

ABOUT ANALGESIA FOR INFANTS DURING TRANSCUTANEOUS ACHILLOTOMY AT TREATMENT OF CONGENITAL CLUBFOOT BY PONSETI METHOD

**V.M. Krestyashin, D.Y. Vibornov, A.O. Domarev,
I.V. Krestyashin, A.V. Isakov**

*The Department of Paediatric Surgery of N.I. Pirogov Russian National Research Medical University,
N.F. Filatov City Children's Clinical Hospital №13*

Method of treatment of congenital clubfoot developed by Professor Ignacio Ponseti as the most effective and humane has won the recognition of specialists throughout the world. Currently in our clinic has experience treating more than 400 feet. The main contingent of patients from the children's orthopedist using the Ponseti method, children first months of life, which in most cases required percutaneous achillotomy. It is known that the condition of hyperalgesia in the neonatal period may alter the "program" of response to pain in the future and lead to the appearance of pain behavior in response to nabulivou stimulus. The use of local anesthetic injection may create technical difficulties in the location of the tendon. This has prompted us to search for an optimal patient-physician method of analgesia manipulation, which was a comparison of different schemes of anesthesia and sedation in achillotomy in newborns in the outpatient setting. A long tradition of interdisciplinary links within the same clinic allowed us to undertake the present study — a joint work of children's orthopedists and anesthesiologists.

One of the main tasks of the anesthesiologist is pain management during and after surgery. Pain, as defined by the International Association for the study of pain is an unpleasant sensory or emotional experience associated with established or potential tissue damage, or described such damage. Pain is always subjective and each individual uses in their description of the word in accordance with previous life experience (IASP, 1979). The formation of nociceptive pain is provided by the analyzer in response to the effects of damaging factors, or oxygen starvation of tissues. In the body there are and antinozipeptivna system that monitors the nociceptive system and prevents overexcitation (increase in braking effect in response to the growing strength of the nociceptive stimulus).

Unfortunately, more recently, in the early 80-s of the last century it was believed that the newborn is



V. M. Krestyashin MD, prof.



D.Y. Vibornov MD, prof.



A.O. Domarev MD



I.V. Krestyashin MD, ass. prof.



I.V. Isakov MD, ass. prof.

insensitive to pain, and premature babies do not feel it at all. Appropriate medical procedures were carried out sometimes "Malaguena" way from the standpoint of pain and pain relief known to date. Misconceptions regarding neonatal pain, there are to date:

— newborns do not have the neurological basis for the perception of pain and therefore do not feel pain or less sensitive to it;

- newborns do not remember pain, and it has no adverse effects;
- newborn too dangerous to prescribe pain medications because of the high risk of side effects.

Features of the nociceptive system of the newborn are: low pain threshold, prolonged response to pain. The large width and overlap of receptor fields, and an immature system of descending control contribute to the higher sensitivity to pain influences at this age (Tibboel D., Anand K. J., 2006, Simons S. H 2006).

Given the above, it is necessary to acknowledge the existence of neonatal pain; and we may even believe that they are more intense than in adults and older children. However, the perception of pain itself is not the biggest problem when carrying out painful manipulations in neonates. It is proven that excessive activity in the developing Central nervous system caused by pain, alters and impairs normal synaptic development. The FLACC scale was developed by the staff of the University of Michigan in 1997 to assess pain intensity in young children (not yet able to speak) in the postoperative period; based on behavioral responses. Assessment can be done awake baby and sleeping.

Interpretation of results: 0 points — the child is relaxed and feels comfortable; 1–3 points — mild discomfort; 4–6 points — moderate pain; 7–10 points — severe discomfort and/or pain.

Scale Douleur Aigue Nouveau-né (DAN) is a behavioral scale developed to quantify acute pain in newborn infants. It is believed that when indicators of pain ≥ 3 treatments painful in 95% of cases, with pain ≤ 2 procedures are painless in 88% of cases. Other behavioral scale for assessment of pain in children generally similar to the one presented.

When deciding on the tactics of management of children with pain syndrome, the doctor needs to weigh the immediate risks and benefits of analgesia in the infant, as well as to analyze possible long-term effects as recurring episodes of acute pain and prolonged anesthesia (if required). The fight against pain in children includes preventive measures, nonpharmacological and pharmacological means.

Prevention of acute pain in newborns:

- limiting the number of painful procedures;
- painful procedures should ensure trained personnel;
- ensure adequate sedation before invasive procedures;
- the use of appropriate atraumatic/traumatic equipment and tools.

Non-pharmacological methods:

- delicate swaddling, the baby support comfortable body position rolls;

- solution of sucrose 24%, 2 ml for 2 min before the procedure and several times during its conduct (oral); also the application of glucose solution 40%;
- contact "skin to skin" mother and child (touching, stroking, etc.);

Pain relief medication:

1) local anesthetics:

— EMLA (EMLA — Eutectic Mixture of Local Anesthetics) is a mixture of 2.5% lidocaine and 2.5% prilocaine based cream (put not later than one hour prior to the procedure);

— tetracaine cream 4% (amethocaine), onset of action in 30–40 minutes;

— lidocaine (subcutaneously; buffering the lidocaine solution (1/10 diluted with a solution of bicarbonate 1 mEq/ml) can reduce the start time without affecting the efficiency and duration of anesthesia);

2) NSAIDs:

— paracetamol: 10–12 mg/kg orally every 4–6 hours; 20–25 mg/kg rectally every 4–6 hours.

— ibuprofen: 5–10 mg/kg every 6–8 hours orally; 10 mg/kg intravenously, with repeated doses at a dose of 5 mg/kg after 24 and 48 hours (for closure of the arterial duct);

3) opioid analgesics:

— fentanyl: analgesia and sedation of 1–2 mcg/kg IV slow jet every 2–4 hours; anesthesia — 20–50 mcg/kg;

— morphine: analgesia — 100 mcg/kg by slow intravenous or intramuscular injection every 10–12 hours; infusion in severe pain — an intravenous bolus of 100 μ g/kg for 1 hour, and then 10–15 mcg/kg/h;

4) sedation: children as a sedative drug is most appropriate is midazolam (dormicum), because it has a more pronounced and rapid anxiolytic and sedative effects compared to other benzodiazepines; 0.2 mg/kg slowly intravenously/ intramuscularly/ orally.

Since our study focuses on the problem of anesthesia achillotomy in the treatment of congenital clubfoot by the Ponseti method, note that the attention this issue is given little information about the anesthesia rather meager, and largely limited to recommendations on the implementation of local anesthesia and light sedation. It is also possible to perform operations under General anesthesia. As we use a local anesthetic EMLA (cream lidocaine-prilocaine); there is evidence of the successful use of this local anesthetic during operations in newborns, particularly when circumcision. In addition, orthopedic manipulation in infants use of NSAIDs — paracetamol and ibuprofen. Ibuprofen is more preferable as compared with other NSAIDs or paracetamol it has the following advantages: unlike paracetamol does not form toxic metabolites, and its toxicity after accidental or

deliberate overdose below; ibuprofen has a relatively high therapeutic index (about 4 times higher than that of paracetamol); number of NSAID ibuprofen is better tolerated by adults and is characterized by greater tolerance in children; use of ibuprofen leads to the development of Reye's syndrome; unlike paracetamol ibuprofen has anti-inflammatory effect. Ibuprofen are increasingly used in babies and even premature babies.

In the present study 2011–2015 included more 100 children in the age from 1.5 to 11 months of life with unilateral idiopathic congenital clubfoot. Equivalent to using medical support for patients with bilateral pathology, we have not included them in this study. All patients hellotime was conducted as a phase of treatment to address the equinus component of the deformity were performed on an outpatient basis. After the procedure, superimposed circular plaster bandage with overcorrection of the deformity.

The main contingent of patients pediatric orthopedics, treating the Ponseti method, children first months of life, which in most cases require a percutaneous achillotomy. It is known that the condition of hyperalgesia in the neonatal period, influences the development of the system of nociception, changes the 'program' of response to pain in the future and leads to the appearance of pain behavior in response to nabulivou stimulus. The use of local injectable anesthesia may create technical difficulties in the location of the tendon. The clinical effectiveness of different schemes of sedation and analgesia were evaluated in five samples: 1 group — 9 children — oral sedation Midazolam 0.2 mg/kg + Ibuprofen suppositories + EMLA cream; group 2 — combination of sedation with Ibuprofen — 9 patients; the third group consisted of 7 children with anesthesia Ibuprofen; the fourth of 6 children with applicational anesthesia. The fifth group consisted of children who used a combination of local anesthesia: EMLA with lidocaine injection to 7 patients. For child's comfort during the procedure was used 40% glucose solution.

Evaluation of behavior and pain response during the procedure was conducted three times: during the modified incision, the application of local antiseptics and modelling plaster bandage with dorsal flexion of the foot was Used by North American and European scales FLACC and DAN.

Fewer points were awarded to children who are most comfortable with undergoing the procedure, more patients are experiencing maximum discomfort. So, the minimum score was observed in groups that used sedation, the average score among children in groups of Ibuprofen and local anesthesia with Lidocaine. Maximum score was observed in patients who underwent only anesthesia application. In group c

stand-alone application EMLA, the points earned in both scales testified about inadequate pain child protection that could lead to serious consequences of uncontrolled pain. The result of analgesia when using NSAIDs in the group III correlated with the effect of local injection anesthesia in group V, which is essential for the comfort of the doctor, as it allows to avoid difficulties with the detection of the tendon under infiltration anesthesia with preservation of adequate analgesia. In a group where sedation combined with anesthesia ibuprofen and EMLA local application, was marked by the optimal level of sedation and analgesia.

The obtained data have found wide clinical use in our practice, confirming its effectiveness. We apply the method of medical support achillotomy in children can be recommended a wide range of children's orthopaedic surgeons involved in the treatment of congenital clubfoot by the Ponseti method.

REFERENCES

1. **A. A. STEPANOV, G. V. YATSYK, L. S. NAMAZOVA** Method of preventing pain in infants during vaccination // *Pediatric pharmacology*, 2007, No. 1
2. **SYNKOVA G. F.** Main problems of nurses in assessing pain in infants // *Home nurse*, No. 12–2009
4. **ZHIRKOVA YU. V.** Prevention and treatment of pain in newborns with surgical diseases. The dissertation on competition of a scientific degree of the doctor of medical Sciences; Moscow, 2011.
5. **ANAND K. J. S., BERGQVIST L., HALL R. W.** Acute pain management in Newborn Infants // *PAIN: clinical updates*, Vol. XIX, Issue 6
7. **LYNN STAHELI, IGNACIO PONSETI, & OTHERS.** Clubfoot: Ponseti Management, 2009
8. **YORAM HEMO, EITAN SEGEV, ARIELLA YAVOR, DROR OVADIA, SHLOMO WIENTROUB, SHLOMO HAYEK AND** The influence of brace type on the success rate of the Ponseti treatment protocol for idiopathic clubfoot // *Journal of Children's Orthopaedics*, 2011, April, 5(2)
9. **V. F. LANDINSKY, M. A. VAVILOV, T. E. A. L. SKLADNEVA.** Treatment of children with congenital clubfoot by the Ponseti method I. // *Traumatology and orthopedics Russia*, 2008, 2(48)
10. **LUCASZ MATUSZEWSK, LESZEK GIL, AND JACEK KARSKI** Early results of treatment for congenital clubfoot using the Ponseti method // *European Journal of Orthopaedic Surgery & Traumatology* 2012, July, 22(5)
11. **MILIND M PORECHA, S DIPAK PARWAR, HIRAL R CHAVDA** Mid-term results of Ponseti method for the treatment of congenital idiopathic clubfoot – (A study of 67 clubfeet with mean five year follow-up) // *Journal of Orthopaedic Surgery and Research*, 2011, 6
14. **Good Practice in Postoperative and Procedural Pain Management**, 2nd Edition. A Guideline from the Association of Paediatric Anaesthetists of Great Britain and Ireland / *PEDIATRIC ANESTHESIA*, Volume 22, Issue s1, July 2012