



Review Article

# Traumatic brain injury and the fall of the Aztec empire: 500 years of head injury diagnosis

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Received : 07 September 2021

Accepted : 15 September 2021

Published : 25 October 2021

DOI

10.25259/SNI\_906\_2021

Quick Response Code:



## ABSTRACT

**Background:** The Aztec civilization has been one of the most powerful and organized cultures in the pre-Columbian era in America. Its fall was due to many factors, including the incursion of Spanish colonization and its violent transculturation, associated with the strong influence of its theological traditions and beliefs, which generated a new configuration in its social structure.

**Methods:** Through a qualitative analysis and a systematic review based on the keywords Montezuma and TBI (Traumatic Brain Injury), we found 70 texts of interest, of which 32 were selected for their anthropological and medical content and their relationship with the history of neurosurgery.

**Results:** The traumatic brain injury (TBI) controversy and its consequences on this leader's decision-making capacity and personal and social repercussions is evident. There are basically two versions of the story. That of the TBI was caused by his own people, and the other is the death due to injuries caused by the Spaniards. Historical texts that confirm these findings are presented.

**Conclusion:** There is documentary evidence of TBI in the Aztec emperor, which partly explains his decision making behavior in the face of the invading Europeans. However, there is no forensic evidence to determine the causes of his death,

**Keywords:** Brain edema, Depressive disorder, Executive functions, Head injury, Post-traumatic stress disorder, Traumatic brain injury

## INTRODUCTION

The Aztec civilization has been one of the most powerful and organized cultures in the pre-Columbian era in America. Aztec civilization was a determining influence on the development of Mesoamerica, from the perspective of a very sophisticated social and political organization and, their cultural tradition with theocratic beliefs, defined many forms of Mesoamerica's social, cultural, and artistic expression in a narrow context, between its idiosyncrasy and the natural environment in a sustainable way.<sup>[15]</sup>

Their military power was the determinant for their regional expansion, with an impact of social dominance towards other cultures such as the Mixtec-Zapoteca, and the Mayan culture. The fall of the Aztec empire in August 1521 was due to many factors, including the incursion of Spanish colonization and its violent transculturation, associated with a strong influence of their theological traditions and beliefs.

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In addition to, these factors were the social effects that defined the social folding posture in the figure of the conquered, and the impact of one of the first biological wars, were infested by bacterial and exanthematic viral diseases such as smallpox referred to as a “Trojan horse”, coming from the so-called Old World.<sup>[5,18,28]</sup>

Among them, the most important was the domination and oppression of the Aztec empire over other indigenous cultures, which generated alliances and an army of nearly 70,000 men, including Spaniards, Tlaxcalans, Huejotzincas, Totonacs, and Cempoaltecos. Consequently, the Mexica culture began to suffer a social, political, and economic weakening, triggering famine among its population.<sup>[22]</sup>

However, the role of the leaders of the Aztec empire in the interaction with European invaders has not been well defined in history. Their decisions and contradictions derived from their initial belief of having considered the invaders as envoys of their own gods such as Quetzalcoatl. Later warning of their position as enemies, put to the test that the capacity for conciliation was unsuccessful since the advancement of the Spanish incursion was in the same great city called Tenochtitlan.

Montezuma II, the last great Aztec emperor, possessed the admiration of his people and was recognized as a strong leader and an assertive man in his tactical decisions. However, doubts were raised about how he approached the unusual and violent arrival of the colonizers. His approach is identified in the papyri and historical treatises, written by the same religious and lay Spaniards. How they were received by emissaries, with a series of gifts and courtesies, far from stopping the incursion, and rather stimulated their interest to know the great city of Tenochtitlan and its treasures [Figure 1].<sup>[27]</sup>

On November 8, 1519, the first meeting between Montezuma II and Hernan Cortés (the Spanish conqueror) took place,



**Figure 1:** The first encounter between Emperor Montezuma II and Hernan Cortés in México (Tenochtitlan), today Mexico City on November 8, 1519. Source: Library of Congress. Washington D.C. USA. Open access to historical paintings and public domain.

opening a leadership meeting that would mark the route for the fall of the ancient capital Tenochtitlán.<sup>[28]</sup> From this first meeting arose the controversy, over whether they should receive the Spaniards as emissaries of their religious beliefs, or as enemies. When Montezuma II discerned this difference, he was already imprisoned by the Spaniards in his own palace. This generated a disproportionate impact on the morale of the tlatoani because the temple where he served as high priest had become an enemy barracks.<sup>[5,22]</sup>

The subsequent rebellion of the people was generated when they considered themselves attacked and wished to respond in a warlike manner to defend their city and to liberate their emperor. However, Montezuma II went out to one of the balconies in his palace and asked his warriors to calm down. Such was the discontent of the Aztec warriors that, they themselves launched arrows and stone projectiles, hitting the arm, leg, and head of Montezuma II, while he was being protected inside the palace by the Spaniards [Figures 2 and 3].<sup>[5]</sup>

Discrepancy and suspicion about different versions of the significance and origin of the injuries that caused the death of Montezuma II still prevails. A series of historical reports recount the details related to Montezuma II's death, in which the trauma suffered to the skull is identified. The significance of the trauma, as a direct cause of his death, is still contradictory despite several studies and ballistic descriptions [Figure 4].<sup>[11]</sup>

### Descriptions of different people involved and historians

Information about the history of the fall of the Aztec empire diverges between two versions, the first one where the death of Montezuma is attributed to the Indians, told by Spaniards such



**Figure 2:** Panoramic view of the perspective of Montezuma II's exit to the balcony of the palace partially guarded by the Spaniards, to express his speech to his people, and the position of the Aztecs in a furious and angry posture. Source: “The death of Montezuma at the hands of his own people” Library of Congress. Washington D.C. USA. Open access to historical paintings and public domain.



**Figure 3:** A coercive posture of Emperor Montezuma in front of the crowd. Observe the position of the arrows in a kinetic attack on the group located on the balcony. Source: Library of Congress. Washington D.C. USA. Open access to historical paintings and public domain.



**Figure 4:** Enlargement of the image showing the stone in the right hand of the Aztec warrior in position for the attack. (Circle). Source: Library of Congress. Washington D.C. USA. Open access to historical paintings and public domain.

as Hernan Cortés and Bernal Diaz del Castillo, and the second, related by historians of indigenous descent such as Fernando Alvarado Tezozómoc and Francisco de San Anton Chimalpahin, who link the Spaniards with the death of the Mexica tlatoani.<sup>[1,8,26]</sup>

#### **Hernan Cortés reported in the report letter “cartas de relación” (relation letters)**

“When Moctezuma spoke to them, he received a stone in the head, and the damage was such that he died three days later.”<sup>[10]</sup>

#### **Antonio Herrera and Tordesillas**

“They had given a bad payment to their lord, because they killed him with a stone, and that he had died more of anger than of the wound.”<sup>[32]</sup>

#### **Fr. Diego Duran**

“It was common opinion that he died of a stone, but I turned to ask. The Mexicas say that the stone was nothing, nor did it hurt him, that in reality they found him stabbed to death and the stone was almost healed in the (mollera) head.”<sup>[13]</sup>

#### **Francisco de Aguilar**

“He barely discovered Moctezuma’s face in order to speak. that a great quantity of stones came, and one of them gave Montezuma in the head.”<sup>[3]</sup>

#### **Vázquez de Tapia**

“The stone wounded Moctezuma to death.”<sup>[3]</sup>

#### **Cuahtémoc’s words to montezuma according to Orozco y Berra**

“We do not want to obey you because you are no longer our king, and as a vile man we must give you the punishment and payment... and raising an immense shout they fired a hail of stones and arrows... the guards failed to protect the monarch, who received a stone in the temple.”<sup>[9]</sup>

#### **Bernal Diaz del Castillo**

“Moctezuma as placed by a battlement of the roof with many of us soldiers guarding him, and he began to speak to his people. telling them to desist from the war. they had hardly finished this speech when suddenly such a shower of stones and darts were discharged that he was hit by three stones, one on the head.”<sup>[12]</sup>

The texts of Bernal Diaz del Castillo give an account that, once Montezuma II recovered from the initial incident, he refused treatment or cure, until his death. Other versions from Mexicans establish that when the Spaniards fled, they inflicted mortal wounds on the emperor. Prostrate, deteriorated and sick, these injuries were the determining factors in his death.

#### **Alvarado Tezozómoc**

“And going in search of the great King Moctezuma they say that they found him stabbed to death, that the Spaniards killed him and the other principals they had with them. In the night they fled, and this was the disastrous end of that wretched King.”<sup>[26]</sup>

#### **Francisco de San Anton Chimalpahin**

“The Spaniards killed the Moteuhcmatzin, strangling him and after that they fled taking advantage of the shadows of the night.”<sup>[8]</sup>

The responsibility attributed to the Spaniards for the death of Montezuma generates doubts, because keeping the tlatoani alive could have been of help to carry out the plans of the Spaniards. On the other hand, holding the Mexica people responsible for the death of their tlatoani could signify displeasure toward a ruler who did not advocate for the interests of his own population. Others insinuate that the depressive state of the tlatoani generated by the stress that he and his people were suffering due to the conquest, caused him to opt for suicide, “the only honorable way left for him”.<sup>[4]</sup>

Regrettably, there is not osteological evidence to give us with certainty the true cause of death of Montezuma, because the supposed skull of the tlatoani that is in the Musée de l’Homme in Paris, according to researchers, corresponds to a person who lived in a more recent era.<sup>[9]</sup>

There are later versions that his body was abandoned by a shore lake area, where he was recovered and incinerated by the Indians who recognized him.<sup>[9,12]</sup> Unfortunately, the story was written by the “winners”, with ink and eventually with blood. The direct version of the losers in this war is unknown. Those who have postulated the Mexica causes in history, not as a cultural incursion, but as a violent and destructive invasion do not commit to a reliable version. We may now know the politically correct version in the history.<sup>[20]</sup>

## DOCUMENTARY ANALYSIS AND FACTS

From information analyzed in different bibliographic references on the position and procedure of Montezuma II in the last days of the Aztec Empire, we can deduce several relevant facts in the interpretative meaning of the medical and neuro-anthropological nature:<sup>[23]</sup>

1. There is evidence of an erratic behavior pattern, which for some authors, is the product of Montezuma II’s mental contrariness. This stems from the fact that he assumed the arrival of the Spaniards as a divine design, and attributed great respect to them, thus, generating doubt about whether he should consider them as enemies
2. The first actions of sending emissaries and valuable gifts as a strategic courtesy rather than a direct action of defense with the warriors can be derived from the erratic conduct
3. It is probable that by the time he discerned the true purpose of the conquistadors, he was already imprisoned. His imprisonment is documented in codex drawings described by historians, in which the Spaniards are identified as pressing Montezuma II to appear on the balcony to the tribe. Montezuma II is shown as a prisoner with a rope tied around his neck held by a Spaniard, illustrating the status of submission and coercion. This condition of “kidnapping” or prison, according to the texts, may have affected his self-esteem, thereby causing emotional stress and depression<sup>[14,16]</sup>
4. The traumatic impact on the head was a determinant in the aggravation of his later physical and mental state,

which presented with signs of cognitive and emotional deterioration. His deteriorated condition might have influenced his decision to refuse medical attention from his captors. Thus, the possibility of a negotiated solution for the Spaniards to leave the city of Tenochtitlan was lost

5. Montezuma finally died on June 30, 1520
6. These events were key for him to gestate the irate response of the Aztec army who managed to expel the Spaniards in the classic fight that Hernan Cortés lost known as the “Sad Night”
7. The Aztec society itself was divided. On the one hand, there were those who identified in him, an emperor who was indecisive and lacked the capacity to defend his city. In an attempt to achieve this objective through diplomacy, they typified him as a traitor. On the other hand, there were those who saw him as a visionary leader, respectful of the divine designs, who did everything possible to defend the Aztec empire, thus becoming a hero and martyr.<sup>[17,20,30]</sup>

## NEURO-ANTHROPOLOGICAL AUTOPSY

According to documented information available in the literature, and the recent analysis of codices that describe the fall of the Aztec empire, it can be deduced that the emperor presented with features compatible with the following:

1. Depression, manifested by the refusal to receive medical attention, self-abandonment, and isolation that characterized his psycho-emotional condition before the traumatic brain injury (TBI)
2. Post traumatic stress disorder, associated with the impact generated by the advance of a hostile civilization unknown in its territory, with unprecedented implications for its people and a challenging prediction of its consequences
3. TBI and probable cerebral contusion, with transitory loss of consciousness, and progressive secondary neurological deterioration of post traumatic character. This was a probable cause of confusion, cognitive changes, and physical deterioration. The possibility of secondary lesions such as brain edema, intracranial hematoma or increased intracranial pressure is compatible with their clinical evolution
4. It is probable, however, that the final cause of his death was determined by other factors or direct injuries inflicted on a prostrate and inert body with neurological deterioration<sup>[6,14,19-21,24,25,30]</sup>
5. Even though, the Mexicas already started with medical practices such as the use of substances with hemostatic, antibiotic, and/or antiseptic potential,<sup>[2,31]</sup> the suturing of wounds with hair, the reduction and fixation of bone fractures,<sup>[29]</sup> including surgical procedures such as trepanation and drainage of facial abscesses,<sup>[7]</sup> neurosurgical care was just in its beginnings and was deficient in the management of TBI.

## CONCLUSION

The behavioral changes presented by the Aztec emperor, after the head trauma, could have influenced the decision-making in the continuity of a strategic plan to defend the city of Tenochtitlan. These conditions were liable for generating uncertainty and indecision in the Aztec community and in the organized response of its warriors. Despite Cuitláhuac's subsequent nomination as a successor to Montezuma II, the Aztec Empire and the city of Tenochtitlan finally succumbed to the power of the alliances and reinforcement of the Spanish army in August of 1521, 500 years ago.

### Declaration of patient consent

Patient's consent not required as there are no patients in this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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**How to cite this article:** Ramos-Zúñiga R, González-Rios JA, Martín-Monzón I. Traumatic brain injury and the fall of the Aztec empire: 500 years of head injury diagnosis. *Surg Neurol Int* 2021;12:536.