Art and epilepsy surgery

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ABSTRACT

The impact of health and disease has led many artists to depict these themes for thousands of years. Specifically, epilepsy has been the subject of many famous works, likely because of the dramatic and misunderstood nature of the clinical presentation. It often evokes religious and even mythical processes. Epilepsy surgical treatment has revolutionized the care of selected patients and is a relatively recent advance. Epilepsy surgery has been depicted in very few artistic works. The first portrait showing a potential surgical treatment for patients with epilepsy was painted in the 12th century. During the Renaissance, Bosch famously provided artistic commentary on traditional beliefs in “The stone of madness”. Several of these works demonstrate a surgeon extracting a stone from a patient’s head, at one time believed to be the source of all “folly”, including epileptic seizures, psychosis, intellectual disability, depression, and a variety of other illnesses. There are some contemporary art pieces including themes around epilepsy surgery, all of them depicting ancient Inca Empire procedures such as trepanning. This article reviews the most relevant artistic works related with epilepsy surgery and also its historical context at the time the work was produced. We also present a painting from the Mexican artist Eduardo Urbano Merino that represents the patient’s journey through refractory epilepsy, investigations, and ultimately recovery. Through this work, the artist intends to communicate hope and reassurance to patients going through this difficult process.

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1. Introduction

Since ancient times, medicine is defined as a science and an art. Medicine is a space where science, culture, and the humanities have no distinct borders. One proof of the close relationship between medicine and art is the large number of physicians who have been dedicated to art and artists who have described medical activities and illnesses in their works [1]. The London National Gallery’s collection highlights neurological themes in classical art [2]. Specifically, many artists have depicted epilepsy as the main subject. Examples of it include the Transfiguration of Christ by Raphael, Transfiguration by Rubens, Possession, Jesus driving out an unclean spirit by an unknown artist, L’Epileptique by Jean Duplessi-Bertaux, and La danse de Saint Guy by Charles Aubry, among others [3].

Attempts to treat epilepsy with surgery are not a recent innovation. The earliest attempts of surgical treatment for epilepsy come from ancient cultures [4]. Surgical procedures were practiced as remotely as the Neolithic period, and there are many ancient descriptions by the Greeks, Romans, and Egyptians, as well as Central and South American cultures [5]. In the majority of descriptions, the most frequently practiced method to cure epilepsy was trepanning [4]. Trepanning is a surgical intervention in which a hole is drilled or scapred into the skull, exposing the dura mater. This was, at times, widely employed to treat numerous health problems thought to be related to intracranial diseases. It may be the world’s oldest known surgical procedure [6].

There were mystical reasons for performing trepanation; it was thought that opening the skullcap would cause the demons of sickness to escape [4]. However, in patients with epilepsy, there was a rational medical reason for the operation. From the Renaissance until the beginning of the 19th century, trepanning was widely advocated for the treatment of head wounds, particularly for depressed fractures and penetrating head wounds [7]. It was also used, at least into the 18th century, for the treatment of epilepsy and mental disease. Hippocrates noted that convulsions following head injury usually begin on the side of the body opposite to the injury, and he recommended immediate trepanation in such cases [4]. Additionally, Sir Victor Horsley examined skulls from the Neolithic period in Europe and found what he considered to be objective evidence of trepanations made for the relief of Jacksonian epilepsy [4].

Centuries passed before the surgical treatment of epilepsy was performed with more scientific basis, and a few remarkable successful operations for epilepsy were achieved by the early 19th century. Finally, the modern era of epilepsy surgery began in 1886 at Queen Square, London [4].
Fig. 1. Epilepticus Sic Curabitur (“the way to cure an epilepticus”) Sloane manuscript, collection of medical manuscripts. Miniature painted at the end of the 12th century. Collection: British Museum, London. Artist: unknown [10].

Fig. 2. Epilepsy treatment from the surgical atlas Cerrahiyetül Haniye (Imperial surgery). Drawn in the 15th century (1465). Collection: Ataturk Institute for Modern Turkish History, Istanbul, Turkey. Artist: Sefereddin Sabuncuoğlu [17].
for not cutting the vessel during that procedure” [17]. It is possible that the patients with an unpleasant odor in the nose had olfactory hallucinations as epileptic auras related to temporal lobe epilepsy, a symptom known since the time of Galen [14]. The illustration shows Sabuncuğlu (right) in his own miniature applying cauterization to the cranium with surgical instruments (center) for the treatment of the unpleasant odor in the nose of a patient (left). The cauterization point in the patient was the frontal region [14] (see Fig. 2).

3.1.3. The cure of folly or The extraction of the stone of madness (see Fig. 3)

Hieronymus van Aeken (1460–1516) is one of the best-known Dutch artists from the Renaissance. He was extremely popular in Catholic Spain and had the nickname of “El Bosco”. He is recognized as a pioneer of the strategies and symbols used in 20th-century surrealism, particularly the art of Salvador Dali. Jung referred to “El Bosco” as “the master of the monstrous … the discovery of the unconscious” [18].

The cure of folly or The operation for the stone, also known as The extraction of the stone of madness and The stone of insanity [19], is an early work of “El Bosco”, and it was completed around 1475. It is one of the earliest paintings depicting a neurosurgical procedure, and it contains a unique combination of sensuality, puritanism, and fantasy. It was one of the first commentaries on the concept of “stone of madness”, which was used by other artists in the following century [20].

In his most famous work, we observe four figures set in a landscape. Tied to a luxuriant chair, there is a distressed and melancholy patient [6,20]. On the left, we observe a medieval barber–surgeon who is making an incision in the patient’s scalp and a woman observing the procedure. The surgeon has a tin funnel on his head, and a water tulip, rather than a stone, has been extracted from the patient [20,21]. The water tulip carried a connotation of stupidity in the 16th century. More recently, the flower has alternatively been identified as the lotus flower, an ancient symbol of spirituality. Some people have suggested that the old man is a priest or monk, suggesting that the surgery is relieving the patient of some perceived spiritual disturbance [22].

Historically, The cure of folly has two interpretations. In the first one, the painting could represent a satire ridiculing medical charlatans who swindled people into believing that they could cure psychosomatic illness through the extraction of “brain stones”. In the second interpretation, it could be only an allegory of stupidity and gullibility, a common theme for many artists of that time [21]. It is not clear if the painting was representing epilepsy surgery, although several historical manuscripts describe that the patient had epilepsy [6,21–24].

3.1.4. The surgeon (see Fig. 4)

Jan Sanders van Hemessen was a Flemish Northern Renaissance painter who was part of the mannerist movement. He was born in Hemessen in the Netherlands but settled in Antwerp in 1524. Hemessen specialized in scenes of human character flaws such as vanity and greed [24,25].

One of Hemessen’s famous paintings is The surgeon. The painting shows a surgeon, who is clearly happy cutting to remove the stone, moving his knife towards the target, which is already visible. Close to the surgeon in the left upper part, there are some “surgical specimens”, which have been successfully removed from other patients. Next to the surgeon stands a man who is wringing his hands in desperation, likely the next patient on this surgeon’s slate. It was believed that the stone was causing the disease, and it had to be surgically removed [24,25].

Other artists from that time, such as Pieter Brueghel (see Fig. 5) [23], Pieter Huys (see Fig. 6) [24], David Teniers the Younger (see Fig. 7), and Jacob Cats (see Fig. 8) [24], represented the same topic. Most of their works display the same procedure: the removal of stones from the heads of restrained patients in the presence of nurses or assistants and other spectators [24,26].

There are other similar depictions such as “L’extraction de la pierre de folie”, “A surgeon attending to a man’s head”, “An operator extracting piers de tête from behind a man’s ear” and “An itinerant surgeon extracting stones from a man’s head” symbolizing the expulsion of ‘folly’ by Pieter Jansz Quast [26], “A surgeon extracting pierres de tête” by Nicolaes Weydmans in 1828, “A pierre de tête operation” by Jean Baptiste Vrints, and “An itinerant surgeon extracting stones from a man’s head” by Lucas Van Leyden, all of them located at Wellcome Library’s collection [10,24,26], and “Cutting for the stone” by Jan Havicksz Steen painted between 1670 and 1675 and located at Museum Boijmans Van Buieningen, Rotterdam [23]. The number of
works showing this procedure reflects its pervasiveness at the time, inspiring social commentary in these artists, either in critical fashion, as a form of praise, or probably a mixture of both.

3.2. Epilepsy surgery in the Inca Empire

The world’s greatest concentration of trepanned skulls was found in the high Andes Mountains in Peru [27]. The earliest Peruvian trepanations took place in the south coast of Peru around the 5th century B.C. The practice subsequently spread to various cultures of the Peruvian highlands and continued through the rise of the Inca Empire around the 5th century AD [27,28]. Cranietomies were practiced through the Inca Empire, except in the Amazonian area, corresponding mostly to the actual Peru, part of Bolivia, and north of Chile [29].

The suggested reasons for trepanation surgery in ancient Peru are numerous. Operations were performed for epilepsy, trauma, headaches, and in general, mental disease. The main trepanation techniques evident in archeological skulls are associated with excavations in the territories of the Paracas in the southern Peruvian coast, the Huarochoiri and Jauyos provinces in the central highlands, and Cusco in the southern highlands, as well as in the Naca, Huari, and Ica cultures [7,28].

There is evidence of herbal preparations of datura, yucca, or coca used as anesthetic. The common practice was chewing the leaves of Erythroxylon coca as an anesthetic. The operation itself followed a consistent sequence. The patient may have been in a sitting position or semireclining to reduce blood pooling and to increase the exposure of the anatomical area. The surgical instruments were chisels of copper, silver, gold, or a mixture of these three metals. They also used knives and obsidian lances, tumis, and crescentic blades with a short central T-shaped handle [30].

Fig. 5. Cutting out the stone of madness or An operation on the head. Painted in 1568. Collection: Museum d’hôtel Sandelin, Saint Omer, France. Artist: Pieter Brueghel, the Elder. Apparently the original is lost, and there are multiple copies [23].

Fig. 6. A surgeon extracting the stone of folly. Signed and illegibly dated (possibly 1561). Technique: oil painting. Measurements: wood 106 × 133.5 cm. Collection: Perigord Museum. There is a copy of the painting at Wellcome Institute for the History of Medicine, London. Artist: Pieter Huys [24].

Fig. 7. Surgical operation on a man’s head or Fool’s stone. Painted between 1680 and 1690. Technique: oil/canvas. Collection: El Prado Museum, Madrid, Spain. Artist: David Teniers the Younger [26].

3.2.1. Trepanning in ancient Peru (see Fig. 9)

Robert Thom (1915–1979) was an American painter and illustrator who specialized in depicting historical scenes. He painted historically accurate portraits of a variety of professions in different fields, including medicine and communications [31]. Between 1948 and 1964, Parke, Davis, and Company commissioned the artist to create eighty-five oil paintings to recreate important moments in the history of medicine [31,32].

Before the paintings were created, he traveled nearly 250,000 mi through North America and Europe [33]. Thom himself quoted the following: “You cannot fake history. You have to know how people lived, what they wore, their physical surroundings, the architecture and furniture of the time, the tools of the physicians and the household instruments. My responsibility is to make you forget they are paintings and feel that you are actually there” [31].

“Trepanning in ancient Peru” is an artistic representation of the Inca trepanation [29]. The painting portrays the Pacific coastline of the Maracas peninsula and shows a first-century Peruvian surgeon initiating a trepanning operation with the aid of knives made of hard obsidian and well-honed bronze. The surgeon is using cotton and bandages from local materials. The assistants immobilize the patient, and a priest prays, seeking supernatural intervention through invocations. The surgical instruments are underlined in the inferior left angle, together with the sedating beverage [29,30]. There were probably two types of “surgeons”: the ones who had been trained, called Hampicamayac and the others called Soncoyoc (Chamanes), who did not have knowledge of technical aspects and likely worked under a spiritual influence of some variety [29].

3.2.2. Skull trepanation scene of the pre-Inca period (see Fig. 10)

Juan Bravo Vizcarra was born in Cusco, Peru (1922). Juan is a painter, cartoonist, muralist, sculptor, photographer, and poet. He has painted over 5000 paintings and participated in several exhibitions in Peru, Spain, Germany, and North America. The ancient gods, the myths, and the joys and tragedies of the Andean world inspired his art. Of the twenty-one murals, perhaps the most important is “The historic Cusco mural”, with a measurement of 300 m². It is the largest in South America [34].

The painting “Skull trepanation scene of the pre-Inca period” is located at the entrance of the Lima Institute of Neurosciences. The painting represents a skull trepanation scene from the pre-Inca period. Surgical instruments and bandages are shown in the lower left, accompanied by potions, cautery, and coca leaves. On the right is the senior neurosurgeon, standing with a tumi in his right hand and with a bowl of chicha. On the left, the junior neurosurgeon is performing the trepanation with the help of two assistants. On the left, there is a female praying for the patients. The scene, although reconstructed by a modern artist, accurately depicts the performance of these ceremonies in ancient times [7].

This painting and the one from Robert Thom depict trepanation surgery, which was a procedure to cure epilepsy. The paintings are based on historical documents and represent the perspective of the artists; both artists share the procedures performed at that time and try to show also that epilepsy surgery was an old procedure.

3.3. Epilepsy, leaving the nightmare behind by Eduardo Urbano Merino (see Fig. 11)

Urbano was born in Mexico City in October 1975. He studied at the Academy of San Carlos in Mexico City where he was an outstanding student in human anatomy, composition, and painting techniques. He has learned much of his technique based on the study of classic
artists such as Caravaggio, Rembrandt, Michelangelo, Velaquez, and Dali, among others. His work is figurative, sometimes hyperrealist, and he is an expert on the human figure and perspective [35]. His works have been exhibited at recognized artistic venues in Mexico, as well as in numerous international exhibitions in Europe and North America. In 2003, Rigoberta Menchu, winner of the Nobel Peace Prize (1992), gave him “The peace medal in the arts” for their collaboration on noble causes. In 2010, Urbano was commissioned to paint a mural in celebration of the bicentennial of Mexico’s independence, creating a monumental work of 5 × 10 m in oil. He recently unveiled a sculpture for the Mexican College of Rheumatology Mexico’s Chapultepec Castle in Mexico City called Hope and fulfillment [36,37].

The painting in Fig. 11 is a contemporary art piece representing “epilepsy surgery”. In general, the painting was created with a clock sequence [38]. On the left side of the painting, it is dark for the patient, there is a storm, the disease is active, and neurons are sick (black) and are trapped between two of the three crystals that float. At the center, the patient is standing up and is being supported by the medical team after successful epilepsy surgery. Above the patient is a grid (device used to map seizure activity in the brain during epilepsy surgery); this “grid” incorporates a characteristic feature of Eduardo’s work, usually a plant with a long vine that represents health and life. After surgery, the patient is surrounded by healthy neurons in white. At the right side, there is a third pane of glass that represents the screen used to read the epileptic activity mapped with the grid. One of the doctors is touching the patient (neurosurgeon); the other is reading an electroencephalogram (epileptologist). The Canadian flag is represented on the pocket of the more senior physician, whereas the younger doctor wears the provincial flag of Saskatchewan. The golden point, where the viewer’s eye is naturally drawn to in artistic works, is represented by the tiger lily — the provincial flower of Saskatchewan.

4. Discussion

4.1. Stone of lunacy

The “stone” depicted in these paintings is the “Stone of folly”, which has been historically associated with lunacy [19]. The Latin term “lunaticus,” leading to the English term “lunatic”, is derived from “luna”, which refers to the moon. The term also means crazy, foolish, idiotic, or mad, and it was widely employed in many plays by William Shakespeare and other contemporary dramatists and authors [39]. Finally, the term “lunaticus” was linked with insanity. One of the earliest references to lunacy was in the fifth-century Latin version of the Bible, translated from ancient Greek by Jerome (347–420) on commission by Pope Damasus. In the Gospel of Matthew (17: 15–18), a father asks Jesus to cure his son because he is “lunaticus”. This episode is described in the Bible of King James (1611) [40] as follows: “Lord, have mercy on my son: for he is lunatic, and sore vexed; for often he falls into the fire, and oft into the water. And I brought him to your disciples, and they could not cure him. Then Jesus answered and said, O faithless and perverse generation, how long shall I be with you? How long shall I suffer you? Bring him here to me. And Jesus rebuked the devil: and the departed out of him: and the child was cured from that very hour”. When this passage is compared with other synoptic gospels (Luke 9: 37–43; Mark 9: 17–29), the most accurate explanation of the same episode leads us to surmise that the boy may have been suffering from epilepsy.

The term “lunaticus est” is the Latin translation of the Greek verb “ὁ εληνιαζεται” (“seleniazetai”), which includes the prefix selen- (from σελήνη — the ancient Greek word for the moon). In general, the term “lunatic” has been linked to epilepsy, rather than to insanity [39]. Additionally, Michael Psellos (eleventh century A.D.) avoided the distinction between lunacy and epilepsy but hypothesized that the moon and air lead to epilepsy [41].

Other authors have analyzed the similarities among epilepsy, lunacy, and demonic possession during medieval times through symbolism, demonology, and religious beliefs. These beliefs were inherited from the Greco–Roman period and remained consistent in the collective consciousness until modern medicine emerged. Medieval physicians applied the ancient Babylonian and Jewish belief that demon possession caused epilepsy, hysteria, and psychosis [41]. In general, there is consensus in the literature that The cure of folly and other similar works probably represent patients with psychiatric and neurological disorders and, in many descriptions, epilepsy as the main disease.

4.2. Real stones?

Several historians have studied paintings such as “The cure of folly”, placing specific emphasis on the stone of madness. The majority of reports coincide in a theatrical dimension. Some authors like Schupbach [24], curator of iconographic collections at the Wellcome Library in London, have performed a detailed review of the topic and paintings, and he concluded that the interventions were probably never carried out. Schupbach [24] suggested that extractions were theatrical performances or potential farces associated with demonstrations and celebrations, concluding that these paintings never documented real procedures. On the other hand, other historians have suggested that the paintings are really depicting surgical procedures. Similar scenes of surgeons with scalpels performing potential operations to treat epilepsy and madness appear explicitly in surgical texts of the time [20,23,24].

As of 2013, at least fifteen articles using the title “brain stones” or “cerebral calculus” have been reported in the literature. The majority have been reported in Japan between 1960 and 1990. The main finding in the majority of articles is “idiopathic brain stones”, and some authors also describe calcified tumors such as meningiomas, osteosarcomas, hemangiomas, choristomas, teratomas, and hamartomas. Some of the cases were associated with epilepsy [42–45]. The terms “brain stone” and “cerebral calculus” have been used by some investigators to describe large, solitary or multiple, abnormal intracerebral calcifications. The origin in some cases is difficult to determine, and some authors [46] use the term “idiopathic brain stone” to describe a calcified mass of unknown etiology, with no viable cells [47].

In 2007, Ghosal et al. [48] reported a case of cerebral calculi. They pointed out that the tumor was composed of organized collections of large areas of bone formation with dystrophic calcifications. The calcified areas showed mineralized calcific concretions of variable size along with hyalinized collagenous tissue, a few fibroblasts, and focal collections of foamy macrophages. The surrounding brain showed gliosis. Part of the choroid plexus and ventricular lining were also seen. No chondromyxoid matrix, lymphoplasmacytic infiltrate, or giant cells were seen. No evidence of any tumor, infective pathology, or vascular malformation was noted. A final histopathological diagnosis of cerebral calculi, temporal horn of right lateral ventricle, was given [48]. While a case such as this raises the possibility of actual stones existing intracranially, the relative rarity makes it unlikely that the apparently frequently performed stone extraction of medieval times was performed for such causes.

Gross [21] considers that whatever other meanings may be hidden in these paintings, the subject was based on a contemporary medical practice. Given the overall setting and relatively primitive state of medical practice at the time, the most likely explanation seems to be that these procedures were actually performed in some cases of desperation, whereas others may have performed sham procedures; this may be supported by the almost constant presence of an audience. Interestingly, this may also have been effective for some patients, since placebo interventions generally have some effect on seizure
frequency, even in the most carefully designed randomized, double-blind, multicenter trials of modern times.

4.3. The death and resurrection

In many cultures, epilepsy has been associated with death. The Indo-European tradition perceives death not necessarily as the end but as a step, as a point, in the life cycle. Because of the sudden loss of movement and consciousness and the state of inanimation after an epileptic seizure, different cultures have variably considered epilepsy as something similar to death; in some cases, the epileptic seizure may be seen as a transient form of death, which offers some analogy to the biblical story of the death and resurrection of Christ [49].

Raphael’s Transfiguration of Christ clearly shows a relation between epilepsy and death [24,49,50]. Theology experts use the gathering between Christ and the boy with epilepsy depicted in the transfiguration as the symbol of the “death of the old, estranged, sinful person and the resurrection of the new person who lives through the power of faith”. One of Raphael’s achievements is to have portrayed both events within the scope of a transfiguration based on suffering, death, and resurrection [50].

In the painting “Epilepsy, leaving the nightmare behind”, there is a clear relation between death and life. Urbano uses a clockwise flow to show the sick patient, initially surrounded by a storm of darkness (dark neurons), myths, social stigma, nightmare, and death. After the surgery, the patient finally manages to stand and breathe, dark neurons become white, and the sickness is left behind. The future is promising, the storm has passed, and the future becomes bright. In contrast with older artistic works about epilepsy surgery where the surgical procedures are shown, Urbano focuses on the recovery process that can be better appreciated by patients who are considering epilepsy surgery.

5. Conclusions

Epilepsy surgery for carefully selected patients (especially medically refractory temporal lobe epilepsy) has become the standard of care. There is evidence that epilepsy surgery was attempted and performed for patients with epilepsy from ancient times. Epilepsy surgery was attempted and promising, the storm has passed, and the future becomes bright. In many cultures, epilepsy has been associated with death. The Holy Bible. King James version: 1611. New York: Hendrickson Publishers; 1823 194.


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