



Utility of a questionnaire tool (QUARAS) for localizing and lateralizing seizures in the epilepsy monitoring unit (EMU)



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ABSTRACT

Objectives: An accurate description of the seizure semiology improves the recognition of the ictal onset zone and helps in hypothesizing the possible epileptogenic zone (EZ). Semiology based on a reliable description of seizures may be as good as investigative modalities, as has been shown by numerous studies. The main objective of this study was to apply a questionnaire-tool for auras and semiology (QUARAS) in refractory epilepsy cohort and compare its yield to that of standard history-taking.

Methods: A drug refractory epilepsy cohort of 139 subjects was selected, based on inclusion and exclusion criteria. All subjects underwent routine history-taking, and a structured interview with QUARAS (in Hindi language) about 3–6 months later when they were admitted for pre-surgical work-up (Video-EEG, MRI, SPECT and PET), by an epilepsy nurse. Seizures were localised and lateralised at the each step separately, in a blinded manner; concordance with the final hypothesis was checked, after the epilepsy-surgery case-conference, and statistical significance of the difference calculated.

Results: Auras were reported in significantly more number of patients after administration of QUARAS ($p < 0.001$); there was also higher concordance between the final hypothesis and the localization and lateralization based on QUARAS than an unstructured history ($p < 0.001$).

Conclusion: Administering a structured questionnaire in the native language of patients by trained personnel leads to better localisation and lateralisation and may help arrive at a hypothesis about the EZ.

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1. Introduction

An accurate description of seizure semiology plays a pivotal role in the presurgical evaluation of drug refractory epilepsy (DRE) [1–3]. Several studies so far on ictal semiology and surgical outcomes of temporal as well extratemporal resections validate this [4–10]. The localizing and lateralising value of auras improves the recognition of the epileptogenic zone (EZ) – the information obtained from clinical description of seizures is as good as

that derived from investigations like Video Electroencephalography (VEEG), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography (SPECT) [9]. In our setting it has been noted that patients are unable to describe auras, possibly due to a limited vocabulary, or inability to effectively communicate- their language and/or dialect being different from that of the examiner, India being the land of many dialects and languages. Also, initial ictal motor manifestations are not carefully observed, as the caregivers are either too overwhelmed in the consequence of a generalization, or are involved in giving primary aid and preventing injury to the patient. Hence, our objective in this study was to administer a questionnaire tool of auras and semiology to our DRE patients undergoing presurgical evaluation, and to compare the clinical information and

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the tool with the data derived from investigations (VEEG, MRI, PET and ictal SPECT).

2. Materials and methods

This was a prospective, observational study carried out at the Centre of Excellence for Epilepsy, at the All India Institute of Medical Sciences, New Delhi, India. All DRE (defined by ILAE, 2010) patients undergoing presurgical evaluation were screened over a period of two years, and 278 patients with single discernible MRI lesions and ability to answer to questions in the Questionnaire were identified for recruitment [11]. Subjects who could not undergo long-term VEEG monitoring till the end of the study-period were not included; the subjects in whom the EZ could not be localised with the available investigations were also excluded from the final analysis. Details of history with seizure semiology were sought from all the recruited patients and their caregivers, and duly recorded in their case-files. These subjects were then admitted to the Epilepsy Monitoring Unit (EMU) and underwent VEEG, after a variable period of three to six months. Some also got PET and ictal-SPECT done, as per the discretion of the neurologists supervising the EMU. During this stay, they were administered the questionnaire tool of auras and semiology (QUARAS), which consists of a set of questions on various types of auras and motor phenomenology of seizures. (appendix1) It was designed by neurologists who were part of the study, based on available literature and evidence, in the English language. It was translated into the local language (Hindi) and then back to English, and checked for linguistic and content validity. The Hindi-version of the tool was administered by the epilepsy-nurse; questions on auras were asked to patients, and those about motor phenomenology were put to the caregivers who had witnessed at least two of the patients' habitual seizures.

A conclusion about the probable lateralisation (right/left/unclear) and localisation (temporal/extra temporal/unclear) of the EZ was drawn by two neurologists independently at two steps-first, at the initial interview in the OPD- referred to henceforth as step one; and second, after the QUARAS was administered-referred to henceforth as step two. The gold standard with which the localization and lateralization at steps one and two were compared was a substrate on the MRI and concordant (right or left; temporal or extratemporal) ictal onsets on scalp recordings of the VEEG. If there was no concordance between the VEEG localization and MRI lesion, comparison was done with the region of the brain hypothesized to be the EZ after discussion of the case along with the results of PET and/or SPECT scans at the weekly multi-speciality epilepsy surgery case-conference. The investigators who derived localisation and lateralisation based on semiology were blinded to all the investigation reports till this case-conference.

2.1. Definitions and terminology used in the study

Epilepsy was defined as per standard criteria in patients who had two or more unprovoked seizures (Commission on Classification and terminology International League against Epilepsy, ILAE, 2001) [12]. Focal epilepsy was defined as per the latest ILAE (2010) terminology as those without impairment of consciousness or awareness, those with observable motor or autonomic components and those only involving subjective sensory or psychic phenomenon [13]. Aura was defined as per the standard definition as the part of the focal seizure which the patient experiences (Commission on Classification and terminology ILAE, 2001) [12].

2.2. Statistical analysis

Fisher exact test was used to calculate statistical significance (p value less than 0.05) of the differences between results of steps one and two.

3. Results

Of the 278 DRE patients identified for the study, 34 could not undergo long-term VEEG monitoring till the end of study period; in 20, there was more than one lesion in the MRI, on review by neuro-radiologists; and in 85, the EZ could not be identified with the available investigations. Hundred and thirty-nine subjects were finally recruited, and four hundred and forty-five seizures recorded, on long-term VEEG monitoring.

3.1. Baseline characteristics

Mean age of the subjects was 21.2 ± 10.30 years. The average duration of epilepsy was 10.29 ± 9.11 years. Fifty-seven out of 139 (41%) patients were on more than two AEDs.

3.2. Auras

Auras were reported in 21.58% (30 out of 139) in step one, and in the second step 61.15% (85 out of 139) ($p < 0.01$). Localisation and lateralisation was done based on semiology and seizures were classified as temporal, extra temporal or unclear in both groups.

3.3. Localisation and lateralisation of seizures: clinical analysis

Seizures were classified in steps one and two as temporal in 50 (35.97%) and 60 (43.16%) patients, extra-temporal in 30 (21.58%) and 51 (36.69%), and unclear localisation in 58 (41.72%) and 27 (19.42%) patients, respectively. The number of patients whose localisation could not be identified based on the semiology was higher at step one- 42% as against 20% at step 2, $p < 0.01$.

Seizures in steps one and two were lateralised based on semiology as arising from the left hemisphere in 32 (23.02%) and 64 patients (46.04%), 62 (44.60%) and 47 patients (33.81%) from the right, and in 44 (31.65%) and 28 subjects (20.14%) as unclear respectively. Lateralisation was unclear in about 32% after step one as against 20% after step 2 ($p = 0.0396$).

Auras were reported in the QUARAS by 50 (62.5%) patients with 'high' seizure frequency (arbitrarily considered ≥ 4 /month), and by 35 (59.3%) of those with lower seizure-frequency, $p = 0.72$.

There were, out of 139 subjects, 54 educated beyond tenth grade, and of these, 37 (68.51%) reported auras on QUARAS. Out of those educated less than tenth grade 48 (56.47%) did and 37 did not have auras when the tool was administered. The influence on educational status was, however not statistically significant ($p = 0.211$).

3.4. Localisation and lateralisation of seizures: investigative analysis

After the epilepsy surgery case-conference and based on all available investigations, the EZ was hypothesized as being in the temporal lobe in 67 (48.20%), extra-temporal 62 (44.60%) and 30 patients (21.58%) as unclear; the EZ was lateralised to the left in 60 (43.10%), to the right in 78 (56.11%) and unclear in 19 patients (13.66%).

3.5. Concordance between both domains (clinical and investigative)

When the clinical and investigative modalities were compared, there was concordance for localization in 66 (47.48%) patients at step one and 99 patients (71.22%) at step two ($p < 0.01$).

The concordance for lateralisation between history and investigative modalities was in 54 (38.84%), and 83 patients (59.71%), at steps one and two respectively, $p < 0.01$.

4. Discussion

We compared the yield of eliciting localizing and lateralizing features from the history in patients planned for admission to the EMU (Epilepsy monitoring unit), between a non-structured interview and a structured questionnaire administration. The highly significant number of auras reported on QUARAS is probably because our patients are unable to put their sensory and psychic, and other relevant experiences into words. Many a times, patients say they are able to tell that a seizure is about to come, however the description in their own words is too vague to have any added value to localization, though it may help the patient save himself from injuries. Most of our patients are from poor socioeconomic backgrounds, and not educated beyond primary school. Their limited repertoire of words may be the reason why, when described to them, they were able to identify the sensation felt by them. Also, India being home to diverse populations speaking many languages and dialects may have led to difficulty in communication and hence, a lower reporting of auras. Carefully obtained history had a significantly higher concordance with investigative modalities as well. Similar results were seen in a previous work by Palmini et al., in which thorough history-taking had the same accuracy in predicting the EZ as ictal-EEG, MRI and or PET [9]. Henkel et al. demonstrated that evolution of abdominal aura into automotor seizure differentiated between temporal lobe and extratemporal epilepsy, increasing the probability of the former to 98.3% [14].

We found that 61% reported auras after careful questioning with the tool, which was higher than the yield of auras in the study by Janati et al. [15] This may have been due to direct administration rather than having the patient fill in a mailed questionnaire, as was done in the latter study. Heo et al. compared observers' description of the seizure with that seen on the videotape of the VEEG recording and found correct classification in 85%, and also that the accuracy of seizure semiology description was better, higher the educational level of the caregiver [16]. We also observed that higher the education of the patient higher the yield of the QUARAS, but the difference was not statistically significant. Higher education levels, particularly secondary education and above may have resulted in better language and/or observation skills in these subjects.

Conclusion

Despite advances in neuroimaging techniques, and many more investigative modalities available to us now, semiology elicited by history still remains the backbone of a good presurgical evaluation [1,2,5,17,18]. Therefore, a structured questionnaire administered

by trained personnel may definitely help arrive at an accurate hypothesis in the localization of the EZ, and hence give better seizure-outcomes after surgery.

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