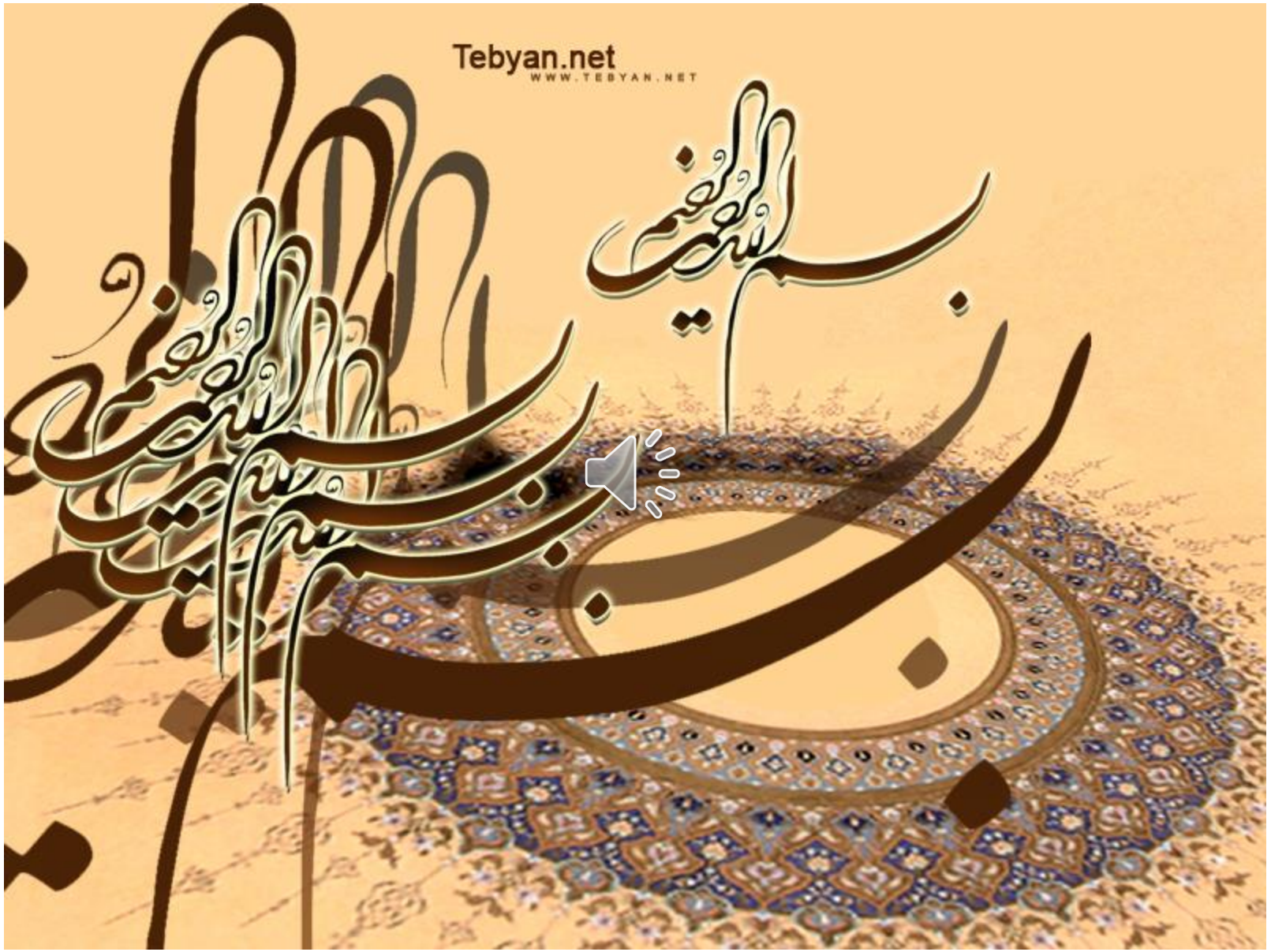
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REGIONAL ANESTHESIA IN CHILDREN

Mahin Seyedhejazi

Professor of Pediatric Anesthesia,
Tabriz University of Medical Sciences

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Objectives

- Introduction
- Differences between Children & adults
- Pharmacology
- Indication,contraindication,..
- **Classification of Regional Anesthesia**
- Caudal block
- Spinal block

Introduction

- Regional anaesthesia in children first studied by August Bier in 1899
- In 1900, Bainbridge reported a case of strangulated hernia repair under spinal anaesthesia in an infant of three months
- Tyrell Gray, a British surgeon published a series of 200 cases of lower abdominal surgeries in infants and children under spinal anaesthesia in 1909-1910

Introduction

The use of caudal analgesia in children was described in the urology literature in the early 1930s.

Body size

- Most obvious
- at birth dura matter ends :S3-S4
- conus medularis:L3-L4
- End of first year: dura matter S2
- conus medularis:L1
- Congenital malformation , genetic disorder , fetal & neonatal asphyxia: resulting in surgical procedures

Delayed ossification of Bones & Fusion of Sacral Vertebrae

- Bones are cartilaginous

- Ossification nuclei can be severely damaged

- **AVOID BONE CONTACT**

anatomy

- **Single Curvature of spine at birth**: same orientation of epidural needles regardless of intervertebral spaces
- **Loose attachment of fasciae & fluidity of epidural fat** : extended spread of LA, high quality nerve block,large volumes of LA required(1.25ml/kg)
- **Delayed myelinization** : myelinzation up to 12 years, LA penetrate & block nerve fibers more easily

LA differences from adult

- Shorter onset time , more extended spread ,shorter duration
- Diluted solutions of LA provide same quality n.block as w/ at least 2fold more concentrated in adults
- High quality n. blockade
- max dose of all aminoamides must be decreased

Pharmacology of LA

- Immaturity of some enzyme pathways : slow LA metabolism ,accumulation after repeat injection

- Progressive increase in body surface area(drug prescription according to body surface area are same as adult(in practice according to body weight)

OPIOIDS

- Elimination half life of neuroaxial opioids increased in infants &neonates
- Short acting lipidsoluble(fentanyl,sufentanyl): not significantly prolong postop pain relief unless repeat injection or continuous infusion(sudden apnea)

Additives

Epi

5ɥg/l or 1/200000,decrease plasma peak con/,prolong duration of block(2-3hr) (especially in children <4 yr)

Detection of accidental iv injection

Decrease absorption of LA by 25%

clonidine:

- Increase duration of block w/o hemodynamic disorder
- Decrease plasma peak concentration
- Slight sedation for1-3 hr
- Clearance in neonates 1/3 adult
- AVOID < 6 MONTHS

additives

- **Ketamin:preservative free ,** S Ketamine

Increase duration of block

0.25-0.5mg/kg

NO significant SE

Not approved for use in USA

- **Other additives(,corticosteroids,Tramadol, Neostigmine,buprenorphine,midazolam): adverse effects,not approved**

Physiologic factors

- Children Frightened by OP,can not cope with anxiety
- Localization of nerve trunks & anatomic spaces reqiures methods independent of patients cooperation (N.stimulator, LOR,USG)
- Sedation or GA may be needed
- Awake versus asleep placement of regional blocks not effect in outcome
- Friendly enviromental condition ,empathy ,explanation on LA pharmacology reduce postop anxiety

indications

1. Anesthetic Indications
2. Intraop & postop analgesia- procedural pain
3. Non surgical pain
4. Chronic pain relief –palliative care
5. Non analgesic indications

Anesthetic Indications of RA

- Not identical to adults
- Testicular torsion at immediate risk of rupture who are not NPO
- Inguinal hernia repair in former preterm infants < 60 weeks of post conceptual age w/ risk of apnea
- Sever acute or chronic respiratory insufficiency
- Emergency conditions in sever metabolic or endocrine disorders
- Neuromuscular disorders,myasthenia gravis
- Some congenital syndromes & skeletal deformities

Cervical instability

- Intubation a risk for tetraplegia
- Chiari malformation
- Achondroplagia
- Down syndrome
- facial deformities,microstomia
- Metabolic disorder(Hunter& Hurler syn/)
- Mandibular hypoplesia
- Epidermolysis bullosa

contraindications & limitations

Absolute Contraindications:

1-sever coagulation disorder (hemophilia,DIC,..)

2-sever infection(septicemia,meningitis…)

3-intracranial tumor w/ increased ICP

4- True allergy to LA(rare even w/ aminoesters)

5- certain chemotheraopies (cisplatin)

6- uncorrected hypovolemia

7- cutaneous or subcutaneous lesions(infection,angioma,tatoo,…)

8- parental refusal

Absolute contraindication to peripheral n.block procedures

True allergy to LA only absolute medical contraindication to peripheral nerve blocks

1-patients at risk for compartment syndrome

2-hemoglobinopathies

3-bone & joint deformities

4- preexisting neurologic disorders

complications

Same as adults,0.12%,major risk factors :age & central blocks

Local cmplications:

1.inappropriate needle insertion(damaging N & surrounding)

2.tissue coding(introduction of epithelial cells into tissues where they do not belong, compressive tumors, spinal canals)

3.injection of neurotoxic solutions(epi to terminal artery)

4.leakage around puncture site(especially w/ cath,partial block failure,bacterial contamination)

Systemic complications

❖ Accidental iv injection, Excessive dosing

- Two types :

1. neurologic ,(tinnitus,malaise,metalic test),masked by GA
2. Cardiac,(heart conduction disorder,arrhythmias, bradycardia ,tachycardia),A/V block, QRS widening,VF ,asystole

- Cardiovascular complications not preceded by neurologic signs, concomitant with cerebral toxicity

LA toxicity

Impaired ventricular conduction is the primary manifestation

Treatment:

- Oxygenation
- Cardiac massage
- Epi(1-2µg /kg)
- Defibrilation (2-4j/kg)
- Intralipid (20% ,2-5 ml/kg) up to 10ml/kg

Significantly higher rate of incidents in neonatal age because of drug errors & LA toxicity

Regional blocks :

- 0.5% adverse incidents
- mostly minor
- majority result from insufficient precaution ,
- Compartment syndrome not hidden by RA ,provided that adequate monitoring

- Use adequate device ,
- Standard precautions
- Tunneling cath
- m/mitochondrial toxicity greater in juvenile : use lower dosage

Selection of block

Based on

1- anatomic consideration must cover areas from which noxious stimuli originate

2-potential morbidity of technique

3-duration of postop/ pain

Selection of equipment

- Tuohy needles :17-21 G,length from 50-90 mm(shorter needles ,25 mm in neonate)
- Caudal A:Only short beveled needles (Crawford needles) with guide or iv cannulas
- USG
- Pencil point needle :no advantage ,decrease success rate ,
- Distance separating tip of the needle from its distal orifice is important

Selection of drug

- Site & severity of surgery
- Expected duration of intense postop pain
- Hospital stay

lidocaine,chloroprocaine ,mepivacaine for outpatient surgery,

Ropivacaine,levobupivacaine ,bupivacaine for inpatient surgery,