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MEĐUNARODNI SIMPOZIJUM

O EKSPERIMENTALNOM TREMORU

1 — 3. APRIL 1971. GODINE

Urednik
PAVEL ŠTERN,
redovni član Akademije nauka i umjetnosti
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RHYTHMICAL ACTIVITY IN THALAMIC AND SUBTHALAMIC STRUCTURES

During stereotactic interventions in different types of Tremor we tried to analyse electrophysiologically subcortical motor structures in order to elaborate functional topographic Dates. We used a precoronary borewhole, the diameter of the leading cannula was 1 mm, the electrode was insulated up to the tip of 5—10μ in diameter, the recording was unipolar. Subcortical activity was first preamplified, then recorded on type-recorder and following the operation confirmed by means of a direct-recorder. Tremor activity in the muscle of the limbs (EMG), was recorded by flexible wire electrodes.

I should like to show you the activity in thalamic and subthalamic structures simultaneously with the tremor activity in the limbs: when the electrode reaches the thalamus, spontaneous activity occcurs all of a sudden, as you know. We first pass the dorsal oral nucleus of the thalamus in our approach before we reach the ventro-oral nucleus.

Increase of rhytmic tremor-activity can be provoked by letting the patient count down, a seen in slide 1. I should like to emphasize that rhythmical activity occurs in this nucleus b e f o r e tremor activity in the flexors of the forearm can be detected. The following slide Nr. 2 demonstrates once more the time-relationship between the peripheral tremor and central rhythmic activity, with faster sweep. Whereas figure 1 showed central rhythmic activity before peripheral activation in the flexor muscle we can observe in slide 3 from the Vop central rhythmic activity that is continuing even though the arm-tremors is inhibited by passive manouvre. The proof that we are dealing with cell-activity is this typical »dying cell-activity«, as you see. This lesion can be due to movement of the brain by respiration or pulsation. With faster sweep, you may see in slide 4 that passive inhibition of arm-tremor does not influence that frequency or central rhythmic activity but recruitment within the single bursts.

Passing from thalamus to subthalamus we find a remarkable reduction in spontaneous activity, — in contrast to the approach to the thalamus, as seen in slide 5. At first (— 2,5) ve don't find any rhythmic activity, but further penetrating on to — 7,5-approximately the lateral border of the nucl. ruber — rhythmical activity reoccurs, but the frequency is different from the original one before. On the other hand we can observe

rhythmical activity in subthalamic regions with the same frequency as in peripheral tremor as seen in slide 7 in the position — 4, the borderline between the prelemniscal radiation and the zona incerta. Further penetration often results in a complete tremor — stop in the arm, as we will se later; but in that case we usually will find rhythmic central activity with the frequency of the original tremor (8). This indicates that the electrode is located within the dentato thalamic tracts, laterally from the nucleus ruber. Here we are very close to the lemniscus medialis, where evoked potentials can be recorded but not as easily as in the lemniscus itself as well as in the sensory relay nuclei of the thalamus. These evoked potentials seem to originate from joint. Receptors as seen in slide 9 and 10. The identification of the lemniscus can further be achieved by stimulation: sensory sensation often provoke nociceptive motor-responses (i. e. reflexes). (Slide 11). Stimulation in position — 2, — approximately the prelemniscal radiation — evokes only a minimal motor-response: the latter will increase with further penetrating into the lemniscus medialis (position — 4 — 8) often resulting in rhythmic nociceptive responses, the sensory as well as motor effects being dependant upon the intensity as well as frequency of the stimulation (Slide 12).

Rhythmical activity in subthalamic structures seems to play an important role in the peripheral tremor. This will be further confirmed by the fact, that penetration of the electrode alone can cause a remarkable modification of the tremor in the limb. (Slide 13).

We should like to emphasize that we are able to produce this remarkable reduction or even complete stop of the tremor from a very discrete region i. e. the dentato-thalamic tracts predominantly. It seems reasonable to conclude that this system plays an important role in the genesis of tremor, but this problem should still be further discussed. Our recordings seem to confirm the morphological concept especially of Hassler, indicating dentato-thalamic afferents to the Vop since we were able to record rhythmic activity not only in Vop but also in the subthalamus. It therefore seems reasonable to assume that not only the Vop plays an important role in the tremor genesis but we have also to take into account the cerebellar influences upont this nucleus.

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RITMIČKA AKTIVNOST U TALAMUSU I SUPTALAMIČKIM STRUKTURAMA

KRATAK SADRŽAJ

Spontana izazvana aktivnost u raznim supkortikalnim strukturama proučavana je tokom stereotaktičkog tretmana ekstrapiramidalnih sindroma. Kod Parkinsonove bolesti ritmički potencijal iste učestalosti, kao Parkinsonov tremor, registrovani su manje ili više konstantno u predjelima talamusa i suptalamusa.

Razmotrene su sljedeće tačke:

1. odnos između perifernog tremora i ritmičke aktivnosti talamusa i suptalamusa;

2. odnos između ritmičke aktivnosti u različitim nukleusima predjela talamusa i suptalamusa.

DISCUSSION

Jušić: Is there any correlation between the rhythmic activity in subthalamic structures and nociceptive reflex?

Struppler: When you stimulate the med. lemniscal fibre with increasing stimuli firts you will produce a sensory sensation in the patient without any motor response. With greater stimuli often there becomes a motor response dependent of the pain-sensation, in the leig, i. e. a nociceptive reflex response.

Bruggencate: Since the voltage for a threshold stimulation is so very much depended on a given electrode (e. g. resistence, polarisation) I wonder if you also measured the current for the threshold stimulation. I feel this may help you to compare both results and electrode localisation in different patients.

Struppler: Up to now we have not measured sistematically the role of the stimulus intensivity that means the current intensivity for identifying different motor structures, like N. ruber. Thank you for your remarks, this method will be helpful for us to identify for example the N. ruber system.

Dimitrijević: One dull, stereotypical question. In how many patients you have collected this results you have presented?

Struppler: No, we were n'table to record »silent cells« when the patients was cuonting which was described by Bates. As far as I know, Bates has recorded this types of cells in thalamic structures whereas our recordings was taken especially in subthalamic structures.