

ARTICLE INFORMATION

Received: June 10, 2026

Revised: June 18, 2026

Available online: June 20, 2026

at: <https://e-jurnal.ipphorr.com/index.php/mchc>

Management of multiple pulp necrosis in a child with periventricular leukomalacia: A case report

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Abstract

Background: Periventricular leukomalacia (PVL) is a white matter lesion of the brain that can cause a variety of neurological disorders, including mental retardation and communication disorders. This condition often presents challenges in dental care due to the patient's limited ability to communicate and cooperate during dental procedures.

Purpose: To address the management of multiple pulp necrosis in a child with periventricular leukomalacia.

Method: A patient presented with a history of PVL, accompanied by mental retardation and communication disorders. Clinical and diagnostic examinations revealed severe pain with a high pain score, requiring comprehensive management. Given the patient's limited cooperation and the complexity of the procedure, treatment was performed under general anesthesia. The procedure included eliminating the source of infection, preserving the remaining teeth, and extracting teeth with poor prognosis. The entire procedure was completed in a single session without significant perioperative complications.

Results: Post-procedure evaluation demonstrated a reduction in pain symptoms and improved eating ability, which positively impacted the patient's nutritional status. Patients with PVL who have intellectual disabilities and communication disorders require a specialized, individualized, and comprehensive approach to dental care.

Conclusion: The use of general anesthesia is an effective and safe option for treating various dental infections in patients with limited cooperation, while improving quality of life through pain reduction, improved oral function, and improved nutritional status.

Keywords: Child; Multiple Pulp Necrosis; Periventricular Leukomalacia.

INTRODUCTION

Periventricular leukomalacia (PVL) is a form of brain injury characterized by necrosis or softening of white matter tissue around the lateral ventricles of the brain. These lesions mainly occur due to impaired blood perfusion and inflammatory processes in the prenatal or perinatal period, especially in premature infants or infants with a history of hypoxia-ischemia (Back, 2017; Volpe, 2009; van Tilborg, de Theije, van Hal, Wagenaar, de Vries, Benders, & Nijboer, 2018). Periventricular white matter plays an important role in the transmission of nerve impulses between the cerebral cortex and subcortical structures, so damage

to this area can lead to long-term neurological disorders (Back, 2017; Volpe, 2009). PVL is one of the main causes of cerebral palsy, particularly the spastic type of diplegia, and is often associated with cognitive developmental disorders, language disorders, and impaired sensory function (Volpe, 2009; Korzeniewski, Slaughter, Lenski, Haak, & Paneth, 2018).

Clinically, the manifestations of PVL vary greatly depending on the extent and location of white matter damage. Some common clinical features include delayed motor development, muscle tone disorders in

the form of spasticity or hypotonia, movement coordination disorders, speech delays, and mental retardation with varying degrees of severity (Volpe, 2009; Korzeniewski, Slaughter, Lenski, Haak, & Paneth, 2018). Some cases, visual impairments, behavioral disorders, and epilepsy can also be found. In addition, PVL patients often exhibit limited communication skills and difficulty following instructions, which impact social interaction and the ability to receive health care, including dental and oral care (Slaughter, Lenski, Haak, & Paneth, 2018; Novak, Morgan, Adde, Blackman, Boyd, Brunstrom-Hernandez, & Badawi, 2017; Da Silva, Gimenez, Souza, Mello-Moura, Raggio, Morimoto, & Tedesco, 2017).

The neurological limitations of PVL have direct implications for dental and oral health. Fine motor disorders cause patients to have difficulty performing oral hygiene on their own effectively, including brushing their teeth and cleaning the interdental area. Oropharyngeal muscle spasticity can interfere with mastication function and decrease the self-cleansing ability of the oral cavity through salivary mechanisms and tongue movements. In addition, cognitive impairment leads to low awareness of the importance of oral hygiene and an inability to recognize early symptoms of dental disease. This condition increases the risk of plaque accumulation, rampant caries, periodontal disease, and multiple pulp infections (Novak, Morgan, Adde, Blackman, Boyd, Brunstrom-Hernandez, & Badawi, 2017; Da Silva, Gimenez, Souza, Mello-Moura, Raggio, Morimoto, & Tedesco, 2017; Hennequin, Faulks, Veyrune, & Bourdiol, 1999; dos Santos, Masiero, & Simionato, 2002).

PVL patients also often experience barriers to access to dental health services. These barriers include limitations in cooperation during treatment, high dental anxiety, excessive vomiting reflex, and the potential for seizures due to procedural stress. Therefore, dental care approaches in PVL patients often require modification of behavior management techniques, the use of sedation, or general anesthesia to allow for adequate and comprehensive treatment (Jan, & Jan, 2016; Morgan, Minihan, Stark, Finkelman, Yantsides, Park, & Must, 2012; America's Academy of Pediatric Dentist, 2021; Hicks, Lee, Nguyen, La Via, & Roberts, 2013).

In addition to neurological factors, systemic and nutritional factors also play a role in the oral health of PVL patients. Chronic toothache due to pulp infections can cause difficulty eating, decreased nutrient intake, and worsen general health conditions. Conversely, poor nutritional status can affect the immune response and accelerate the progression of infectious diseases in the oral cavity. This two-way relationship between oral health and systemic health makes dental care an integral part of the health management of patients with chronic neurological disorders such as PVL (dos Santos et al., 2002; Jan, & Jan, 2016; Morgan et al., 2012; America's Academy of Pediatric Dentist, 2021; Hicks et al., 2013; Mallineni & Yiu, 2016).

In the case of PVL with severe neurological disabilities, the dental care approach should be comprehensive and based on long-term prevention. The role of the caregiver is very important in maintaining the cleanliness of the patient's oral cavity. Caregiver education on oral hygiene techniques, non-cariogenic dietary patterns, and the importance of regular check-ups to the dentist are the main strategies to reduce the morbidity of dental diseases in this population (Novak et al., 2017; Hennequin et al., 1999; dos Santos et al., 2002).

Considering the complexity of neurological conditions, functional limitations, and the high risk of dental and oral disease in PVL patients, a multidisciplinary approach involving dentists, pediatricians, neurologists, and medical rehabilitation personnel is needed to achieve optimal health outcomes (Da Silva et al., 2017; Jan & Jan, 2016; Morgan et al., 2012).

RESEARCH METHOD

This study was conducted as a case report describing the dental management of a 12-year-10-month-old female patient diagnosed with periventricular leukomalacia (PVL), speech delay, and intellectual disability who presented with multiple pulp necrosis, pulp gangrene, and severe odontogenic pain. Data were obtained from medical records, caregiver interviews, clinical and radiographic examinations, and perioperative observations. Comprehensive oral assessment was

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performed to determine the extent of infection, tooth prognosis, and treatment needs.

Due to severe communication impairment, lack of cooperation, high dental anxiety, and the risk of seizure episodes during dental procedures, treatment was performed under general anesthesia in a hospital setting. The procedures included elimination of infection sources through extraction of teeth with poor prognosis, followed by postoperative monitoring and caregiver education regarding oral hygiene maintenance and preventive dental care. Clinical outcomes were evaluated during a one-month follow-up period, focusing on pain reduction, improvement in eating ability, nutritional status, and the occurrence of postoperative complications.

RESEARCH RESULTS

It was reported that the case of a female patient aged 12 years and 10 months, weighing 35 kg, with a

history of PVL, speech delay, and mental retardation. Radiological examination shows thoracalis dextrosciosis. Neurological status GCS 4-5-6. The patient shows severe pain with a high pain scale. Intraoral examination showed pulp necrosis in teeth 14, 16, 17, 64, 35, 45, 46; gangrene of the pulp in teeth 15, 26, 36, 46; as well as pulp polyps in teeth 17 and 46.

Patients are unable to communicate effectively, refuse to open their mouths, and experience severe anxiety to the point of triggering seizures during dental procedures. Based on these conditions, it was decided that treatment should be carried out under general anesthesia. The actions carried out were in the form of extraction of teeth 14, 15, 16, 17, 64, 26, 35, 36, 45, and 46. After the action, communication, information, and education were provided to families to improve dental health education (DHE). Control is carried out one month after the action.



Pictures 1 & 2. Before and After Treatment Photographs Of Region 1 (Upper Right Quadrant).



Pictures 3 & 4. Before and After Treatment photographs of Region 3 (Lower Left quadrant).

Patients show clinical improvement post-treatment. Orophageal pain decreased significantly, patients were able to eat more comfortably, and there was an improvement in nutritional status indicated by weight

gain. No post-anesthesia or post-extraction complications were found during the one-month observation period.

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DISCUSSION

Periventricular leukomalacia (PVL) is a form of brain white matter injury that mainly occurs in the area around the lateral ventricles due to ischemia, inflammation, or a combination of both during the perinatal period. This damage causes disturbances in the corticospinal motor pathways, so many patients develop spastic-type cerebral palsy, especially spastic diplegia. In addition to motor disorders, PVL is also often accompanied by cognitive impairments, speech delay, sensory impairments, and behavioral regulation (Back, 2017; Volpe, 2009; van Tilborg et al., 2018; Korzeniewski, et al., 2018). This neurological impact directly affects the patient's ability to perform self-care activities, including maintaining the cleanliness of the oral cavity (Novak et al., 2017; Da Silva et al., 2017; Hennequin et al., 1999).

In PVL patients, limitations in fine motor coordination cause difficulty in effective tooth brushing. Orophageal muscle spasticity can also interfere with the natural process of mastication and saliva clearance, which increases the retention of food debris and the colonization of karyogenic bacteria. In addition, cognitive and communication impairments make patients unable to adequately express pain complaints, so pulp infections are often detected in advanced stages (Novak et al., 2017; Da Silva et al., 2017; Hennequin et al., 1999; dos Santos et al., 2002). This condition is consistent with the findings of cases where there was multiple pulp necrosis and pulp gangrene in many teeth when the first examination was carried out.

Another factor that plays a role is high dependence on caregivers. The oral hygiene of PVL patients is highly dependent on the level of knowledge and compliance of the caregiver with dental home care. Without adequate education, patients are at high risk of developing rampant caries, chronic odontogenic infections, and persistent pain that impacts quality of life (Da Silva et al., 2017; Hennequin et al., 1999; dos Santos et al., 2002; Jan & Jan, 2016). In this case, providing communication, information, and education (KIE) to families is an important component to prevent the recurrence of dental diseases.

In terms of clinical management, PVL patients often show severe dental anxiety, excessive vomiting

reflex, and potential episodes of seizures due to procedural stress. This makes conventional dental care in a dental chair difficult to do. General anesthesia is a rational choice in patients with severe cooperative limitations, especially when there are multiple focus infections that require action in a single session. The single-stage comprehensive treatment approach under GA has several clinical advantages, namely the complete elimination of the source of infection, reduced exposure to recurrent stress, and improved patient safety compared to multiple appointments with minimal restraint or sedation (Morgan et al., 2012; America's Academy of Pediatric Dentist, 2021; Hicks et al., 2013).

The relationship between oral health and nutritional status in PVL patients is also important. Chronic dental pain can lead to decreased food intake, high-carbohydrate soft food preferences, and ultimately worsening nutritional status. In these cases, after the elimination of the focus of the infection, the patient was able to eat more comfortably and weight gain occurred, suggesting that oral infection control has a significant systemic impact. This supports the concept that oral health is an integral part of the health management of patients with chronic neurological disabilities (Jan & Jan, 2016; Messieha, 2009).

Pathophysiologically, PVL is often associated with prematurity, perinatal hypoxia-ischemia, intrauterine infections, as well as systemic inflammation. Damage to mature oligodendrocytes leads to disruption of white matter myelination, which then interferes with long-term neuronal connectivity (Back, 2017; Volpe, 2009; van Tilborg et al., 2018). This permanent neurological disorder explains why patients need a long-term dental care approach based on preventive dentistry and periodic recall with shorter intervals than the general population (Da Silva et al., 2017; Jan & Jan, 2016).

The clinical implications for dentists are the need for an interdisciplinary approach with pediatricians, neurologists, and medical rehabilitation experts. In addition, treatment planning must consider the long-term prognosis, the patient's cooperative ability, and the burden of caregiver care. In many cases, radical approaches such as multiple extraction are more

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rational than maintaining teeth with a dubious prognosis, considering the limitations of long-term plaque control and the risk of recurrent infections (Da Silva et al., 2017; Morgan et al., 2012; America's Academy of Pediatric Dentist, 2021).

Overall, PVL patients are a high-risk group in dental and oral health. The success of therapy is determined not only by operative measures, but also by long-term preventive strategies, caregiver education, and multidisciplinary care coordination to maintain the patient's quality of life (Novak et al., 2017; Da Silva et al., 2017; Jan & Jan, 2016).

CONCLUSION

PVL patients with mental retardation and communication impairment require a specific and comprehensive dental care approach. Dental care using general anesthesia is effective in treating cases of multiple infections in patients with limited cooperation and provides improved quality of life, especially related to pain and nutritional status.

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DOI: 10.56922/mchc.v5i3.3455