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A case of vaccine associated paralytic poliomyelitis in an immune competent child in Morocco

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ABSTRACT

This article describes the case of a previously healthy immune competent child who, despite having received full protection against poliomyelitis with OPV, developed severe flaccid paralysis which eventually led to his death. Poliovirus testing of his contacts revealed the presence of Sabin Like type 3 poliovirus in one of them. The patient developed paralysis and respiratory distress and deceased a few months after onset of paralysis with respiratory failure. This tragic case report demonstrates the emergence of VAPP and emphasizes the significance of early diagnosis of VAPP infections to enhance clinical management of VAPP-infected patients.

Keywords: Vaccine associated paralytic poliomyelitis, Acute Flaccid Paralysis, Morocco, Oral Polio Vaccine.

INTRODUCTION

Poliomyelitis is caused by the poliovirus, an enterovirus belonging to the Picornaviridae family. The poliovirus enters the body of a person through the mouth, where it then adheres to mucous membranes and multiplies at different levels of the digestive tract [1]. After 3 to 5 days, the virus can be recovered from stool samples and throat swabs of exposed patients. There may be no symptoms at all during this time or only mild signs of viremia [2]. In 1-2% of infected people, the virus reaches the central nervous system and replicates in motor neurons inside the spinal cord, brain stem, or motor cortex, causing viremia that passes away due to the development of antibodies. The virus multiplies throughout the spinal cord's motor neurons, resulting in the characteristic muscle paralysis [3].

Since the Global Polio Eradication Initiative (GPEI) launched, the number of paralytic cases linked to wild poliovirus (WPV) has decreased from 350,000 in 1988 to 6 cases in 2023 (5 cases from Afghanistan and 1 case from Pakistan) [4]. WPV2 and WPV3 were last detected in 1999 and 2012, respectively. WPV1 continues to be endemic and remains the focal point of global eradication efforts.

Vaccine-associated paralytic poliomyelitis (VAPP) is an infrequent adverse event linked to the oral poliovirus vaccine (OPV) [5]. Globally, there are approximately 2 to 4 cases associated with the type 3 vaccine virus for every 1 million live born infants who receive the OPV [6]. OPV is a live attenuated vaccine containing weakened strains of the poliovirus, administered orally. In rare circumstances, the weakened virus present in the OPV can revert to a virulent form, leading to paralysis and the emergence of VAPP [7]. This occurs when the attenuated virus in the vaccine replicates in the intestines and migrates to the nervous system, resulting in paralysis resembling the poliomyelitis caused by wild poliovirus (WPV) [8].

Due to variations in transmissibility and attenuation among different serotypes used in vaccinations, type 3 has shown a higher association with VAPP in recipients, type 2 has been more commonly

detected in cases involving immune compromised individuals and contact-associated VAPP cases, while type 1 has exhibited a lower frequency of association with VAPP instances [9].

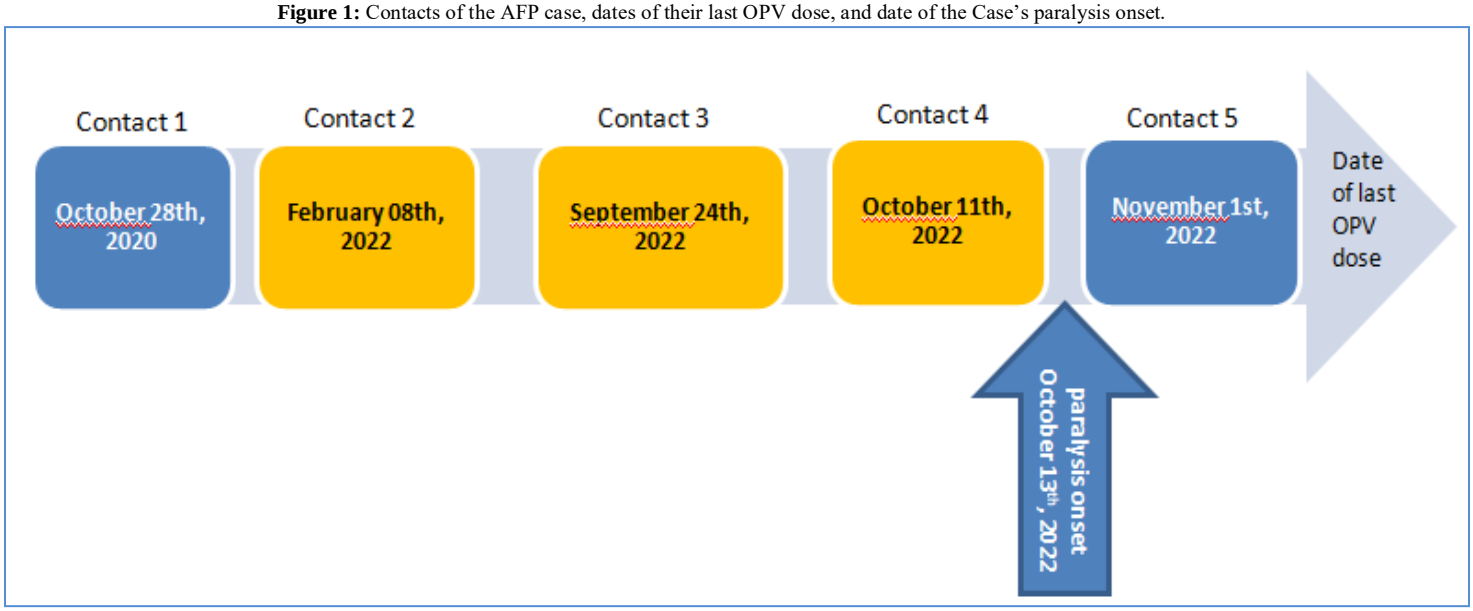
The oral poliovirus vaccine (OPV) stands out as the clear preference for ongoing utilization in low-income countries due to its affordability, ease of administration, capacity to reach susceptible individuals who have not received inoculation, and its ability to stimulate immunity in the gastrointestinal system. Insights from countries that transitioned from OPV to a single inactivated polio vaccine within their primary immunization regimen reveal that cases of vaccine-associated paralytic polio (VAPP) cease to occur following the switch [10].In Morocco, the IPV was included in the vaccination calendar since 2015 and one dose is administered at four months of age.

The most common definition of a VAPP case was acute flaccid paralysis (AFP) accompanied by lasting residual paralysis, consistent with paralytic poliomyelitis, for a minimum of 60 days. This paralysis would manifest in an individual who received OPV between 4 and 40 days prior or in someone who had come into contact with a vaccine recipient between 7 and 60 days following OPV administration.

MATERIALS AND METHODS

A 4-year-old boy with AFP was hospitalized for reanimation, and after the weakness started, poliomyelitis was looked into. It was hard to collect the child's feces sample, therefore, a query was made through his contacts. Figure 1 shows the dates of most recent OPV dose for case's contacts and the date of paralysis onset for the AFP case.

Figure 1: Contacts of the AFP case, dates of their last OPV dose, and date of the Case's paralysis onset.



We observed that the AFP case had close touch with other children who received their vaccinations in the same year but with slightly later delays. Following the immunization of the two contacts (number 3 and 4), the vaccine strain was likely transmitted. The patient became a reservoir for the attenuated virus thus escaping his immunity and causing paralysis. The child passed away 40 days following the commencement of his AFP symptoms.

For stool samples of the five contacts, pre-treatment and cell culture procedures were performed according to the standard procedure recommended by WHO [11]. Cell lines that showed cytopathic effect were directed to the intratypic differentiation (ITD) to identify the type of the Poliovirus detected (Wild Type Poliovirus WPV or Sabin Like Poliovirus SL).

RESULTS AND DISCUSSION

Four of the Contacts's samples were negative for poliovirus isolation while the contact 3 stool sample tested positive for Sabin Like Poliovirus type 3 (SL3) supporting the theory that the sickness originated from a VAPP. The child's death was caused by the severity of the sickness, underscoring how fatal polio can be. This was the lone VAPP incidence in 2022, and it was discovered as part of the AFP surveillance for the program to eradicate the Poliovirus.

Indeed, poliovirus transmission has been eliminated from more than 99% of the world thanks to the effective use of OPV and IPV over the course of the previous few decades. However, in nations where maintaining cold chains and other logistical and financial issues continue, the issue of OPV and its capacity to induce VAPP has received considerable attention. Risk estimates for VAPP span from 1 in 750,000 for the initial OPV dose to 1 in 2.4 million for the cumulative doses of OPV [6,7]. From the literature, it is clear that two doses of IPV provide high protection levels (>90%) for poliovirus-1 and 2, but only 75% for poliovirus-3 [12].

CONCLUSION

As international efforts to eradicate polio progress, issues such as the current case become topics of discussion. Effective

programmatic use and delivery of these two vaccines in the current polio reservoirs should be sufficient to enable global polio eradication in the near future. In the end, the choice to stop polio vaccine after eradication will be based on public health considerations, epidemiological factors, resource availability, and an assessment of potential risks. Because polio has not been eradicated worldwide, it is crucial to continue immunizing at-risk populations to keep the disease under control and prevent any resurgence.

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