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Dry Tap during Ventriculostomy-Lessons to be Learnt

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Abstract

Pneumocephalus following Ventriculoperitoneal (VP) shunt is an exceptionally rare entity. We report such event after an attempt of ventricular puncture (ventriculostomy) for VP shunt and then discuss the management of the same. The dry tap can lead to multiple attempts for ventriculostomy with added risk of complications. It can add dilemma as to what the subsequent management would be.There is also increased risk of tension pneumocephalus, seizures and shunt failure due to blockage by air bubbles. Head down positioning, adequate cruciate dural incision prior to cortex puncture and avoiding excessive egress of CSF are certain nuainces that will help to prevent such complication during the procedure.

Keywords: Dry tap; Pneumocephalus; Management

Introduction

Pneumocephalus is defined as the presence of air within the calvarium. It often follows trauma but is also a common sequelae after intracranial surgeries [1,2]. Tension pneumocephalus is a lifethreatening emergency that needs immediate surgical intervention [3]. It is rarely reported after cerebrospinal fluid (CSF) divertion procedures [4,5]. For the correct positioning of the proximal end of the shunt system, we first make a burr hole most commonly on the kocher's or the keen's point. We make a cruciate incision in the dura followed by ventricular puncturing at right angle to the bone surface with the help of Dandy's cannula. Then we look for free egress of CSF before connecting to its chamber. Though a simple procedure, sometimes it can lead to disastrous consequences. We present a rare case of tension pneumocephalus resulting in dry tap during ventriculostomy and discuss its subsequent management.

Case Report

Herein we report a case of 35 year young male from Nawalparasi , Nepal who had undergone External Ventricular Drainage (EVD) placement for the management of post traumatic hydrocephalus. He had undergone craniotomy and evacuation of acute subdural hematoma following road traffic accident. Later as he was dependent on EVD, he was planned for VP shunting. Intraoperatively, there was dry tap during an attempt of ventriculostomy from the Kocher's point. So we placed the proximal shunt in assumed position of frontal horn of lateral ventricle. We did not remove the EVD hoping that it would act as a safety channel for CSF bypass. Post operative scan showed presence of tension pneumocephalus and pneumoventriculi (Figures 1 and 2). The patient was managed with 100% oxygen and stringent neurological monitoring for evaluating early neurological deterioration. After complete resolution of the condition, repeat computerized tomography

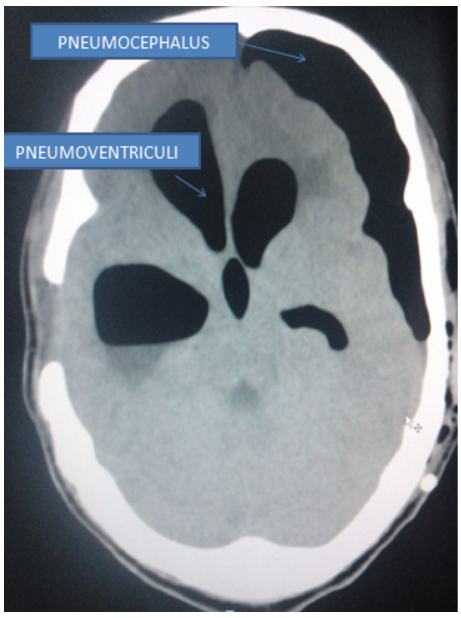

Figure 1: CT image showing presence of pneumocephalus and pneumoventriculi.

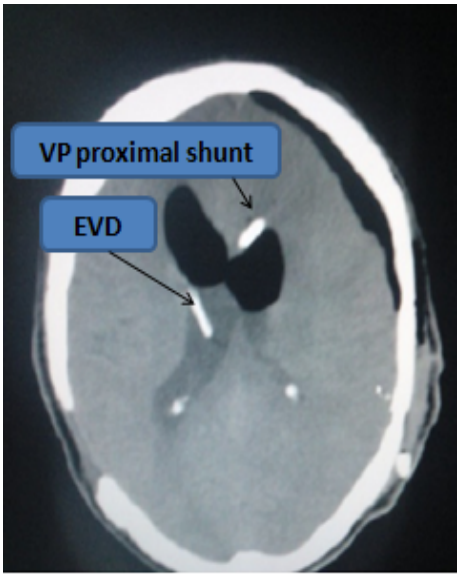

Figure 2: CT image showing location of EVD and VP Shunt proximal end.

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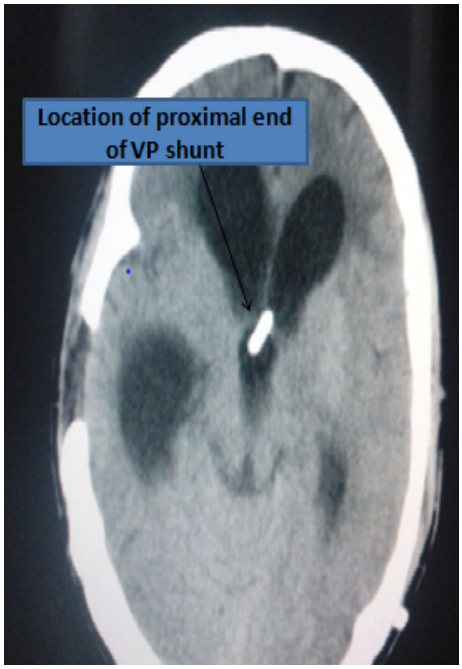

Figure 3: CT image confirming location of proximal end of VP shunt.

scan showed that the proximal shunt was in third ventricle (Figure 3). EVD was subsequently removed with no neurological deterioration of the patient.

Discussion

Pneumocephalus usually occurs after head trauma, skull base fractures and asociated CSF fistulas [1]. The incidence of this entity was reported to be as high as 100% following supratentorial craniotomies [6]. On the other hand tension pneumocephalus is a neurosurgical emergency that requires rapid surgical intervention. Pneumocephalus as a complication of CSF diversion procedures is rare [5]. Diagnosis is mainly based on clinical examination and Computerized Tomography (CT) scan [4]. Two characterized CT findings –Mount Fuji sign and the air bubble sign have been described by Ishiwata et al. [7].

There are two factors that are thought to be responsible for tension pneumocephalus developement. The first one is a decrease of intracranial pressure due to sudden egress of CSF and the second one is the presence of a craniodural defect that works as a one way valve allowing air inflow to the intracranial space and preventing outflow [4]. It is claimed that the moderate cerebral atrophy might have played a role [1].

The duration of the shunt surgery must be as short as possible and CSF leakage during the connection of the shunt system must be avoided. Another factor can be during puncturing of the cortex. Adequate cruciate incision must be given to prevent the passage of environmental air into the subdural space. Filling of the subdural space on the ventriculostomy site with the irrigation fluid until overflowing might be helpful in the outflow of the air from the intracranial vault and reducing the risk of this rare complication. Cortical atrophy probably had also an effect on the isolated air collection within the subdural space. Another remote possibility in our case would be any leak in the closed drainage system of the previous EVD drain. Proper layered closure of the skin in VP shunt surgery is the most important factor for prevention of this rare complication.

The dry tap as seen in our case can lead to multiple attempts for the correct trajectory thereby increasing the risk of false trajectories and also track hematomas. If there had been no EVD, as in our case, then it would lead to termination of the procedure thereby adding the morbidity and risk of subsequent surgery for the same. There is also risk of seizures and rapid neurological deterioration.

Once it occurs, close monitoring of the patient, rapid identification of tension pneumocephalus and immediate surgical intervention is life-saving. Gore et al. [8] have advocated the use of 100% oxygen for rapid resolution of the pneumocephalus.

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