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PROJECT REPORT

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EFFECT OF YOGA ON SEIZURE CONTROL IN MEDICALLY REFRACTORY EPILEPSY

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CERTIFICATE

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CONTENTS

INTRODUCTION

Inspite of advances in both medical as well as surgical management of epilepsy, there are patients who are unsuitable or unwilling for surgery and continue to get recurrent seizures despite optimal antiepileptic drugs. For these persons with medically refractory epilepsy, presently there is nothing much which can be done. Chronic epilepsy characterized by recurrent unprovoked seizures is often associated with social problems like unemployment, family disharmony, depression and fear of occurrence of seizures and suffer from stress. Stress is considered an important precipitating factor for seizures.

Yoga is an ancient Indian way of thinking and living, meant for spiritual upliftment with the ultimate goal of self realization. Many aspects of Yoga have been described in the Vedas and Puranas and the sage Patanjali divided the practice of yoga into 8 steps – known as *"Ashtanga Yoga"*. But in common practice people recognize Yoga as mere exercises or body postures, which actually is only a component (*asanas*) of Yoga.

Yoga is believed to induce relaxation, a sense of well being and reduce stress. It has been found beneficial in several medical conditions like Hypertension, asthma, etc.

There are only few studies regarding Yoga in epilepsy and involved only small numbers of patients and concrete conclusions cannot be made. Yoga, if proven beneficial, would be an attractive therapeutic option for epilepsy in view of its non pharmacological nature, freedom from side effects and international acceptance.

Therefore this prospective study was undertaken to study the effect of Yoga-Meditation in persons with medically refractory epilepsy.

REVIEW OF LITERATURE

Epilepsy is defined as recurrent unprovoked seizures. It affects 0.5 to 1% of world's population[1]. Approximately 15% of patients with epilepsy continue to have epileptic seizures despite optimal AEDs (antiepileptic drugs) and only about 5% of epilepsy patients are potential surgical candidates. About 10% patients are refractory to all modalities of treatment[2]. Moreover, after epilepsy surgery, only 60 to 70% of patients become seizure free[3]. Thus there exists a group of epilepsy patients who continue to get seizures in spite of modern advancements in epilepsy management and yearn for newer AEDs or cost effective adjuvant therapy. However, non pharmacologic conservative treatments have received too little attention in the management of epilepsy[4].

Yoga is an ancient traditional Indian psycho-philosophical-cultural method of leading one's life aimed at attaining the spiritual perfection of self realization or *Brahmagyana.* It is a method of controlling the mind through the union of an individual's dormant energy with the universal energy. Commonly practiced yoga methods are *'Pranayama'* (controlled deep breathing), *'Asanas'* (physical postures) and *'Dhyana'* (meditation) admixed in varying proportions with differing philosophic ideas. Yoga is believed to alleviate stress, induce relaxation and provide multiple health benefits[5].

SCIENTIFIC BASIS AND MECHANISM OF YOGA

The scientific basis and mechanism by which yoga brings about desirable effects has been explored in several studies. Practice of many ancient meditative or yogic traditions show objective indicators of health beyond absence of disease. Several physical signs have been confirmed by research or are consistent with modern science.[6]

Meditation is not a state of drowsiness or sleep, but a conscious wakeful

state and is accompanied by lowering of cortical and autonomic arousal[7,8].

A growing number of research studies have shown that the practice of Yoga can improve strength and flexibility, and may help control such physiological variables as blood pressure, respiration, heart rate and metabolic rate, to improve the overall exercise capacity[9].

Lonsdorfer and Nussbaum studied several parameters concerning hatha-yoga and concluded that it provided a regular functioning of the main bodily functions fostering a psycho-physical balance. Wallace and Benson proved that transcendental meditation increases aerobic metabolism, counteracting anaerobic metabolism which is related to mental distress. Correlation with EEG studies during states of concentration (yoga, transcendental meditation and Zen) found these to be specific brain activities, and different from deep sleep, in spite of certain similarities in the EEG[10].

Arambula P et al[11] studied the physiological correlates of a highly practiced Kundalini Yoga meditator. A decrease in respiration rate during meditation was observed from a mean rate of 11 breaths/min pre-baseline and 13 breaths/min post-baseline to 5 breaths/min during meditation. There was more alpha EEG activity during meditation and increase in theta activity immediately following meditation. A shift in breathing patterns was postulated to contribute to the development of alpha EEG. Kamei T et al[12] found that during yoga exercise (in 7 yoga instructors) serum cortisol level decreased and correlated with increased alpha waves.

Yoga Nidra, a type of yogic practice, is characterized by a depressed level of desire for action and is associated with decreased blood flow in prefrontal, cerebellar and subcortical regions, structures thought to be organized in open loops subserving executive control. Kjaer TW et al[13] demonstrated increased endogenous dopamine release in the ventral striatum during Yoga Nidra meditation using 11C-raclopride PET. During meditation, 11C-raclopride binding

in ventral striatum decreased by 7.9% correspondimg to a 65% increase in endogenous dopamine release. The reduced raclopride binding correlated significantly with a concomitant increase in EEG theta activity, a characteristic feature of meditation. Conscious state of meditation caused suppression of cortico-striatal glutamatergic transmission.

Khare KC and Nigam SK[14] studied electroencephalographic patterns in 30 normal healthy individuals practicing meditation and compared with 10 normal healthy controls not practicing meditation and found prominent alpha wave activity with increased voltage in meditators as compared to controls. Percentage of alpha waves was higher in persons performing meditation with good coherence which suggested good homogenicity, uniformity and increased orderliness of brain.

Aftanas LI and Golocheikine SA[15] proposed selective associations of theta and alpha oscillating networks activity with states of internalized attention and positive emotional experience which occur during meditation. Subjective scores of emotional experience significantly correlated with theta, whereas scores of internalized attention correlated with both theta and alpha synchronization.

Meditators more readily demonstrate alpha and theta activity than nonmeditators, even when not meditating. Certain individuals, namely the psychologically "healthy" and those with a capacity for relaxed absorbed attention, appear to be more favourably disposed to meditation. Meditators appear to show both stronger orienting and recovery responses to stressors than controls[16].

Travis F and Wallace RK[17] compared autonomic and EEG variables during 10-minute eyes-closed rest and Transcendental Meditation (TM) sessions. TM sessions were characterized by lower breath rates, lower skin conductance levels, higher respiratory sinus arrhythmia levels and higher alpha EEG coherence. It appeared to lead to a state different than eyes-closed rest and resulted in a cascade

of events in the central and autonomic nervous systems.

Rapid change in state occured within a minute and was maintained throughout the TM session. Rapid shift in physiological functioning within the first minute was attributed to be mediated by a "neural switch" in prefrontal areas inhibiting activity in specific and nonspecific thalamocortical circuits. The resulting "restfully alert" state was thought to be sustained by a basal ganglia-corticothalamic threshold regulation mechanism, automatically maintaining lower levels of cortical excitability.

Lou HC et al[18] investigated cerebral blood flow (CBF) distribution with 15O-H20 PET technique in nine highly experienced yoga teachers, during the relaxation meditation (Yoga Nidra), and during the resting state of normal consciousness. In meditation, differential activity was seen in the posterior sensory and associative cortices known to participate in imagery tasks. In the resting state of normal consciousness differential activity was found in dorso-lateral and orbital frontal cortex, anterior cingulate gyri, left temporal gyri, left inferior parietal lobule, striatal and thalamic regions, pons and cerebellar vermis and hemispheres, i.e structures thought to support an executive attentional network.

Jevning R et al[19] found increased frontal and occipital CBF in TM determined by electrical impedance plethysmography [rheoencephalography or REG]. A high correlation between increased CBF and decreased cerebrovascular resistance during TM was noted.

Mason LI et al[20] studied standard ambulatory night sleep electroencephalograph (EEG) of 11 long-term practitioners of the Transcendental Meditation (TM) and 11 non-practitioners. During sleep, the TM group had theta-alpha activity as occurring during periods of TM, simultaneously with delta activity and decreased chin electromyograph (EMG) during deep sleep. The maintenance of transcendental consciousness during deep sleep is said to be a stabilized higher state of consciousness.

EFFECT OF YOGA ON GENERAL HEALTH

Malathi A et al[21] studied the effect of yogic practices on subjective well being in 48 healthy volunteers who practiced yoga over a period of 4 months. A significant improvement in 9 of the 11 factors of Subjective Well Being Inventory was observed at the end of 4 months.

In a group of 40 physical education teachers, 3 months of yogic training produced significant improvement in general health in terms of body weight, BP reduction, improved lung functions and decreased autonomic arousal[22]

Gura ST[23] reported that Yoga at the workplace is a convenient and practical outlet that improves work performance by relieving tension and job stress.

EFFECT OF YOGA IN MEDICAL CONDITIONS

Yoga lifestyle intervention was found to retard progression and increase regression of coronary atherosclerosis in patients with severe coronary artery disease and improved functional class and risk factor profile[24]. Goyeche JR et al[25] found yoga therapy to be effective in asthma.

Telles S and Naveen KV[26] found Yoga useful for rehabilitation. They found Yoga practice beneficial in mentally handicapped subjects by improving mental ability, motor co-ordination and social skills. Physically handicapped subjects had a restoration of some degree of functional ability after practicing yoga. Visually impaired children showed a significant decrease in their abnormal anxiety levels when they practiced yoga for three weeks, while a program of physical activity had no such effect. Socially disadvantaged adults (prisoners in a jail) and children in a remand home showed significant improvement in sleep, appetite and general well being, as well as a decrease in physiological arousal. The practice of

meditation was reported to decrease the degree of substance (marijuana) abuse, by strengthening the mental resolve and decreasing anxiety.

STUDIES ON EFFECT OF YOGA IN EPILEPSY

As far as epilepsy is concerned there is a dearth of randomized, blinded, controlled studies related to yoga and seizure control.

Ramaratnam S and Sridharan K[27] reviewed the efficacy of yoga in the treatment of patients with epilepsy based on search from the Cochrane Epilepsy Group trial register, MEDLINE articles and registries of research council for complimentary medicine. They also explored ongoing studies or studies published in non indexed journals and unpublished studies and found that no reliable conclusions could be drawn regarding the efficacy of yoga as a treatment for epilepsy.

Gupta HL et al[28] reported a 79% reduction in seizures after practicing Sahaja Yoga for 6 months, in 10 patients who had no obvious cause for epilepsy.

Panjwani U et al[29] assessed the effect of Sahaja yoga meditation on seizure control and electroencephalographic alterations in 32 patients of idiopathic epilepsy. The subjects were randomly divided into 3 groups. Group I (n = 10) practiced Sahaja yoga for 6 months, Group II (n = 10) practiced exercises mimicking Sahaja yoga for 6 months and Group III (n = 12) served as the epileptic control group. Group I subjects reported a 62% decrease in seizure frequency at 3 months and a further decrease of 86% at 6 months of intervention. Power spectral analysis of EEG showed a shift in frequency from 0-8 Hz towards 8-20 Hz. No significant changes in any of the parameters were found in Groups II and III, indicating that Sahaja yoga practice effected seizure reduction and EEG changes. Galvanic skin resistance, blood lactate and urinary vinyl mandelic acid showed significant changes at 3 & 6 months as compared to 0 month values in group I

subjects, but not in group II and group III subjects, indicating reduction in stress following Sahaja yoga practice[30].

Deepak KK et al[31] showed that continued meditation practice is of substantial help in improving the clinico electrographic picture in drug-resistant epileptics. Eleven adults with drug-resistant epilepsies were given training in meditation, which they practiced for 20 minutes a day for one year. Statistically significant reduction in seizure frequency and duration was found along with an increase in the dominant background EEG frequency.

AIMS & OBJECTIVES

To study the effect of Yoga-Meditation on seizure frequency in persons with medically refractory epilepsy.

PATIENTS & METHODS

The study was conducted from May 2001 to July 2003 at the Dept. of Neurology, Sree Chitra Tirunal Institute for Medical Sciences and Technology,Trivandrum under the guidance of Dr.K.Radhakrishnan, Professor and Head of Dept of Neurology. Mr.G.Mohandas, Director, Yoga Centre for Health Research, Attingal, Trivandrum was the Yoga instructor. Patients attending the epilepsy clinics of the institute were informed about the study. Patients with medically refractory epilepsy willing to participate in the study strictly adhering to the protocols were prospectively recruited for the study. Although a randomized cross over study was planned, due to the small number of potential participants, it could not be done. Therefore it was decided to compare the seizure frequency in the patients before and after yoga. The selection criteria were as follows:

SELECTION:

Inclusion:

- Age > 12yrs.
- Should have had at least 4 seizures in the last 3 months inspite of optimal AED medications and good drug compliance.
- Should have been on same AEDs for the last 6 months and should not modify AEDs for the entire study period.
- Ready to provide written consent to participate in the study.
- Women should be non-pregnant / ready to practice contraception during the study period.

Exclusion:

- Mental retardation
- Progressive neurological disorder.
- Psychiatric dysfunction preventing active co-operation.

TECHNIQUE:

The expert in yoga and meditation instructed the patients and supervised the yoga-meditation sessions. Patients were taught to sit in proper posture, breathing exercises and silent meditation. The type of meditation practiced was "concentration over the point in between the eyebrows". Patients were required to meditate for 20 minutes daily at their homes in morning and evening. They had to attend supervised sessions every week for at least 3 months. Further continuation was optional.

Patients had to strictly maintain a seizure diary and have good drug compliance. The AED regime was kept unchanged during the study period. Patients violating the study norms were excluded from analysis. Seizure frequency was measured using Engel's scoring system (Appendix 1). Seizures were considered severe if associated with secondary generalized seizures or had falls during seizures.

A total of thirtythree patients were recruited for the study. Twenty one patients completed the study strictly adhering to the protocol and were taken up for analysis. The remaining 12 patients either dropped out of the study (9 patients) or violated the protocol (3 patients). The Engel score for seizure frequency prior to yoga was compared with that at the end of 3 months and 6 months for the entire group. Comparison of seizure frequency at 6 months was done between patients who discontinued yoga at 3 months and those who continued for 6 months. Comparison was also drawn for patients who discontinued yoga at 6 months and those who continued beyond 1 year.

OBSERVATIONS

A total of thirty-three patients were recruited for the study. They belonged to different religions. All had medically refractory complex partial seizures. Nine patients dropped out of the study and 3 patients violated the study protocol. Twenty one patients completed the study, strictly adhering to the protocol, and were taken up for analysis. There were 15 males and 6 females. The patient's ages ranged from 12-47 years. Four patients stopped yoga practice at the end of 3 months and two discontinued at 5 months. Of the remaining 15 patients, 7 stopped practice at the end of 6 months while 8 patients continued practice beyond 12 months. The Engel score for seizure frequency prior to Yoga were compared with that at the end of 3 months, 6 months and 12 months, and among patients who practiced Yoga for different periods of 3, 6 and 12 months. There was no difference in the baseline scores between patients who practiced yoga for only 3 months, 6 months or 12 months. There was statistically significant reduction in seizure frequency from baseline at 3, 6months and 12 months.

Effect at three and six months

Table 1 shows the Engel scores at baseline, 3 months and 6 months for the entire group as well as for patients who discontinued yoga at 3 months.

For the whole group (n=21), the Engel score was 7.38 at baseline, 5.95 at the end of 3 months and 5 at the end of 6 months. There was significant decrease in Engel scores at 3 and 6 months ($p=0.0056$, $p=0.00037$ respectively) when compared to the baseline.

When compared to the 3 month score, the further decrease in Engel score observed at the end of 6 months was not statistically significant ($p=0.215$).

The patients who discontinued yoga after 3 months had no significant decrease in Engel scores at either 3 or 6 months ($p = 0.39$ & $p = 0.21$ respectively).

Table1 Mean Engel score at baseline, 3 months and 6 months

	n	Baseline	3 months	6 months
Whole group	21	7.38	5.95 (0.0056)	5.00 (0.00037)
Yoga for only 3 months	4	7.25	7 *(0.39)*	5.75 *(0.21)*
Yoga for 6 months	15	7.4	5.47 *(0.003)*	4.8 *(0.0004)*

Figure in parenthesis indicate *p*- values (for seizure frequency when compared to baseline); n= number of patients.

The patients who practiced yoga for 6 months had significant decrease in Engel scores at the end of both 3 and 6 months (p=0.003, p=0.0004 respectively). Though there was a further decrease in seizures at the end of 6 months when compared to the reduction in seizures observed at the end of 3 months, it was not significant (p =0.85).

When the scores at the end of 6 months were compared between those who stopped Yoga after 3 months and those who continued for 6 months, a statistically significant reduction in seizure score was observed in patients who practiced Yoga for 6 months (p = 0.022).

Effect of Yoga at the end of 12 months

The 8 patients, who practiced Yoga for 12 months had significant reduction in seizures at 3 months, 6 months & 12 months as compared to baseline. Though there was a further decrease in seizures at the end of 12 months, it was not significant when compared to the reduction in seizures observed at the end of 3 months (p = 0.78) or 6 months (p = 0.264).

When the Engel scores at the end of 12 months were compared between those who quit yoga at 6 months and those who continued practice beyond 12 months (table 2), there was no significant difference ($p = 0.87$).

Table 2. Seizure frequency in patients practicing yoga for only 6 months Vs patients with continued practice for 12 months

Duration of yoga	n	Time of assessment	Mean Engel score
Yoga for only 6 months	7	12 months	4.71
Yoga for 12 months	8	12 months	4.57 $p=0.87$

The seizure frequency at 18 months in patients who continued yoga practice was not different from their previous seizure frequency at the end of 12 months (p=0.84).

In patients who quit yoga at 6 months (n=7), the Engel score at 12 months was not significantly different from the 18 month score of patients who continued yoga.

Effect of yoga on severe seizures

For patients with severe seizures i.e. seizures associated with falls or generalized convulsions (n=12), the mean seizure frequency per month was 5.28 at base line, 3.66 at 3 months and 2.91 at 6 months as shown in Table 3. The decrease in seizures at the end of 3 or 6 months was not statistically significant.

Table 3. Seizure frequency in 12 patients with severe seizures

No of patients	Baseline Seizures.freq	3 month Seizures.freq	6 month Seizures freq
12	5.28	3.66	2.37
p value	--	*0.61*	*0.39*

Of the entire group, 1 patient underwent epilepsy surgery subsequently when presurgical re-evaluation showed concordance for a temporal lobe focus. One patient developed psychosis and made suicidal attempts. A 12 year old boy and a 15 year old girl showed no improvement at all whereas a 19 year old boy had marked improvement from 30 seizures associated with fall per month to 3 seizures per month with infrequent falls. Two patients got married subsequently. At the end of 6 months, 9 patients were totally seizure free of which 8 continued to remain so at 1 year, while 1 patient had subsequent recurrence. All patients reported reduction in the duration of seizures, but this could not be quantified.

Taking the absolute no. of seizures into consideration, there was a 37.8% decrease at 3 months and 54% at 6 months for the whole group.

For patients who continued Yoga for 6 months, there was a 41.1% and 64.4% decrease in seizures at 3months and 6 months respectively.

For patients who continued Yoga for 12 months, there was 35.2% decrease in seizures at 3 months, 67.6% at 6 months and 86.33% at 12 months.

For patients who discontinued Yoga after 6 months, there was 76.7% decrease in seizures at 3 months, 66% at 6 months and 57.5% at 12 months.

DISCUSSION

The advent of newer antiepileptic drugs and surgery has provided much respite for several patients with epilepsy. Yet a large number of patients with medically refractory epilepsy, are either unamenable to surgery or are unwilling for surgery or cannot afford the entire cost of presurgical evaluation and subsequent surgery. Moreover only 60 to 70% post surgery patients benefit from the procedure[3]. Effective adjuvant therapies if available would definitely improve the outlook for these patients.

Yoga has been found beneficial in several medical disorders[24,25]. However there is a dearth of randomized, blinded, controlled studies related to yoga and epilepsy.

The effects of yoga in epilepsy reported in previous studies are shown in Table 4. Panjwani et al[29] observed a 62% and 80% decrease in seizure frequency at 3 months and 6 months while Gupta HL et al[28] observed a 79% seizure reduction at 6 months.

Table 4. Outcomes in different of studies of Yoga-Meditation in epilepsy

Study	n	Duration of Yoga	Seizure reduction			
			3month	6month	12month	18 month
Panjwani U[29]	10	6 months	62%	86%	-	
Gupta HL[28]	10	6 months	-	79%	-	
Present study	21	3 months	38%	54%		
	15	6 months	41%	64%		
	7	6 months	77%	66%	57%	
	8	18 months	35%	68%	86%	94%

n= number of patients

In the present study significant seizure reduction was observed as early as three months, with further reduction with continued practice of Yoga. The decrease in seizure frequency noted at 3 and 6 months in the present study is lesser than that observed by Panjwani et al[29] and Gupta HL et al[28]. Seizure reduction by about 80% was noted in these studies at 6 months, but could be achieved only by 1 year in the present study.

Long term outcomes have not been looked into in previous studies. The patients who stopped yoga at 6 months had a sustained benefit even after 12 months. But after a 77% peak seizure reduction at 3 months, the reduction observed at 12 months was only 57%. On the contrary, in patients who continued practice of Yoga beyond 12 months, progressive reduction in seizure frequency was observed, though not statistically significant. After 18 months of practice there was a 94% reduction in seizures.

In the present study 43% (9 patients) became seizure free at the end of 6 months and 38% (8 patients) continued to remain seizure free at 1 year. Gupta HL et al observed seizure freedom in 30% of patients. But no conclusions regarding reduction or stopping AEDs can be drawn.

Various mechanisms have been put forward to explain the effects of Yoga-Meditation. Meditation reduces respiratory rate[12], increases endogenous dopamine release[12] and increases cerebral blood flow to certain areas of the brain [18, 19]. EEG changes have been consistent and consists of increased alpha and theta activity [11,12,14,16]. More orderly electrical activity following meditation could be responsible for limiting abnormal cortical excitation and thus reduce occurrence of seizures. Meditation results in subjective well being [21], improves general health in terms of body weight, BP reduction, lung functions and decreases autonomic arousal[22]. Stress is an important precipitating factor for seizures. Relief of stress following meditation[21,22,23] also contributes to seizure reduction[30].

Meditators more readily demonstrate alpha and theta activity than nonmeditators, even when not meditating [16] and the effect persists during sleep[20]. These could be the reasons for sustained benefits of meditation even after stopping Yoga practice.

Ramaratnam S and Sridharan K[27] reviewed the efficacy of yoga in the treatment of patients with epilepsy and suggested that no reliable conclusions could be drawn regarding the efficacy of yoga as a treatment for epilepsy. However the present study as well as the previous studies[28,29,31] show significant reduction in seizures inspite of small sample size, non uniform techniques and duration of Yoga.

Problems and Pitfalls

Conducting Yoga based studies is inherent with multitude of difficulties. In spite of having originated in India, only few Indians practice yoga regularly. Yoga is often misunderstood as some sort of exercise. Many Yoga schools stress more on *'asanas'* than other components like breathing or meditation. Yoga is also wrongly identified with religion and often viewed with skepticism.

These could have contributed to failure to recruit a large number of patients for this study, although the requirements as per the study protocol could also be responsible. But the previous studies could also recruit only a small number of patients. Gupta et al[28] recruited only 10 patients while Panjwani et al [29] studied 32 patients of which only 10 were included for Yoga intervention whereas Deepak et al[31] studied only 11 patients.

Since the effects of Yoga will not be immediate, it requires a lot of commitment for persistent practice. Early and high expectations may lead to disinterest. This could be the reason why there was a 27% dropout of patients after attending a few sessions. The previous studies have not looked into the dropout rate.

Several techniques of Yoga are in practice and different terms like Sahaja yoga, transcendental meditation, Sky meditation, Kundalini Yoga etc are in use. Therefore for comparison between studies, the techniques used must be similar. However all patients cannot carry out the same amount of asanas and may have different breathing capacities. Meditation being more a matter of the mind, is impossible to quantitate. The depth of meditation attained during each session may be variable and cannot be compared between patients.

The practice of Yoga- Meditation requires a quiet congenial atmosphere which may not be present in all households. Though Yogis recommend a vegetarian diet for better meditation, forced vegetarianism may not be acceptable.

Other factors may also influence stress like visiting religious places, circumstances at family and job, etc. Therefore a dose- response effect cannot be obtained. Experienced yogis believe that the techniques are not important but the attitude of the persons and constant efforts to attempt meditation leads to successful meditation subsequently.

Confounding factors influencing seizure frequency like AED modification, pregnancy, poor drug compliance, etc were carefully excluded in this study by adhering to strict protocols. Previous studies have not mentioned whether these factors influenced their outcomes.

Confounding effects may be caused by the natural history of epilepsy, where progression as well as spontaneous remission is possible. Patients and relatives also reported reduction in duration of seizures but there are no measures to quantify this. On the other hand very brief seizures may have gone unnoticed.

A separate control group was not involved in the study and the effect of Yoga was compared with the participant's baseline seizure frequency. The sample size was small and therefore the findings cannot be generalized to the population.

CONCLUSIONS

Yoga-Meditation is beneficial as an adjuvant to AEDs in patients with medically refractory epilepsy. The beneficial effects appear as early as 3months. A practice for only 6 months results in sustained benefit even at 1year, but continued practice helps in maintaining the benefits and further decreases the seizure frequency.

The effect of Yoga on the quality of life was not analyzed, but the patients who continued Yoga after even the scheduled period experienced better confidence and sense of well being.

Although 38% of patients became seizure free no conclusions regarding reduction or stopping AEDs can be made. Whether Yoga helps in withdrawal of AEDs needs to be assessed by a separate study in patients with well controlled seizures.

A multi-centre, cross-cultural, preferably blinded, well-randomized controlled trial, using a single standardized yogic technique and study protocol in a large population is warranted, as significant benefits have been observed in previous as well as the present study. If the findings of the present study are substantiated, then Yoga definitely would have a role to play in the management of epilepsy.

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APPENDIX- I

Seizure Scoring System*

Seizure frequency	Score
Seizure-free, off antiepileptic drug	0
Seizure-free, need for AEDs unknown	1
Seizure-free, requires AEDs to remain so	2
Non disabling simple partial seizures	3
Non disabling nocturnal seizures only	4
1-3 per year	5
4-11 per year	6
1-3 per month	7
1-6 per week	8
1-3 per day	9
4-10 per day	10
>10 per day but not status epilepticus	11
Status epilepticus without barbiturate coma	12

* Engel J. Jr., Van Ness P C, Rasmussen T B, Ojemann L M. Outcome with respect to epileptic seizures. In : Engel J Jr. ed. Surgical Treatment of the Epilepsies. New York: Raven Press, 1993:609 – 22.