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Short Communication

Prevalence of cavum vergae in psychosis and mood spectrum disorders

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ABSTRACT

Background: Midline brain abnormalities might increase susceptibility to both first-episode and chronic mental disorder. Evidence of cavum vergae (CV) abnormality in mental disorders is scarce.
Methods: The presence of CV was assessed by a researcher blind to clinical information in a cross-disorder sample of 639 patients with mood and psychotic disorders and in 223 healthy controls. Homogeneous magnetic resonance imaging methods of acquisition and assessment were applied.
Results: Seven out of 639 patients with mood or psychotic disorders were detected with CV which corresponds to a prevalence of 1.1%. There were no concurrent cases of CV in the healthy control group. Identified cases which are briefly described were diagnosed from bipolar I disorder ($n=2$), delusional disorder ($n=1$), brief psychotic disorder ($n=1$) and schizoaffective disorder ($n=3$). Patients with CV had descriptively lower current IQ, executive functioning and memory scores in relation to patients without CV but this was not statistically significant.
Limitations: Effects of medication and lack of statistical power of the CV patient group.
Conclusions: Midline brain abnormalities, such as CV, might represent an unspecific risk factor for the development of severe mental disorders.

1. Background

A large body of literature has emphasized the role of aberrant neurodevelopmental processes in the pathophysiology of psychosis (Insel, 2010). Only few of these studies have specifically examined the prevalence of abnormalities in midline brain structures such as the septum pellucidum. The septum pellucidum is a component of the limbic system that forms the medial walls of the lateral ventricles and consists of two layers or laminae of both gray and white matter. When a septum pellucidum has a separation between its two layers this is termed a cavum septum pellucidum (CSP). CSP is present in all fetuses, but over 85% of them fuse around 3–6 months after birth (Shaw and Alvord, 1969). The cavum vergae (CV) is the posterior extension of the CSP. This structure is present in up to 30% of newborns but persists into adulthood in less than 1% of individuals (Tubbs et al., 2011). We recently found evidence of an increased prevalence of CSP in a large cross-disorder sample of 639 patients with different psychotic and mood disorders in comparison to 233 healthy controls (Landin-Romero et al., 2015) and concluded that this may increase susceptibility to mental disorders. As data about the prevalence of the CV are scarce, we performed a systematic search for this abnormality in this sample of patients diagnosed from mood and psychotic disorders in comparison to healthy controls.

2. Methods

The patients were recruited from the inpatient units and outpatient departments of three psychiatric hospitals in the Barcelona area. Patients met DSM-IV criteria for their corresponding disorders but patients with schizoaffective disorder had to fulfill also Research Diagnostic Criteria. Right-handed subjects were between 18 and 65 years old and were excluded in case of alcohol/substance abuse in the 12 months prior to participation and history of

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neurological disease, brain trauma or gross brain morphological findings. The latter were evaluated via MRI acquisitions by a single radiologist. Presence of CV or CSP was not considered as exclusion criteria. Healthy subjects were recruited via poster and web-based advertisement in the hospital and local community, plus word-of-mouth requests from staff in the research unit. They met the same exclusion criteria as the patients and they were interviewed and excluded if they reported a history of mental illness and/or treatment with psychotropic medication other than non-regular use of benzodiazepines or similar drugs for insomnia. They were also questioned about family history of mental illness and excluded if a first-degree relative had experienced symptoms consistent with major psychiatric disorder and/or had received any form of in- or out-patient psychiatric care.

Data for this study have been previously acquired, preprocessed and analyzed using the same 1.5 T GE Signa scanner in a series of neuroimaging studies evaluating structural and functional differences between patients with psychotic or mood disorders and healthy controls (Amann et al., 2015; Canales-Rodriguez et al., 2014; Landin-Romero et al., 2015; Pomarol-Clotet et al., 2010; Vicens et al., 2015; Radua et al., 2014). A high-resolution structural T1 MRI sequence with the following parameters had been used: number of axial slices=180; slice thickness=1 mm, slice gap=0 mm, matrix size=512 × 512; voxel resolution $0.5 \times 0.5 \times 1\ mm^3$; echo time (TE)=4 ms, repetition time (TR)=2000 ms, flip angle=15°. Structural images had the non-brain matter removed with the 'brain extraction tool' (BET), were affine-registered to a standard $1 \times 1 \times 1\ mm^3$ MNI template, had their intensity standardized to a 0–255 scale and were sliced for presentation in a zoomable and scrollable computer screen. The anatomical slices were presented in coronal plane. Scans were visually inspected for the presence of a CSP and CV. When assessing CSP, those abnormal CSPs extending beyond the columns of the fornix and the foramina of Monro were labeled as CV (anteroposterior length >15 mm). The same researcher (RLR) assessed all the images blind to any information of the individuals.

3. Results

Demographic, cognitive and clinical data for all participants can be gathered from Table 1. Independent samples *t*-tests and chi-square tests (for normal and dichotomous variables respectively) were used to compare patients with CV with patients without CV, and patients with CV with healthy controls. Seven out of 639 patients with mood or psychotic disorders presented CV persisting into adulthood which corresponds to a prevalence of 1.1%. Patients were diagnosed from bipolar I disorder ($n=2$), delusional disorder ($n=1$), brief psychotic disorder ($n=1$) and schizoaffective disorder ($n=3$). None of 233 healthy controls was identified with CV. Age, sex, university studies and premorbid IQ were comparable across groups. Current IQ, executive functioning and memory were descriptively lower in the patient group with CV (when compared to the patient group without CV) but results were not statistically significant. Age of onset in the CV patient group was later with a shorter duration of the disease but results were not statistically significant either.

3.1. Brief description of identified cases

Case A is a 27 year old male who developed first psychiatric symptoms at the age of 24 with complex auditory hallucinations, persecutory type delusions and megalomania. He was first admitted one year later due to a manic episode with psychotic symptoms, cannabis dependency, nicotine and alcohol abuse. He had a positive family history of an unknown mental disorder in a second-degree relative. At discharge the diagnosis was *schizoaffective disorder, bipolar type*, cannabis dependence and alcohol abuse disorder.

Case B is a 39 year old female patient with a first psychiatric admission at the age of 37 when she suffered from a psychotic episode in the context of economic environmental stressors. She had no prior substance use disorders or psychiatric, medical and surgical history of interest. Her symptoms consisted of self-referential delusions of infringement, auditory hallucinations, ideation of control and mind reading. No affective symptoms were observed. The patient went into clinical remission and was diagnosed with a *brief psychotic episode* at discharge.

Case C was a 43 year old male patient who presented at the age of 28 clinical manifestations compatible with irritable bowel syndrome. After consultation with multiple gastroenterologists and normal results of gastroscopy and colonoscopy, he was visited by a psychiatrist. He presented with hypochondriac delusional features and a permanent obsessive rumination about the origin of

Table 1
Description of the subsample of patients with cavum vergae (CV), patients without CV, and healthy controls.

	Patients			Healthy controls ($n=223$)	*P-value* (vs healthy controls)
	With CV ($n=7$)	Without CV ($n=632$)	*P-value* (vs patients without CV)		
Age in years (mean, S.D.)	41.1 (9.2)	39.4 (11.9)	n.s.	36.0 (11.3)	n.s.
Sex (women)	3 (42.9%)	256 (40.5%)	n.s.	124 (55.6%)	n.s.
University studies[a]	1 (14.3%)	87 (13.7%)	n.s.	74 (30.2%)	n.s.
Premorbid IQ (TAP) (mean, S.D.)[b]	22.8 (3.5)	21.5 (5.1)	n.s.	23.7 (4.5)	n.s.
Current IQ (WAIS-III) (mean, S.D.)[c]	84.6 (21.8)	91.3 (16.8)	n.s.	108.5 (14.7)	n.s.
Executive function (BADS) (mean, S.D.)[d]	54.4 (22.6)	78.5 (22.1)	n.s.	100.8 (12.6)	0.010
Memory (WMS) (mean, S.D.)[e]	24.0 (7.3)	29.1 (8.5)	n.s.	42.1 (8.0)	0.014
Age of onset in years (mean, S.D.)[f]	30.0 (8.8)	25.5 (9.3)	n.s.	–	–
Duration of the disease in years (mean, S.D.)[f]	10.8 (13.5)	13.4 (11.6)	n.s.	–	–

S.D.: standard deviation. n: number of cases. %: percentage. BADS: Behavioral Assessment of the Dysexecutive Syndrome. CV: cavum vergae. TAP: "Test de Acentuacion de Palabras" (Word Accentuation Test). WMS: Wechsler Memory Scale. n.s.: non-significant.

[a] Information missing for 208 (24.1%) individuals.
[b] Information missing for 114 (13.2%) individuals.
[c] Information missing for 142 (16.5%) individuals.
[d] Information missing for 239 (27.7%) individuals.
[e] Information missing for 290 (33.6%) individuals.
[f] Information missing for 111 (17.4%) patients.