



CONSORCI
HOSPITAL GENERAL
UNIVERSITARI
VALÈNCIA



ANESTESIA PARA CIRUGÍA DE ESTRABISMO EN LOS NIÑOS

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ESTRABISMO



- **Estrabismo (Tropia)** es la desviación del alineamiento de un ojo en relación al otro.
- Falta de coordinación entre los músculos oculares.
- Afectación de la visión binocular espacial.
- Si congénito o en la infancia puede asociar **Ambliopía**.
- **Foria** es un estrabismo que muchas veces se oculta.



ANATOMÍA

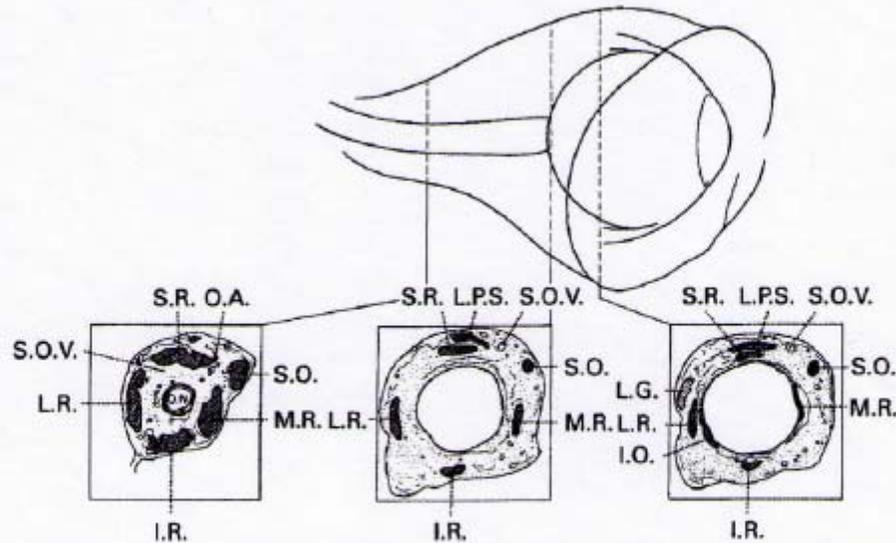


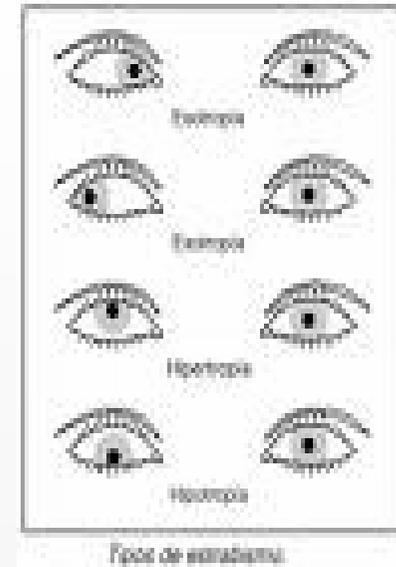
Figure 5 Diagrammatic representation of the parasagittal view of the orbit with the frontal sections, demonstrating spatial relationships at the levels indicated. S.R. = Superior rectus muscle, M.R. = medial rectus muscle, I.R. = inferior rectus muscle, L.R. = lateral rectus muscle, I.O. = inferior oblique muscle, S.O. = superior oblique muscle, O.A. = ophthalmic artery, S.O.V. = superior ophthalmic vein, L.G. = lacrimal gland and L.P.S. = levator palpebrae superioris muscle.



CLASIFICACIÓN

EJE DE DESVIACIÓN

- **Esotropia/endotropia** hacia la región nasal
- **Exotropia** hacia temporal
- **Hipertropia/hipotropia**, desviación vertical



MOVIMIENTOS DE MIRADA

- **COMITANTE:** La desviación es igual, independientemente de la mirada. Los músculos extraoculares funcionan individualmente pero no se enfocan hacia el mismo objeto.
- **INCOMITANTE:** La desviación varía con la dirección de la mirada. Uno o más de los músculos extraoculares no funcionan con normalidad.

TRATAMIENTO

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CIRUGÍA (I)

Es la cirugía oftalmológica más frecuente en pediatría.
Se efectúa en niños entre 2-12 años.

OBJETIVO

- Restaurar la estereopsia o mejorar la función y el bienestar.
- Cirugía reconstructiva más que estética.

INDICACIONES

- Astenopia.
- Diplopia.
- Trastornos posturales.

CIRUGÍA (II)

TÉCNICAS

- **Debilitamiento** (miotomía, tenotomía, extirpación)
- **Refuerzo** (sutura posterior de los músculos rectos)

PRUEBA DE DUCCIÓN PASIVA

Adjustable Sutures in Children Using a Modified Technique

J. Mark Engel, MD, and Sepideh Tara Roust, MD

Journal of AAPOS
Volume 8 Number 3 June 2004

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CIRUGÍA (III)

COMPLICACIONES

Quirúrgicas

- Alineación insatisfactoria.
- Diplopia.
- Infecciones.
- Perforación de corioides/retina.
- Granuloma.
- Quiste de inclusión conjuntival.
- Cicatrización conjuntival.

- Náuseas y vómitos postoperatorios
- Reflejos oculares.

CIRUGÍA (IV)

Reflejos oculares

- **Trigger:** presión o torsión sobre los músculos extraoculares.
- Transmitidos por la rama oftálmica del trigémino (vía aferente).

- **Reflejo ocularespiratorio (ORR)**
 - Centro pneumotáxico pontino y respiratorios medulares.
 - Bradi/Taquipnea.
 - Menos frecuente bajo AG.
- **Reflejo oculoemético (OER)**
 - Se asocia al OCR.
 - Explicaría la alta incidencia de PONV.
- **Reflejo oculocaríaco (OCR)**
 - 70% de la cirugías.
 - Bradicardia sinusal (el más frecuente).
 - BAV, ESV, TV, Asistolia.
 - Agotamiento con estimulaciones repetidas.

CIRUGÍA (IV)

Reflejos oculares

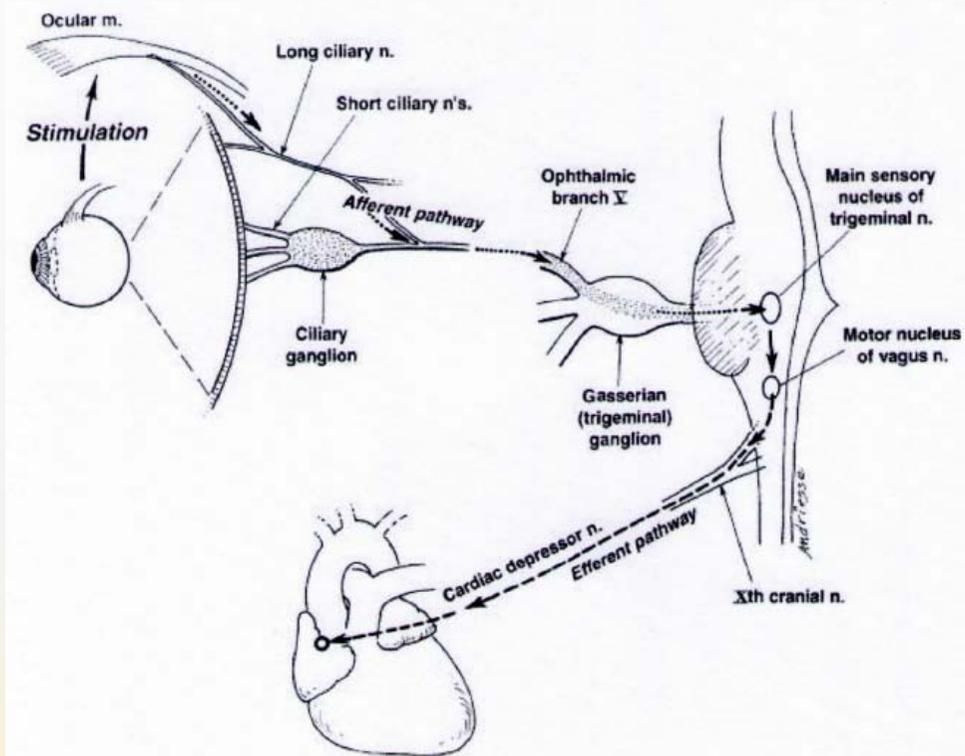


FIGURE 22-3 Anatomy and physiology of the oculocardiac reflex. (From Vassallo SA, Ferrari LR: *Anesthesia for ophthalmology*. In Coté CJ, Ryan JF, Todres ID, et al., editors: *A practice of anesthesia for infants and children*, 2nd ed. Philadelphia, 1993, WB Saunders, p 325, with permission.)

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CIRUGÍA (V)

Náusea y vómitos postoperatorios (PONV)

Editorial: The Big “Little Problem”

Patricia A. Kapur, MD

Anesth Ana Even lesser degrees of postoperative nausea are often perceived as failures of therapy, rather than as an unavoidable consequence of the perioperative experience. In most instances, the latter is in fact the

The Development and Validation of a Risk Score to Predict the Probability of Postoperative Vomiting in Pediatric Patients

Anesth Analg 2004;99:1630–7

Table 4. Results of the Logistic Regression Analysis in Which Duplicate Risk Factors (Each with Two Levels) Were Reduced to One Dichotomous Information (age ≥ 3 yr; Duration of Surgery >30 min)

	β Coefficient	SE	P value	OR	95% Confidence interval of the OR
Strabismus surgery	1.465	0.196	<0.0001	4.327	2.945–6.357
Age of ≥ 3 yr	1.204	0.229	<0.0001	3.334	2.130–5.218
Duration of surgery >30 min	1.179	0.155	<0.0001	3.252	2.400–4.408
History of PV in the child or history of PV/PONV in the father, mother, or siblings	1.445	0.342	<0.0001	4.241	2.168–8.296
Constant	-2.786	0.241	<0.0001		

CIRUGÍA (VI)

Náusea y vómitos postoperatorios Complicaciones

- Ingreso hospitalario imprevisto en régimen de UCMA (18-33%)¹
- Aumento de tiempo en URPO.
- Deshidratación.
- Broncoaspiración.
- Aumento de la PIO.
- Disminución de satisfacción de los padres.

Postoperative symptoms at home following day-case surgery in children: a multicentre survey of 551 children

Anaesthesia, 1997, **52**, pages 963–969

1.



MANEJO ANESTÉSICO



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PREANESTESIA

- Rango de edad : 2-12 años

Preparación:

- Pruebas complementarias: Analítica completa, ECG.
- Ayuno 6 horas para sólidos y 3 h para líquidos claros.

Comorbilidad:

- Riesgo de Hipertermia Maligna: niños con anomalías músculo esqueléticas/ptosis.
- Puede verse en niños con parálisis cerebral y/o trastornos neurológicos.

Premedicación:

- Midazolam 0,25-0,5 mg/kg v.o o Intranasal.
- Crema EMLA en dorso manos 30 min-1h previa cirugía.

PREANESTESIA

Enfermedad Asociada	Implicaciones anestésicas
Síndrome de Apert	Estenosis coanal, Fusión vertebral cervical, Cardiopatía
Síndrome de Crouzon	Posible vía aérea difícil, Posible PIC elevada
Síndrome del Cri du chat	Micrognatia, Hipotonía, Hipotermia, Cardiopatía
Síndrome de Down	Obstrucción vía aérea, Macroglosia, Inestabilidad C1-C2, sensibilidad a Atropina
Síndrome de Goldenhar	Microsomia hemifacial, Fusión cervical espinal posible, Hidrocefalia
Síndrome de Marfan	Dilatación aortica o Pulmonar, Valvulopatía, Pectus excavatum
Secuencia de Moebius	Ptosis, Parálisis VI/VII par craneal, Micrognatia, secreciones copiosas
Distrofia Miotónica	Contracciones musculares, trastornos ritmo cardiaco, hiperkaliemia con succinilcolina

MANEJO PERIOPERATORIO

▪ Inducción

- Inhalatoria (Sevoflurano +/- N₂O) y canalización de vía venosa.
- Canalización previa con EMLA si:
 - ✓ Niño mayor/colaborador.
 - ✓ Riesgo HM.

▪ Mantenimiento: Sevoflurano o T.I.V.A. en O₂/aire 50%.

▪ Analgesia

- Fentanilo 1- 2 mcg/kg i.v.
- Remifentanilo p.c.i.v. 0,05- 0,02mcg/kg/min.
- Bloqueo peribulbar.
- Paracetamol 15 mg/kg i.v. o Metamizol 20-40 mg/kg +/- AINE si > 6 meses.

MANEJO PERIOPERATORIO II

Necesidades de líquidos durante la intervención

1. Cálculo de necesidad de líquidos (CNL) por hora (líquido de mantenimiento)	0-10 Kg= 4 ml/kg/h + 10-20 kg= 2 ml/kg/h + > 20 kg = 1 ml/kg/h
2. Déficit preoperatorio de líquidos (DPL) calculado	Nº de horas de ayuno x CNL 1ª hora, adm. ½ DPL + CNL 2ª hora, adm. ¼ DPL + CNL 3ª hora, adm. ¼ DPL + CNL
3. Pérdidas insensibles (PI)	DESESTIMADAS
4. Pérdidas de sangre calculada (PSC):	DESESTIMADAS

Manual de Anestesia pediátrica. C.Bell. Yale University School of Medicine.

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MANEJO PERIOPERATORIO

Tiempo quirúrgico: 30-60 minutos



Manejo vía aérea

- Mascarilla laríngea
 - Despertar suave.
 - No aumenta PIO.
 - Suturas.
- Si fracaso, valorar IOT.

MANEJO PERIOPERATORIO

- La manipulación quirúrgica requiere acinesia ocular.
 - Prueba de ducción forzada.
- Relajante neuromuscular: Rocuronio 0,4-0,6 mg/kg i.v.
Cisatracurium: 0,08-0,15 mg/kg.

Desventajas de Succinilcolina

- Interfiere en la prueba de ducción forzada.
- *Trigger* hipertermia.
- Hiperkaliemia relativa.

by chemical encapsulation of rocuronium. This phase IIIA study explored efficacy and safety of sugammadex in infants (~~28 days~~ to 23 months), children (2–11 yr), adolescents (12–17 yr), and adults (18–65 yr).

with Sugammadex in Pediatric and Adult Surgical Patients

Anesthesiology 20

ular Blockade
Conclusions: Sugammadex is a new reversal agent that rapidly, effectively, safely, and with similar recovery times reverses rocuronium-induced neuromuscular blockade in children, adolescents, adults, and the small number of infants studied.

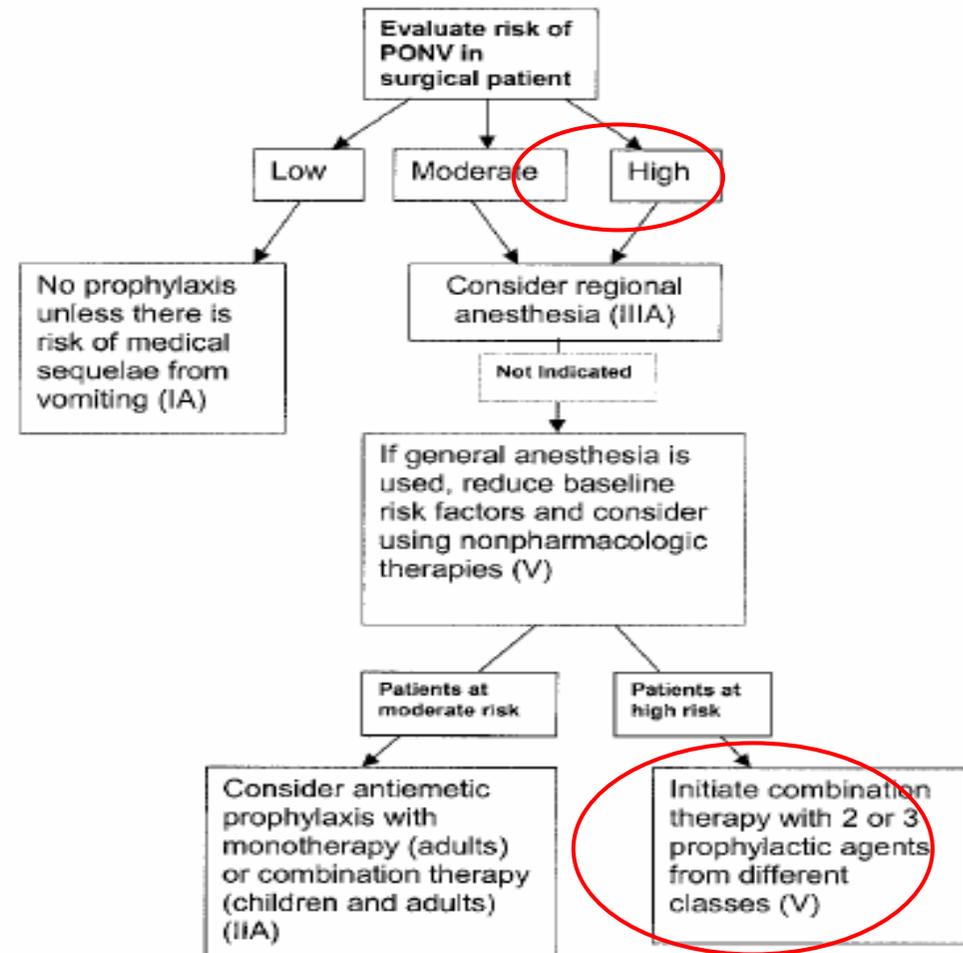
NÁUSEAS Y VÓMITOS POSTOPERATORIOS

Consensus Guidelines for Managing Postoperative Nausea and Vomiting

Anesth Analg 2003;97:62-71

Table 4. Strategies to Reduce Baseline Risk

- Use of regional anesthesia (IIIA) (16)
- Use of propofol for induction and maintenance of anesthesia (IA) (29)
- Use of intraoperative supplemental oxygen (IIIB) (30,31)
- Use of hydration (IIIA) (32)
- Avoidance of nitrous oxide (IIA) (19,33)
- Avoidance of volatile anesthetics (IA) (18,20)
- Minimization of intraoperative (IIA) and postoperative (IVA) opioids (7,18,21-23)
- Minimization of neostigmine (IIA) (34)



NÁUSEAS Y VÓMITOS POSTOPERATORIOS

Prophylactic Ondansetron in Prevention of Postoperative Nausea and Vomiting following Pediatric Strabismus Surgery

Anesthesiology
2000; 92:1035-42

Conclusion: The routine prophylactic use of ondansetron at a dose of 75 µg/kg is as effective as 150 µg/kg in preventing PONV and improving the “true” outcome measures after strabismus repair in children. (Key words: Emesis; PONV.)

Dexamethasone for the Prevention of Postoperative Nausea and Vomiting: A Quantitative Systematic Review

Anesth Analg 2000;90:186-94)

When there is a high risk of postoperative nausea and vomiting, a single prophylactic dose of dexamethasone is antiemetic compared with placebo, without evidence of any clinically relevant toxicity in otherwise healthy patients. Late efficacy seems to be most pronounced. It

Prophylactic Dexamethasone for Postoperative Nausea and Vomiting in Pediatric Strabismus Surgery: A Dose Ranging and Safety Evaluation Study

Anesth Analg 2005;100:1622-6

was satisfactory in all four groups. The results suggest that dexamethasone 0.25 mg/kg is more effective than saline and equally effective compared with larger doses for preventing PONV for pediatric strabismus surgery.

NÁUSEAS Y VÓMITOS POSTOPERATORIOS

Ondansetron Reduces the Incidence and Severity of Poststrabismus Repair Vomiting in Children

Anesth Analg 1994;79:486-9

to eye muscle manipulation, subjects received normal saline 0.3 mL/kg (Group 1), metoclopramide 0.25 mg/kg (Group 2), or ondansetron 0.15 mg/kg (Group 3), intravenously. There were no differences between

technique, or time in the operating room. The incidence of vomiting in Groups 1, 2, and 3 was 50%, 27%, and 10% prior to discharge, and 67%, 53%, and 30% during

Comparative Efficacy and Safety of Ondansetron, Droperidol, and Metoclopramide for Preventing Postoperative Nausea and Vomiting: A Meta-Analysis

(Anesth Analg 1999;88:1370-9)

among drug combinations. We conclude that ondansetron and droperidol are more effective than metoclopramide in reducing postoperative vomiting. Implica-

Effect of midazolam, dexamethasone and their combination on the prevention of nausea and vomiting following strabismus repair in children

European Journal of Anaesthesiology 2007; 24: 697-701

after surgery. *Results:* The incidence of postoperative nausea was 48%, 32%, 12% and 0% with placebo, dexamethasone, midazolam and the midazolam-dexamethasone combination, respectively. The incidence of vomiting was 52% and 32% with placebo and dexamethasone, respectively; no child vomited with midazolam

Dexamethasone is a cost-effective alternative to ondansetron in preventing PONV after paediatric strabismus repair

British Journal of Anaesthesia 86 (1): 84-9 (2001)

lysed. The incidence and severity of PONV in the first 24 h were significantly less in the dexamethasone and ondansetron groups than in the placebo group ($P<0.05$). The incidence ($P=0.04$) and severity ($P=0.03$) of PONV at the 6-24 h epoch were significantly less in the dexamethasone group than in the ondansetron group. Recovery time ($P=0.07$), fast tracking time

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NÁUSEAS Y VÓMITOS POSTOPERATORIOS

Effects of Droperidol Dosage on Postoperative Emetic Symptoms Following Pediatric Strabismus Surgery

Journal of Clinical Anesthesia 16:34-39, 2004

Interventions: Patients were assigned to one of four doses of droperidol (10, 20, 40, or 80 $\mu\text{g} \cdot \text{kg}^{-1}$) (Groups 1, 2, 3, and 4, respectively). All patients received the same anesthetic management, with droperidol administered intravenously immediately after induction of anesthesia.

Conclusions: Prophylactic administration of droperidol 80 $\mu\text{g} \cdot \text{kg}^{-1}$ is most effective in reducing postoperative emetic symptoms without increasing time to discharge. In those

Droperidol y arritmias cardíacas

(Rev. Esp. Anesthesiol. Reanim. 2003; 50: 221-224)

¿Están justificadas estas advertencias? Dershwitz intentó responder a esta pregunta analizando con detalle los 19 casos en que, de acuerdo con la base de datos de la FDA, el uso de dosis inferiores a 10 mg de droperidol se asoció con la producción de arritmias. Según su análisis, en todos ellos existían múltiples circunstancias que impedían establecer claramente dicha asociación. En su opinión, dosis como las utilizadas en la profilaxis de las náuseas y vómitos postoperatorios serían seguras¹⁷. También Bailey y col revisan los

MEDICAMENTOS AUTORIZADOS POR LA AEMPS EN JUNIO 2008

02/06/2008	VENLAFAXINA IDIFARMA 50 mg Comprimidos	FARMACEUTICO, S.L.	HIDROCLORURO	661028	Si	No
02/06/2008	VENLAFAXINA IDIFARMA 75 mg comprimidos	IDIFARMA, DESARROLLO FARMACEUTICO, S.L.	VENLAFAXINA HIDROCLORURO	661027	Si	No
02/06/2008	XOMOLIX 2,5 mg/ml solución inyectable	PROSTRAKAN LIMITED	DROPERIDOL	661030	No	No
04/06/2008	FLUCONAZOL ARAFARMA GROUP 100 mg cápsulas	ARAFARMA GROUP, S.A.	FLUCONAZOL	661047	Si	No

Pendiente de revisión por la Comisión de Farmacia

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NÁUSEAS Y VÓMITOS POSTOPERATORIOS

MANEJO

1. Doble profilaxis:

- Dexametasona 0,25 mg/kg i.v.
- Ondansetron 75-150 mcg/kg i.v.
- (Droperidol 80 mcg/kg i.v.)

2. Tratamiento:

- Metoclopramida 150 mcg/kg i.v.

REFLEJO OCULO-CARDÍACO

MANEJO

- Profilaxis farmacológica:
 - Eficacia debatida.
 - Atropina 0,01-0,02 mg/kg i.v.
 - La misma puede provocar trastornos del ritmo.
- **Cesar el estímulo quirúrgico +++**
- Evitar hipercapnia e hipoxemia.
- Atropina 0,01-0,02 mg/kg i.v.
- Anestesia loco-regional.
- Profundidad del plano anestésico

Influence of the anaesthetic depth on the inhibition of the oculocardiac reflex during sevoflurane anaesthesia for paediatric strabismus surgery

Conclusions. We confirmed that OCR is relevant to the depth of anaesthesia. BIS values of 40–50 seem adequate for the inhibition of OCR. The results suggest that BIS may be a valuable tool during sevoflurane anaesthesia for strabismus surgery in children.

British Journal of Anaesthesia 101 (2): 234–8 (2008)

ANESTESIA LOCO-REGIONAL

Safety and efficacy of peribulbar block as adjunct to general anaesthesia for paediatric ophthalmic surgery

Paediatric Anaesthesia 2001 11: 161–167

Results: Intraoperative values of haemodynamic variables were significantly higher in the control group ($P < 0.01$). Requirement for intraoperative rescue analgesic and postoperative analgesia was higher in the control group ($P < 0.05$ and $P < 0.001$, respectively). Children in the block group had lower postoperative pain scores at all times. Incidence of oculocardiac reflex was significantly higher ($P < 0.001$) in the control group. Seventy-six percent of children in the control group had postoperative nausea and vomiting compared to 20% children in the block group ($P < 0.001$).

Anesthetic Techniques and Postoperative Emesis in Pediatric Strabismus Surgery

Regional Anesthesia and Pain Medicine, Vol 30, No 1 (January–February), 2005: pp 43–47

Conclusion: Among the three techniques, peribulbar block with propofol-based anesthesia is the technique with the lowest incidence of postoperative emesis. Fentanyl-propofol is an equally acceptable alternative;

A prospective randomised double blind study to evaluate the effect of peribulbar block or topical application of local anaesthesia combined with general anaesthesia on intra-operative and postoperative complications during paediatric strabismus surgery

Anaesthesia, 2007, 62, pages 1110–1113

with general anaesthesia, or general anaesthesia alone. The incidence and severity of the oculocardiac reflex, the requirement for atropine, the occurrence of arrhythmias and incidence of postoperative nausea and vomiting following surgery at 1, 2 and 4 h were studied. We found the incidence and severity of oculocardiac reflex intra-operatively was significantly reduced in children who received a peribulbar block. The incidence of postoperative nausea and vomiting was significantly reduced in patients receiving either peribulbar block or topical local anaesthesia

ANESTESIA LOCO-REGIONAL

TÉCNICA

- Referencias anatómicas similares al adulto.
- Aguja 26 G.

Fármacos:

- Lidocaina 2% + Bupivacaina 0,5% (Levobupivacaina 0,5%)
- Hialuronidasa 15 UI/ml.
- 0,3 ml/kg.

Adjunctive peribulbar anaesthesia for paediatric ophthalmic surgery: are the risks justified?

Paediatric Anaesthesia 2002 12: 85–89

Peribulbar block or topical application of local anaesthesia combined for paediatric strabismus surgery

Anaesthesia, 2008, 63, pages 1139–1153

There are important anatomical differences between children and adults. The size of the eye relative to the bony orbit is much greater in childhood. The eye occupies Subtenon's anaesthesia is a safer and equally effective alternative. Since this technique involves insertion of a

Gupta's current results [1] do not justify the routine use of peribulbar block in paediatric anaesthesia to prevent the trigemino-cardiac reflex. The potential usefulness of this technique is much smaller (especially in strabismus surgery), than the potential harmful side effects (e.g. persistent diplopia through direct damage to the inferior rectus muscle).

POSTOPERATORIO

- Educción suave para evitar:
 - Aumento de la PIO.
 - Desplazamiento de las suturas.
 - Laringoespasma.
- Observación en URPO.
 - Nivel de conciencia.
 - Analgesia.
 - PONV.
 - Tolerancia oral.
- Si cumple criterios: ALTA AMBULATORIA



MUCHAS GRACIAS

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