

Pediatric Regional Anesthesia: Updates from 2008

Lynn D. Martin, MD, FAAP, FCCM

Professor of Anesthesiology & Pediatrics (Adjunct)

Director, Department of Anesthesiology & Pain Medicine

UNIVERSITY OF WASHINGTON
SCHOOL OF MEDICINE



Children's
Hospital & Regional Medical Center

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Objective

- Review new (2007) published information regarding regional anesthesia in children

Regional Anesthesia 2007

- Medline search on 01/18/2008 revealed 99 publications focused on regional anesthesia
- 15 were in the pediatric population (0-18 yrs)

Trends in Regional Anesthesia

- Single institution
 - University Hospital Lapeyronie (Montpellier, France)
- Retrospective review
 - prospective collected computerized data (1989-2005)
- Patients divided into 2 groups
 - < 5 years of age
 - 5 year and older

Rochette et al: *Pediatr Anesth* 2007; 17: 874-80

Trends in Regional Anesthesia

- 51,408 anesthetics delivered
- 10,929 regional anesthesia blocks (21%)
 - 1042 neonatal spinals
 - 9887 combined general/regional cases
- Percentage of regional anesthesia increased
 - All ages - 9.3% to 24.9% ($p < 0.001$)

Rochette et al: *Pediatr Anesth* 2007; 17: 874-80

Trends in Regional Anesthesia

- Contribution neuraxial blocks declined significantly from 1993-1999 ($p < 0.001$)
 - < 5 yrs – 100% to 59.7%
 - 5 yrs or older – 97.4% to 25%
- Distribution of neuraxial blocks changed
 - < 5 yrs – caudals declined by 60% (1995-2000)
 - 5 yrs or older – 80% epidurals

Rochette et al: *Pediatr Anesth* 2007; 17: 874-80

Trends in Regional Anesthesia

- Peripheral blocks responsible for increase in RA
 - < 5 yrs – 37% of total RA
 - 5 yrs or older – 75% of total RA ($p < 0.0001$)
- Peripheral catheters
 - 12.9% of peripheral blocks
 - 15/yr to 105/yr (7-fold increase) from 2000 to 2005

Rochette et al: *Pediatr Anesth* 2007; 17: 874-80

U.K. Pediatric Epidural Infusion Audit

- Prospective data registry (21 pediatric centers)
- Voluntary reporting
 - Monthly numbers of epidural infusions
 - Detailed incident (complication) reports
- Data collected over 5 years (03/2001-12/2005)
- Monitoring committee review & graded all incidents
 - Grade 1: severe (infection, injury, arrest, etc.)
 - Grade 2: moderate
 - Grade 3: minor

Llewellyn *et al*: *Pediatr Anesth* 2007; 17: 520-33

U.K. Pediatric Epidural Infusion Audit

- 96 incidents reported in 10,633 epidurals
 - Neonates – 6/529 (1.13%)
 - Infants – 13/1726 (0.75%)
 - 1-8 yrs – 12/4136 (0.29%)
 - >8 yrs – 25/4242 (0.58%)
- Incidents severity
 - Grade 1: severe – five (1:2000)
 - Grade 2: moderate – nine (1:1100)
 - Grade 3: minor – fifty six (1:189)
- Epidural infusion incidents (decreasing trend over time)
 - Pressure sores (n = 33)
 - Four compartment syndromes (not masked by EI)

Effect of Anesthesia Technique on Epidural Anesthesia

- Prospective randomized trial (n=113 children)
- Sevoflurane vs. propofol anesthesia
- Caudal or lumbar epidural

Ingelmo et al, *Pediatr Anesth* 2007; 17: 255-62

Effect of Anesthesia Technique on Epidural Anesthesia

| | TIVA | Volatile | p-value |
|---|-----------|-----------|---------|
| Onset time (min) | 4.7 (0.7) | 3.1 (0.2) | <0.001 |
| Pain at wake up | 2 (4) | 9 (15) | 0.01 |
| Supplemental analgesia | 10 (19) | 16 (27) | -- |
| Bromage score >1 at 180 min (0-24 months) | 3 (6) | 7 (12) | 0.03 |

Ingelmo et al, *Pediatr Anesth* 2007; 17: 255-62

Continuous Peripheral Nerve Blockade

- Children's Hospital of Philadelphia
- Consecutive cases 02/2003 to 07/2006
- Patients prospectively followed
- Contemporaneously collected data

Ganesh et al, *Anesth Analg* 2007; 105:1234-42

Continuous Peripheral Nerve Blockade

- Total - 226 catheters in 217 patients
- Ambulatory – 112 catheters in 108 patients
- Mean duration 48.4 ± 29.3 hours (range 0-160 hr)
- 6/226 (2.8%) patients had complications
 - Prolonged numbness (n=3)
 - Superficial cellulitis (n=1)
 - Difficulty removing catheter (n=1)
 - Drug overdose/tinnitus (n=1)

Ganesh et al, *Anesth Analg* 2007; 105:1234-42

Peripheral Nerve Block with Nerve Stimulation

- Children's Hospital of Philadelphia
- Consecutive cases 10/2002 to 07/2006
- Nerve blockage via single-injection using peripheral nerve stimulator

Gurnaney et al: *Anesth Analg* 2007; 105: 1605-9

Peripheral Nerve Block with Nerve Stimulation

- 660 patients, age 13.8 (range 2-18 yrs)
- Current between 0.2 – 1 mA (mean = 0.5)
- 96% success rate
- Stimulation threshold success rate
 - < 0.5 mA = 96.3%
 - > 0.5 mA = 95.9%
- Prolonged numbness 72 hrs (n = 2)

Gurnaney et al: Anesth Analg 2007; 105: 1605-9

Clonidine in Peripheral Nerve Blockade

- Children's Hospital of Philadelphia
- Consecutive cases 10/2002 to 12/2005
- Prospective follow-up by nurses Q4 hrs
- Local anesthesia: bupivacaine vs. ropivacaine
- Clonidine 1 mcg/kg (max 100 mcg)

Cucchiaro and Ganesh, *Anesth Analg* 2007; 104:532-7

Clonidine in Peripheral Nerve Blockade

- Local anesthesia (LA) only – 215 patients (47%)
- LA + Clonidine (LAC) – 220 patients (53%)
- Duration:
 - LAC 17.2 ± 5 hr; LA 13.2 ± 5 hr ($p = 0.001$)
- Motor blockade:
 - LAC 9.6 ± 5 hr; LA 4.3 ± 4 hr ($p = 0.014$)

Cucchiaro and Ganesh, *Anesth Analg* 2007; 104:532-7

Ultrasound Guidance for Sciatic & Femoral Nerve Block

- Prospective clinical trial (n = 46)
- Randomized ultrasound vs. nerve stimulator
- Levobupivacaine local anesthesia
- ↑ HR >15% from baseline during surgery

Oberndorfer et al: *Br J Anaesth* 2007; 98: 797-801

Ultrasound Guidance for Sciatic & Femoral Nerve Block

| | Ultrasound | Nerve Stimulator | P-value |
|---------------------------|-------------|------------------|---------|
| Age (years) | 5 (1-8) | 5 (1-8) | -- |
| Weight (kg) | 19.4 (8) | 18.3 (7.4) | -- |
| Surgery time (min) | 56 (15-130) | 47 (15-180) | -- |
| Anesthesia volume (ml/kg) | | | |
| sciatic | 0.2 (0.060) | 0.3 | <0.001 |
| femoral | 0.15 (0.04) | 0.3 | <0.001 |
| Additional analgesia | 0 | 2 | -- |
| Analgesia duration (min) | 508 (178) | 335 (169) | <0.001 |

Oberndorfer et al: Br J Anaesth 2007; 98: 797-801

Ilioinguinal / Iliohypogastric Nerve Block

- 62 patients having inguinal hernia repair
- Blockage via standard anatomic landmarks
- 0.3 ml/kg 0.5% bupivacaine
- Ultrasound determined location LA
- Success define by
 - Ultrasound location
 - < 10% HR or BP from baseline

Weintraud et al: *Anesth Analg* 2008; 106: 89-93

Ilioinguinal / Iliohypogastric Nerve Block

- Ultrasound determined location LA
- 14% blocks successful by ultrasound
- 86% defined as failure by ultrasound location
 - Internal oblique abdominal muscle (29%)
 - Transverse abdominal muscle (26%)
 - Iliac muscle (18%)
 - External oblique abdominal muscle (9%)
 - Subcutaneous (2%)
 - Peritoneum (2%)
- 45% ultrasound failure were clinical failures

Ultrasound-guided Ilioinguinal / Iliohypogastric Block

- 40 consecutive patients schedule inguinal hernia repair
- Ultrasound location nerves identified
- 0.25% levobupivacaine infiltrated
- Modified step-up/step-down approach
(n=10, initial 0.2 ml/kg)
- Success = <15% increase HR and/or BP after infiltration

Willschke et al: *Anesth Analg* 2006; 102: 1680-4

Ultrasound-guided Ilioinguinal/Iliohypogastric Block

- All nerve could be visualized
- Response at skin incision
 - 0.2 ml/kg: 0/10 (success)
 - 0.1 ml/kg: 0/10 (success)
 - 0.075 ml/kg: 0/10 (success)
 - 0.05 ml/kg: 3/10 (failure-Rx with fentanyl and acetaminophen)
- Defined optimal volume 0.075 ml/kg

Willschke et al: *Anesth Analg* 2006; 102: 1680-4

Summary

- Regional anesthesia is gaining in popularity and utility
- Ultrasound guidance is rapidly becoming 'best' clinical practice
- Practice of peripheral nerve blockade is rapidly expanding

