



Rasmussen's Encephalitis: A Case Reports of a Pediatric Patient and Literature Review

Naznin Akter^{1*} and Mashura Musharraf²

¹Department of Pediatric Neurology, Dhaka Medical College, Bangladesh

²Department of Pediatrics, Dhaka Medical College, Bangladesh

Abstract

Rasmussen's Encephalitis (RE) is one form of chronic and progressive focal encephalitis of children presented with intractable epilepsy and progressive neurologic deficits. The cause of the disease is still unknown but thought to be an immunological disorder following a viral infection. Brain imaging is one of the best tools for the diagnosis.

Introduction

Rasmussen's Encephalitis (RE) was first described by Theodore Rasmussen in 1958 about its clinical and pathological characteristics [1]. RE is one of the rare chronic progressive focal inflammatory lesions in the brain of unknown etiology clinically manifested as refractory epilepsy, progressive motor and cognitive deterioration. Epileptic activity of RE is thought to be responsible for the neurocognitive decline of the patients [2]. Exact incidence of this disease is yet not clearly calculated however it is estimated 2.4 per 10⁷ people ≤ 18 year [3]. Brain imaging plays an important role for the diagnosis of RE, MRI of brain will also help to assess the prognosis. Proper antiepileptic drugs, immunotherapy and surgery now the current treatment strategy for the patients of RE. Clinical diagnosis of RE depends on European consensus criteria proposed on 2005 described in two parts, all three conditions in part A or two conditions in part B need to be satisfied for a diagnosis of RE [4].

Part A:

1. Clinical: Focal epilepsy (with or without EPC) and unilateral cortical deficit
2. EEG: Unilateral hemispheric slowing with or without epileptic activity and unilateral seizure onset
3. MRI: Unihemispheric focal cortical atrophy and at least one of the following grey or white matter T2/Flair hyperintense signal or atrophy of the ipsilateral caudate head

Part B:

1. Clinical: EPC or progressive unilateral cortical deficits
2. MRI: Progressive unihemispheric focal cortical atrophy
3. Histopathology: T cell dominated encephalitis with activated microglial cells and reactive astrogliosis. Numerous parenchymal macrophages. B cells or plasma cells or viral inclusion bodies exclude the diagnosis of RE.

Here we report a pediatric case of RE with typical clinical, electroencephalographic and MRI findings.

Case Study

A 3 year 6 month old boy only son of non consanguineous parents was reasonably well up to 18 months of age, then he had a attack of fever, convulsion and unconsciousness and was diagnosed as a case of meningoencephalitis and treated accordingly in a tertiary care hospital (Figure 1), His neuroimage was normal during this illness (Figure 2) after recovery he developed recurrent episode of focal seizure in the form of myoclonic jerks and occasional staring, for this illness he was treated with antiepileptic drugs phenobarbital without any improvement of symptoms. At the age of 25 months of age he hospitalized again with symptoms of encephalitis and was treated for 15

OPEN ACCESS

*Correspondence:

Naznin Akter, Department of Pediatric Neurology, Dhaka Medical College, Dhaka, Bangladesh, Tel: 01712552740; E-mail: nazninruby73@gmail.com

Received Date: 10 Jan 2022

Accepted Date: 31 Jan 2022

Published Date: 04 Feb 2022

Citation:

Akter N, Musharraf M. Rasmussen's Encephalitis: A Case Reports of a Pediatric Patient and Literature Review. *Clin Case Rep Int.* 2022; 6: 1278.

Copyright © 2022 Naznin Akter. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Figure 1: Our cases.

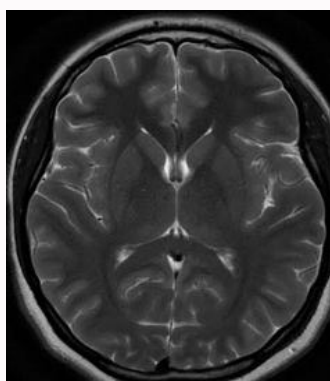


Figure 2: MRI of brain at 25 months of age, Slight symmetrical cortical atrophy.



Figure 3: MRI of brain at 25 months of age shown T2 hyperintensity of right hemisphere.



Figure 4: Hyperintensity in DWI involving right hemisphere at 25 month of age.



Figure 5: Hyperintense right cerebral hemisphere with leptomeningeal enhancement in FLAIR at 40th month of age.

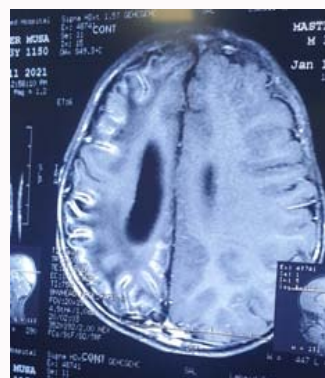


Figure 6: Atrophied right hemisphere at 40th month of age.

days, during that period his neuroimage of brain have shown hyperintensity on right hemisphere in T2WI, FLAIR and DWI with normal ventricles (Figure 3, 4). MRA of brain, cardiac evaluation, metabolic screening, coagulation profile, EEG findings all were normal. At the age of 40 months he came to us with history of recurrent fall, weakness of left side of body and recurrent seizure in the form of myoclonic jerks. His antenatal and perinatal history was uneventful. His developmental age was age appropriate up to 18 months of age before the attack of meningoencephalitis then there is stagnation of motor, cognitive and speech development. He is anthropometrically well thrived and vaccinated as per EPI schedule. On examination

there is no facial dysmorphism, OFC 48 cm which lies above 10th centile on centile chart. On neurological examination he is conscious, cooperative, no sign of meningeal irritation, no cranial nerve palsies, motor examination reveals hypertonicity present in left upper and lower limb with brisk deep tendon reflexes, plantar extensor on left. His motor developmental age around 18 months, speech and cognitive age corresponds the age of 18. Interictal EEG showed right fronto-temporo parietal discharge with generalized slowing of background activity (Figure 5). Brain Magnetic Resonance Imaging (MRI) showed hyper intensity on T2WI and FLAIR images on the whole right cerebral hemispheres with leptomeningeal enhancement. Right lateral ventricles are effaced (Figure 6, 7). Magnetic Resonance Spectroscopy (MRS) of brain shows decrease NAA peak and

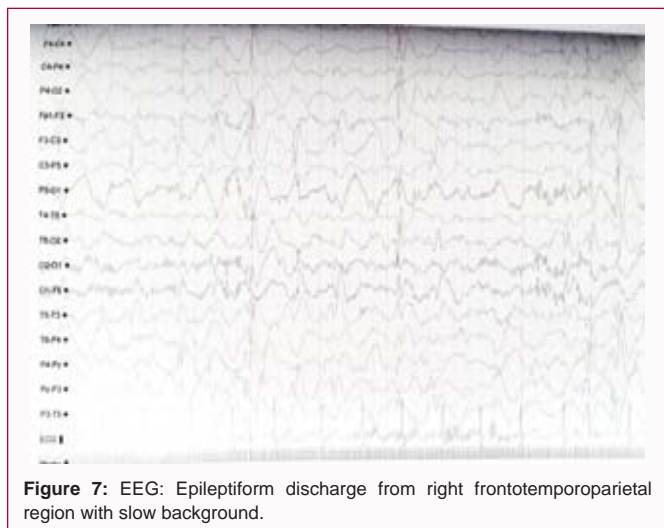


Figure 7: EEG: Epileptiform discharge from right frontotemporoparietal region with slow background.

normal choline peak. His routine blood and CSF investigations all are within normal limits. On the basis of clinical criteria based on European consensus criteria proposed on 2005 we diagnosed the case as Rasmussen's encephalitis and started Inj. Methylprednisolone at a dose of 30 mg/kg for 5 days followed by oral prednisolone 2 mg/kg for one month and tapering for next one month along with antiepileptics levetiracetam and clobazam. With this treatment his clinical improvement obtained and complained no seizure activity for last 3 months. Now he can run and able to talk two word sentence. Parents were advised to come for follow up visit regularly; they were also counseled about the nature and treatment plan of the disease and also instructed to continue his physiotherapy, speech therapy and cognitive behavior therapy.

Discussion

Here we report a case of a three year six month old boy presented with recurrent focal seizure, weakness of one side of body after 18 months of normal development. Diagnosis of RE is based on clinical and neuro-radiological criteria based on European consensus criteria proposed on 2005 [4]. Progressive neuroimaging deterioration indicates the chronic inflammatory nature of the disease.

This disorder is rare and usually affects children with median age of onset 6 years, but our patient presents at early age. Delayed presentation may also reported by Klaa et al. [5]. There is no gender preference. RE almost in every patients involved one hemisphere of brain which progressively atrophied in the course of time, typical disease course usually follow the pattern of variable prodromal period which is usually contains minor sign and symptoms of viral fever then the patients enters in to the acute stage which is characterized by progressive deterioration of functions of the affected hemispheres like hemiparesis, hemianopia, cognitive deterioration, aphasia and predominantly intractable unilateral focal motor seizure with or without secondary generalization [6-8]. Epilepsia Partialis Continua (EPC) in the form of focal myoclonic twitching of facial muscles or muscles of distal extremities persisted for more than one hour with seizure free interval less than ten seconds is one of the characteristics features of RE that may present among half of the patients. Some patients may present without any evidence of seizures. Acute stage of the disease usually persists around 8 to 10 months thereafter a phase of residual stage came which have a stable neurological deficit but seizure activity remains high but low

compared to acute stage [8-10]. Several studies has been carried out to search the etiology of RE, Rasmussen and their colleagues in their index paper suggested slow viral infection as a causative factors but still it is neither established nor excluded as a causal association [11]. Antibody mediated pathogenetic hypothesis originated in 1994, antibodies to subunit 3 of the AMPA receptor (Glu R3 antibodies) had been suggested to dominate pathogenesis. Other anti-neuronal antibodies such as Munc-18, and the alpha7-acetylcholine receptor were identified in some patients with RE [12-14]. Function of cytotoxic T cells is now considered in the pathogenesis of RE, where affected hemispheres found to be infiltrated with cytotoxic CD8+ T cell, astrocytic degeneration caused by cytotoxic T lymphocyte attack give rise to neuronal cell death and seizure induction [15]. Abnormal Electroencephalography (EEG) as slow background with slow focal and epileptic abnormalities in the lesion hemisphere present in the acute stage later on interictal abnormal discharge may appear on unaffected hemispheres [16]. Brain MRI is one of the best tools for diagnostic evaluation and to assess the prognosis of the disease, at the early stage unilateral hyper intensity in T2, FLAIR image noticed in the cortical, subcortical region, then unihemispheric atrophy sets on, our case typically follow those changes. Most of the tissue loss happens from the 12 months onset of symptoms. Usually post contrast enhancement less commonly present in RE. Functional imaging like Flurodeoxyglucose-Positron Emission Tomography (FDG-PET) shows diffuse hypometabolism of affected segment [17,18]. Magnetic Resonance Spectroscopy (MRS) studies showed decreased N-Acetyl-Aspartate (NAA) levels and increased or normal choline peaks resulting in a decreased NAA/Cho-ratio suggestive of neuronal loss or dysfunction [7,19].

As the etiology is still clearly not known so the treatment is aimed to symptoms and inflammation, to control seizure and to prevent further deterioration of neurological deficit effective AEDs, immunotherapy and surgery are the main modalities of treatment. Immunosuppressive, immunomodulatory and antiviral treatment approaches have been tried in different studies, among them corticosteroid found to be effective on seizure control and neurological improvement. For long term steroid therapy started with bolus methylprednisolone 20 mg/kg to 30 mg/kg, followed by oral prednisolone 1 mg/kg to 2 mg/kg for months then slow tapering. Here in our patients we followed the regimen with significant improvement in seizure remission and also there is improvement observed in motor, speech and cognitive domain. IVIG and IVIG plus steroid other modalities of immunotherapy also found effective by some reports [20]. Tacrolimus also found as superior outcome regarding neurological function but not found as effective as seizure control [21]. Other immunotherapies targeting to T-cells like cyclophosphamide, natalizumab and alemtuzumab helps to reduce the inflammatory reaction of RE patients [22]. Epilepsy surgery may consider in case of refractory epilepsy for seizure control but neurological deficit could not be avoided. Functional hemispherectomy and hemispherotomy are associated with lower complications compared to anatomical hemispherectomies [12].

As the etiology of the disease is still controversial so specific management approach detected at pathogenic factors, most work is now directed to the activation of infiltration CD8+ T cells and microglia to ensure the alternative of surgical management. Early suspicion at early stage with proper management to halt the inflammatory process will help to prevent neurological deficits.

Conclusion

Rasmussen encephalitis is a rare chronic progressive unihemispheric inflammatory disease manifested with recurrent focal seizure, hemiparesis and neurocognitive deterioration. Neuroimage, EEG findings, early suspicion with exclusion of possible differential diagnosis may help to diagnose the patients earlier and will add better prognosis.

References

1. Rasmussen T, Olszewski J, Lloydsmith D. Focal seizures due to chronic localized encephalitis. *Neurology*. 1958;8(6):435-45.
2. Nabbout R, Dulac O. Epileptic encephalopathies: A brief overview. *J Clin Neurophysiol*. 2003;20(6):393-7.
3. Christian GB, Henning T, Robert S, Stefan K, Horst U, Marec VL, et al. Rasmussen encephalitis: Incidence and course under randomized therapy with tacrolimus or intravenous immunoglobulins. *Epilepsia*. 2013;54(3):543-50.
4. Bien CG, Granata T, Antozzi C, Cross JH, Dulac O, Kurthen M, et al. Pathogenesis, diagnosis and treatment of Rasmussen encephalitis: A European consensus statement. *Brain*. 2005;128(Pt 3):454-71.
5. Klaa H, Younes TB, Benrhouma H, Nagi S, Rouissi A, Kraoua I, et al. Rasmussen encephalitis: A report of a Tunisian pediatric case and literature review. *Case Rep Neurol Med*. 2020;2020:6810237.
6. Bien CG, Widman G, Urbach H, Sassen R, Kuczaty S, Wiestler OD, et al. The natural history of Rasmussen's encephalitis. *Brain*. 2002;125(Pt 8):1751-9.
7. Chiapparini L, Granata T, Farina L, Ciceri E, Erbetta A, Ragona F, et al. Diagnostic imaging in 13 cases of Rasmussen's encephalitis: can early MRI suggest the diagnosis? *Neuroradiology*. 2003;45(3):171-83.
8. Christian GB, Johannes S. Treatment of Rasmussen's encephalitis half a century after its initial description: Promising prospects and a dilemma. *Epilepsy Res*. 2009;86(2-3):101-12.
9. Bien CG, Elger CE, Leitner Y, Gomori M, Ran B, Urbach H, et al. Slowly progressive hemiparesis in childhood as a consequence of Rasmussen encephalitis without or with delayed onset seizures. *Eur J Neuro*. 2007;14(4):387-90.
10. Korn-Lubetzki I, Bien CG, Bauer J, Gomori M, Wiendl H, Trajo L, et al. Rasmussen encephalitis with active inflammation and delayed seizures onset. *Neurology*. 2004;62(6):984-86.
11. Theodore WH, Epstein L, Gaillard WD, Shinnar S, Wainwright MS, Jacobson S. Human herpes virus 6B: A possible role in epilepsy? *Epilepsia*. 2008;49(11):1828-37.
12. Chongyang T, Guoming L, Tianfu L. Rasmussen's encephalitis: Mechanisms update and potential therapy target. *Ther Adv Chronic Dis*. 2020;11:2040622320971413.
13. Watson R, Jiang Y, Bermudez I, Houlihan L, Clover L, McKnight K, et al. Absence of antibodies to Glutamate Receptor type 3 (GluR3) in Rasmussen's encephalitis. *Neurology*. 2004;63(1):43-50.
14. Alvarez- Baron E, Bien CG, Schramm J, Elger CE, Becker AJ, Schoch S. Autoantibodies to MUNC 18, cerebral plasma cells and B-Lymphocytes in Rasmussen encephalitis. *Epilepsy Res*. 2008;80(1):93-7.
15. Bauer J, Elger CE, Hans VH, Schramm J, Urbach H, Lassmann H, et al. Astrocytes are a specific immunological target in Rasmussen's encephalitis. *Ann Neurol*. 2007;62(1):67-80.
16. Longaretti F, Dunkley C, Varadkar S, Vargha-Khadem F, Boyd SG, Cross JH, et al. Evolution of the EEG in children with Rasmussen's syndrome. *Epilepsia*. 2012;53(9):1539-45.
17. David B, Prillwitz CC, Hoppe C, Sassen R, Hörsch S, Weber B, et al. Morphometric MRI challenges the concept of the unaffected hemisphere in Rasmussen encephalitis. *Epilepsia*. 2019;60(5):40-6.
18. Kuki I, Matsuda K, Kubota Y, Fukuyama T, Takahashi Y, Inoue Y, et al. Functional neuroimaging in Rasmussen syndrome. *Epilepsy Res*. 2018;140:120-7.
19. Sener RN. Diffusion MRI and spectroscopy in Rasmussen's encephalitis. *Eur Radiol*. 2003;13(9):2186-91.
20. Granata T, Fusco L, Gobbi G, Freri E, Ragona F, Broggi G, et al. Experience with immunomodulatory treatments in Rasmussen's encephalitis. *Neurology*. 2003;61(12):1807-10.
21. Bien CG, Gleissner U, Sassen R, Widman G, Urbach H, Elger CE. An open study of tacrolimus therapy in Rasmussen's encephalitis. *Neurology*. 2004;62(11):2106-9.
22. Liba Z, Vaskove M, Zamecnik J, Kayserova J, Nohejlova H, Ebel M, et al. An immunotherapy effect analysis in Rasmussen encephalitis. *BMC Neurol*. 2020; 20(1):359.