

The Neurologist in Dante's *Inferno*

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Abstract

The year 2015 marks the 750th birth anniversary of the Italian poet Dante Alighieri (1265–1321). It is less known that Dante had a sound level of medical knowledge, probably derived by his academic studies. In his works, medieval notions of neuroanatomy and neurophysiology (e.g. the connection between brain and spinal cord, function of optic nerve and peripheral nerves, knowledge of vegetative nervous system) and descriptions of neurological disorders (e.g. epileptic seizures, effects on nervous system by metal intoxication, and narcolepsy) may be found, specially in the *Inferno*, the first part of his masterpiece, the *Divine Comedy*. These accurate descriptions have led some authors to believe that the poet himself may have suffered from a neurological disease (epilepsy or hypersomnia). Damned souls of the *Inferno* seem to be also afflicted by psychiatric disorders, such as melancholia and depression. The analysis of Dante's works confirms that poetry – as well as literature in general – may be an important source of information for historians of neurology.

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Introduction: Dante and Medicine

Dante Alighieri (1265–1321) is universally considered one of the most important authors of Italian and world-wide literature; his works have inspired ancient and modern writers. He embodied a new model of intellectual spread between the 13th and the 14th century; he was indeed involved in political affairs and in education of urban classes, making literature the perfect device to show patterns of behaviour and to teach medieval values [1]. Dante wrote several texts both in Latin and in Italian, but his masterpiece is *La Divina Commedia* (The *Divine Comedy*), an epic poem – written between 1304 and 1321 – that describes an imaginative and allegorical travel in the after-life, through Hell (*Inferno*), Purgatory (*Purgatorio*) and Heaven (*Paradiso*). It is less known whether Dante had a sound level of medical knowledge, as demonstrated by his description of some physical and mental disorders, often using a technical language and showing to be familiar with theories of Hippocrates, Galen and coeval physicians [2]. Even if there is not much information about his early education, Dante is believed to have attended courses at the University of Bologna and at the Sorbonne of Paris, where he may have also studied human anatomy and physiology, reading ancient medical writings by Greek, Roman and

Arab physicians [2, 3]. In the Middle Ages, these texts were indeed known not only to doctors, but also to all intellectuals, since they belonged to common cultural patrimony of that time. Dante's knowledge of medical and natural sciences was so accurate that it enabled him to join the Guild of Physicians and Pharmacists (*Ars Medicorum et Apothecariorum*) of Florence, his city, even though he probably never practiced medicine [2]. For these reasons, it comes as no surprise that medical theories and accurate descriptions of physical disorders and diseases may be found in all his works [2]. For example, in the *Inferno* the poet depicts the torments of damned souls of falsifiers suffering from scabies [4], whereas in the *Convivio*, a prose work written between 1304 and 1307, Dante provides an accurate description of a sudden visual disorder – probably asthenopia – that he suffered from when he was 27 years old [5]. Furthermore, modern medical readers may also find references to some symptoms (collapse, syncope, orthopnea, shortness of breath) and signs (ascites, paleness), which may be nowadays attributed to cardiovascular disorders [6, 7]. It is to be expected that references to neurological diseases and symptoms could be similarly evidenced in his works. The year 2015, that marks the 750th anniversary from the birth of the Italian poet, represents a timely opportunity not only to celebrate his extraordinary talent but also to analyse his encyclopaedic literary works, which throws great understanding on the state of knowledge on nervous system and its pathophysiology during the Middle Ages.

Dante and Anatomical Knowledge of Nervous System

In Dante's works, some medieval notions of neuroanatomy may be unexpectedly found, referring to both the central and the peripheral nervous system. In particular, in the *Divine Comedy*, the poet often uses specific anatomical terms to define some part of the nervous system.

In the *Inferno*, for example, Dante portrays the baron Bertran de Born as a sower of schism, doomed to carry his severed head like a lantern. To explain the reasons of his punishment Bertran states: 'Perch'io parti' così giunte persone,/partito porto il mio cerebro, lasso!;/dal suo principio ch'è in questo troncone' ('because I divided persons so united,/I bear my brain, alas! divided/from its source which is in this trunk', Inf. XXVIII, 139–141) [8]. These verses demonstrate that in the Middle Ages the spinal cord (*troncone*) was considered the origin (*principio*) of the brain (*cerebro*). The connection between these two

parts of the nervous system is again evidenced in another famous passage of Dante's *Comedy*. In the part of the Hell where betrayers are punished, Dante meets Count Ugolino entrapped in ice up to his neck, constantly gnawing at the head of his enemy Archbishop Ruggieri, in the part of the brain joined to the nape ('come 'l pan per fame si manduca,/così 'l sovrano li denti a l'altro pose/là 've 'l cervel s'aggiugne con la nuca', 'and as bread is devoured in hunger, so the uppermost one set his teeth upon the other where the brain joins with the nape', Inf. XXXII, 127–129) [8]. According to Gilson, in these verses the term *nuca* is used 'in a technical designation, not as the neck but as the spinal marrow which runs from the brain along the vertebral column' [9]. The Latin term 'nucha' was indeed used by Albert the Great (1206–1280) – medieval commentator of Aristotle, well known by Dante – to indicate the part of the brain who 'administers motion to the entire lower part of the body through the nerves which arise from it' [9]. Therefore, the aforementioned verses again supported the theory that spinal cord was believed as connected to the brain in the medieval conception.

In the tenth *bolgia*, where counterfeiters are punished, Dante sees Gianni Schicchi biting Capocchio in a point defined by the poet as 'the knot of the neck' (*nodo del collo*, Inf. XXX, 28–29). The part of the body that Schicchi bites to prevail on the opponent – who immediately falls to the ground – may be identified as the brainstem, leading to think that Dante was aware of the lethal effects of lesions to this area of the brain, also known as *noeud vital*. When reaching the Sixth Circle of Hell, another important component of the central nervous system is mentioned, the optic nerve, that is defined as '*il nerbo/del viso*' ('the nerve/of vision', Inf. IX, 73–74), thus indicating that the poet may have known the association of this cranial nerve with the sight [2].

Dante's works also provide some information on the state of knowledge of the peripheral nervous system in the Middle Ages. Actually, the Italian poet often uses the term '*nervi*' (nerves) with different meanings. For example, in the third ring of the Seventh Circle, where sodomites were punished, in the verse 'dove lasciò li mal protesi nervi' ('where he has left his sin-excited nerves', Inf. XV, 114), the word '*nervi*' indicates the male organ. According to Gilson, this verse 'corresponds to the idea that the penis is closely related to nervous system' [9], as Albert the Great also sustained. Could this verse indicate a medieval knowledge of vegetative nervous system? In the *Divine Comedy*, the term '*nerbo*' can also be found with the meaning of tendon ('e quei tenea de' piè ghermito 'l nerbo', 'the sinew of whose feet he held clutched', Inf. XXI,

36) [8]. This passage demonstrates the confusion between these anatomical structures in the Middle Ages, probably derived by Greek and Latin authors.

Finally, it is interesting to note that Dante's *Inferno* may have inspired neuroanatomical terminology and, above all, the word 'limbic' [10]. In the masterpiece of the Italian poet, *limbo* indicates the first infernal circle, a dark and painful valley, existing on the border of Hell, inhabited by virtuous non-christened spirits ('della valle d'abisso dolorosa/che 'ntorno accoglie d'infiniti guai./Oscura e profonda era e nebulosa', 'the valley dolorous of the Abyss,/which gathers the deep sound of countless woes./It was obscure, profound, and vaporous', Inf. IV, 8–10) [8]. Similarly, the limbic system is an 'obscure' neurological structure consisting of a ring or a series of concentric rings that includes a set of neural circuits in the deepest and the most ancient part of the forebrain (limbic lobe) and linked to essential functions for the conservation of the species. According to the French neurologist Jean-Didier Vincent, 'like limbo of Christian [i.e. Dante's] mythology, the limbic system is the link between the neocortical sky and the reptilian hell' [10, 11].

Neurological Disorders in Dante's Works

Dante's works also contain some reports of symptoms and signs that may be ascribed to neurological diseases. In XXIV Canto of the *Inferno*, for example, a description of an epileptic seizure may be found. In the Eighth Circle of the Hell (named as Malebolge), where the thieves are punished, Dante sees a snake that bites a damned man between the neck and the shoulder, causing him to fall to the ground. When the thief gets up from the ground, he is compared to the awakening of an epileptic patient after a seizure:

'E qual è quel che cade, e non sa como,/per forza di demon ch'a terra il tira,/o d'altra oppilazion che lega l'omo,/quando si leva, che 'ntorno si mira/tutto smarrito de la grande angoscia/ch'elli ha sofferta, e guardando sospira:/tal era 'l peccator levato poscia' ('and as he is who falls, and knows not how,/by force of demons who to earth down drag him,/or other oppilation that binds man,/when he arises and around him looks,/wholly bewildered by the mighty anguish/which he has suffered, and in looking sighs,/such was that sinner after he had risen', Inf. XIV, 112–118) [8].

The use of some terms as *smarrito* (bewildered), *angoscia* (anguish), *sospira* (to sigh) accurately depicts the state of mind of an epileptic after his crisis, leading some scholars to believe that Dante himself may have suffered from

seizures. In particular, at the end of the nineteenth century, the Italian physician and criminologist Cesare Lombroso (1835–1909) first supposed that Dante was afflicted by epilepsy with frequent spells and visions [12, 13]. Despite these speculations, the aforementioned verses could provide further information on medieval beliefs about aetiology of epilepsy. As well known, in ancient times, this disease was generally credited as caused by a demoniac entity that possessed a person (per forza di demon ch'a terra il tira) [14]. To explain the pathogenesis of this disorder, Dante also used a technical term belonging to medieval medicine, *oppilatio* that indicated the obstruction of the ventricles of the brain that did not allow bodily humours to move, causing fainting and trembling [15].

The *Inferno* may also provide a pioneering description of the effects of metal intoxication on the central and peripheral nervous system. In the Middle Ages, indeed, the use of metals was widespread and people knew some of them might have harmful effects on human health. Walking among counterfeiters, the poet meets some alchemists who suffer from limb paralysis ('che non potean levar le lor persone', 'who had not strength enough to lift their bodies', Inf. XXIX, 72). On the contrary, some of the counterfeiters appeared to be angry and quarrelsome: for example, the aforementioned Gianni Schicchi is defined as *rabbioso* ('rabid', Inf. X, 33). According to Lucchini et al., both physical (palsy) and behavioral (mood changes) conditions may be due to the use of neurotoxic metals by alchemists [16].

Dante's loss of consciousness, hallucinations and fainting episodes appear to be very frequent in *Divine Comedy*. Recently, some scholars have suggested that even if the Italian poet attributes his recurring fainting to love and passion, fear and anguish, and mysticism and other feelings, these may be actually expressions of a real pathological condition of Dante himself, which may have started since he was a child. In particular, according to Plazzi, narcolepsy as clinical entity seems to better collect all the symptoms that afflict Dante during his journey in the afterlife [12], such as cataplexy, hallucinations, sleep paralysis (Inf. IV, 1–4), episodes of muscle weakness (Inf. I, 52), and falls, which are always triggered by strong emotions (Inf. V, 142). In addition, in *Divine Comedy*, sleep and dream play an important role; Dante himself explained that his work was originated by a vision in an oneiric state. So, in the first verses of his masterpiece Dante's statement that he began his journey 'full of slumber' ('pien di sonno', Inf. I, 10) and confused, would suggest that all his imaginative journey may be interpreted as a result of a hypnagogic/hypnopompic hallucination in a subject afflicted by hypersomnia.

Finally, the *Inferno* also contains descriptions of psychiatric disorders, particularly depression. Dante thinks that melancholia (i.e. depression) is not a sin, but it is a disease state, a fitting punishment for those souls who have transgressed God's laws and fallen into sin in their life. According to Widmer, 'Dante Alighieri's use of terms and descriptions so strongly associated with melancholia suggests that it is this disease and its emotional state that epitomized the environment of the *Inferno*' [17]. So, weakness, limb paralysis, rigidity and heaviness, which many inhabitants of Hell suffer from, could be interpreted as an expression of a psychomotor dysfunction due to an excess of black bile in the body of melancholic souls [17]. The poet sometimes shows to have a secret sympathy for characters afflicted by depression, perhaps because Dante himself well knew sadness and grief, having written the *Divine Comedy* while he was exiled from Florence for political reasons. This emotional entanglement with suffering souls has been interpreted as a form of countertransference by authors that tried to analyse Dante's work from a psychoanalytic viewpoint [18]. In particular, several scholars considered the approach of the Italian poet as a medieval precursor of a psychoanalytic technique that integrates and revises ancient models of psyche and personhood [19–21].

Conclusions

Literature can often provide unexpected information on the state of medical knowledge in a specific historical period, specially in ancient times [22, 23]. In particular,

Dante's works represent a precious source of information on all the medieval life and culture, including healing arts, likely also because of his educational background. At that time, interest in medicine originated from the need to understand the relationships between organic and spiritual life and among the disease, the physical structure and psyche through natural philosophy. The synthesis of all the philosophical and scientific thought of that time was an essential prerequisite to study and better understand the order established by God [2, 24]. Therefore, the connection between brain, mind and soul represented an important field of interest also in the medieval world. It is interesting to note that all the references to anatomy of nervous system and to neurological disorders can be found in the *Inferno*, the first part of the poem. In the afterlife, the Hell represents the place with major emotions (pain, fear, but also condemned pleasure and passion), where in the Aristotelian and Thomistic vision the sensitive and vegetative souls seem to prevail over the rational and intellective soul; so it is likely that Dante preferred to use bodily (anatomical) and medical metaphors in this part of his work. Perhaps the prevalence of allegorical images related to the nervous system in the *Inferno* may underlie a pioneering acknowledgement of the role of brain in perception and reinterpretation of feelings by Dante and medieval medicine. However, despite these speculations, it is undeniable that, as already happened in the lives of other poets [25, 26], Dante Alighieri and his works should be reconsidered by historians of medicine and by all those who are interested in the history of neurology.

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