

# TORAX LEÑOSO

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# INTRODUCCIÓN

- ▶ 1953 Hamilton y Cullen describieron “wooden chest syndrome”
- ▶ Fentanyl y otros opioides sintéticos pueden causar rigidez muscular torácica, estructuras laríngeas y dificultad para ventilar resultando en hipercapnia e hipoxemia
- ▶ mecanismo central y no mediado por el centro ventilatorio.
- ▶ El cierre de la glotis y de estructuras supraglóticas contribuye a la dificultad ventilatoria
- ▶ dosis alta de opioide y rapidez en la infusión
- ▶ En neonatos y lactantes puede suceder con dosis pequeñas
- ▶ Fentanyl , remifentanyl, sufentanyl

# FISIOPATOLOGÍA

- ▶ Desconocida
- ▶ Se ha postulado que la rigidez está mediada en parte por la modulación de las vías del ácido F-aminobutírico a nivel de la médula espinal y los ganglios basales a través de la unión del fentanilo a los receptores opioides K1 y J8. También se ha sugerido la participación de vías noradrenérgicas ceruloespinales.

**TABLE 1.** Previous Reports of Chest Wall Rigidity in Infants and Children

<b>References</b>	<b>Cohort Size and Patient Demographics</b>	<b>Dose of Fentanyl, <math>\mu\text{g}/\text{kg}</math></b>
Prakash et al <sup>10</sup>	9-month-old, 6-kg infant	2 $\mu\text{g}/\text{kg}$ of rapid bolus for anesthetic induction
Elakkumanan et al <sup>11</sup>	2-year-old, 10-kg child	1 $\mu\text{g}/\text{kg}$ of intraoperative bolus
Muller and Vogtmann <sup>12</sup>	1-day-old term infant, 3420 g	4 $\mu\text{g}/\text{kg}$ over 12 seconds
	2-week-old term infant, 4220 g	2 $\mu\text{g}/\text{kg}$ bolus over 5 seconds
Fahnenstich et al <sup>13</sup>	Premature, 28 weeks gestation, 615-g infant 8 neonates, 25–40 weeks gestation	3 $\mu\text{g}/\text{kg}$ over 15 seconds 2.2–6.5 $\mu\text{g}/\text{kg}$ of bolus (infusion in 1 case)
MacGregor and Bauman <sup>14</sup>	2-month-old, 4.6-kg infant	4.3 $\mu\text{g}/\text{kg}/\text{h}$ of infusion for analgesia and sedation
Glick et al <sup>15</sup>	16-month-old infant 8-year-old child	4 $\mu\text{g}/\text{kg}/\text{h}$ of infusion for sedation Dose not specified. Infusion for sedation during mechanical ventilation
Wells et al <sup>16</sup>	8-week-old, 4.14-kg term infant	5 $\mu\text{g}/\text{kg}/\text{h}$ of infusion for sedation during mechanical ventilation
Lui et al <sup>17</sup>	10-week-old, 6-kg infant	8 $\mu\text{g}/\text{kg}$ of bolus intraoperatively
Eventov-Friedman et al <sup>18</sup>	Preterm, 28-week gestation infant	20 $\mu\text{g}/\text{kg}$ given to mother for sedation during lung injury and mechanical ventilation



## Manifestation of Fentanyl-Induced Rigidity

## Treatment and Outcome

Coughing, rigidity of trunk and limbs, cessation of spontaneous respirations.

Neuromuscular blockade with vecuronium.

Immediate of  $ET_{CO_2}$ , 50% decrease in tidal volume during pressure-controlled ventilation.

Increased inspiratory pressure and respiratory rate on mechanical ventilator.

Hypoxemia (oxygen saturation 30% after 1 minute) which did not resolve with increased ventilatory pressures and  $FiO_2$  1.0. Chest wall rigidity with no movements observed for 2 minutes.

Bradycardia treated with epinephrine. Resolution of clinical signs by 20 minutes.

Increased muscle tone of upper extremities and thorax, arrest of mechanical ventilation with decrease of oxygen saturation to 20%.

Resolution of signs after 30 seconds.

Isolated tongue rigidity.

Self-limited at 20 seconds.

Chest wall rigidity impairing ventilation, elevated  $Paco_2$ , oxygen desaturation, and bradycardia. Laryngospasm in 2 patients.

Improvement with naloxone administration.

Inability to achieve chest expansion and ventilation with mechanical ventilation, 30 minutes after infusion started. Cyanosis and asystole.

Asystole treated with epinephrine. Naloxone resulted in chest excursion and adequate ventilation.

Progressive hypertonia of limbs and pelvic girdle. Chest wall compliance not affected.

Relaxation with naloxone.

With discontinuation of neuromuscular blockade, choreoathetosis, and global rigidity including decrease chest wall compliance.

Neuromuscular blockade with pancuronium. Fentanyl discontinued.

Thirty minutes after infusion started, chest wall rigidity prevented ventilation resulting in hypoxemia and asystole.

Epinephrine for asystole, naloxone resolved chest wall rigidity.

Choreoathetoid movements and rigidity during emergence from anesthesia.

Resolution of rigidity within 1 minute of naloxone administration.

Chest wall rigidity noted after delivery by cesarean section. Peak inflating pressure of 25 cm  $H_2O$  needed to move chest during mechanical ventilation.

Naloxone

# GRADOS

- ▶ Grado 0 ausencia de rigidez
- ▶ Grado I escasa rigidez
- ▶ Grado II rigidez moderada
- ▶ Grado III rigidez severa

# MANEJO

- ▶ Uso de naloxona
- ▶ Bloqueadores neuromusculares
- ▶ Intubación endotraqueal
- ▶ Ventilación mecánica controlada

# BIBLIOGRAFÍA

- ▶ Chest wall rigidity in two infants after low-dose fentanyl administration.
- ▶ Dewhirst E<sup>1</sup>, Naguib A, Tobias JD.
- ▶ (Pediatr Emer Care 2012;28: 465Y468)