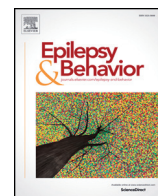




Contents lists available at ScienceDirect

Epilepsy & Behavior

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

Review

Joan of Arc: Sanctity, Witchcraft or Epilepsy?

Nicolas Nicastrò *, Fabienne Picard

Neurology Department, Geneva University Hospitals, 4 Avenue G. Perret-Gentil, 1205 Geneva, Switzerland

ARTICLE INFO

Article history:

Revised 26 December 2015

Accepted 28 December 2015

Available online xxxx

Keywords:

Joan of Arc

Historical figures

Epilepsy

Auditory hallucinations

Experiential phenomena

ABSTRACT

Objective: The objective of this article is to describe whether Joan of Arc had epilepsy and how that may have influenced her sense of mission and ability to encourage thousands of people to help her to chase the English out of France.

Methods: Documentation of her Trial of Condemnation in 1431 provides a description of her episodes of experienced voices and visions.

Results: From the age of thirteen, Joan of Arc experienced frequent episodes of auditory hallucinations associated with elementary or complex visual hallucinations (e.g., a great light or human faces). These had sudden onset, lasting seconds or minutes at most, and occurred when awake or during sleep, arousing her. Some could be triggered by an auditory stimulus. She had no disorganized thought between the episodes.

Conclusions: The semiology of the episodes is very suggestive of epileptic seizures, which have been considered as ecstatic by some authors or as partial epilepsy with auditory features by others, which seems more concordant with the ictal symptoms. The auditory and visual hallucinations could have had a religious content because during her childhood and adolescence, she was brought up in a religious environment, inasmuch as this content first undefined only appeared after a few seizures. We can suppose that such hallucinations, without the knowledge of their medical origin, gave her a sense of divine mission, hence, a real strength to try to accomplish the orders she heard during the episodes. Her role during the Hundred Years' War and her narration of her strange episodes led her to be burned for heresy at the age of nineteen, yet rehabilitated 25 years later and to be canonized for her achievements in 1920.

This article is part of a Special Issue entitled "Epilepsy, Art, and Creativity".

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

1.1. Historical background

Joan of Arc (1412–1431) is a major figure in the history of France. However, it seems improbable that such a young girl, the daughter of a peasant living in Domrémy (in Lorraine), could play such a pivotal role in the Hundred Years' War and help the French people to defeat the English during the siege of Orleans, resulting in the coronation of the Dauphin Charles VII as King of France. As described in the transcripts of her Condemnation Trial, Joan of Arc stated that she had been sent on a spiritual mission and could hear the voices of Saints Michael, Catherine, and Margaret, urging her to save France. There is a debate among historians to determine if Joan of Arc really played such a strategic role in the war or if she was more of a mascot [1]. In any case, she was condemned for heresy in 1431 and executed, before Pope Callixtus III considered her an innocent martyr in 1456. Ultimately, Joan of Arc was beatified in

1909 and her canonization took place in Saint Peter's Basilica in Rome in 1920. She is considered a prominent figure of the French nation.

For centuries, the destiny of the Maid of Orleans and the voices she heard raised a growing interest among artists, such as William Shakespeare, Voltaire, Therese of Lisieux, Bertolt Brecht, Jean Anouilh, and Georges Bernard Shaw. Painters Peter Paul Rubens, John Everett Millais, and Jules-Eugene Lenepveu also depicted her in an often heroic and innocent posture. More recently, medical researchers have examined her case to explore whether the visual and auditory hallucinations she experienced were part of a specific medical condition.

2. Methods

As a preamble, it is crucial to realize that there are few reliable sources about the historical context of the short life of Joan of Arc. The transcripts from her Trial of Condemnation (1431) and her Trial of Rehabilitation (1456) constitute the main historical substrate [2]. The impressive work of Jules Quicherat, who during the nineteenth century collected the exhaustive historiography written during the lifetime of Joan of Arc, represents another invaluable source [3]. The most arduous

* Corresponding author. Tel.: +41 22 372 33 11; fax: +41 22 372 83 40.
E-mail address: Nicolas.Nicastrò@hcuge.ch (N. Nicastrò).

task for the researcher is to sort the various interpretations given limited facts from legends.

3. Results and discussion

Joan of Arc was the youngest and fifth child of the farmer Jacques of Arc and Isabelle Romée, presumably born in 1412 in the town of Domrémy, situated in the actual Lorraine region. Joan received a simple and very religious education. She experienced her first episode of hallucinations at the age of thirteen, in her father's garden.

According to the verbatim report of her Trial of Condemnation, she described an external voice coming from her right and a great light. It was only after a few other episodes that she supposed that the voice came from the Archangel Michael. She explained: *"When I heard it for the third time, I recognized that it was the voice of an angel", "I should know quite well if it were Saint Michael or a counterfeit. The first time I was in great doubt if it were Saint Michael; and I was much afraid. I had seen him many times before I knew it was Saint Michael"*. The modality of the hallucination was always complex auditory (voices), sometimes triggered by a sound such as the tinkling of a bell. It was often accompanied by visual content, such as a great light coming at the same time as the voice, or images that she identified as visions of Saints. She saw what she thought was Saint Michael, or Saint Catherine, and Saint Margaret (*"Their faces are adorned with beautiful crowns, rich and precious. I know quite well it is they; and I can easily distinguish one from the other. I saw the face. I do not know if they have arms or other members"*). Joan of Arc explained how she was sent on a mission, urged by these voices to be good, to go to church and to come to France to raise the siege of Orleans. It is of particular interest to notice that these episodes were very stereotypical, lasting a few seconds to minutes at most, and their frequency varied from two or three times a week to daily. They could happen during the day or sometimes during night sleep, awakening her. No other symptoms such as epigastric aura, automatisms, or abnormal movements were described.

3.1. Did Joan of Arc suffer from a psychiatric condition?

One of the many hypotheses that have been considered is that Joan of Arc suffered from a psychiatric illness, causing auditory and visual hallucinations, especially schizophrenia, the prototypical psychiatric disease causing hallucinations [4,5]. However, many specialists find this assumption improbable. First, the hallucinations experienced by the Maid of Orleans were mostly of positive content: it was supposed to exhort her to pursue a divine mission to save France. It is recognized that hallucinations of epileptic origin may be of positive or negative content while they are usually hostile and threatening in psychosis [6–9]. Contrary to Joan of Arc's experience, patients with schizophrenia experience auditory hallucinations that are described as internal voices (*"inside the head"*), usually not lateralized [10]. According to some authors, auditory hallucinations in patients with epilepsy are more frequently reported outside the head [7]. Moreover, Joan of Arc has been described, beside these clear-cut episodes of hallucinations, as an organized person, with a joyous mood, which argues against a schizophrenic condition [11].

3.2. Did Joan of Arc have epilepsy?

The hypothesis of an epileptic condition remains the more robust one, in light of the few sources available. In fact, it has the advantage of being concordant with the short duration of the episodes, their occurrence during waking or awakening from sleep, their frequency, and the normal behavior of Joan of Arc in between these spells [12]. Other neurologists have tried to look further to a specific entity [13]: ecstatic seizures have been evoked to explain her hallucinations, in particular by Oliver Sacks [14] and by Foote-Smith and Baine [15]. This condition has also emerged from the descriptions of F. M. Dostoevsky's own

attacks [16,17] and has been a subject of debate among neurologists, some claiming that the Russian writer simply embellished his feeling of enhanced well-being [18]. However, many case reports have described patients feeling this state of heightened consciousness and intense positive emotion [19]. The anterior insula may be a plausible candidate for the anatomical origin of this rare type of seizure [20]. However, the clinical description of Joan of Arc's seizures in the Trial of Condemnation does not seem to match with the typical symptoms of this condition. Joan of Arc never mentioned a sense of bliss during the episodes, which were limited to auditory and visual hallucinations.

A more attractive hypothesis has been evoked by D'Orsi and Tinuper [21], claiming that Joan of Arc had suffered from temporal lobe epilepsy with auditory symptoms, as observed in autosomal dominant lateral temporal epilepsy (ADLTE), also called autosomal dominant partial epilepsy with auditory features (ADPEAF) or, in the sporadic form, idiopathic partial epilepsy with auditory features (IPEAF) [22]. In this (familial or sporadic) form of epilepsy, which can be associated with LGI1 mutations [23], auditory features are prominent, but other symptoms include complex visual hallucinations [24]. Joan of Arc's attacks began at the age of 13 years, and occurred twice or three times a week. There was no known family history of epilepsy, making these compatible with IPEAF. Auditory hallucinations are usually encountered in patients with lateral temporal lobe epilepsy [25,26] with characteristics which differ from the hallucinations of psychiatric patients. Epileptic auditory hallucinations are usually situated outside the body (external voice), often lateralized to the opposite side of the epileptic focus [7]. The fact that Joan of Arc heard voices on her right could suggest left temporal lobe epilepsy. In epileptic hallucinations, voices speak in the second person to the patient, while in schizophrenia they speak as second or third persons, the latter talking about the patient [9]. There is a frequent association with visual hallucinations in epilepsy, while this association is rarer in schizophrenia. In Penfield and Perot's study, electrical stimulations performed in different patients during presurgical evaluation showed that induction of combined auditory and visual hallucinations was always related to stimulations in the first temporal gyrus, on either side [27]. They also noticed that patients suffering from seizures with ictal hallucinations often have abortive attacks consisting of the hallucinations alone, without secondary generalizations, which is compatible with the absence of generalized tonic-clonic seizures in Joan of Arc. Nonetheless, it seems superfluous to elaborate more hypotheses about Joan of Arc's condition, as sources are clearly lacking.

3.3. The spiritual brain

Throughout history, epilepsy has been associated with great leaders (Alexander the Great, Julius Caesar, Napoleon Bonaparte) and famous artists, such as Dostoevsky, Van Gogh, and Flaubert [18,28–30], although in certain cases, this diagnosis has been a subject of debate among epileptologists [31,32]. Many neurologists have written on the story of these characters, exploring their depictions, trying to make sense of the clinical picture to distinguish history from legend.

Saint Paul, one of the pillars of the Christian Church, is considered to have suffered from temporal lobe epilepsy [13,33,34]. In his Second Epistle to the Corinthians, he speaks about his mysterious disease, whose first bout appeared suddenly while he was on the road to Damascus. A big light flashed in his eyes, he fell on the ground and heard the voice from Jesus Christ. He then lost sight for three days, before recovering it when visited by Ananias of Damascus. It is considered that from that moment, Saul of Tarsus (original name of Saint Paul), at that time a severe Pharisee who persecuted the early Christian members, converted to Christianity. A diagnosis of temporal lobe epilepsy has also been evoked to explain the spells of prophet Ezekiel [35].

Based on clinical observations of patients and lesion mapping, researchers have determined specific regions of the brain that could elicit

particular visual or auditory content and, ultimately, that could play a role in spiritual thinking [36].

Penfield and Perot [27], Mahl et al. [37], Halgren et al. [38], and Ferguson et al. [39] performed preoperative electrical stimulation of the temporal lobes of patients with epilepsy, producing what has been called experiential phenomena, further described by Gloor [40] and Bancaud et al. [41], which are summarized as vivid sensations of déjà vu, accompanied by intense emotions, like fear or anger, and sometimes auditory hallucinations, almost always lacking a coherent content. Interestingly, different patients experiencing electrical stimulation of the same region can exhibit totally different symptoms. Conversely, stimulation of different regions can produce the same clinical findings [12].

Another key feature is that the personal context in which hallucinations appear modulate their content, whether hallucinations occur in patients with or without epilepsy. These findings have been studied in patients with schizophrenia [42,43] and, interestingly, in patients experiencing electrical stimulation of the mesial temporal lobe [44]. It has been noticed that the content of hallucinations was frequently related to the personality of the patient [38], or to a personal event, might be a distant memory or a situation that happened a few hours before the seizure [26,27,44]. The mental content just before the seizure [37] has also been mentioned as a substrate of the hallucinations. In well-formed verbal auditory hallucinations, the content of the sentences may be variable from one seizure to the other [26]. On the one hand, being educated in a particular cultural or religious context can modulate or influence the content of hallucinations. On the other hand, the patient can interpret the content of the hallucinations, whether visual or auditory, in light of his cultural context [45].

Thus, it may be plausible that Joan of Arc experienced vague (or fuzzy) hallucinations whose content could have been influenced by her strict religious education and the historical context of the Hundred Years' War, i.e., the inducement of Saints to go on a mystic mission to save France. It can be noticed that Joan of Arc clearly recognized that it was the voice and face of Saint Michael only after a few episodes, as she told according to the verbatim report of her Trial of Condemnation. The full messages were not always understandable. Although she reported: *"The voice said to me 'Be good and go often to church' 'Go into France! Raise the siege that is being made before the city of Orleans!'"*, she also pointed out: *"It said to me several words I could not really understand"* or *"I did not quite understand it"*, or *"Sometimes I fail to understand because of the great disturbance in the prison and the noise made by my guards"*.

4. Conclusion

The hypothesis of epilepsy in Joan of Arc is only based on her own description of the episodes as reported in her trials. There is no available medical evaluation, and the diagnosis will never be confirmed. In addition, it may prove complicated to separate the real historical facts from the legend surrounding her.

Our aim was precisely to address the mysterious role of a possible neurological disorder, in this case epilepsy with its numerous and sometimes spectacular symptoms, on the trajectory of a famous historical character. It is possible that some political leaders, saints, and artists who have made great achievements suffered from a medical condition that could have played a major role in the perception of the world they lived in and of the shape they wanted it to take.

Disclosure

The authors report no disclosure regarding the present article.

References

- [1] Contamine P, Tesnière M-H. *Jeanne de France, duchesse de Bourbon, et son livre d'heures*. Paris: Académie des inscriptions et belles-lettres; 2013.
- [2] Leclercq H. *Les Martyrs, recueil de pièces authentiques sur les martyrs, depuis les origines jusqu'au XXe siècle, traduites et publiées par le R. P. Dom H. Leclercq*. Paris; 1903.
- [3] Quicherat J-É. Procès de condamnation et de réhabilitation de Jeanne d'Arc, dite la Pucelle publiés pour la première fois d'après les manuscrits de la Bibliothèque royale, suivis de tous les documents historiques qu'on a pu réunir et accompagnés de notes et d'éclaircissements. Paris: J. Renouard et Cie; 1841.
- [4] Allen C. The schizophrenia of Joan of Arc. *Hist Med* 1975;6(3-4):4-9.
- [5] Henker FO. Joan of Arc and DSM III. *South Med J* 1984;77(12):1488-90.
- [6] Laroi F, Sommer IE, Blom JD, Fernyhough C, Fytche DH, Hugdahl K, et al. The characteristic features of auditory verbal hallucinations in clinical and non-clinical groups: state-of-the-art overview and future directions. *Schizophr Bull* 2012;38(4):724-33.
- [7] Serino A, Heydrich L, Kurian M, Spinelli L, Seeck M, Blanke O. Auditory verbal hallucinations of epileptic origin. *Epilepsy Behav* 2014;31:181-6.
- [8] Sanjuan J, Gonzalez JC, Aguilar EJ, Leal C, Van Os J. Pleasurable auditory hallucinations. *Acta Psychiatr Scand* 2004;110(4):273-8.
- [9] Daalman K, Boks MP, Diederiksen KM, de Weijer AD, Blom JD, Kahn RS, et al. The same or different? A phenomenological comparison of auditory verbal hallucinations in healthy and psychotic individuals. *J Clin Psychiatry* 2011;72(3):320-5.
- [10] Fletcher PC, Frith CD. Perceiving is believing: a Bayesian approach to explaining the positive symptoms of schizophrenia. *Nat Rev Neurosci* 2009;10(1):48-58.
- [11] American Psychiatric Association. *Desk reference to the diagnostic criteria from DSM-5*. Washington, DC: American Psychiatric Publishing; 2013.
- [12] Elliott B, Joyce E, Shorvon S. Delusions, illusions and hallucinations in epilepsy: 1. Elementary phenomena. *Epilepsy Res* 2009;85(2-3):162-71.
- [13] Muhammed L. A retrospective diagnosis of epilepsy in three historical figures: St Paul, Joan of Arc and Socrates. *J Med Biogr* 2013;21(4):208-11.
- [14] Sacks OW. *Hallucinations*. London: Picador; 2012.
- [15] Foote-Smith E, Bayne L. Joan of Arc. *Epilepsia* 1991;32(6):810-5.
- [16] Dostoevsky FM. *The demons*. London: Methuen; 1872.
- [17] Dostoevsky FM. *The idiot*. London: Methuen; 1869.
- [18] Gastaut H. Fyodor Mikhailovitch Dostoevsky's involuntary contribution to the symptomatology and prognosis of epilepsy. William G. Lennox Lecture, 1977. *Epilepsia* 1978;19(2):186-201.
- [19] Picard F, Craig AD. Ecstatic epileptic seizures: a potential window on the neural basis for human self-awareness. *Epilepsy Behav* 2009;16(3):539-46.
- [20] Picard F, Scavarda D, Bartolomei F. Induction of a sense of bliss by electrical stimulation of the anterior insula. *Cortex* 2013;49(10):2935-7.
- [21] d'Orsi G, Tinuper P. "I heard voices...": from semiology, a historical review, and a new hypothesis on the presumed epilepsy of Joan of Arc. *Epilepsy Behav* 2006;9(1):152-7.
- [22] Bisulli F, Tinuper P, Avoni P, Striano P, Striano S, d'Orsi G, et al. Idiopathic partial epilepsy with auditory features (IPEAF): a clinical and genetic study of 53 sporadic cases. *Brain* 2004;127(Pt 6):1343-52.
- [23] Nobile C, Michelucci R, Andreazza S, Pasini E, Tosatto SC, Striano P. LGI1 mutations in autosomal dominant and sporadic lateral temporal epilepsy. *Hum Mutat* 2009;30(4):530-6.
- [24] Michelucci R, Pasini E, Malacrida S, Striano P, Bonaventura CD, Pulitano P, et al. Low penetrance of autosomal dominant lateral temporal epilepsy in Italian families without LGI1 mutations. *Epilepsia* 2013;54(7):1288-97.
- [25] Maillard L, Vignal JP, Gavaret M, Guye M, Biraben A, McGonigal A, et al. Semiologic and electrophysiologic correlations in temporal lobe seizure subtypes. *Epilepsia* 2004;45(12):1590-9.
- [26] Sasaki T, Kodaka F, Taniguchi G, Nishikawa T, Watanabe M. Experiential auditory hallucinations due to chronic epileptic discharges after radiotherapy for oligastrocytoma. *Epileptic Disord* 2013;15(2):188-92.
- [27] Penfield W, Perot P. The brain's record of auditory and visual experience. A final summary and discussion. *Brain* 1963;86:595-696.
- [28] Gastaut H. New comments on the epilepsy of Fyodor Dostoevsky. *Epilepsia* 1984;25(4):408-12.
- [29] Picard F. Vincent Van Gogh's epilepsy. *Epilepsy Behav* 2011;22(2):414-5.
- [30] Arnold LM, Baumann CR, Siegel AM. Gustave Flaubert's "nervous disease": an autobiographic and epileptological approach. *Epilepsy Behav* 2007;11(2):212-7.
- [31] Hughes JR. Did all those famous people really have epilepsy? *Epilepsy Behav* 2005;6(2):115-39.
- [32] Hughes JR. A reappraisal of the possible epilepsy of Vincent Van Gogh. *Epilepsy Behav* 2005;6(4):504-10.
- [33] Landsborough D. St Paul and temporal lobe epilepsy. *J Neurol Neurosurg Psychiatry* 1987;50(6):659-64.
- [34] Vercelletto P. Saint Paul disease. Ectasia and ecstatic seizures. *Rev Neurol (Paris)* 1994;150(12):835-9.
- [35] Altschuler E. Did Ezekiel have epilepsy? *Arch Gen Psychiatry* 2002;59(6):561-2.
- [36] Urgesi C, Aglioti SM, Skrap M, Fabbro F. The spiritual brain: selective cortical lesions modulate human self-transcendence. *Neuron* 2010;65(3):309-19.
- [37] Mahl GF, Rothenberg A, Delgado JM, Hamlin H. Psychological responses in the human to intracerebral electrical stimulation. *Psychosom Med* 1964;26:37-68.
- [38] Halgren E, Walter RD, Cherlow DG, Crandall PH. Mental phenomena evoked by electrical stimulation of the human hippocampal formation and amygdala. *Brain* 1978;101(1):83-117.
- [39] Ferguson SM, Rayport M, Gardner R, Kass W, Weiner H, Reiser MF. Similarities in mental content of psychotic states, spontaneous seizures, dreams, and responses to electrical brain stimulation in patients with temporal lobe epilepsy. *Psychosom Med* 1969;31(6):479-98.
- [40] Gloor P. Experiential phenomena of temporal lobe epilepsy. Facts and hypotheses. *Brain* 1990;113(Pt 6):1673-94.

- [41] Bancaud J, Brunet-Bourgin F, Chauvel P, Halgren E. Anatomical origin of déjà vu and vivid 'memories' in human temporal lobe epilepsy. *Brain* 1994;117(Pt 1):71–90.
- [42] Murphy JM. Psychiatric labeling in cross-cultural perspective. *Science* 1976;191(4231):1019–28.
- [43] Myers NL. Update: schizophrenia across cultures. *Curr Psychiatry Rep* 2011;13(4):305–11.
- [44] Vignal JP, Maillard L, McGonigal A, Chauvel P. The dreamy state: hallucinations of autobiographic memory evoked by temporal lobe stimulations and seizures. *Brain* 2007;130(Pt 1):88–99.
- [45] Knight WD, Fox NC, Rossor MN, Warren JD. The cultural context of visual hallucinations. *Postgrad Med J* 2008;84(988):103–5.