Epilepsy & Behavior xxx (2011) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Epilepsy & Behavior

journal homepage: www.elsevier.com/locate/yebeh

Case Report

Psychosis after epilepsy surgery: Report of three cases

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ARTICLE INFO

Article history:
Received 2 September 2011
Revised 17 September 2011
Accepted 25 September 2011
Available online xxxx

Keywords:
Psychosis
Epilepsy
Epilepsy surgery
Risperidone

ABSTRACT

Temporal lobe epilepsy surgery has become a successful alternative in patients with refractory epilepsy. However, the outcome of epilepsy surgery may be affected by the occurrence of postsurgical psychiatric symptoms, such as psychosis. This report describes three cases of refractory temporal lobe epilepsy and hippocampal sclerosis, which, after anterior temporal lobectomy, presented with acute psychosis. One of them had a history of acute psychosis, and all of them met criteria for Cluster A personality disorder (schizoid/schizotypal) during psychiatric assessment prior to surgery. The three cases had a good seizure outcome (Engel I), but, on follow-up during the first year after surgery, developed an acute psychotic episode compatible with schizoaffective disorder; brief psychotic disorder; and a delusional disorder, respectively, according to the *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition. Treatment with low-dose risperidone was successful.

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1. Introduction

Temporal lobe surgery has become a successful alternative in patients with refractory epilepsy. Current evidence suggests a 60 to 70% remission rate for epileptic symptoms in the long term, resulting in significant improvement in quality of life [1,2]. Nevertheless, psychiatric symptoms, such as an increase in or de novo appearance of affective disorders, anxiety, and/or psychotic symptoms may affect both the outcome of epilepsy surgery and quality of life [1]. Psychosis in epilepsy has been associated with different factors—the time of evolution of the epilepsy, high-frequency seizure rate, temporal lobe epilepsy, polypharmacy, and use of newer antiepileptic drugs—and constitutes a serious condition that affects the patient's quality of life beyond the frequency of the seizures [3–13].

In this report we describe three persons with refractory temporal lobe epilepsy who underwent surgery (temporal anterior lobectomy) and, within the first year after surgery, developed psychotic symptoms without seizures. Refractory epilepsy was defined as at least one seizure per month during the preceding 2 years with appropriate treatment. Patients were admitted to the refractory epilepsy protocol, which includes a complete neurological evaluation and complementary studies: EEG, video/EEG, MRI, neuropsychological evaluation, and routine clinical, neurological and psychiatric evaluations (Structured Clinical Interview for DSM Disorders [SCID] I [14] and II [15] of the *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition [DSM-IV] [16]). In the first few years after surgery, psychiatric evaluation and clinical and neurological follow-up were periodically repeated. Engel's classification system was used to determine the evolution of seizures after epilepsy surgery [5,17].

The purpose of this report is to describe the clinical characteristics and their evolution of three persons who developed acute psychosis after epilepsy surgery. We discuss the casuistic aspects and provide the available bibliography on the controversial relationship between psychosis and epilepsy, focusing on the forced normalization phenomenon as one possible explanation for the occurrence of psychotic symptoms concomitantly with epilepsy remission.

2. Case 1

A 46-year-old, right handed woman was admitted to the Epilepsy Center of Ramos Mejía Hospital (ECRMH) with the diagnosis of refractory temporal lobe epilepsy. Seizures began when she was 18 months old, and at the time of admission, she was experiencing complex partial seizures on a daily basis. Seizures were preceded by psychoaffective manifestations and complex automatisms. MRI revealed right hippocampal sclerosis. Presurgical psychiatric evaluation revealed a history of a major depression episode, and the patient met criteria for Axis II schizoid personality disorder. There was evidence neither of other current DSM-IV Axis I psychiatric disorders, nor of a history of psychotic symptoms. The surgical procedure was successfully

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1525-5050/$ – see front matter. Published by Elsevier Inc.
doi:10.1016/j.yebeh.2011.09.029

performed. One month after the intervention, the patient entered a transitory and moderately depressive state that spontaneously remitted. A year later, she developed symptoms compatible with a psychotic episode characterized by emotional lability; hyperthymia; pressure of speech; erotomania and paranoid delusional thinking; hypersexuality; and visual, cenesthetic, and auditory hallucinations (many voices commenting on her actions) that motivated referral to the emergency department of our hospital. At that time, she had discontinued antiepileptic medication on her own, and her symptoms completely remitted after re-introduction of the medication. However, 4 months later, she presented with similar symptoms along with paranoid delusional symptoms. She had not discontinued her antiepileptic drugs this time. Risperidone 2 mg/day was introduced with a partial response. Delusional symptoms continued, with retrospective delusion and memory fallacies [6,18,19] ("hours before the surgery, a woman told me that they were going to change my sex and now that I think about it, she had a scar much like mine"), paranoid interpretative delusions ("people know that they inserted a chip in my brain and that changed my sex," "in the bank, people know that I went under surgery because my male features were accentuated"), and thought withdrawal delusions ("they know what I think, I think about going to the supermarket and when I get there, it's closed"). After risperidone was increased to 3 mg per day, delusional thinking and withdrawal delusions decreased. After 1 year of psychiatric follow-up evaluation and risperidone maintenance treatment, delusional thinking continued, however, with a lesser subjective impact and without conditioning of her conduct, developing into a schizophrenia-like syndrome [20]. Table 1 summarizes the main clinical and therapeutic characteristics of the three cases.

3. Case 2

A 41-year-old, right-handed man was admitted to ECRMH for refractory temporal lobe epilepsy to evaluate the possibility of surgical intervention. Epileptic seizures had begun when he was 11 years old. At present, he experienced complex and simple partial seizures, at a frequency of seven per month, which were characterized by an epigastric sensation of vacuum, lack of responsiveness, and myoclonus. MRI revealed right hippocampal sclerosis. The presurgical psychiatric assessment revealed a history of a transitory psychotic episode, with delusions and aggressiveness that required treatment with risperidone. On such occasions, the patient had discontinued his antiepileptic medication before the onset of psychosis. Furthermore, he was determined to have a DSM-IV Axis II schizotypal personality disorder. At the time of the surgical procedure, however, there was no acute psychotic symptomatology or other psychiatric symptomatology. Seventy-two hours postsurgery, he developed an acute psychotic episode, characterized by visual and kinetic hallucinations ("the surrounding and the people came over me"), auditory hallucinations (the voice of his neurologist), uninhibited sexual behavior, and grandiose delusional thinking. Haloperidol 15 mg/day and lorazepam 12 mg/day were administered. After the acute stage, oral risperidone 3 mg/day was prescribed. Psychotic symptoms decreased significantly during the first 48–72 hours of treatment, with complete recovery (*restitutio ad integrum*). During the first year of follow-up, his evolution was favorable in terms of both psychoses and seizures. The patient has not presented with another psychotic episode and remembers his past delusional state. The patient did not have any seizure during the first year after surgery and was classified as Engel class I (without seizures after surgery) (see Table 1).

4. Case 3

A 29-year-old, right-handed man was admitted to ECRMH for refractory temporal lobe epilepsy and left hippocampal sclerosis. Complex partial seizures had begun at age 5, with a current frequency of four to seven per month. The decision was made to perform epilepsy surgery. Psychiatric assessment revealed no psychiatric history and no DSM-IV Axis I psychiatric symptoms; however, he did fulfill the criteria for Axis II schizotypal personality disorder. Although the patient was a good employee, he had difficulties making friends and had no close relationships. Anterior temporal lobectomy was performed with good results. Nine months after the procedure he developed a delusional disorder characterized by delusional thoughts about past situations: "he was worried about violent and bizarre situations he had when he was younger"; "he remembered talking to dead people in the past"; and "he believed that he also was dead during the surgery." Delusional thoughts conditioned his behavior, and he was seeking revenge by planning the construction of a machine for spying on people inside their houses. Risperidone 3 mg/day was administered, and delusional symptoms decreased progressively, but did not completely disappear during the 2-year follow up. However, quality of life did improve; he went to live with his girlfriend, began to study at the university, and was seizure free (Table 1).

5. Discussion

Psychosis in epilepsy was recognized and described in detail in the mid-19th century by Falret, Hoffman, Morel, Samt, and Sommer, who observed signs of "craziness" in patients with mesial temporal sclerosis [20,21]. Today, the prevalence of psychosis in epilepsy is estimated to be around 9% [11] and even higher (19–27%) in specialized centers of epilepsy [4].

Psychosis is one of the most feared complications of epilepsy surgery. However, the disorders more frequently reported after surgery are affective disorders, especially emotional liability and depression, which typically are transitory and occur within the first 3 months of surgery [1,22,23].

Table 1
Clinical and therapeutic characteristics of cases 1–3.

Case	Type of epilepsy	MRI	Follow-up	Pharmaco-therapy	Presurgical psychiatric assessment (DSM-IV)	Postsurgical psychiatric diagnosis (DSM-IV)
1	Refractory temporal lobe epilepsy	Right hippocampal sclerosis	2 years without seizures Engel I	Valproic acid 800 mg/day Carbamazepine 600 mg/day Risperidone 3 mg/day	Axis I: no psychiatric disorder Axis II: Schizoid personality disorder	Schizoaffective disorder
2	Refractory temporal lobe epilepsy	Right hippocampal sclerosis	1 year without seizures Engel I	Carbamazepine 1200 mg/day Lamotrigine 500 mg/day Risperidone 3 mg/day Lorazepam 3 mg/day	Axis I: Acute psychotic episode (probable postictal psychosis) Axis II: schizotypal personality disorder	Brief psychotic disorder
3	Refractory temporal lobe epilepsy	Left hippocampal sclerosis	5 years without seizures Engel I	Carbamazepine 1000 mg/day Lamotrigine 200 mg/d Clonazepam 3 mg/day Risperidone 3 mg/day	Axis I: no psychiatric disorder Axis II: schizotypal personality disorder	Delusional disorder

Please cite this article as: Calvet E, et al, Psychosis after epilepsy surgery: Report of three cases, Epilepsy Behav (2011), doi:10.1016/j.yebeh.2011.09.029

The prevalence of de novo psychosis (without psychotic history) after surgery is low, around 1% [24,25]. De novo interictal psychosis can occur months or even years after surgery (usually in the first 6 months) [22,26]. Cases 1 and 3 did not have a history of DSM-IV Axis I psychosis, and we can thus consider their postsurgery episodes as "de novo" psychosis. However, the presurgical assessment did reveal Cluster A premorbid personality (schizotypal or schizoid compensated personality disorder). Cluster A premorbid personality is part of the schizophrenic spectrum and has been considered a risk factor for development of a psychotic disorder [5,27,28]. In accordance, other authors have reported that patients who developed de novo psychosis had previous premorbid personality factors [29,30].

Cases 1 and 3 presented with chronic evolution of psychotic symptoms (more than 6 months) with total remission of the seizures. This pattern of antagonism between seizures and psychosis has been reported in the literature under the term *forced normalization*, introduced by Landolt to refer to the electric phenomenon whose counterpart is the "alternative psychosis" described by Tellenbach [2,31]. This phenomenon, also called "paradoxical normalization," has been documented by many authors with the additional observation that the EEG can be completely normal or at least less pathological than it was before [31,32].

The neurophysiology of forced normalization is controversial. One hypothesis is that it represents mesial temporal or subcortical epileptic activity, with increased cortical inhibition. However, it is possible that the psychosis does not represent epileptiform activity, but is a sustained response to the preceding ictal activity [33,34]. The inhibitory events described beforehand are produced more often in proximity to the epileptic focus, reducing the electric current generated by it [31,35,36]. On the other hand, it has been shown that epileptic activity in the hippocampus leads to plastic changes and the aberrant reinnervation phenomenon and reorganization of the synapses which have also been used to explain the physiopathological mechanism that occurs in the area of the surgery in a de novo psychosis [1].

A peculiar characteristic of the phenomenon described previously in cases 1 and 3 is that the delusional thinking is based on memory fallacies (retrospective delusion) [19]. This coincides with other studies describing neurological patients with delusional thinking who have temporal or bifrontal lesions [6,37–40]. Therefore, delusional thinking can develop because of the loss of self-related functions such as reality monitoring, memory, and familiarity [6,38,41,42]. Confabulation and anosognosia are "relatives" of delusional thinking. The confabulation generally is associated with memory (medial temporal or diencephalic) and executive (bifrontal) dysfunctions [37,43,44]. If retrieved information cannot be contextually and temporally labeled, past memories blur with current experience. Conscious guidance and maintenance of the search to link the results with past and current experience, or strategic recall, are often impaired [40]. On the contrary, the associative recovery does not deteriorate. Deficits in automonitoring and memory linkage with its source degrade reality monitoring and the capacity to differentiate memory from an autogenerated thought [43]. "The past is altered in favor of a hypothesis; the more blurred and uncertain perceptions are most likely to deform and the delusion that already exists, spreads at the past's expense" [19].

6. Conclusion

Psychiatric complications of epilepsy surgery call for previous psychiatric evaluation as well as continuous follow-up. The association between postsurgical psychosis and premorbid risk factors remains controversial; however, premorbid personality should be taken into account in presurgical assessment. Risperidone, in low doses, was demonstrated to be useful in the treatment of these cases, leading to a favorable outcome.

References

[1] Foong J, Flugel D. Psychiatric outcome of surgery for temporal lobe epilepsy and presurgical considerations. Epilepsy Res 2007;75:84–96.
[2] Marchangelo MJ, Ovsiew F. Psychiatric aspects of epilepsy. Psychiatr Clin North Am 2007;30:781–802.
[3] Andermann LF, Savard G, Meencke HJ, McLachlan R, Moshé S, Andermann F. Psychosis after resection of ganglioglioma or DNET: evidence of an association. Epilepsia 1999;40:83–87.
[4] D´Alessio L, Giagante B, Ibarra V, et al. Analysis of psychotic disorders in patients with refractory partial epilepsy: psychiatric diagnosis and clinical aspects. Actas Esp Psiquiatr 2008;36:138–43.
[5] D'Alessio L, Giagante B, Papayannis C, et al. Psychotic disorders in Argentine patients with refractory temporal lobe epilepsy: a case–control study. Epilepsy Behav 2009;14:604–9.
[6] Devinsky O. Right cerebral hemisphere dominance for a sense of corporeal and emotional self. Epilepsy Behav 2000;1:60–73.
[7] Flor-Henry P. Psychosis and temporal lobe epilepsy: a controlled investigation. Epilepsia 1969;10:363–95.
[8] Jensen I, Larsen JK. Psychoses in drug-resistant temporal lobe epilepsy. J Neurol Neurosurg Psychiatry 1979;42:948–54.
[9] Kanemoto K, Kawasaki J, Kawai I. Postictal psychosis: a comparison with acute and chronic interictal psychosis. Epilepsia 1996;37:551–6.
[10] Kanner A, Stagno S, Kotagal P, Morris H. Postictal psychiatric events during prolonged video-electroencephalographic monitoring studies. Arch Neurol 1996;53:258–63.
[11] Mendez MF, Grau R, Doss RC, Taylor JL. Schizophrenia in epilepsy: seizure and psychosis variables. Neurology 1993;43:1073–7.
[12] Kanner AM. Psychosis of epilepsy: a neurologist's perspective. Epilepsy Behav 2000;1:219–27.
[13] Cramer J, Blum D, Reed M, Fanning K. The influence of comorbid depression on quality of life for people with epilepsy. Epilepsy Behav 2003;4:515–21.
[14] First M, Gibbon M, Spitzer R, Williams J, Smith L. Entrevista Clínica Estructurada para los trastornos del EJE I del DSM IV, SCID-I. Barcelona: Masson; 1999.
[15] First M, Gibbon M, Spitzer R, Williams J, Smith L. Entrevista Clínica Estructurada para los trastornos de la Personalidad del EJE II del DSM IV, SCID-II. Barcelona: Masson; 1999.
[16] Diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV). Washington, DC: Am. Psychiatric Assoc; 1994.
[17] Kochen S, Melcon M. Prognosis of epilepsy in a community-based study: eight years of follow-up in an Argentine community. Acta Neurol Scand 2005;112:370–4.
[18] Devinsky O. Delusional misidentifications and duplications: right brain lesions, left brain delusions. Neurology 2009;72:80–7.
[19] Pereyra CR. Semiología y psicopatología de los procesos de la esfera intelectual. Buenos Aires: Editorial Salerno; 2000.
[20] Slater E, Beard AW, Glithero E. The schizophrenic-like psychosis of epilepsy: psychiatric aspects. Br J Psychiatry 1963;109:95–112.
[21] Nadkarni S, Arnedo V, Devinsky O. Psychosis in epilepsy patients. Epilepsia 2007;48:17–9.
[22] Blumer D, Wakhlu S, Davies K, Hermann B. Psychiatric outcome of temporal lobectomy for epilepsy: incidence and treatment of psychiatric complications. Epilepsy 1998;39:478–86.
[23] Callender JS, Fenton GW. Psychosis de novo following temporal lobectomy. Seizure 1997;6:409–11.
[24] Christodoulou C, Koutroumanidis M, Hennessy MJ, Elwes RD, Polkey CE, Toone BK. Postictal psychosis after temporal lobectomy. Neurology 2002;59:1432–5.
[25] Manchanda R, Miller H, McLachlan RS. Post-ictal psychosis after right temporal lobectomy. J Neurol Neurosurg Psychiatry 1993;56:277–9.
[26] Marchetti RL, Fiore LA, Valente KD, Gronich G, Nogueira AB, Tzu WH. Surgical treatment of temporal lobe epilepsy with interictal psychosis: results of six cases. Epilepsy Behav 2003;4:146–52.
[27] Fogelson D, Nuechterlein K, Asarnow R, Payne D, Subotnik K. Validity of the family history method for diagnosing schizophrenia, schizophrenia-related psychoses, and schizophrenia-spectrum personality disorders in first-degree relatives of schizophrenia probands. Schizophr Res 2004;68:309–17.
[28] Siever LJ, Davis KL. The pathophysiology of schizophrenia disorders: perspectives from the spectrum. Am J Psychiatry 2004;161:398–413.
[29] Glosser G, Zwil AS, Glosser DS, O´Connor MJ, Sperling MR. Psychiatric aspects of temporal lobe epilepsy before and after anterior temporal lobectomy. J Neurol Neurosurg Psychiatry 2000;68:53–8.
[30] Hermann BP, Whitman S. Behavioral and personality correlates of epilepsy: a review, methodological critique, and conceptual model. Psychol Bull 1984;95:451–97.
[31] Krishnamoorthy ES, Trimble MR, Sander JW, Kanner AM. Forced normalization at interface between epilepsy and psychiatry. Epilepsy Behav 2002;3:303–8.
[32] Landolt H. Some clinical electroencephalographical correlations in epileptic psychoses (twilight states). Electroencephalogr Clin Neurophysiol 1953;5:121.
[33] D´Alessio L, Kochen S. Esquizofreniform psychosis after epilepsy surgery: a case of forced normalization phenomena. Actas Esp Psiquiatr 2001;29:351–4.
[34] Sachdev PS. Alternating and postictal psychoses: review and a unifying hypothesis. Schizophr Bull 2007;33:1029–37.
[35] Akanuma N, Kanemoto K, Adachi N, Kawasaki J, Ito M, Onuma T. Prolonged postictal psychosis with forced normalization (Landolt) in temporal lobe epilepsy. Epilepsy Behav 2005;6:456–9.
[36] Wolf P. The clinical syndromes of forced normalization. Jpn J Psychiatry Neurol 1984;38:187–92.
[37] Benson DF, Djenderedjian A, Miller BL, et al. Neural basis of confabulation. Neurology 1996;46:1239–43.

Please cite this article as: Calvet E, et al, Psychosis after epilepsy surgery: Report of three cases, Epilepsy Behav (2011), doi:10.1016/j.yebeh.2011.09.029

[38] Feinberg TE, Deluca J, Giacino JT, Roane DM, Solms M. Right-hemisphere pathology and the self: delusional misidentification and reduplication. In: Feinberg TE, Keenan JP, editors. The lost self. New York: Oxford Univ. Press; 2005, 100–130.
[39] Joseph KA. Capgras syndrome and its relationship to neurodegenerative disease. Arch Neurol 2007;64:1762–6.
[40] Postal KS. The mirror sign delusional misidentification symptom. In: Feinberg TE, Keenan JP, editors. The lost self: pathologies of the brain and identity. New York: Oxford Univ. Press; 2005, 131–146.
[41] Gainotti G. Face familiarity feelings, the right temporal lobe and the possible underlying neural mechanisms. Brain Res Rev 2007;56:214–35.
[42] Gazzaniga MS. The split brain revisited. Sci Am 1998;279:50–5.
[43] Johnson MK, Hayes SM, D'Esposito M, Raye CL. Confabulation. In: Grafman J, Boller F, editors. Handbook of neuropsychology. 2nd ed. Amsterdam: Elsevier Science; 2000.
[44] Moscovitch M, Melo B. Strategic recall and the frontal lobes: evidence from confabulation and amnesia. Neuropsychologia 1997;35:1017–34.

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