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A Juvenile Airway in an Adult with Suprasellar Tumor

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Abnormalities of airway development secondary to growth hormone deficiency can occur, but have not been reported as causing anesthetic difficulties. We describe a case in which a smaller diameter tube than expected was required for endotracheal intubation in a patient with a suprasellar tumor and resultant growth arrest.

REPORT OF A CASE

A 25-year-old woman was admitted for exploration and removal of a suprasellar tumor. She was the offspring of a normal pregnancy and delivery and had normal development until eight years of age when she was noted to be of unusually short stature. In the subsequent years, she failed to have menses or develop secondary sexual characteristics. She had normal intelligence and did well at school. From 14 years old until admission, she had mild polydypsia, polyuria, and nocturia. Endocrinologic investigation revealed absence of growth hormone, abnormal responses of luteinizing hormone and luteinizing hormone releasing factor, and mild diabetes insipidus. Thyroid function was normal. No pathology was found on neuroradiologic investigation. At 14 years of age, her bone age was 11 ± 1 years and she had the habitus of an eight-year old girl. Growth hormone replacement was *not* prescribed. Instead, she was started on a course of estrogen therapy resulting in development of normal secondary sexual characteristics and menses. Her growth was minimal with height remaining at 130 cm. Over the next six to seven years, her symptoms remained stable, except for the development of galactorrhea at 25 years of age. A computerized tomography brain scan revealed a suprasellar tumor. She was then admitted for excision of the tumor.

Preoperative anesthetic evaluation revealed a normally developed woman of short stature. Secondary sexual characteristics were normal. Her height was 135 cm, and weight was 40 kg. She had never undergone anesthesia and had no history of tracheal instrumentation. There was no history of dyspnea, hoarseness, or decreased exercise tolerance. Routine laboratory values were normal. Anterior-posterior and lateral chest roentgenogram showed no abnormality.

After premedication with 100 mg secobarbital, im, anesthesia was induced with 175 mg thiopental and 200 μg fentanyl, iv. Because no difficulty was encountered controlling ventilation, 4 mg pancuronium were administered, iv. After relaxation was obtained, 100 mg thiopental and 60 mg lidocaine were given iv and laryngoscopy was easily performed. The vocal cords were well-exposed and no abnormalities of the larynx were seen. A 7.0-mm ID, cuffed endotracheal tube was easily passed through the cords but could not be advanced further. Smaller tube sizes were tried until a 5.5-mm ID cuffed endotracheal tube was passed. Only 2 ml of air were needed to seal the cuff. Anesthesia was uneventful throughout the rest of the procedure. The trachea was extubated immediately following surgery, and she had an uneventful recovery. The neurosurgeon was not able to completely excise the mass, a germinoma, because of adherence to the hypothalamus. The patient subsequently underwent radiation treatment for her tumor. Postoperative anterior-posterior and lateral soft tissue neck roentgenograms were taken and showed no evidence of subglottic stenosis.

DISCUSSION

Difficult endotracheal intubation secondary to endocrine abnormalities are described frequently in the anesthetic literature. The problem in this patient most likely represented a persistent juvenile airway in an adult resulting from absence of growth hormone. The obstruction to endotracheal intubation was at the level of the cricoid as was evidenced by the easy insertion of a 7.0-mm ID endotracheal tube through the vocal cords which met resistance a few centimeters further. That her trachea was narrow past the obstruction was evidenced by the small amount of air required to seal the cuff. Other types of subglottic stenosis are unlikely since the patient had no history of tracheal instrumentation, a normal laryngoscopic examination, and a normal tracheal air shadow on soft tissue roentgenograms of the neck. We conclude that her small tracheal diameter was most probably due to a growth hormone deficiency occurring before the age of eight years, causing persistence of a juvenile airway morphology.

The size of endotracheal tube used was the same as used in an eight- or nine-year-old, according to various

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pediatric formulae. This size also corresponded with the diameter of her little finger. The predicted diameter for a cuffed tracheal tube at age eight or nine years is 5.5 to 6.0 mm.[1] In this case, the patient's height of 135 cm corresponded (at the 50th percentile level) with an age of eight years. Bone age was not helpful in determining the age of growth arrest or approximating airway size in this case.

Growth hormone is known to act via an intermediate compound, somatomedin, to stimulate cartilage growth.[2-4] Without growth hormone effect, cartilage and epiphyseal growth are markedly retarded. As in this case with predominantly a growth hormone deficiency, growth will cease altogether when adolescence is reached. In the absence of other hormones which cause the epiphyseal plate to close (*e.g.*, thyroid hormone, androgenic hormones), slow growth will continue instead until middle adulthood when the patient may reach normal proportions, as is the case in some familial syndromes of anterior pituitary deficiency.[2] We could find no information in the literature regarding abnormalities of airway size with other growth retardation syndromes.

If a patient with small stature requires anesthesia, the anesthesiologist should ascertain whether this is due to lack of growth hormone effect or secondary organ failure (*e.g.*, achondroplastic dwarfism). If the dwarfism is associated with the absence of growth hormone effect, then the cartilages in the airway may not have developed beyond the age of growth arrest, and the airway may be similarly "dwarfed" and retain juvenile characteristics despite adult habitus. Using the age of growth arrest or the median age corresponding to present height, various pediatric formulae may be useful for predicting airway size.

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