just inside the right atrium and viewed under fluoroscope. Then the another end of shunt is connected with the ventricular end and both the ends are closed in standard process.20,22 Accurate positioning of the VA shunt is very important to avoid serious complications associated with VA shunts. The tip of the catheter must lie near the cavoatrial junction.19

**Results**

In our study, we implanted all of the VA shunt catheters under fluoroscope scans to appropriately position them in the right atrium. 4 children had congenital hydrocephalus that needed VP shunt which was later converted to VA shunt due to repeated distal shunt failures, 2 patients had peritonitis, 2 patient had repeated distal VP shunt block. 1 patient had intraventricular tumour that needed VP shunt after excision of tumour. She had repeated distal shunt malfunction which was eventually converted to VA shunt. Each of the 9 patients were managed including revisions of existing VP shunt, shunt removal, and external ventricular drainage for 2 to 5 times. All 9 patients successfully underwent conversion from a VP to VA shunt and obtained a functioning VA shunt, and no complications occurred related to the shunt during the follow-up period. Postoperatively all the patients had remarkable improvement and subsequently in the follow up.

**Discussion**

Among the most common type of CSF diversion surgery, VP shunt is the most common one. It is simple, safe and easy to perform and suitable for all ages with different cause of hydrocephalus but complications related to VP shunts continue to occur and shunt malfunction remains a significant cause of morbidity and a main hurdle in the successful outcome of hydrocephalus.21 Recent reports suggest that despite VP shunts being the most preferred method there is a notable patient population where VA shunt is needed.19 So VA shunt is another alternative for multiple VP shunt failures.

In our study, we implanted all the VA shunt catheters under fluoroscope scans to appropriately position them in the right atrium (Figure 2). Several other methods for VA shunt placement has been developed over the period of time. Chuang et al. reported the use of percutaneous VA shunt placement trans-esophageal echocardiogram monitoring. They claimed that this method can be used less
invasively, as well as more accurately, quickly and safely.\cite{5,7,12,19} Endovascular placement of a VA shunt was presented by Gonzales et al., who reported three advantages of this technique: The venous system can be identified easily, the jugular vein patency can be demonstrated clearly and the true placement or malposition of the catheter can be determined quickly.\cite{10} Ellegaard et al. also reported that ultrasound guided percutaneous placement of a VA shunt which results in a safe, quick and easy procedure with preoperative knowledge of the diameter of the vein, no accidental carotid artery puncture or pneumothorax, minimal blood loss, short operative time, few infectious complications and a good cosmetic result.\cite{9} Similar results were shown by Metellus et al using ultrasound guided percutaneous placement of VA shunt.\cite{13}

A few larger studies on the percutaneous method have been published but in our study, the conventional open method is used in which the distal catheter is inserted inside the right atrium via facial vein (Figure 2).\cite{4,8} Numerous complications have been reported in the literature and the most common complications are catheter obstruction, infection, arrhythmia etc.\cite{7,14,15}

Elhammady et al. reported a VA shunt displacement in a case with a partial anomalous pulmonary venous return.\cite{8} Aribas et al. reported pulmonary hypertension development in a case following a VA shunt implantation.\cite{1} Cardiac complications can occur during or after VA shunt implantation as Natarajan et al. reported a case of a 57-year-old male patient who was treated for pneumonia and new-onset atrial fibrillation.\cite{15} Ben-Ami et al. reported a catheter related Gram-positive bacteremia and nephritis in a 47-year-old woman who had a VA shunt for 10 years due to hydrocephalus.\cite{2} Chaw et al. reported infective endocarditis in one VA shunt case. They claimed that appropriate treatment should be applied with the removal of foreign material in such cases.\cite{6}

All 9 patients had uneventful postoperative recovery and no serious complication related to VA shunt were recorded.

**Conclusion**

Although the treatment of choice in most patients with hydrocephalus is VP shunt, there is still a group of patients in whom VA shunt is needed. As for the patients with multiple previous VP shunt failures, conversion of a VP shunt to VA shunt results in excellent outcome as shown in our series. The VA shunt is a safer, less invasive, and quicker and hence should be recommended. Even though, our series is a small series, our results are quite satisfactory.

**References**


