

Comparative pharmacological studies on the method of sodium channel inhibition by local anesthetics, anticonvulsants and antiarrhythmics and the use local anesthetic mixtures in brachial plexus block with axillary approach

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Background: Hand surgery is a sub division of plastic surgery which implies special skills from both the surgeon and anesthetist. Thus the anesthesia has to ensure patients comfort and surgeon's comfort during surgery, as well. The postoperative period has to be covered as well by an appropriate analgesia.

Regional anesthesia has some advantages compared to general anesthesia. Among these we can point out the avoidance of hemodynamic instability, of airways manipulation, the elimination of systemic drug side effects, especially of opioids, both in the intraoperative and postoperative period. In order to achieve these results, the anesthetic substances that have to be used have to confer both a good quality anesthesia and analgesia, which should last for a long period of time.

This thesis reaches these goals by experimental studies on local anesthetics, by clinical studies on performing regional anesthesia through revolutionary methods and also by studies which have in sight the postoperative period, describing the use of special techniques and devices.

The thesis is structured as follows: a general part, where the current knowledge on the subject is presented, and a special part which comprises three studies.

Out of the three studies, **the first is an experimental study**, conducted in Budapest at the Experimental Medicine Institute, together with a Hungarian team. The results of this study were the identification of the exact binding site of local anesthetics on voltage gated sodium channel and the pH dependence of several drug categories. The correlation between the chemical

properties and the pH dependence, guided us towards a general perspective on some details about the access pathways along the sodium channel of the inhibitory molecules. In this experimental study we identified some chemical disturbances which interfere with local anesthetic action.

The clinical studies were conducted in the Emergency Clinical County Hospital from Tîrgu Mures, in the Anesthesiology and Intensive Care Clinic with the collaboration of the Plastic Surgery Department from the hospital.

The clinical studies focused on the methods of brachial plexus block performance, by two different methods, the result highlighting the superiority of ultrasounds in regional anesthesia as well as the efficacy of local anesthetic mixtures.

The final part of this thesis focused on postoperative analgesia achieved by inserting perineural catheters at the brachial plexus site. Through these devices the local anesthetic mixture was administered for the anesthesia at the beginning and in the postoperative period for analgesia. The insertion of these perineural catheters conferred a good quality analgesia and it can be used for subsequent anesthesia as well. The presence of such device eliminates the risk of second effects of systemic administered drugs, especially of opioids.

In conclusion the thesis answers to some questions about the mode of how local anesthetic reach the binding site and how tissular or plasmatic pH can influence the action of drugs and establishes the exact role of the ultrasounds in regional anesthesia, nu just as an auxiliary method, but as a main method used in peripheral blocks performance.

Key words: *local anesthetics, sodium channel, pH dependence, regional anesthesia, ultrasound, perineural catheter.*