



External Ventricular Port Implantation for Intraventricular Therapy

Yi Chieh Wu¹, Hsu Po-Shun², Kuan-Nien Chou¹, Ming-Shen Dai³

¹Departement of Neurological Surgery, National Defense Medical Center, Tri-Service General Hospital, ²Department of Internal Medicine, Division of Cardiovascular Surgery, National Defense Medical Center, Tri-Service General Hospital, ³Department of Internal Medicine, Division of Hematology and Oncology, National Defense Medical Center, Tri-service General Hospital, Taipei, Taiwan, China

The Ommaya device is commonly used during intraventricular therapy. However, the superiority of intraventricular or intralumbar therapies for intrathecal administration is disputable. Here, we report the case of a 63-year-old woman who received intraventricular chemotherapy for breast cancer with progression and leptomeningeal metastases. We describe external ventricular port device implantation to establish a modified intraventricular route to replace the traditional Ommaya device.

Key words: Ommaya reservoir, intraventricular, port-A-catheter, chemotherapy, leptomeningeal metastases

INTRODUCTION

Intraventricular therapy is one of the routes used for intrathecal drug administration with the use of Ommaya reservoir under the scalp and behind the hairline.¹⁻⁴ However, the long-term use of this device under hairy scalps involves complications such as hemorrhage, infection, pericatheter cysts, and subdural hygroma. We modified the intraventricular route to reduce the risk of these complications.

CASE REPORT

A 63-year-old female underwent left modified radical mastectomy in July 2015 and was postoperatively diagnosed with invasive pleomorphic lobular carcinoma of the left breast, Grade II, ER (70%) 1+, PR (-), Her/neu DAKO 2+ (10%), FISH (-), Ki-67 (8%), ECE (+), LVSI (+), T3N3aM1, and Stage IV. She received intravenous chemotherapy from the subcutaneous port over the right subclavian region. However, breast cancer progression was characterized with leptomeningeal metastases, which was identified by magnetic resonance imaging in September 2018. Chemotherapy was intrathecally administered by repeated lumbar punctures. However, she was unable to tolerate repeated intralumbar drug administration because of discomfort. In October 2018, an external ventricular port was implanted for regular intrathecal administration of 8 mg

methotrexate as chemotherapy. No new neurological deficits developed over three sessions of intraventricular chemotherapy administered via an external ventricular port. Unfortunately, the patient died because of aspiration pneumonia and not during intraventricular chemotherapy administration.

Surgical procedures

1. Patient position with the head orienting to the left side and surgical field sterilization from the head to the right chest wall [Figure 1]
2. 3-cm incision at Kocher's point (right side) and burr hole
3. 3-cm incision over the right subclavian and subcutaneous port pocket dissection
4. The catheter is tunneled subcutaneously between the two incisions
5. Insertion of the ventricular catheter and connection to the peripheral catheter with a right-angle connector [Figure 2]
6. Connection of the distal peripheral catheter with the port reservoir and suture fixation within the port pocket [Figure 3]
7. Evaluation of the function of the external ventricular port by the creation of negative pressure to withdraw cerebrospinal fluid (CSF) into a vacuum needle from the port reservoir
8. Wound closure [Figure 4].

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Corresponding Author: Dr. Kuan-Nien Chou, Department of Neurological Surgery, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, China.
E-mail: imchou1207@gmail.com

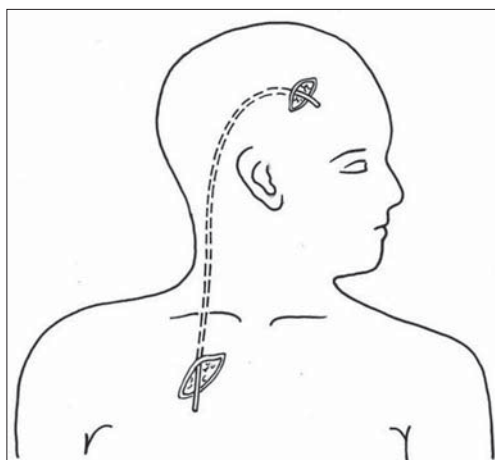


Figure 1: Kocher's point and subclavian skin incision were performed. The catheter was tunneled subcutaneously between the two incisions

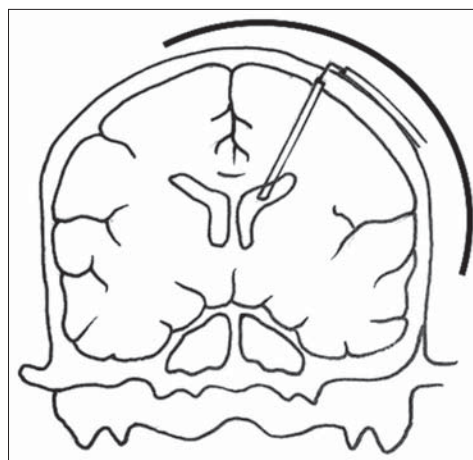


Figure 2: The ventricular catheter was implanted into ventricular space and connected to the port catheter with a right-angle connector

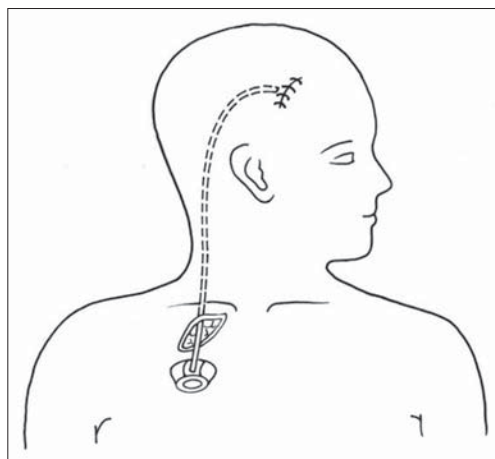


Figure 3: Connection of the distal peripheral catheter with the port reservoir and suture fixation within the port pocket

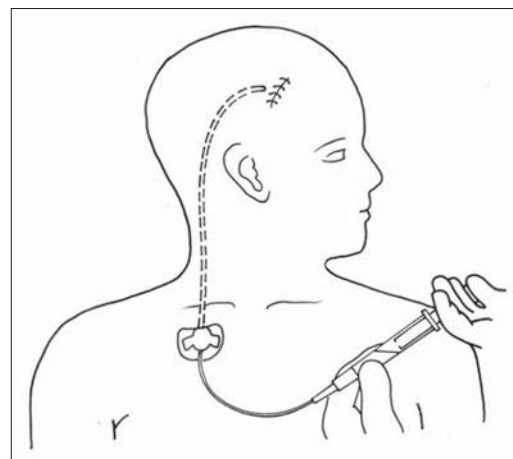


Figure 4: Wound closure and function confirmation

Surgical instrumentation

1. Barium ventricular catheter, Codman (1.4 mm inner diameter and 2.7 mm outer diameter)
2. Catheter connector, right angle, Medtronic (1.0 mm inner diameter and 1.9 mm outer diameter)
3. Port-A-catheter, Smiths Medical (1.6 mm inner diameter and 2.6 mm outer diameter).

DISCUSSION

Intrathecal therapy involves the administration of drugs into the subarachnoid space via the intraventricular or lumbar puncture routes. Pharmacokinetic and clinical studies of the CSF reveal that the hypesthesia intraventricular route is superior to the lumbar puncture routes, but there

is no convincing evidence to demonstrate the superiority of the intraventricular route over the intralumbar route for drug administration.^{5,6} Intraventricular drug administration requires the catheter to puncture the ventricular or cistern space and connect to a reservoir under the scalp, and the most commonly used device is the Ommaya reservoir.^{7,8} Surgical complications following external ventricular catheter implantation occur at a rate of 5%–10% and include hemorrhage, infection, and revision. However, the rate of noninfectious complications following long-term use of intraventricular drug administration is reportedly as high as 33% per patient. These complications include catheter malpositioning, malfunction, obstruction, pericatheter cysts, and subdural hygroma. In addition, the rate of infectious complications is up to 27%. Infectious complications associated with the Ommaya device generally include skin flora infection.⁹ Over the long-term period, <5% noninfectious

and 3% infectious complications were associated with the use of a subcutaneous port as a trunk for chemotherapy.¹⁰ Hence, we connected the catheter implanted into the lateral ventricle to a subcutaneous port over the subclavian region. Using this modified route, drugs can be introduced to the intraventricular space, thus reducing the rate of infectious complications. Increase in intracerebral pressure and accumulation of CSF can occur during intraventricular therapy;¹¹ however, the new route appears to improve the risk of these complications secondary to the use of slower medication infusion pump rates.

However, the catheter diameters were incompatible and required the use of a connector. This might increase the complications associated with broken catheters and induce medication leakage or skin erosion. This was a single-case study, and additional well-powered studies are needed to validate the effects of this novel method on the treatment of primary and secondary brain tumors and other central nervous system diseases.

The ventriculostomy was preferred on the right frontal approach (Kocher's point) because the left side brain is the dominant cerebral hemisphere.¹² Hence, we chose the right-sided approach at that time. We also educated the patient well and medical group to perform the intraventricular medicine administration in the correct port. Perhaps, we will perform the port operation on the other side next time to prevent from the administration of medicine in the wrong port.

The catheter occlusion, dysfunction, or get infection was the worrying problem in clinic usage. The fluid in the external ventricular port is different from the venous port. The CSF is the main content. Hence, less occlusion occurred in this catheter, and fluid with heparin is not necessary to inject into the catheter to prevent from occlusion. However, the computed tomography of the brain is needed before the first intraventricular administration of medicine or as suspicious occlusion in the catheter to ensure the intraventricular position of catheter. Invasive procedures have the infection risk. We have no huge data to present the infection rate of this catheter. We compared the infection rate of venous port to the Ommaya port routes in our article because of the similar procedures of administration of medicine in venous and intraventricular port.

CONCLUSION

External ventricular port installation was performed using one subcutaneous port under the subclavian region to distally connect the catheter to the intraventricular space. This method might help improve the rates of infectious and noninfectious complications associated with the traditional

Ommaya device. Although there are some clinical problems that will require resolution over additional studies, this method may improve the safety and convenience of intraventricular therapy.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given her consent for her images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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