

## CORRESPONDENCE

using halothane *via* the tracheostomy. Bronchoscopy revealed marked tracheomalacia and tracheal collapse during spontaneous ventilation. The tracheostomy was, therefore, left in place, and the child was subsequently discharged home without further adverse events.

To my knowledge, there are no reports of respiratory compromise secondary to oral midazolam administration. In addition, during the past 5 yr, I have used oral midazolam premedication in more than 100 children with sleep apnea presenting for tonsillectomy, and I have not seen worsening of upper airway obstruction. Respiratory compromise has been reported in healthy children after nasally administered midazolam.<sup>1,2</sup> Peak plasma concentrations after intranasal midazolam are generally higher than those after oral administration.<sup>1</sup> This complication illustrates that, although oral midazolam premedication is generally extremely safe, selected patients with airway abnormalities might be at greater than usual risk for respiratory compromise.

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## ParaGraph Muscle Stimulator: New Approach to Placement

*To the Editor:*—The ParaGraph Muscle Stimulator (Vital Signs, Totowa, NJ) is a new type of neuromuscular stimulator that uses a piezoelectric motion sensor. The sensor, when correctly applied, allows for the electronic interpretation and a computer screen display of the movement of a stimulated muscle. This permits monitoring of muscle relaxation without direct contact with the patient's extremity, a distinct advantage because an extremity is frequently not available during surgery.

The literature provided with the ParaGraph Muscle Stimulator\* suggests placing the electric stimulator pad over the ulnar nerve at the wrist and the motion sensor over the bulk of the thenar eminence. We have found more satisfactory results by placing the motion sensor over the intersection of the hypothenar eminence and digit minimi (fifth digit). Stimulation of the ulnar nerve causes more motion of

\* ParaGraph Operator's Manual. Vital Signs, Inc. 1993.

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*In Reply:*—As inventors and developers of the ParaGraph muscle relaxation monitor, we support the findings of Roberts and Dorsch regarding the placement of the piezo-electric motion sensor of the ParaGraph monitor.

Historically, the piezo-electric motion sensor was placed on the thumb to record movement of the adductor pollicis muscle to facilitate clinical comparison with an isometric mechanomyogram. The

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the fifth digit than the thumb. Another approach is to place the stimulating pad more lateral, so the median nerve is stimulated. This will cause the thumb to move more.

It is important to visually assess the response to stimulation before administering muscle relaxants, to determine where the motion sensor and stimulating pad should be placed.

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mechanomyogram is the clinical standard for measurement of muscle relaxation. It requires the hand be fixed to an arm board and the thumb to be placed in a ring so that force generated by the thumb in response to stimulation can be quantified. These research studies required placing the ParaGraph motion sensor over the thumb, to compare its response with the mechanomyogram. However, during routine clinical use, the motion sensor should be placed over the

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muscle group that is most responsive to the stimulation, as suggested by Roberts and Dorsch.

We endorse the motion sensor placement procedure described by Roberts and Dorsch as:

- 1) Place the stimulating pad over the ulnar nerve before administration of any muscle relaxant.
- 2) Electrically stimulate the nerve using a train-of-four or single twitch stimulation.
- 3) Observe visually where the maximum motion on the hand occurs in response to electrical stimulation.
- 4) Place the piezo-electric motion sensor over the joint of the hand where maximum motion was observed.

We realize that it is not always possible to observe muscle movement and position the motion sensor before muscle relaxants are given because there may not be adequate analgesia to use the stimulator. In these situations, placement over the intersection of the hypothenar eminence and the fifth digit, as described by Roberts and Dorsch, is appropriate.

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## Practice Guidelines for Blood Component Therapy

*To the Editor:*—Regarding the recent Practice Guidelines for blood component therapy, I have a suggestion concerning the use of fresh-frozen plasma. If, after excessive bleeding and massive transfusion of erythrocytes, the addition of fresh-frozen plasma becomes necessary, we use the fresh frozen plasma from the same donor. We think that the fresh-frozen plasma from the same donor is the best fresh-frozen plasma you can give a patient who has already received the blood cells from this blood donation. Our blood donation center always separates erythrocytes and fresh-frozen plasma. It gives the same registration number to the erythrocyte unit and the fresh-frozen plasma and then stores the fresh-frozen plasma according to the registration numbers. When we need fresh-frozen plasma, we tell the blood donation center the number of the fresh-frozen plasma we

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*In Reply:*—Günter correctly points out that it is possible to freeze the plasma after separation from a donated unit of blood, and thereby have the plasma, in addition to the erythrocytes, available from the same donor, when necessary. The potential reduction of the number of donors to which the recipient is exposed is the rationale for the recommendation to use whole blood rather

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want (which is the number of the erythrocyte unit already given). We think this is the better way to use fresh-frozen plasma than to add something toxic to the fresh-frozen plasma (methylene blue with ultraviolet-radiation or chemicals in the hope of killing viruses). The above has been used for 10 yr in our hospital without problems and with very low costs.

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than the combination of packed cells and fresh frozen plasma to treat massive blood loss.<sup>1</sup>

Although it is possible to carry out Günter's suggestion in a small blood center, it would be logistically more difficult to effect for nondirected allogeneic units in larger centers or when transportation is required. It is easier (and likely less prone to error) to store the