

Neurophysiology Quiz

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Notice: This is intended to be the first of a new educational series of neurophysiology quizzes. Other authors are encouraged to submit quizzes of their own for possible publication in the Journal. These may be in any field of Clinical Neurophysiology, and should approximately follow the format used here (maximum of 2 figures). Please address any submissions to the quiz editor: Dr. David B. MacDonald, Head, Section of Neurophysiology, Department of Neurosciences, King Faisal Specialist Hospital & Research Centre, MBC 76 PO Box 3354, 11211 Riyadh, Saudi Arabia. E-mail: dmacdonald@kfshrc.edu.sa

A boy with sporadic seizures

Instructional Objectives

Given a fundamental knowledge of EEG, after studying this quiz the reader should be able to:

1. Apply criteria to identify 2 distinctive EEG patterns.
2. State their clinical significance.

Clinical History

A 13-year-old boy was referred for a follow-up EEG (**Figure 1**). He had experienced 2 possible seizures described as "left facial twitching," one at age 4 and the other at age 8. A report of multifocal epileptiform abnormalities in a previous EEG at age 8 (**Figure 2**) had prompted carbamazepine therapy, but this was discontinued at age 11 because he was then seizure-free, and there had been no recurrence since. His development, neurologic examination, and MRI scan were normal, and there was no family history of epilepsy.

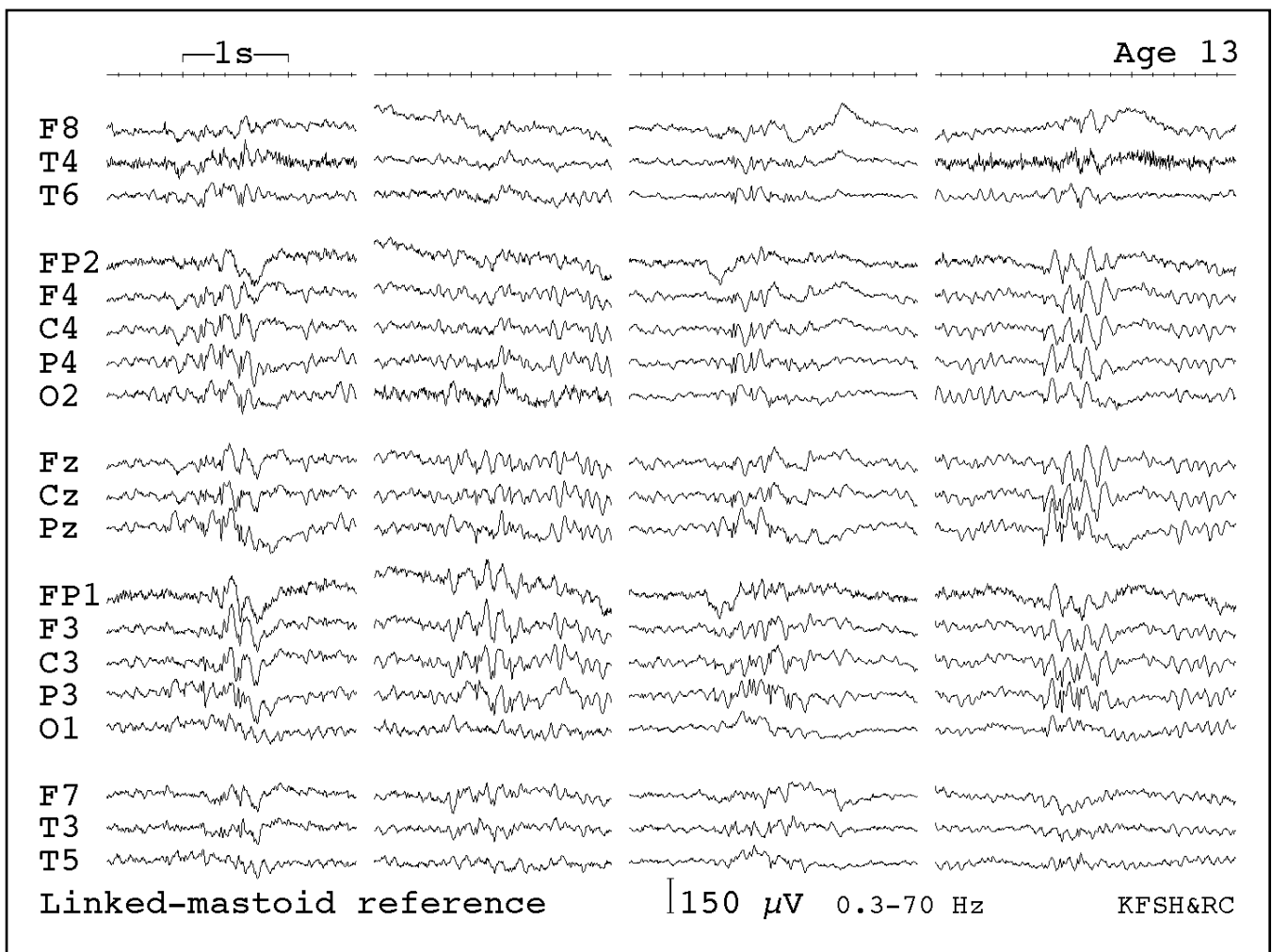


Figure 1

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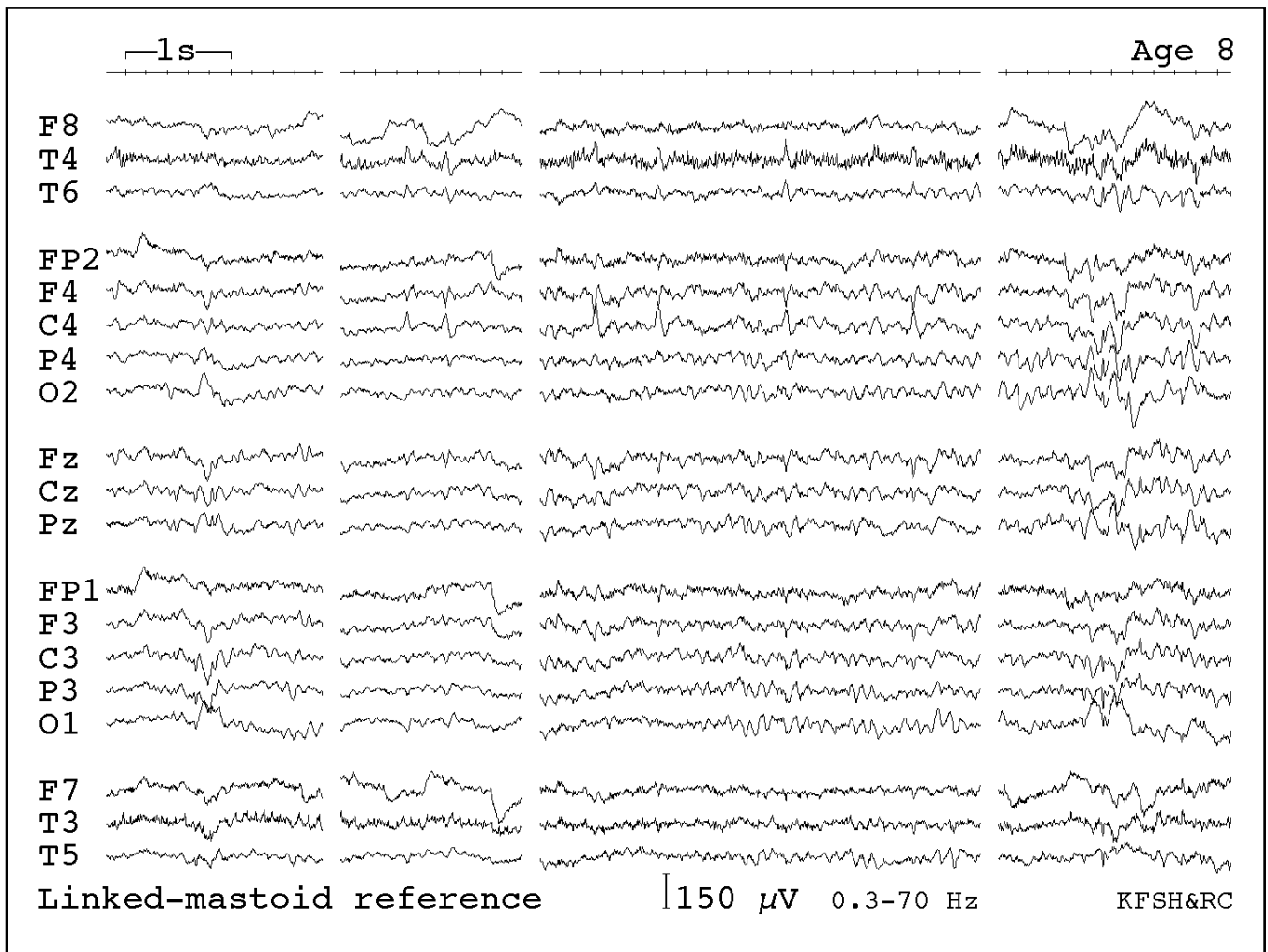


Figure 2

Questions

1. What are the EEG findings?
2. What is the most likely diagnosis?

Answer Page

Answers

1. All the EEG segments in **Figure 1** and the first and fourth segments in **Figure 2** contain the 6 Hz "phantom" spike-and-wave variant pattern.^{1,2} The second and third segments in **Figure 2** contain right centro-temporal benign epileptiform discharges of childhood.³
2. The most likely diagnosis is benign rolandic epilepsy of childhood (BREC).

Discussion

Criteria that identify the 6 Hz "phantom" spike-and-wave variant pattern include 1. brief 5-7 Hz miniature spike-and-wave bursts, 2. low-voltage spike components, 3. a generalized, posterior or less often, frontal dominant distribution, 4. shifting asymmetry, and 5. a predilection for drowsiness and light sleep.^{1,2} The spike-and-wave complexes in **Figures 1 and 2** conform to these criteria. "Phantom" refers to the fleeting, evanescent appearance. Despite its resemblance to epileptiform abnormalities, this distinctive pattern is "benign" because it is not associated with seizures, and therefore must be excluded to avoid potentially harmful misdiagnosis or misclassification.² It is an incidental finding, and does not clarify this child's diagnosis.

Criteria that identify centro-temporal benign epileptiform discharges of childhood include 1. simple diphasic sharp waves, distinct from a 2. normal background, and 3. usually a dipolar centro-temporal negative/bifrontal positive scalp distribution.^{3,4} The sharp waves in **Figure 2** conform to these criteria. This abnormality is also known as benign rolandic sharp waves, or simply centro-temporal sharp waves. Bilateral independence and marked sleep activation are other characteristics that were not encountered in this case. Although also found in some children without recognized seizures, this finding supports a diagnosis of BREC in otherwise normal children who do manifest seizures (often nocturnal), and the sporadic partial motor seizures in this child are also typical. Here, the term "benign" signifies that the epilepsy syndrome normally subsides by age 15, which is probably why the EEG abnormality was absent at age 13.

Teaching Points

1. Specific criteria identify the 6 Hz "phantom" spike-and-wave variant pattern, which is unassociated with seizures, and must be excluded from clinical diagnosis.
2. Specific criteria define centro-temporal benign epileptiform discharges of childhood, which support a diagnosis of BREC in the appropriate clinical setting.

References

1. Westmoreland BF. Benign variants and patterns of uncertain significance. In: Daly DD, Pedley TA, editors. *Current practice of clinical electroencephalography*. 2nd ed. New York (NY): Raven Press; 1990. p. 243-252.
2. MacDonald DB. Normal EEG and benign variants. *Neurosciences* 2003; 8 Suppl 2: S110-S118.
3. Lüders HO, Noachtar S. *Atlas and classification of electroencephalography*. 1st ed. Philadelphia (PA): WB Saunders; 2000.
4. Blume WT, Kaibara M. *Atlas of pediatric electroencephalography*. 2nd ed. Philadelphia (PA): Lippincott Raven; 1999.