



# Neurotrauma and Cerebrospinal Fluid in Homer's Poems

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## Abstract

Homer's Iliad, from the 8th century BC, remains the oldest record of Greek medicine and a unique source of surgical history. The Odyssey, also authored by Homer, narrates several medically significant events. Among the 148 war traumas described in the Iliad, over a quarter occurred in the craniocervical region. Studies on the Odyssey report at least 11 craniocervical traumas, 9 of which prove fatal. Is there any indication of the presence of cerebrospinal fluid (CSF) in the cases described by Homer, considering its last mention was 800 years prior in the Egyptian surgical papyrus of Edwin Smith? A passage in the Iliad suggests that the "tears" Homer mentions in the eyes of Eumelos, resulting from trauma, might be due to CSF oculorrhoea secondary to a skull base fracture. In Odyssey Book IX, when the Cyclops strikes the heads of two sailors, and fluid and cranial contents emerge, it can be inferred that the poet was aware of fluid in the head (CSF), as there is no mention of blood. It is proposed that 800 years after the writing of the Edwin Smith papyrus, Homer probably provides the second human observation of CSF associated with traumatic situations involving direct head blows.

## Keywords

- ▶ cerebrospinal fluid
- ▶ Edwin Smith papyrus
- ▶ Homer
- ▶ Iliad
- ▶ Odyssey

## Introduction

Despite the apparent existence of cerebrospinal fluid (CSF) in contemporary understanding, eminent anatomists for centuries overlooked its presence. Classical treatises on human anatomy have historically attributed the first observation of CSF to Domenico Cotugno, while others argue that it was Valsalva who, contrary to Cotugno, "upon cutting the spinal membrane of the dog, saw, before Cotugno, the pouring out of an ounce of a certain liquid entirely similar to that found in the joints."<sup>1</sup>

It has been demonstrated that the earliest mentions of CSF date back to the 16th century BC in the Surgical Papyrus of Edwin Smith. However, it was not until the 16th century AD that

its mention was documented again in medical publications.<sup>2-4</sup> Homer's Iliad, written in the 8th century BC, stands as the oldest record of Greek medicine and a unique source of surgical history. While not a medical text, its numerous descriptions of traumatic injuries and their consequences make it an important source for understanding early anatomical concepts and knowledge of pathologies resulting from trauma.

Of the 148 war traumas described in the 28 books of the Iliad, over a quarter occurred in the craniocervical region.<sup>5</sup> In addition, studies on the Odyssey report at least 11 head or neck traumas, 9 of which are fatal.<sup>6</sup> Is there any indication that suggest the presence of CSF in the cases described by Homer?

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## Development

In 1842, François Magendie defined CSF as a physiological fluid of the human body and termed it "CSF." He also accurately described the flow direction of CSF, specifically its exit from the fourth ventricle to the exterior of the brain.<sup>7</sup> The timeline from the reports in the Edwin Smith papyrus to Cushing's confirmation in 1914 of CSF production by the choroid plexus and the postulation of a third circulatory system spans over 3,500 years of history.<sup>7,8</sup>

During most of this period, from 1600 BC until the publication of Nicolo Massa's observations in 1536, no other description similar to CSF has been demonstrated in other medical writings.<sup>2</sup> Despite thorough examinations of the writings of figures like Diocles of Carystus, Hippocrates of Kos, Herophilus of Chalcedon, and Claudius Galen of Pergamon, as well as Renaissance giants like Leonardo da Vinci, Andreas Vesalius, and Berengario da Carpi, none provided a clear or explicit description comparable to Nicolo Massa's mention of CSF in his *Liber Introductorius Anatomiae*.<sup>2,9</sup>

The surgical papyrus of Edwin Smith showcases the remarkable skills of ancient Egyptian physicians, containing the first description of the brain and its intracranial pulsations, contusions, dura mater, and CSF. It reveals a comprehensive understanding of cerebral anatomy, with 48 cases, 27 of which involve cranial injuries. The first mention in human records of the word "brain," as well as the meningeal membranes and the "fluid beneath them," is found in case 6.<sup>10</sup>

An English translation of the commentary on this case in the papyrus states: "the cranial rupture and cerebral tear" mean that the rupture is a large opening into the interior of the skull, above the membrane enveloping the brain, allowing the fluid to escape from inside the head.<sup>11,12</sup> This commentary has been interpreted as the first observation of CSF in humans.

Eight hundred years later, in the 8th century BC, a narrative attributed to Homer emerges, detailing the final year of the Trojan War, the Iliad; and a few decades later, the Odyssey, recounting King Odysseus's journey back to Ithaca after the siege and fall of Troy, spanning 10 years.

Most of the traumas in the Iliad occur during the battles between the Achaeans and the Trojans. The events in the Odyssey, on the other hand, are fewer and described more succinctly.<sup>13-15</sup> Several medical articles have been published analyzing injuries to characters in the Iliad, including facial,<sup>16</sup> thoracic,<sup>17</sup> cardiac,<sup>18</sup> craniocervical,<sup>19</sup> craniomaxillofacial,<sup>20</sup> ocular,<sup>21</sup> pelvic and lower extremity,<sup>22</sup> and upper extremity injuries.<sup>23</sup>

In the XXIII chant of the Iliad, Patroclus' funerals are depicted, and in its second part, amidst the customary celebratory games, the accident of Eumelos occurs, narrated as follows<sup>24</sup>:

"And the goddess, angered, immediately went to Admetus's son, broke his yoke, and each mare went her own way, outside the path. The chariot fell to the ground, and the hero fell from the chariot to the ground and struck a wheel; his elbows, mouth, and nose were wounded, and

his forehead was opened above the eyebrows; tears veiled his eyes, and his powerful voice was broken."

In their 1883 translation, Lang et al phrase it as: "...and Eumelos was thrown out of the chariot beside the wheel, and his elbows, mouth, and nose were skinned, and his forehead bruised above the eyebrows; and his eyes were filled with tears, and his strong voice was choked."<sup>25</sup>

The linguistic form in which Homer narrates the presence of "tears" in Eumelos' eyes has been analyzed in detail, comparing other passages in the Iliad and the Odyssey where characters cry or shed tears as part of emotional events.<sup>26</sup> The conclusion is that these "tears" could be CSF, part of an oculorrhea secondary to a skull base fracture, due to the direct impact that also caused a frontal wound or hematoma or tear above the eyebrows.<sup>24,25</sup>

Pease et al indicate that CSF can occasionally migrate into the orbit or, through the scalp, into the eyelid, forming a cranio-orbital fistula and/or pseudomeningocele, where there is no CSF leakage to the exterior.<sup>27</sup> In rare cases, CSF can also traverse the orbit and exit through the eye, mimicking tear formation. Salame et al described this phenomenon in several cases and coined the term "oculorrhea" in 2000,<sup>28</sup> although in 1981 Galzio et al had used "pseudoepiphora" to describe this finding in a similar case.<sup>29</sup>

Other incidents of posttraumatic CSF leakage, initially appearing as tears, have also been highlighted in the medical literature: Joshi and Crockard published the case of an 8-month-old infant,<sup>30</sup> Till and Marion in the case of a 14-month-old child,<sup>31</sup> Batur et al in the case of a 21-month-old child.<sup>32</sup>

The incident reported by Andersson and Kjellén is significant, where a 75-year-old man suffered a facial injury in a bicycle accident. The computed tomography revealed a fracture in the orbital roof, affecting the cribriform and papery plates. The patient had epiphora, and laboratory analysis showed CSF leakage. The authors propose considering the diagnosis of "oculorrhea" when excessive tearing appears in a midfacial trauma.<sup>33</sup>

All the elements provided so far suggest that the "tears" Homer mentions in Eumelos' eyes, as a result of the trauma, could be due to oculorrhea of CSF, secondary to a skull base fracture. This does not imply that a simple observation can translate into knowledge about the biological origin or function, but it is interesting to conclude that Homer noticed the presence of a liquid like tears and different from blood, flowing from the head, secondary to trauma.

The Odyssey is another text where Homer somehow recounts the contents of the skull when it is traumatized during violent events. The term "brain" is used to refer to the brain three times in the Odyssey and seven times in the Iliad, but only as a term, not to describe its specific nervous functions.<sup>34</sup>

Regarding head traumas and their consequences, Homer outlines the content of the skull in terms that sometimes suggest "fluid" or liquid, without explicitly naming blood. For example, the passage from Book IX of the Odyssey, describing the moment when the Cyclops strikes the heads of two sailors to devour them, states that liquid and cranial

content flowed from them: "...and taking two together dashed them against the ground like puppies, and the brain flowed over the earth, and the earth was wet..."<sup>35</sup> In this passage, the concept of "fluid" is complemented by the description of wetting the earth; from this, it can be inferred that the poet was aware of fluid in the head (CSF), as there is no mention of blood.<sup>36</sup>

## Conclusion

In the presented article, the traumatic events described in the *Odyssey* and the *Iliad* reveal Homer's identification of a liquid content, distinct from blood, in the heads of the affected individuals, which could be correlated with CSF. This analysis is derived from less popular or less known sections of these epic poems and has highlighted issues that have received less attention from other researchers to date. According to our interpretation of those texts, it could be suggested that 800 years after the drafting of the Edwin Smith papyrus, Homer probably provides the second human observation of CSF associated with craniofacial trauma.

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### Conflict of Interest

None declared.

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