An audit evaluating the utility of ambulatory EEG monitoring

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Background

- Correct diagnosis and electro-clinical classification of epilepsy is important for appropriate management
- The gold standard test for investigating paroxysmal events is long term video telemetry (VT) but availability is sparse and needs inpatient stay
- Ambulatory EEG (aEEG) has emerged as an alternative. The demand for long term EEG monitoring is increasing with the emphasis on recording patients'attacks. The average number of aEEG requests have doubled since 2012
- In comparison to routine EEG and sleep EEG, aEEG is labour intensive and has higher utilization of resources both in terms of technical time input as well as review and reporting. Surprisingly the tariff for aEEG is the same as routine EEG

Aims/Objectives

- To study the patients referred for aEEG so that improved patient selection may be suggested
- To assess impact of aEEG on management from the perspective of both clinician and neurophysiologist

Standards/Evidence Base

- The ILAE and the American Clinical Neurophysiology guidelines recommend long term EEG monitoring to resolve diagnostic uncertainty, to classify the epilepsy syndrome, to quantify seizures, to study circadian patterns and for the electro-clinical basis prior to epilepsy surgery
- ***No existent guidelines at the National level regarding the use and application criteria for aEEG***

Proposed standards for this audit

- Based on the literature we proposed the following standards:
  - All referrals should clearly mention:
    - The reason for the request: 100%
    - Frequency of episodes in question: 100%
    - Details of the description of episodes: 100%
- aEEG should be performed within 6wks of request: 100%
- Duration of aEEG should be at least 24hr: 80%
- Diary maintenance should be adequate: 100%

Methodology

- We analyzed the requests and results of all the aEEGs performed over 6m. (1.12.13-30.5.14)
- The requests were obtained from pediatric neurologists, adult neurologists and pediatricians
- The aEEGs were recorded using XLTEK Trex Ambulatory System. Verification of requests as per the long-term monitoring guidelines was done
- The patient or observer were expected to press an event button during events. A standard diary form was used to note the date and time and nature of events
- The aEEG requests were analysed for pre test diagnosis, demographics and seizure frequency
- Clinicians who ordered the test were asked regarding its impact on management

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Results and Analysis

- No. of aEEG analyzed: 52
- Age of patients referred for aEEG: Average: 22.9y (Adult: 36.2y; Paediatric: 9.6y)
- Sex distribution: M=20; F=32
- Test performed while Inpatient 7 (13.5%). Duration of aEEG: 22.5 -72h. Mean: 24.8h (A:26h; P:23.7h)
- Reasons for referral for aEEG:

Reasons	Adult	Paediatric	Total
Epilepsy	12	19	31
NES	12	0	2
Epilepsy / NES	4	3	7
Epilepsy + NES	8	4	12

- Frequency of events on referral: Daily: 63.4% Weekly: 7.7% Monthly: 5.8% Not stated: 23%
- Behavioural problems: 44.2% (A 30.7%; P 57.69%)
- Sleep related events: 44.23% (A 38.5% P 50%)
- Comorbidities:
  - Adults (34.6%) e.g. Anxiety, headaches, fluctuating consciousness, multiple sclerosis
  - Child(69.23%) e.g. learning disability, autism, cerebral palsy, chromosomal aberrations

aEEG Results

- Inter-ictal epileptiform abnormalities were noted in 19% (A=15, P -6)
- Frequency of attacks reported during monitoring: 38.5% had no events; 1-4: 40.3% ; ≥5: 21%
- Subclinical episodes noted on review: 8 cases
- Alert button pressed noting episodes: 28
- Diary description: Inadequate 13 cases of which 10 were adults. Ictal EEG:

Ictal EEG	A	P	Overall
Normal	16	11	27
Abnormal	2	6	8
Not Applicable	8	9	17

- Technical flaw: 2 cases.
- Final Diagnosis:

	Adult	Child	Total
Epilepsy	1	10	11
NEAD	15	6	21
Epilepsy + NEAD	2	5	7
Unknown	8	5	13

Contribution of aEEG Results

- As per the neurophysiologists opinion: Contributed in 73% cases (A = 65.8%, P = 80.76%)
- As per the clinicians who ordered aEEG: Response received from 5 paediatric and 4 adult neurologists
  - Useful in confirmation of diagnosis, revision of diagnosis and alteration of management: 82% (A 80% P 84%)
- **Non contributory aEEG results:** 15 cases (A=9; P=6)
  - Inpatient 4/7
  - No. of cases not having daily events: 8
  - No. of cases who had no attack during the recording: 12
  - Technical faults: 2

Results as per audit standards

All referrals should clearly mention	Standard	Achieved
Reason for the request	100%	66%
Frequency of episodes in question	100%	77%
Details of the description of episodes	100%	60%
The test should be performed within 6 wks of request	100%	100%
Duration of Ambulatory EEG should be at least 24hr	80%	75%
Diary maintenance should be adequate	100%	75%

Timeline between audit and closing the loop

- Audit data was presented at the governance meetings:
  - 29/7/14 Adult Neurology
    20/8/14 Neurophysiology
    23/9/14 Paediatric Neurology
  - Local guidelines for aEEG drawn
- Re-audit conducted: 1/1/15 - 28/2/15 (Standards used for re-audit: similar to the initial audit)

Results of re-audit

- Total no. of cases: 21 (50% P)
- Reason for obtaining aEEG mentioned in requests: 100%. Diagnostic 75%; Classification of epilepsy 10%; Monitoring purpose 15%
- Frequency of events cited in requests: >4/ week
- Results as per audit standards

All referrals should clearly mention	Standard	Achieved initially	Current
Reason for the request	100%	66%	100%
Frequency of episodes in question	100%	77%	100%
Details of the description of episodes	100%	60%	100%
The test should be performed within 6 wks of request	100%	100%	62%
Duration of Ambulatory EEG should be at least 24hr	80%	75%	90%
Diary maintenance should be adequate	100%	75%	83%
Diagnostic contribution as per: Neurophysiologist Clinician		**73%** **82%**	**82%** **90%**

Conclusions

- Established as a good modality for long term monitoring of patients with paroxysmal events
- aEEG guidelines generated helped in optimizing patient selection and streamlining its use
- Detailed history provided in requests helps in easier data interpretation
- Patients need to be encouraged to use seizure log better
- Call by the technical staff to confirm frequency prior to conducting test helps
- Essential tool for sleep related events like ESES
- Breach of tests due to increased referral and fixed slot availability which need amendment
- Cost effective in comparison to VT hence used optimally can help in management of epilepsy

Future plan

- Re-audit in a years time
- Once we can optimize the use of this modality incorporation of video will be planned

References

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