JUVENILE MYOCLONIC EPILEPSY IS DEFINITELY A WELL-DEFINED EPILEPTIC SYNDROME

Betül Baykan
Turkey

Juvenile myoclonic epilepsy (JME) first described by Herpin and afterwards by Janz in 1985 shows all characteristics of a well-defined syndrome. This typical clinical picture occurring in approximately 5% of epileptic patients was recognized as a special idiopathic generalized epilepsy (IGE) syndrome since 1989 by the International League Against Epilepsy (ILAE), which is the leading organization of the epilepsy experts. Thus there is no doubt about the clinical relevance and importance of JME.

The diagnosis of JME is principally based on recurring myoclonic jerks as the essential, and characteristic seizure type starting in the late childhood, adolescence and also in the early adulthood accompanied by generalized tonic-clonic seizures (GTCS) and/or absence seizures. However myoclonia may remain as the only seizure type in some individuals. Although myoclonia are not specific for JME, their appearance as the cardinal symptom, mostly in the morning, in a neurologically normal adolescent makes the diagnosis easy in the presence of a typical EEG, which shows 3-6 Hz generalized multi-spike waves with anterior predominance interictally and normal background activity. Photosensitivity occurs in about 30%, and polyspikes are seen ictally. Furthermore, there are typical triggers for seizures such as sleep deprivation and stress.

Although seizures in JME can easily be controlled with accurate diagnosis and appropriate therapy, and Valproate is considered to be effective in 90% of the patients; in the long-term follow-up, we found a benign course in only $2/3^{rd}$ of the patients. On the other hand, $1/6^{th}$ of the patients had pseudo-resistance due to problems in treatment or lifestyle, even though they were counseled about the triggering factors. The true-resistant course, observed in another $1/6^{th}$, was significantly associated with psychiatric disorders and the presence of some systemic problems such as thyroid diseases. The majority of the JME patients had continuing seizures after a follow-up of two decades. However, a minority of them was able to discontinue medication and remained seizure-free thereafter. This slight prognostic variability within a syndrome is quite possible in the medical literature. Although it is often unwise to discontinue treatment once seizure control has been achieved, severity of myoclonic seizures diminishes in the 4^{th} decade as another characteristic of JME syndrome.

Avicenna (980-1037) pioneered the idea of a "syndrome" and this was further developed by Sydenham in the 17th century in the field of medicine. Currently, a syndrome is the association of several clinically recognizable features, signs or symptoms, with phenomena or characteristics that often occur together so that the presence of one or more features alerts the healthcare provider to the possible presence of the others. In JME, we have easily recognizable features such as myoclonia after awakening and GTCS, as well as characteristics such as onset in adolescence, typical triggers, good response to Valproate, and seizure recurrence after drug withdrawal. Therefore, we could definitely say that JME is an established syndrome.

There are studies suggesting the presence of some subsyndromes of JME based on electroclinical findings, including age at onset of the first seizure, seizure phenotypes, family history of epilepsy and interictal EEG findings. However, the most common subsyndrome of JME corresponding to $3/4^{th}$ of the cases was reported as classic JME, which resembles the original descriptions of JME. These efforts again confirmed the justification of JME as a well-defined syndrome. The possible clinical overlaps between various IGE syndromes in some families and in some individuals do not contradict the existence of the JME syndrome.

JME is currently a topic of growing scientific interest by clinicians and neuroscientists potentially due to its high frequency, easily recognizable clinical characteristics and recent developments in the fields of neuro-genetics and neuro-imaging. However, this worldwide recognition has also created some controversies and confusion about its real spectrum,

which is highly typical for any kind of popular topic of medicine. The diagnostic criteria for JME have been somewhat broadened over time by some studies, whereas some other authors still use more strict criteria. Furthermore there is a loosening of the diagnostic criteria given in ILAE classification; *i.e*., abnormal consistent focal EEG or clinical features (such as rotatory seizures or presence of aura) and abnormal MRI findings are considered permissible by some authors. On the other hand some patients with JME still face suboptimal management which makes its recognition critical.

Although several important genes for JME such as EFHC1 and GABRA1 have been identified, these genes account for a small proportion of JME cases, indicating multifactorial or complex inheritance. The roles played by other major genes, susceptibility genes and environmental factors in the pathogenesis of JME remain to be identified. But this kind of genetic diversity could be seen in many well-defined syndromes. Some syndromes, such as Down syndrome, have only one cause; others, such as Parkinson syndrome, have multiple possible causes, whereas in some cases, the cause of the syndrome is unknown. JME shows clinical as well as genetic heterogeneity for which different genes and loci have been proposed. These possible diverse genetic causes of JME do not exclude its acceptance as a syndrome.

Although conventional neuro-imaging studies of JME are normal, there are now convincing evidence that functional and structural abnormalities are present in the frontal cortex and thalamus. Sophisticated MRI techniques reported a thickening of the grey matter in the medial-frontal regions associated with abnormal cortical organization in JME patients. Increased functional connectivity between the motor system and frontoparietal cognitive networks were shown. On the other hand, neuropsychological studies revealed subtle cognitive deficits in patients with JME, mainly implicating the frontal lobes. Furthermore, studies with transcranial magnetic stimulation, somatosensory evoked potentials, and MR spectroscopy all showed some functional abnormalities in the cortical structures of JME patients, helping to understand the pathophysiology of this intriguing syndrome more clearly. It should be noted that all researchers supplying so many data are sure of the presence of JME as a separate syndrome.

In conclusion, juvenile myoclonic epilepsy is a well-defined epileptic syndrome with increasing scientific knowledge about its pathogenesis; and furthermore it is one of the prototypes of the epileptic syndromes known worldwide.