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Research Article

Encephalopathy

The rare side effect of DPwT vaccination: Status epilepticus and encephalopathy

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Serious adverse effects have been reported with the DTwP vaccine but are rare. The frequency of these side effects/1000 doses is 0.2-4.4 for fever more than 40.5 C, 4-8.8 for persistent crying, 0.06-0.8 for hypotonic hyporesponsive episodes, 0.16-0.39 for seizures, 0.007 for encephalopathy. A 2-month-old male infant presented to the emergency pediatrics outpatient of our hospital with complaints of fever and abnormal body movements. Fever subsided after taking paracetamol. Then after 5 hours of the onset of fever patient had episodes of abnormal body movements in the form of jerky movements of bilateral upper and lower limbs. They started on methylprednisolone therapy. The seizure becomes passive after 24 hours. Antiepileptics were tapered off over 48 hours. In conclusion, although the acellular pertussis vaccine is safer than the cellular vaccine, it may rarely lead to adverse effects such as seizures.

Keywords: DPT, Diptheria, Pertussis, Tetanus, Encephalopathy

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Introduction

Vaccines are among the safest medicines to use, and these are considered a very effective tool for preventing infectious diseases. Like any other drug, no vaccine is 100% effective or 100% safe at 100%of times [1]. Serious adverse effects have been reported with the DTwP vaccine but are rare. The frequency of these side effects/1000 doses is 0.2-4.4 for fever more than 40.5 C, 4-8.8 for persistent crying, 0.06-0.8 for hypotonic hyporesponsive episodes, 0.16-0.39 for seizures, 0.007 for encephalopathy [2].

Despite these methodologic difficulties, the National Childhood Encephalopathy Study (NCES) and other controlled epidemiologic studies have proved that DTP can cause acute encephalopathy [3-7]. This adverse event rarely occurs, with an estimated risk of zero to 10.5 episodes per million DTP vaccinations [7]. A detailed follow-up of the NCES indicated that children who had had a severe acute neurologic illness after DTP administration were significantly more likely than children in the control group to have chronic nervous system dysfunction ten years later. These children with chronic nervous system dysfunction were more likely than children in the control group to have received DTP within seven days of onset of the original acute severe neurologic illness (i.e., 12 {3.3%} of 367 children vs six {0.8%} of 723 children) [8]. Our purpose is to understand the severe DTP vaccine-associated reactions further.

Case Report

A 2-month-old male infant presented to the emergency pediatrics outpatient of our hospital with complaints of fever and abnormal body movements (multiple episodes). His medical history revealed that the patient was well 02 days back; when he started complaining of fever which was not documented, the patient was warm to touch to mother; for the same illness, the patient was given paracetamol.

Fever subsided after taking paracetamol. Then after 5 hours of the onset of fever patient had episodes of abnormal body movements in the form of jerky movements of bilateral upper and lower limbs. His antenatal history and perinatal history was uneventful. No record of epilepsy in the family. It was elicited from the history that the patient had pentavalent immunization in the morning.

In the physical examination, the heart rate was 164/min, respiratory rate was 60/min, RBS was 68mg/dl, sp02 was 95%, muscle tone was increased in all four limbs, anterior fontanelle was open, and with normal bulging, and no pulsation. The rest of the physical examination was normal. The patient is having generalized tonic seizures during the examination. In the laboratory investigations, white blood cell count was 8600, hemoglobin was 9, platelet count was 240000, the differential count was N44L51E01M04B00, serum calcium was 8.3, CRP was 39.2, magnesium was 2.1, AST was 997, ALT was 220, ALP was 522, PT/INR was31.1/2.47 and rest of the initial investigations were normal.

Cranial ultrasound was done and was normal. The EEG recording is suggestive of generalized epileptiform discharges. The patient was administered a phenytoin loading dose followed by a maintenance dose. CSF analysis was done and was normal. CSF viral panel, viral culture, bacterial culture, a gram stain was done and were normal. MRI brain shows gyral swelling involving bilateral cerebral hemisphere showing diffusion restriction and post-contrast enhancement with leptomeningeal enhancement – suggestive of meningoencephalitis. The neurotropic virus panel was normal. HSP serum panel was normal. Seizures were not controlled on phenytoin; they also started on phenobarbitone, levetiracetam.

The patient had a history of immunization before the onset of illness; the possibility of adverse effects following immunization was kept and started on methylprednisolone therapy. The seizure becomes passive after 24 hours. Antiepileptics were tapered off over 48 hours. Repeat EEG was done after five days of methylprednisolone therapy and was expected. Methylprednisolone was gradually tapered off over six days. This case was reported to the adverse effect reporting system of the ministry of health.

The patient had no seizure since 24 hours of initiation of steroid therapy, neurological examination was normal. Patient discharged, and regular follow done after one month period, and neurological examination and development assessment were normal. Seizure with or without fever within 72 hours of administration of pentavalent vaccination is considered a precaution but not a contraindication to future doses. Signed consent was obtained from parents for this publication.

Discussion

The most severe reaction in pertussis vaccination was the neurologic side effects such as seizures and encephalopathy, which are related to the whole-cell pertussis vaccine. With the introduction of the acellular vaccine, these adverse effects have been reduced significantly [9,10]. Side effects of whole-cell pertussis vaccine are significantly higher than those of acellular vaccine because acellular pertussis vaccine contains 2–5 proteins. In comparison, the whole-cell vaccine contains approximately 3000 proteins, and again the whole-cell vaccine contains endotoxin, known as a neurotoxin, pertussis toxin, and adenylate cyclase [10]. In a recent retrospective study in the US following a huge outbreak of pertussis in California, the researchers found that the 5-component aP vaccine had an estimated efficacy of 88.7% [95% confidence interval (CI), 79.4–93.8%] [11]. A Cochrane review by Zhang et al. after studying six aP vaccine efficacy trials and 52 safety trials concluded that the efficacy of multicomponent (≥3) aP vaccines varied from 84% to 85% in preventing "typical whooping cough" and from 71% to 78% in preventing mild disease. In contrast, the efficacy of one- and two-component vaccines varied from 59% to 75% against typical whooping cough and from 13% to 54% against mild disease [12]. However, a few countries have demonstrated high levels of effectiveness of mono- and bicomponent aP products in preventing pertussis by employing them in their immunization programs [13]. The available evidence is not sufficient to establish any significant difference in vaccine effectiveness of aP vaccines with differing numbers of components [14]. The "murine intracerebral challenge test" has been considered as a "gold standard" for wP vaccines and has been used to standardize and assess the potency of wP vaccines [15]. In a comprehensive study, Huang WT et al. [16]. Retrospectively evaluated 433.654 infants aged between six weeks and 23 months and found no statistically significant increase in the risk for suffering convulsions within the first three days after DaBT-IPA-Hib vaccination. Berkovic et al. [17]. Studied 14 patients who had their first seizure within the first 72 hours after vaccination and who were then followed up with the diagnosis of resistance epilepsy, and they found a mutation in SCN1A encoding alpha one lower unit of the sodium canal. The authors concluded that encephalopathy-resistant convulsion might be associated with genetic epileptic syndromes.

This would positively affect the adoption of the vaccines by society if this could be confirmed with further studies. The only definite contraindication for all vaccines is previous anaphylaxis experienced with vaccines.

Conclusion

In conclusion, although the acellular pertussis vaccine is safer than the cellular vaccine, it may rarely lead to adverse effects such as seizures. However, given the morbidity and mortality that arise from a pertussis infection, these effects are infrequent. Thus, they do not cause a debate on the safety of this vaccination.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report.

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