
THE AETIOLOGY OF EPILEPSY SPIRITUAL OR PHYSICAL?

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Abstract

Epilepsy has been a dreaded and puzzling disease since its first description approximately 4000 years ago. The elusive cause of this seizure disorder has confounded many generations. Ancient cultures and the Bible itself had proposed that the disease could be caused by demons, unclean spirits, the Moon goddess Selene, sin, divine punishment by gods and other supernatural causes. Amazingly, among the prevalent confusion, Hippocrates proposed that epilepsy did not have a supernatural cause and was simply a disease of the brain. And he lived approximately 400 years before Christ. Unfortunately, no attention was paid to him and epilepsy remained a 'spiritual, demonic and sacred' disease for centuries, treated often by exorcism mostly in church environments. Modern medical science has discovered, however, that epilepsy is caused by a brain disorder just as Hippocrates had suggested. In epilepsy, abnormal bursts of electricity are discharged in the brain causing the observable seizure. Today, modern imaging techniques can detect and identify the lesion or the brain focus from which the seizure arises and modern medical and surgical techniques exist to treat the condition. We no longer need to cling to supernatural aetiologies of this dreaded disease. We, however, still need God's comfort to endure the suffering diseases entail.

Keywords: epilepsy, biblical causes, medical aetiology, brain imaging

1. Introduction

Watching a generalized seizure in a human being can be terrifying. But the event is not only scary; uncontrolled seizures can cause brain damage, lowered intelligence and permanent mental or physical impairment. Therefore, this condition is a serious and potentially a life-shortening brain disorder. When seizures are recurrent, the condition is termed 'epilepsy'. And it is the third most common serious neurologic disease, only following stroke and Alzheimer's disease in prevalence with approximately 50 million epileptics worldwide [1, 2]. It is more prevalent in low-income groups. The incidence of epilepsy in high-income countries is approximately 45.0 per 100,000 per year but as high as 81.7 in low- and middle-income countries [3].

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For thousands of years, epilepsy has been looked upon differently than most other medical problems and has been fraught with social stigma. It has been linked to divine, demonic and supernatural powers throughout its long history [4].

A study was recently conducted in Saudi Arabia to explore whether misconceptions about the cause of epilepsy, such as possession by demons, still exist in the 21st century among the educated. The study revealed that 40.3% of university-educated school teachers and 50.4% of university undergraduate students believed spiritual possession to be a cause of epilepsy [5].

In another study, approximately 26-27% of medical students from an institution in Southern Nigeria believed that epilepsy was transferable from one person to another and approximately 48% of the junior students said they would take a seizure patient to a church (rather than to a hospital) [6].

Another study from India found that 6% of epilepsy patients attributed their disease to a curse from God and 14% saw their affliction as a punishment for bad deeds committed in this or in a past life [7].

Although these studies were performed in Saudi Arabia, India and Southern Africa, we must recognize that similar beliefs are still present in some of our western countries. In a 2005 study among epileptic patients in the United Kingdom, over half of responders attributed their illness to fate, to the will of God or to punishment for sins of a past life [8].

New Testament biblical authors also described the aetiology of epilepsy as spiritual, demoniac or supernatural. In this study, we will review Biblical and ancient extra biblical concepts about epilepsy and will analyse them in light of accepted medical findings.

2. Case presentation

“When they came to the crowd, a man came up to Jesus, falling on his knees before Him and saying, ‘Lord, have mercy on my son, for he is a lunatic and is very ill; for he often falls into the fire and often into the water. I brought him to your disciples, and they could not cure him.’ And Jesus answered and said, ‘You unbelieving and perverted generation, how long shall I be with you? How long shall I put up with you? Bring him here to me.’ And Jesus rebuked him, and the demon came out of him, and the boy was cured at once.” (Matthew 17.14-18, NASB).

We notice that Mark adds: *“And one of the crowd answered Him, ‘Teacher, I brought You my son, possessed with a spirit which makes him mute; and whenever it seizes him, it slams him to the ground and he foams at the mouth, and grinds his teeth and stiffens out. I told your disciples to cast it out, and they could not do it.’ And He answered them and said, ‘O unbelieving generation, how long shall I be with you? How long shall I put up with you? Bring him to Me!’ They brought the boy to Him. When he saw Him, immediately the spirit threw him into a convulsion, and falling to the ground, he began rolling around and foaming at the mouth. And He asked his*

father, 'How long has this been happening to him?' And he said, 'From childhood. It has often thrown him both into the fire and into the water to destroy him. But if you can do anything, take pity on us and help us!' And Jesus said to him, 'If you can?' All things are possible to him who believes.' Immediately the boy's father cried out and said, 'I do believe; help my unbelief.' When Jesus saw that a crowd was rapidly gathering, He rebuked the unclean spirit, saying to it, 'You deaf and mute spirit, I command you, come out of him and do not enter him again'. After crying out and throwing him into terrible convulsions, it came out; and the boy became so much like a corpse that most of them said, 'He is dead!' But Jesus took him by the hand and raised him; and he got up." (Mark 9.17-27, NASB)

After the child had been cured, the disciples asked Jesus: "why could not we cast him out? And he said unto them, this kind can come forth by nothing but prayer and fasting" (Mark 9.28-29, KJV)

The biblical description states that the condition dashes the boy down causing him to fall. Already on the ground, he becomes rigid at first but he then begins to roll and convulse terribly. In addition, he foams at the mouth, grinds his teeth and emits cries and vocal noises. It is obvious that he loses consciousness as he may fall involuntarily into the fire and into the water. After the seizure, all bodily movements cease and he becomes still like a corpse, as if he were dead. But soon after, he can be aroused and eventually returns to a conscious functional state. The boy's disease had been present since childhood. There is no doubt by the description that the boy's disease is a seizure disorder; epilepsy. But the question concerning us today revolves around the possible aetiology or cause of these seizures.

3. Presumed biblical causes of epilepsy

The Gospels suggest several possible aetiologies for the seizures in this child. The first one is 'possession by a spirit'. The Gospel of Mark tells us that when the spirit saw Jesus, "*it immediately convulsed the boy*" (Mark 9.20). The word spirit comes from 'spirare' which in Latin means 'breath'. This implies that the cause of the seizure is something that cannot be seen; something not physical, not unlike a breath; a spirit. Matthew classified the spirit as a 'demon' (Matthew 17.18) and it was only after the demon had left him that the boy was 'cured'. Mark had classified it as an 'unclean spirit' which is similar.

The belief that epilepsy was caused by a spirit or a demon left the treatment of epilepsy in the hands of the Church for many years [9]. Until the 14th century people with epilepsy were treated only by religious methods through exorcism of the unclean spirits. It wasn't until the Renaissance that people began to think there could be natural causes for this condition although Hippocrates is said to have suggested this possibility centuries before as we will discuss later.

A second aetiology for epilepsy suggested by the biblical narrative is 'the Moon'. The author of the Book of Matthew uses the Greek word 'σεληνιάζεται' (seleniazetai) to indicate that the boy is a lunatic or epileptic (Matthew 17.15).

The word originates from the root Selene. In Greek mythology, Selene is the goddess of the Moon. Seleniazetai essentially means ‘Moonstruck’ which implies that a person has become crazy, insane, irrational, bewitched or sick due to the Moon’s influence [10]. At the time, the Greeks also believed a variant of this. They thought that the disease could be caused by a curse for having offended the Moon goddess Selene. They also claimed that if the sick person spent one night in the Temple of Selene, she would appear in their dreams and reveal the way to remove the curse.

As the Latin word for Moon is ‘luna’, people so affected were also called ‘lunatics’; as in the KJV version of Matthew 17.15. The word lunatic has been preserved and used even in modern times to identify people considered mentally ill, epileptic, unpredictable or dangerous [11]. At the time, the phases of the Moon had also been associated with the oceanic tides and with female fertility and even with menstruation cycles [RT Carroll, *Full Moon and Lunar Effects*, in *The Sceptics Dictionary*, <http://skeptdic.com/fullMoon.html>]. The Moon was also used to explain disposition or mood changes and was believed to explain certain forms of mental disease in which the patient’s behaviour varied ‘with the phases of the Moon’. Moon phases were also associated with periods of increased criminality [12] and even with the transformation of men into werewolves. However, this was total fiction, of course.

The biblical narrative may suggest a third aetiology for epilepsy. When the anguished father brought the epileptic child to Jesus and explained that his disciples were not able to cure the boy, Jesus said, addressing the father: “*you faithless and perverse generation, how much longer must I be with you and bear with you?*” (Luke 9.41). Who was perverse? Was Jesus referring to perversity of his disciples, the audience, the boy or his father? Was the child’s disease due to sin or perversity?

It is not clear, but at the time it was thought that a person who committed a sin could be afflicted by disease as punishment. We read that the disciples also held the same beliefs and even asked Jesus about it: “*As he (Jesus) walked along, he saw a man blind from birth. His disciples asked him, ‘Rabbi, who sinned, this man or his parents, that he was born blind?’*” (John 9.1-2). Clearly, they believed that the blindness of the man could have been caused by sin. Although Jesus corrected them, we see that this belief was prevalent in that society. If the disease was caused by sin, it must have been inflicted by a divinity as retribution. The Greeks had named epilepsy the ‘Sacred Disease’ believing that it had a divine aetiology. (‘On the Sacred Disease’ is a work of the Hippocratic Corpus written approximately in the year 400 B.C. It stated that men regarded the nature of epilepsy as divine but this was due to ignorance. It proposed that the condition arose from natural causes.)

At this point, Jesus was ready to cure the boy. He approached the child: “*... rebuked the demon, and it came out of him, and the boy was cured instantly*” (Matthew 17.18).

In summary, we have found three presumed Biblical aetiologies for the boy's epilepsy. First: the seizures were caused by the child's possession by an unclean spirit or demon. The second aetiology proposed was termed 'seleniazetai' which suggests that an evil influence or a curse by the Moon or the Moon goddess may be the cause of the disease. A third possible aetiology is sin; sin either by the affected boy or by his parents. In this case, the consequence of sin is a seizure disorder, likely of divine origin.

4. Extra biblical causes of epilepsy as understood in the distant past

The clinical entity of epilepsy has been known since the beginning of recorded history. The earliest known description of an epileptic seizure comes from a text in Akkadian, a language of Ancient Mesopotamia, which was written approximately 4000 years ago. The person afflicted in the report was thought to be under the influence of a "Moon god" [13].

Concepts regarding epilepsy were later refined and developed in ancient Indian medicine during the Vedic period (c.3500 – c. 2500 years ago). In the oldest existing description of the complete Ayurvedic medical system, epilepsy is described as '*apasmara*' which simply means 'loss of consciousness' [14].

A detailed account of epilepsy, as it was anciently conceived and understood, is found on the 25th and 26th Babylonian tablets located in the British Museum in London. It provides a nearly complete medical diagnostic series known as '*Sakikku*'. In these texts, the condition of epilepsy was referred to as '*antassubba*' which means 'the falling disease'. From the tablets, we learn that to the Babylonians, it was clear that the manifestations of epilepsy were the work of demons and ghosts. The work of the demons was to 'to possess' and 'to seize'. The Babylon tablets may be dated to approximately the beginning or middle of the first millennium BC, approximately 2500 years ago [15]. It appears likely that these demon-induced beliefs about epilepsy were present in Babylon at the time of the Jewish exile. And it is also likely that some New Testament ideas about epilepsy may have originated at that time or, maybe even earlier.

The ancient Greeks also believed epilepsy arose from spiritual causes but in addition, they considered the condition to be associated with the divine, and thus called epilepsy the 'Sacred Disease' as mentioned earlier. In times when scientific ignorance attributed diseases to a deity or the supernatural, the term 'sacred disease' was probably utilized literally. Greek mythology also associated the condition with the Moon goddess Selene [14]. So, we notice that in ancient times the aetiologies ascribed to epilepsy were similar throughout the known world.

The only exception to those spiritual, demonic, Moon-caused aetiologies was Hippocrates in his work '*On the Sacred Disease*'. He accused those who believed in spiritual and divine causes of epilepsy of spreading ignorance and superstition. Moreover, he proposed that epilepsy was a physical disorder arising in the brain [16]. In his famous text Hippocrates stated: "*I do not believe that the*

Sacred Disease is any more divine than any other disease but, on the contrary, has specific characteristics and a definite cause. Nevertheless, because it is completely different from other diseases it has been regarded as a divine visitation by those who, being only human, view it with ignorance and astonishment. ... The brain is the seat of this disease, as it is of other very violent diseases.” [17]

Unfortunately, the Hippocratic concept of a treatable brain disorder had little influence on the prevailing supernatural views, as described by Temkin in his study of the history of epilepsy [18].

It is apparent, then, that the aetiologies attributed to epilepsy were similar in the biblical and the non-biblical ancient world: spirits, demons, the Moon and supernatural powers. Those were the causes of the seizures. But, how do these differ from more recently identified causes of epilepsy?

5. Medical aetiologies of epilepsy

Brain cells normally use electrical signals to communicate with each other. These electrical signals are carefully regulated. We now know that a seizure occurs when there is an abnormal discharge of electricity involving multiple brain cells. In fact, a seizure is defined as an uncontrolled, episodic neuronal discharge of electricity in any part of the brain.

Today we can measure electrical activity in the brain. The electrical impulses causing the seizure can be detected and measured by electroencephalography (EEG) [19]. In some cases, the EEG can even point to the location of the specific focus of origin of the abnormal electrical activity in the brain [20].

But not all who experience a seizure are epileptics. A seizure disorder or epilepsy is diagnosed only when seizures are recurrent, as stated before.

An epileptic disorder may be classified as being generalized, partial (also called, focal), or undetermined. Generalized convulsions start as a disturbance in both cerebral hemispheres, tend to be major motor seizures affecting the entire body, and the person regularly loses consciousness. Partial seizures start in a focal area of the brain and may remain localized without alterations of consciousness. These are termed ‘simple partial seizures’. However, if the event spreads, it may involve larger areas of the brain and may manifest itself just like a generalized seizure. These are called ‘complex partial seizures’. Other types of seizure disorders exist but are not pertinent to this article.

6. Procedures to localize the cause of the seizure: the epileptogenic focus

Some seizure disorders can be associated with, or caused by, structural brain lesions. These may include tumours, infections, infarctions, traumatic brain injuries, vascular malformation, intracerebral bleeds, hamartomas, mesial temporal sclerosis, hippocampal or temporal lobe atrophy, cortical dysplasia, and other developmental abnormalities [21-25]. Many can be identified by CT or

MRI imaging and resection of the lesion may lead to seizure freedom in many patients. However, even the more advanced anatomic imaging techniques of CT and MRI identify focal abnormalities only in approximately 51% of patients with partial epilepsy [26]. Although some authors claim that this number may be as high as 80% [L. De Cocker, F. D'Arco, P. Demaeral and R. Smithuis, *Role of MRI in Epilepsy*, <http://www.radiologyassistant.nl/en/p4f53597deae16/role-of-mri-in-epilepsy.html>].

There are, however, seizure foci which may be non-detectable by diagnostic studies such as CT, EEG or MRI. (The seizure focus is the specific brain site from which the seizure originates.) These epileptogenic foci may be identifiable by functional, rather than anatomical, imaging techniques such as PET and SPECT studies (CT = Computed Tomography, MRI = Magnetic Resonance Imaging, PET = Positron Emission Tomography, SPECT = Single Photon Emission Computerized Tomography, EEG = Electroencephalography). Instead of identifying a structural lesion, they detect brain lesions with abnormal blood flow or metabolism which may give rise to convulsions.

The epileptic boy described in this study may have had any of the brain abnormalities described above. A genetically inherited condition cannot be excluded.

Now, localization of the lesion site is important because if the patient fails to respond to medical treatment, brain surgery may need be considered. Approximately 20-30%, or maybe more, of all epileptic patients are refractory to medical therapy [27]. It is essential to know the exact localization of the epileptogenic lesion so it can be completely excised surgically. This should be accomplished without removing other brain tissue that may lead to cognitive or neurologic deficits. Surgery is usually considered when the seizures are disabling, when medication does not control them and when the drug side effects are so severe as to affect the patient's quality of life.

Electroencephalographic (EEG) investigation remains an important aspect of the pre-surgical evaluation of these patients. In the evaluation unit, recording the EEG with concomitant videotape during a seizure episode is considered of extreme value in localizing the epileptogenic lesion. Sophisticated computerized equipment and software may be helpful to identify the epileptogenic focus during the seizure and even during the interictal period [28] although, in this case, the sensitivity is suboptimal. 'Interictal' refers to a state between seizures when the patient is not convulsing. The word 'ictal', on the other hand, refers to the moment in time when the subject is experiencing the seizure.

Functional brain imaging with either PET or SPECT, are now well-established techniques to localize the epileptic foci in patients with refractory complex partial seizures [29]. These techniques attempt to visualize alterations in cerebral blood flow or metabolism of lesions which can lead to seizures.

7. Diagnostic importance of the functional imaging study

The techniques discussed above, PET and SPECT, can identify the cause and the site of origin of the seizure in a large group of patients. They can detect the epileptogenic focus as a focal area of increased tracer activity if the study is performed during or close to a seizure; during the ictal period. However, if the study is performed interictally, the lesion can be seen as a focus of decreased activity [30, 31].

In a group of 119 patients with partial or focal epilepsy and known unilateral temporal lobe epilepsy, the ictal SPECT correctly localized 97% of the cases. The results were also excellent in patients with extratemporal epilepsy, which are more difficult to localize, showing a 92% accuracy with ictal studies [32]. Interictal studies, however, showed a much lower accuracy.

8. SPECT scan images

In Figure 1, we show the ictal and interictal SPECT scans of a patient who had intractable epilepsy but a normal MRI study. One can easily identify the epileptogenic focus as an area of increased tracer uptake in the right frontal brain due to its high focal perfusion. One can also notice that the frontal epileptogenic lesion is only identified on the ictal scan and not, or only subtly, on the images acquired interictally. Another patient underwent an MRI and an ictal SPECT scan of the brain (Figure 2).

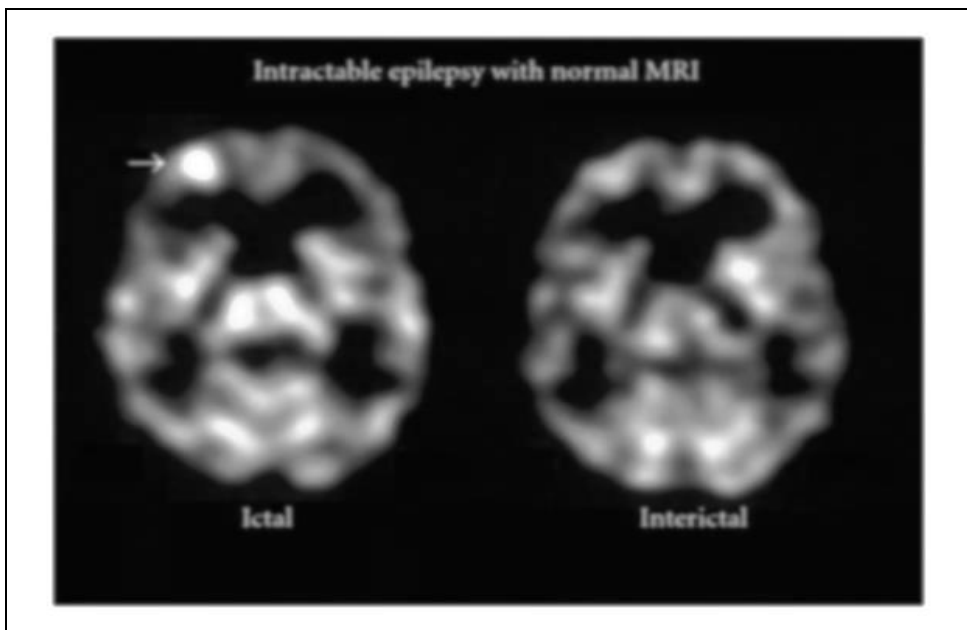


Figure 1. Illustration of the value of ictal SPECT in a 38-year-old male with intractable epilepsy. The MRI was normal. The Tc-99m HMPAO ictal brain SPECT scan showed a focal area of hyperperfusion (increased blood flow) in the right frontal area [33].

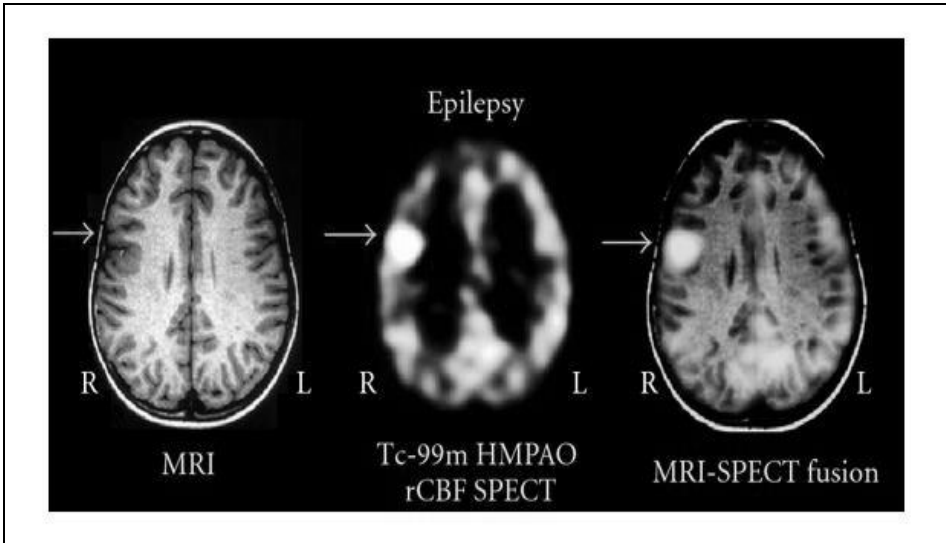


Figure 2. Tc-99m HMPAO ictal brain SPECT scan showing a focal area of hyperperfusion in the right premotor area. The ictal brain SPECT scan (injected during the seizure) was subsequently superimposed on the MRI scan (left). The resulting fusion image (right) shows the anatomic location of the epileptogenic focus, which was surgically excised, and the patient was rendered seizure-free [33].

Notice that the MRI was normal while the SPECT images clearly showed the area of increased activity corresponding to the epileptogenic focus. This ‘hot’ focus identifies the site from which the abnormal electrical discharges originate to cause the seizures. The MRI and SPECT images can be ‘fused’ to correctly identify the anatomical localization of the lesion to be surgically resected.

9. Discussion and conclusions

We have discussed the biblical and extra biblical aetiologies of epilepsy as conceived and understood in ancient times. We have also presented the known medical causes of this condition. The main message of this discussion and the most important fact to understand is that epilepsy is caused by a brain abnormality; not by supernatural entities. The seizures may be produced by tumours, post-traumatic scars, strokes, sclerosis, focal atrophy and other brain lesions. But some epileptogenic brain abnormalities may be subtler and may not be identifiable by anatomical imaging techniques such as CT or MRI. These may require functional images, such as PET and SPECT scanning for their detection. These lesions promote the surge of abnormal electrical brain activity which gives rise to the epileptic seizures.

The lesions, whether anatomical or functional, can be identified and even accurately localized using techniques such as EEG’s, CT, MRI, PET or SPECT, which measure either electrical activity, metabolism, or local perfusion in the

brain. Armed with this knowledge the lesions may be surgically removed to affect a cure, or medications may be given to stabilize electrical brain activity and thus control the disease.

But all causes of epilepsy are physical; not spiritual or supernatural. Of course, even today, science cannot prove nor exclude the existence of spirits. If a spirit exists it may only be of an energetic nature; immaterial. Someday we may develop instrumentation capable of detecting or even measuring such forms of energy. But that time hasn't arrived yet. And today we can correctly identify the medical aetiology of many seizure disorders and can effectively treat them using modern techniques and precise knowledge regarding the true nature of the disease.

It is interesting that after curing the child described in the narrative, Jesus said: "*this kind (of spirit) can come forth by nothing but by prayer and fasting*" (Mark 9.29, KJV). Did he imply that there was some relationship between epilepsy and nutritional habits? Was he referring to a food regimen that could cause or worsen the disease? It is interesting that, since the 1920's, the medical field has utilized a diet, called the Ketogenic diet, which can improve the symptomatology of epileptic children [34]. A modified Atkins diet is another nutritional intervention which can be utilized in these patients [35].

But, what did Biblical epilepsy narratives, such as the one we have discussed, mean to the people in New Testament times? It was a time when the aetiology of most diseases was not well known. The Biblical authors would have spoken in terms familiar to the people of the time who believed in supernatural causes of disease. Anyway, the true intention of these stories was not to define the aetiology of epilepsy. At the time, people may have believed that the cause of epilepsy was supernatural but that probably made no difference. The important truth is that people had developed the absolute conviction that, given an encounter with Jesus, their sick relative would be healed. This meant confidence and faith in Jesus as a healer and as a Saviour. This belief brought necessary spiritual peace to the masses.

Today we believe God has advanced our knowledge and insights on the cause of many diseases and has allowed us to devise new techniques and treatments to solve our medical problems. From a theological and emotional point of view, the result is similar. We now receive spiritual peace with the knowledge that God has cared and watched over us, always providing in health or in disease.

We no longer need to hold on to the biblical or ancient epilepsy aetiologies ascribed to demons, spirits, moon gods, sin, curses or punishment. Epilepsy is a brain disorder and not a spiritual malady. But we still need God's comfort to endure the suffering our diseases entail, regardless of the disease aetiology.

Rudolf Bultmann said the following about our times: "*it is impossible to use electric light and the wireless and to avail ourselves of modern medical and surgical discoveries, and at the same time to believe in the...world of spirits and miracles. We may think we can manage it in our own lives, but to expect others*

to do so is to make the Christian faith unintelligible and unacceptable to the modern world.” [36]

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