Case report

First case of vaccine derived poliovirus isolated from a patient with a primary immune deficiency in Sri Lanka

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Abstract

Persons with primary immune deficiency disorders (PIDD) exposed to oral polio vaccine (OPV)) are at increased risk of vaccine-associated paralytic poliomyelitis (VAPP)[1, 2] and prolonged excretion of vaccine-derived polioviruses (VDPVs).[3] VDPV types 1 and 3 are identified by a genetic divergence of at least 1% in the VP 1 region from the corresponding parent Sabin strains.[4] With VDPV type 2, divergence is at least 0.6%. Circulating VDPV (cVDPV) develop in under immunized populations by chains of virus infections initiated from OPV vaccinated individuals to unimmunized children. Outbreaks of cVDPV have been reported in a few countries.[5] Another potential source of VDPV is a person with PID who excretes vaccine-derived polioviruses (iVDPVs). These viruses may occasionally cause paralytic disease in the patient with PID, but have not been reported to cause outbreaks of paralysis in immunologically normal people.[6]

We report the first isolate of iVDPV in Sri Lanka from a child with severe combined immune deficiency (SCID).

Key words: polio, primary immune deficiency, vaccine-derived polioviruses (VDPV), immune deficient VDPV (iVDPV)

Case report

An 8 month old boy with severe pneumonia was investigated for a possible immune deficiency at the Department of Immunology, Medical Research Institute (MRI), Colombo. Investigations (Table 1) resulted in a diagnosis of T lymphocyte negative B lymphocyte negative (T- B-) SCID. As part of a study to determine poliovirus excretion in patients with immunodeficiency, two stool samples were collected 24 hours apart from this patient and investigated for excretion of poliovirus. The child had received age appropriate immunization with OPV 6, 4, 2 months before the collection of samples**.** The stool specimens were processed at the Polio Network Regional Reference Laboratory at the MRI, using WHO standard guidelines for poliovirus isolation in L20B and RD cell lines.[7] The isolates were tested for intra-typic differentiation (ITD) by Enzyme Linked Immunosorbent Assay, reverse

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transcription - polymerase chain reaction (RT-PCR), ITD Real Time RT- PCR and VDPV screening Real Time PCR and identified as poliovirus type 2 (PV2).[7]

Table 1: Immunological profile of patient

Test		Patient data	Normal range
Full blood count		9400/µl	6–14,000/µl
Neutrophils (absolute)		88% (940/ µl)	52–64% (1500–3000/µl)
Lymphocytes		10%	25 – 33%
Serum Immunoglobulins	IgG	436 mg/dl	279–1533 mg/dl
	IgA	<15mg/dl	16–98 mg/dl
	IgM	153 mg/dl	22–146 mg/dl
Flowcytometry	CD3 + (T lymphocytes)	339/ µl	2400–6800/µl
	CD 4	125 / µl	1400–5100/µl
	CD 8	250 / µl	600–2200/µl
	CD 19 + (B lymphocytes)	0	700–2500/µl
	CD 16+56+ (NK cells)	18/ µl	100–1000/µl

Sequencing of VP 1 region[8] (BigDye Terminator V3.1 Cycle Sequencing Kit, Applied Biosystem) at the Global Specialized Laboratory, Enterovirus Research Centre, Mumbai, India revealed 2 isolates of PV2 with 8 and 12 nucleotide changes in the VP1 region respectively. As per WHO definition, they were identified as VDPV type 2.
The patient subsequently expired

Discussion

This is the first isolate of vaccine derived poliovirus in a patient with PIDD in Sri Lanka. Since the introduction of OPV in 1961, 65 persons with PIDD have been found worldwide to be excreting iVDPV.[4] iVDPV can sometimes cause paralysis in patients with PIDD. Our patient did not develop paralysis. While transmission was not detected in this case, there is a potential risk of spread to the community.

In certain instances, excretion can be prolonged (> 6 months) or chronic (> 5 years)[2] and these persons can transmit poliovirus to others, particularly in under immunized communities.[9] After termination of immunization with OPV, the risk of reintroduction of these polioviruses might be of concern.[2]

Most patients who excrete VDPV have common variable immune deficiency (CVID), X linked agammaglobulinaemia (XLA) or SCID.[2] While patients with PIDD should not be given OPV, they may acquire it from household contacts or from the environment.

Patients with SCID have a limited life span, as seen by this patient, who succumbed to the underlying pneumonia within a few days. Patients with CVID and XLA would survive at least till early adulthood. They should be screened at least annually for poliovirus excretion, as they may acquire the virus at any age.[2] These patients are on intravenous immunoglobulin (IVIG) therapy, which may prevent infection of the central nervous system (CNS), even though CNS infections have occurred in spite of adequate therapy.[9] IVIG therapy is not very effective in the prevention or treatment of chronic poliovirus infection in these patients.

Ultimately, as antiviral compounds are becoming available, identification and treatment of these patients with prolonged or chronic excretion of poliovirus will become increasingly feasible, not only because of the public health imperative, but also because these patients are at risk for paralytic disease due to vaccine poliovirus.

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