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Treatment of pentobarbitol sodium (Nembutal) hyperactivity: a new approach

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Sir,
Proper sedation of the pediatric patient is essential for obtaining high-quality imaging examinations and performing interventional procedures. This sedation is usually achieved using pentobarbital sodium alone or in combination.

In approximately 1 % of cases, pentobarbital sodium (Nembutal) causes paradoxical hyperactivity [1–3]. This reaction is similar to the hyperactivity seen in children with attention deficit hyperactivity disorder (ADHD), leaving the patient agitated and restless.

Stimulants have been used to treat ADHD since 1937 [4]. While most treatments have centered on amphetamines, caffeine has also been successfully used to treat ADHD. As a result of this experience, it appeared that the paradoxical reaction secondary to pentobarbital could be treated in a similar fashion. We have found that caffeine administered orally in Mountain Dew (a soft drink) can be effective.

In the past 2 years we have treated 25 children ranging in age from 14 months to 11 years for 26 episodes of paradoxical hyperactivity after injection of pentobarbital (mean dose 4.36 mg/kg). Of the 25 children treated, 24 calmed down within 10–90 min of ingestion. Each child received 1–12 oz (mean 3.5 oz) of Mountain Dew (mean 8.6 mg/kg caffeine).

Barbituates affect the reticular activating system. Slovis and colleagues suggest that paradoxical hyperactivity does not occur with Versed or fentanyl administration [3]. While the mechanism of action of stimulants remains unknown, evidence suggests their effects on hyperactivity are produced by a combined effect on dopamine and nonadrenergic-dependant pathways in the CNS [5]. The currently accepted mechanism of action of caffeine is a blockade of methyl-xanthine sensitive adenosine receptors [6]. Adenosine promotes the onset of slow-wave sleep, reduced vigilance, effects opposite those of caffeine.

Mountain Dew is readily available and is an excellent source of caffeine, 4.6 mg/oz. Patients readily drink this preparation. Children who develop paradoxical hyperactivity may be offered a can (12 oz). If necessary, the liquid may be given by NG tube. Alternatively, although not in our subgroup, caffeine may be given intravenously or orally (20 mg/kg). Our experience suggests that paradoxical hyperactivity can be treated with orally administered Mountain Dew (or other high-caffeine sodas).

References

1. Hubbard AM, Markowitz RI, Kimmel B, et al (1992) Sedation for pediatric patients undergoing CT and MRI. J Comput Assist Tomogr 6: 3–6
2. Strain JD, Campbell JB, Harvey LA (1988) IV Nembutal: safe sedation for children undergoing CT. Am J Roentgenol 151: 975–979
3. Slovis TL, Parks C, Reneau D, et al (1993) Pediatric sedation: short-term effects. Pediatr Radiol 23: 345–348
4. Bradley C (1937) The behavior of children receiving benzedrine. Am J Psychiatry 94: 577–585
5. Fox AM, Rieder MJ (1993) Risks and benefits of drugs used in the management of the hyperactive child. Drug Safety 9: 38–50
6. Sawynok J (1995) Pharmacological rationale for the clinical use of caffeine. Drugs 49: 37–50

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