AUTOMATED DETECTION OF K-COMPLEXES: CHARACTERIZATION OF BENZODIAZEPINE EFFECTS.

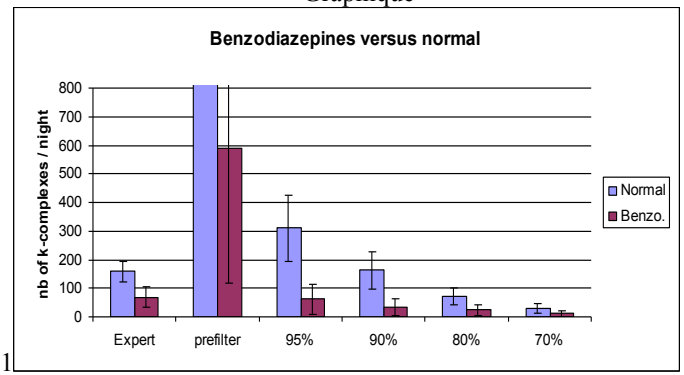
A. Coatanhay[1], C. Richard[2], R. Lendellé[2], A. Muzet[3] and J.P. Macher[1]

1. FORENAP- Institute for Research in Neurosciences, Neuropharmacology and Neuropsychiatry, Centre Hospitalier, 68250 Rouffach, France.
2. LM2S, Laboratoire de l'Université de Technologie de Troyes, 10010 Troyes Cedex, France.
3. CEPA-CNRS UPS 858, Centre d'Études de Physiologie Appliquée, 67087 Strasbourg Cedex, France.

We have recently proved (Coatanhay et al. 1999; Richard et al. 1999) that an automated detector, based on time frequency approach, could be one of the most selective automated detector of K-complexes. In fact, we consider a standard linear prefilter and pattern recognition in time-frequency domain. To train the time-frequency receiver, the all-night sleep recordings of 3 healthy young volunteers were scored by 6 experts. The test set was obtained in the same way with 3 other healthy young volunteers. 12 EEG derivations were displayed on screen and common scoring criteria were set together with the experts. Nevertheless, the detection of K-complexes is a very difficult problem, and, in spite of the great selectivity of our detector, the number of false positive is still quite high, in practice. Yet, in this paper, we show that, in clinical conditions, our detector could be very useful to discriminate subject receiving a pharmacological treatment from healthy subjects.

The figure compare human experts scoring (3 experts using only a single central EEG derivation displayed on screen) from automated detection, in two cases: a group receiving benzodiazepine and a normal group. It has been proved (Kubicki et al. 1988) that benzodiazepines reduce the number of K-complexes. The threshold of the time-frequency receiver is adjusted so that the true positive rate is 100% (only prefiltering), 95%, 90%, 80% and 70%. With the exception of the first threshold (only prefiltering) , the automated scoring give a very significant difference between benzodiazepine group and the normal group. This figure must be considered as a preliminary result (only three subjects in each group), and other subjects are to be studied for confirming the efficiency of automated K-complexes detection.

Graphique



1

Coatanhay A., Richard C., Lengellé R., Muzet A. and Macher J.P. Time-Frequency detection of K-complexes. Methodology and performance estimation. *Proc. Third international congress WFSRS*, Dresden, 1999.

Richard C. and Lengellé R. Data-driven design and complexity control of time frequency detectors. *Signal Processing*, 1999, 77(1).

Kubicki ST., Haag-Wüsthof C., Röhmel J., Herrmann W. M. and Scheuler W. The pharmacodynamic influence of three benzodiazepines on rapid eye movements, K-complexes and sleep spindles in healthy volunteers. *Human psychopharmacology*, 1988, (3), 247-255.

Keywords: K-complexes, Automated detection, Benzodiazepines.