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This case is exceptional with regard to symptoms caused by a hydrocephalus and changes in artistic work

# Hydrocephalus, psychosis and art: a case report

Sarah Noll, Heinz Boeker, Gerold Roth-Greminger, Paul Hoff, Daniel Schuepbach

Department of Psychiatry, Psychotherapy and Psychosomatics, Hospital of Psychiatry, University of Zurich, Switzerland

## Summary

**Objectives:** Published evidence suggests a linkage between structural brain damage and psychotic symptoms. Internal hydrocephalus often manifests with neurological and psychiatric symptoms, which occur with great variety between individuals.

**Methods and results:** We present a case of a male suffering from treatment refractory psychosis for years, and with a special talent for artistic painting. An enormous communicating hydrocephalus, which has probably existed for several years, was detected by means of anatomical neuroimaging. As the patient began to suffer from signs of high intracranial pressure such as headache and dizziness, an endoscopic third ventriculostomy was successfully performed. The neurological symptoms disappeared shortly after surgery, psychotic symptoms attenuated gradually and artistic work changed.

**Conclusions:** This case is exceptional with regard to symptoms caused by a hydrocephalus and changes in artistic work, as an expression of executive function and abstract thinking, due to surgical intervention. It demonstrates the need to pay attention to cerebral lesions when confronted with neuropsychiatric symptomatology, especially if psychotic symptoms persist despite adequate antipsychotic treatment.

Key words: antipsychotics; hydrocephalus; neurosurgery; outcome; treatment refractory psychosis

## Introduction

Although the correlation between psychotic disorder and neurodevelopment has been considered in the literature, there are still unsolved issues regarding adequate treatment of refractory psychosis or schizophrenia. Several studies reported a linkage between cerebral lesions and behavioural and cognitive impairments, and psychosis [1–4].

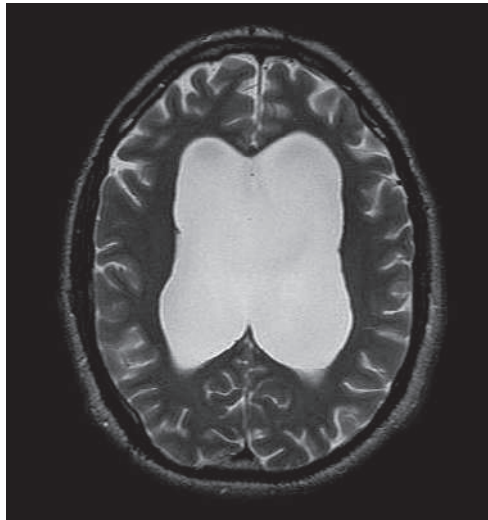
## Case report

The patient, a male born in 1974, had been struggling with serious mental symptoms for years. At the age of 22, his paranoid and homicidal tendencies led to involuntary admission to a psychiatric hospital. After treatment with zuclopenthixol (50 mg/die) and amisulprid (800 mg/die), the patient's condition

improved. During the following years, from 1996 to 2007, several hospitalisations were necessary (in total 8 hospital treatments). The patient suffered from acoustic hallucinations and persecution mania and anxiety disorder. He was often tense and sometimes acted with aggression and restlessness. In 2004, he was diagnosed with paranoid schizophrenia (ICD-10, F20.0 [5]). Various psychoactive drugs were administered (quetiapine 1000mg/die, later in the course of illness additionally haloperidol 5 mg/die and promazine 25 mg/die, and in 2007 medication consisted of flupentixol 1 mg/die, risperidone 2 mg/die, duloxetine 60 mg/die, valproic acid 150 mg/die and lorazepam up to 5mg/die) but none improved psychopathology permanently. In addition, the patient began to display signs of depression (Beck Depression Inventory [6] in 2007: 17 points), insufficient adherence to medication and psychosocial deficits. Neuropsychological tests, performed in 2008, showed normal levels of concentration, alertness and memory, but a decrease of executive functions. Blood tests and urine analyses, which were carried out frequently, never showed any abnormalities. Drug screenings were always negative. Additionally EEG performed in 2006 revealed a mildly increased activity, but there were no signs of potentials typical for epilepsy.

In 2006, a computed tomographic (CT) scan of the cranium revealed a communicating hydrocephalus. There were massively enlarged and lumpy side ventricles, subtly bigger on the left side with an axial diameter of 34 mm on the level of the frontal horns and 46 mm in ventrodorsal direction. The third ventricle also showed an expansion (axial diameter 16 mm) whereas the fourth ventricle did not show any expansion. The sulci were not detectable, there were no pathologic alternations of the parenchyma, and the aqueduct was open. As typical symptoms of high intracranial pressure were missing, the patient decided against a shunt placement.

In 2007, urge incontinence of unclear origin and erectile dysfunction due to hyperprolactinaemia (prolactine 62.4 µg/l) occurred, probably caused by

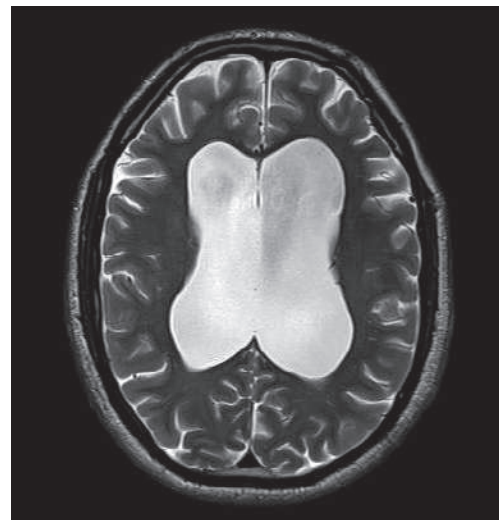


**Figure 1:** Axial T2-weighted MRI scan of the brain before surgery (2008) showing enlarged lateral ventricles and missing sulci (parameters: Slice thickness 4 mm, 32 slices, repetition time 6260 ms, echo time 96 ms).

risperidone. In 2008, the patient exhibited symptoms of intracranial pressure, including incontinence, forgetfulness, visual defect (blurred seeing), and gait disturbance (decelerated motion with tendency to fall). The diagnosis was altered to “Organic Psycho Syndrome with Hydrocephalus, unspecified” (ICD-10, G91.9 [5]). The patient had, until this point of time, never complained about headache or dizziness as signs of high intracranial pressure.

A magnetic resonance imaging (MRI) scan performed in 2008 showed an obvious triventricular hydrocephalus with an enlargement of the lateral ventri-

cles, a dilatation of the third ventricle as well as of the distal aqueduct. There was a detectable stenosis of the proximal aqueduct on the passage to the fourth ventricle, which itself wasn't enlarged (fig. 1). Finally, as symptoms worsened, the patient, agreed to undergo the suggested surgery. In February 2009, neurosurgical diagnosis was a triventricular hydrocephalus with stenosis of the aqueduct, and an endoscopic third ventriculostomy (ETV) was successfully performed. Following surgery, MRI scans showed a small decrease of the size of ventricles, but a persistent dilatation of the supratentorial ventricular system with reduction of the corpus callosum.



**Figure 3:** Axial T2-weighted MRI scan of the brain after surgery (2009). Still there are large lateral ventricles (parameters: Slice thickness 4 mm, 32 slices, repetition time 7180 ms, echo time 97 ms).



**Figure 2a, b:** Two artistic paintings by the patient: Figure 2a before surgery (2005/2006) title: “Hermann and Hermine”, 2b after surgery (2010), title: “Lieb dich hinein” (English: “loving yourself into”).

Postoperative course proceeded without any complication. In a control examination, half a year after the operation, the patient stated that headache, dizziness and gait disturbance had completely disappeared after surgery. Also his mental state had improved, and paranoid thoughts and mood changes had decreased. Cognitive functions, especially handling complex situations, improved according to the patient's statement. Furthermore, his artistic painting had changed; specifically characters of figures were now more concrete (fig. 2 a, b).

A control MRI scan performed in 2009, six months after surgery, showed an open aqueduct with a proper flow signal. The enlargement of the third ventricle and lateral ventricles was regressive (fig. 3).

However, residual symptoms of the psychotic disorder are still present. The patient's current antipsychotic medication is clozapine (225 mg/die).

## Discussion

Ventricular enlargement due to aqueduct stenosis sporadically results in schizophreniform psychosis [7]. One variant is the Dandy-Walker complex continuum with mega-cisterna magna, which can lead to hydrocephalus [2]. There have been reports of patients suffering from Dandy-Walker complex and refractory psychotic symptoms, and it has been put forth that psychosis constitutes a rare symptom of the illness [1, 2]. In addition, research about normal pressure hydrocephalus (NPH) has revealed that the classical description of the condition is clearly too narrow. There is a triad of typical symptoms, namely cognitive impairment, gait disturbance and urinary incontinence. However, the illness does often affect the patients' psychological wellbeing [7, 8]. Indeed, apathy, depression and akinetic mutism, even aggressive features, paranoia and change of personality, mania, rapid mood swings and symptoms of schizoaffective disorder have been observed [7]. Symptoms manifest themselves individually, according to age and anatomical deformation of the patient's ventricular system. Even insidious onsets have been described [9]. Moreover, it is not unusual that these psychiatric manifestations are given priority over the neurological signs of high intracranial pressure. In our case typical signs of hydrocephalus developed rather late during the course of illness [7]. Neuroimaging studies have revealed neuromorphological abnormalities in patients with schizophrenia, and, intriguingly, mainly ventricle enlargement and cortical atrophy. Reports imply an average of 20% increase in ventricular volume in schizophrenia as compared to healthy subjects [10]. In other words, psychotic symptoms are associated with a neuromorphological overlap, namely between NPH and ventricular enlargement commonly observed in schizophrenia.

There are two neurosurgical procedures for hydrocephalus due to aqueductal stenosis: either by means of an extracranial shunt, such as ventriculo-peritoneal or ventriculo-atrial shunts, or ETV [9]. The response to surgery varies greatly and is hardly foreseeable, and recent reports have shown an improvement after surgery – probably due to normalisation of cerebral blood flow. Consequently, the gait and incontinence may improve within a period of three months, although psychotic conditions need several months to resolve [7]. The duration of symptoms is associated with outcome; chronic conditions and delayed diagnosis result in a poorer prospect for rehabilitation. Surgery can

only effect a partial regression of symptoms in those cases [9].

This presentation of the disease and the linkage between hydrocephalus, psychosis and artistic abilities has, to the best of our knowledge, not been described in the past. This case stresses the need for complete evaluation, including neuroimaging, in patients with psychosis – especially if symptoms persist despite adequate antipsychotic treatment. Nowadays, an anatomical MRI scan of the brain should be performed in refractory psychosis.

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Correspondence:  
Daniel Schuepbach, MD  
Klinik für Allgemeine Psychiatrie und Psychotherapie West  
Klinikum am Weissenhof  
Zentrum für Psychiatrie Weinsberg  
DE-74189 Weinsberg  
Deutschland  
D.Schuepbach[at]klinikum-weissenhof.de