

## The deafness of Ludwig van Beethoven

*Ljiljana Čvorović (1,2), Biljana Krstić (2), Milan Dragišić (2), Simona Randelović (2), Neda Mladenović (2), Aleksa Krugić (2), Silvana Babić (2)*

(1) FACULTY OF MEDICINE, UNIVERSITY OF BELGRADE; (2) ENT AND ENT CLINIC, UNIVERSITY CLINICAL CENTER OF SERBIA

**Abstract:** Ludwig van Beethoven (1770-1827) began experiencing hearing loss in his thirties, which eventually progressed to profound deafness. Physicians and historians have sought for centuries to interpret the original sources from Beethoven's letters, medical documents, and autopsy reports to determine the causes of his deafness and systemic illnesses. This article reviews the current literature on the theories surrounding Beethoven's deafness and medical conditions. It is based on a PubMed® search spanning from 1958 to 2023 and provides a critical analysis of these theories.

**Key words:** deafness/history, history of medicine, Beethoven.

### INTRODUCTION

Ludwig Van Beethoven (1770-1827) began to face hearing loss in his thirties. By the age of forty-two, people had to shout in order for him to understand them [1]. His last public performance was at the age of forty-four when he started using writing for conversation. At forty-seven, he could not hear his own music, and after the premiere of his Ninth Symphony, he couldn't even hear that the concert had ended [2].

The initial symptoms started at the age of 27, first in his left ear, interpreted by scholars today as tinnitus and high-frequency hearing impairment, associated with poor speech discrimination and recruitment. Initially, these symptoms were temporary and unilateral, but after a year, they became permanent, bilateral, and progressive [3]. It has been described that Beethoven occasionally used a wooden horn, holding one end in his teeth while pressing the other end against the piano, suggesting possible conductive deafness [3,4]. Findings from the autopsy conducted the day after his death in 1827 describe the following (Figure 1): "The Eustachian tube (and)...facial nerves are unusually thick. The auditory nerves are convoluted and devoid of medulla. Auditory arteries are dilated with cartilaginous walls. The left auditory nerve is thinner... the right one with a thicker root, the brain substance in the region of the fourth ventricle is denser and more vascular than the nerves originating there" [5,6].

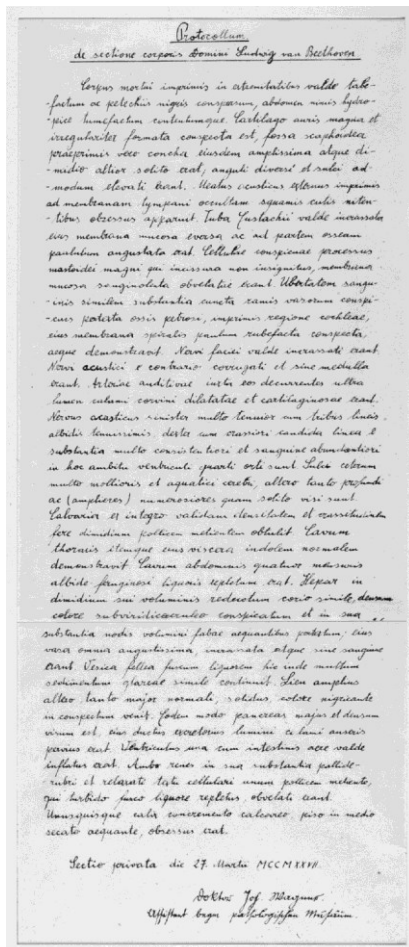
In summary, most doctors agree that his hearing loss was bilateral. Initially, hearing impairment affected high frequencies, the discomfort with loud sounds was later interpreted as recruitment and cochlear damage, while speech incomprehension was attributed to poor speech discrimination. Beethoven experienced progressive hearing loss, leading to complete deafness twenty years after the initial symptoms.

There are no records of hearing problems or ear infections in Beethoven's early childhood or youth. Since puberty, he suffered from episodes of asthma, headaches in winter months, most likely due to sinusitis [5].

Beethoven died from liver failure due to cirrhosis on March 26, 1827. Throughout his life, he suffered from abdominal colic, episodes of diarrhea, rectal bleeding, rheumatism, rheumatic fever, various skin changes, abscesses, and recurrent infections, eye disorders (uveitis), inflammatory artery degeneration, melancholia (depression), behavioral disorders, jaundice, anemia, and progressive hearing loss [8].

In line with modern medicine, many scholars sought connections between these symptoms and illnesses, aiming to establish a proper diagnosis, using autopsy findings, data from his letters, and available medical documentation. From 1920 to 1970, otolaryngologists was the group most interested in this field (67%), while since 1971, most authors belonged to non-otolaryngological subspecialties (81%) [7].

Figure 1. Postmortem autopsy protocol of Ludwig van Beethoven conducted by Dr. J. Wagner [7].



In the literature, it's noted that autoimmunity could be linked to digestive issues and hearing loss [8]. Abdominal problems are explained by autoimmune bowel inflammation (ulcerative colitis or Crohn's disease). There's documentation suggesting an association between both conditions and sensorineural hearing loss, all attributed to autoimmunity [18,19,20]. An autoimmune condition within the inner ear could realistically be the cause of his deafness.

Given that Beethoven's mother and brother died from tuberculosis, it's possible that he was also infected with Koch's bacillus. His gastrointestinal and neurological symptoms could be explained by miliary tuberculosis, a condition that had a prolonged course over thirty years. The likelihood of Beethoven suffering from tuberculous pachymeningitis, which would have affected the eighth cranial nerve, is low due to the high mortality rate of this condition during that time [4]. A substantial number of authors suggest that Beethoven's initial jaundice might be explained by viral hepatitis, while his final disease could be attributed to alcoholic cirrhosis [4]. However, there are conflicting reports about Beethoven's inclination toward alcoholism among his contemporaries and friends [21,22].

Systemic lupus erythematosus is proposed as a potential diagnosis due to Beethoven's episodes of rheumatism, eye pains (uveitis), and facial scarring. Isolated deafness in the early stages of lupus or liver cirrhosis isn't described. Symptoms like alopecia, lymphadenopathy, pericarditis, and a tendency to bleed aren't documented in Beethoven's medical records, despite often accompanying a diagnosis of systemic lupus erythematosus [23].

A recent genetic study of Beethoven's hair samples didn't provide a genetic explanation for his hearing disorder or gastrointestinal problems. However, it revealed a genetic predisposition to liver disease.

Metagenomic analysis also showed evidence of Beethoven having a hepatitis B infection a month before his death, explaining the cirrhosis that led to his demise [24].

### AIM OF THE STUDY

Presentation of published literature on possible causes of Beethoven's deafness and a critical review thereof.

### METHODS

This paper provides a literature review of Beethoven's illnesses and the possible etiology of his deafness through a PubMed® search from 1958 to 2023.

### RESULTS AND DISCUSSION

#### Beethoven's Deafness and Systemic Conditions

Kubba and Young [4] suggest a possible diagnosis of chronic otitis media. Beethoven's letters do not mention any ear discharge or pain. His hearing loss is interpreted as sensorineural damage, while chronic ear inflammation predominantly leads to conductive deafness. Autopsy findings did not describe a perforated eardrum or the presence of a cholesteatoma [9].

Stevens and Hemingway [3] consider otosclerosis as a possible cause of Beethoven's deafness. Otosclerosis predominantly affects the bony labyrinth capsule, leading to conductive hearing loss, mixed impairment, or, rarely, pure sensorineural hearing loss. It often starts in one's twenties as conductive hearing loss with slow progression. Patients hear better in noise and do not complain of discomfort with loud tones or recruitment. "Cochlear otosclerosis" as a possible cause of Beethoven's sensorineural deafness is also plausible, but isolated otosclerosis of the bony labyrinth capsule without involvement of the stapes plate has not been found in literature, making this cause less likely [8]. In his letters and notes, Beethoven does not mention experiencing dizziness or balance loss, excluding vestibular neuritis, Ménière's disease, and labyrinthitis as potential causes [10].

McCabe [11] attributed Beethoven's deafness to syphilis. Deafness due to congenital syphilis presents at birth, in late childhood, or middle age, accompanied by vertiginous symptoms. Autopsy findings did not indicate skull deformities, palate issues, or other pathological changes typical of congenital syphilis. Acquired syphilis is also ruled out because other characteristic signs such as tabes dorsalis, paresis, dementia, gumma, were not described. Hearing loss in syphilis may occur but within neurosyphilis alongside other neurological deficits. Traces of mercury, a treatment for syphilis in the early 19th century, were not found in tissue samples, suggesting Beethoven did not receive it, despite its prevalent use.

The hypothesis of Paget's disease as the cause of Beethoven's deafness is based on his large head and thin bones described in the autopsy report. Paget's disease manifests in one's forties, affects other bones in the body, and causes mixed deafness with a predominantly conductive component. Both Jasserer and Bankl [12], after histological analysis of Beethoven's skull fragments, exclude the presence of Paget's disease.

Drake [13] states that sarcoidosis caused Beethoven's deafness, dysesthesia, depression, diarrhea, pulmonary edema, and death. Although sarcoidosis causes sensorineural hearing loss, most cases are accompanied by facial nerve paralysis, which he did not have. Granulomatous hepatitis due to sarcoidosis causes hepatomegaly, and not cirrhosis found in Beethoven's autopsy. Therefore, it is unlikely that Beethoven suffered from sarcoidosis.

Walsh et al. [14] discovered a high concentration of lead in Beethoven's hair, attributing his abdominal issues to lead poisoning. Cirrhosis is rare in patients with lead poisoning. Chronic lead intoxication has no toxic effect on the inner ear, and its association with hearing loss is not documented. However, Cohen et al. [16] believe that prolonged exposure to lead can lead to slow, progressive high-frequency hearing loss likely due to axonal degeneration of the cochlear nerve. Stevens explained Beethoven's chronic lead exposure through his long-term consumption of wine, which might have started at the age of 17 after his mother's death. Lead was added to wine at that time to enhance the taste of cheaper wines, such as the Hungarian ones Beethoven favored [17].

### CONCLUSION

For centuries, physicians have attempted to unravel the mystery of Beethoven's deafness. Is it an isolated condition or part of a complex disease? Can all the symptoms and signs be attributed to one illness, possibly unrecognized in his time? The exact cause of his hearing loss, one that most scientists

and doctors would agree upon, has yet to be established. Modern times and contemporary medicine bring new methods and hypotheses.

#### REFERENCES

1. Czerny C. Recollections of Beethoven. *Dwight's journal of music* 1852;21:185-6.
2. Umlauf M. In: Clive HP, ed. *Beethoven and his world*. Oxford:Oxford University Press;2001:374-5.
3. Stevens KM, Hemingway WG. Beethoven's deafness. *JAMA* 1970;213:434-7.
4. Kubba AK, Young M. Ludwig van Beethoven: a medical biography. *Lancet* 1996;347:167-70.
5. Larkin E. Beethoven's medical history. In: Cooper M. *Beethoven: the last decade 1817-1827*. 2nd ed. Oxford. Oxford University Press, 1985:439-64.
6. Forbes E. *Thayer's life of Beethoven*. New Jersey: Princetown University Press;1970:1059-60.
7. Thomas JP, Dazert S, Prescher A, Voelter C. Aetiology of Ludwig van Beethoven's hearing impairment: hypotheses over the past 100 years - A systematic review. *Eur Arch Otorhinolaryngol*. 2021;278(8):2703-2712.
8. Karmody C, Bachor E. The Deafness of Ludwig Van Beethoven: an Immunopathy. *Otol Neurotol* 2005;26:809-14.
9. Davies PJ. Beethoven's deafness: a new theory. *Med J Aust* 1988;149:644-9.
10. Hui ACF, Wong SM. Deafness and liver disease in a 57-year-old man: a medical history of Beethoven. *HKJM* 2000;6:433-8.
11. McCabe BF. Beethoven's Deafness. *Ann Otol Rhinol laryngol* 1958;67:192-206.
12. Jesserer H, Bankl H. Ertaubte Beethoven an einer Paget'schen Krankheit? Bericht über die Auffindung und Untersuchung von Schädelfragmenten Ludwig van Beethoven. *Laryngol-Rhinol-Otol* 1986;65:592-7. (German)
13. Drake ME, Jr. Deafness, dysesthesia, depression, diarrhea, dropsy and death: the case for sarcoidosis in Ludwig van Beethoven. *Neurology* 1994;44:562-5.
14. Martin R. *Beethoven's hair*. New York: Broadway;2000.
15. Buchanan LH, Counter SA, Ortega F, Laurell G. Distortion product oto-acoustic emissions in Andean children and adults with chronic lead intoxication. *Acta Otolaryngol (Stockh)* 1999;119:652-8.
16. Cohen SM. Lead poisoning: a summary of treatment and prevention. *Pediatr Nurs*. 2001;27(29):125-126.
17. Stevens MH, Jacobsen T, Crofts AK. Lead and the deafness of Ludwig van Beethoven. *Laryngoscope*. 2013;123(11):2854-2858.
18. Bachmeyer C, Leclerc-Landgraf N, Laurette F, Coutarel P, Cadranet JF, Medioni J, et al. Acute autoimmune sensorineural hearing loss associated with Crohn's disease. *Am J Gastroenterol* 1998;93:2565-7.
19. Kumar BN, Smith MS, Walsh RM, Green JR. Sensorineural hearing loss in ulcerative colitis. *Clin Otolaryngol* 2000;25:143-5.
20. Hoistad DL, Schachern PA, Paparella MM. Autoimmune sensorineural hearing loss: a human temporal bone study. *Am J Otolaryngol* 1998;19:33-9.
21. Wegeler FG, Ries F. *Biographische Notizen über Ludwig van Beethoven von Wegeler und Ries*. Neudruck mit Ergänzungen und Erläuterungen von Dr. A. C. Kalischer. Berlin: Schuster and Loeffler; 1906:210. (German)
22. Wawruch AJ. *Arztlicher Rückblick auf die Todeskrankheit*. In: Nohl, Ludwig, ed. *Beethoven nach den Schilderungen seiner Zeitgenossen*. Stuttgart: J.G Cotta; 1877:247-54. (German)
23. Palferman TG. Classical notes: Beethoven's medical history, a variation on a rheumatological theme. *J R Soc Med* 1990;83:640-5.
24. Begg TJA i sar. Genomic analyses of hair from Ludwig van Beethoven. *Curr Biol*. 2023;33(8):1431-1447.