

Idiopathic Neuralgic Amyotrophy: A Rarely Documented Disease in Children

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Abstract

Idiopathic Neuralgic amyotrophy (INA) is a neurological disease that occurs in all age groups. It is characterized by sudden onset of pain and subsequent weakness followed by atrophies of arm and shoulder muscles. But in children, it is uncommon and has a diverse clinical spectrum and etiology. Diagnosis is often delayed or even missed. Its treatment protocol and prognosis are still controversial. We herein describe three cases of INA with a thorough review of the previously reported cases in children. This will provide an overview of the pediatric phenotype and prognosis.

Keywords: Idiopathic neuralgic amyotrophy (INA), Children, Brachial neuritis (BN), autoimmune, Electrophysiological study.

Introduction

Idiopathic neuralgic amyotrophy (INA) is a disorder of the peripheral nervous system which is relatively rare in children. It affects the brachial plexus and/or individual nerve or nerve branches. This disorder is also known as Parsonage-turner syndrome or Brachial neuritis (BN).^{1,2} It is clinically characterized by an acute onset of deep, sharp, or burning pain in or around the shoulders or arms. Pain may persist for few weeks and is followed by muscular weakness, sensory deficit, or atrophy of the affected muscles.³

The incidence of INA is 2-3/100,000/year in the whole population and the mean age of onset is 41.3 years.^{4,5} It is a rare entity in children. BN exists in two forms. In idiopathic form, the exact etiology is not known. But believed to be immune-mediated since, in children fever, upper respiratory tract infections, vaccination often precede the attacks.¹ The hereditary form, also known as hereditary neuralgic amyotrophy (HNA) is an autosomal dominant disorder caused by mutations in the SEPT9 gene.⁶

INA is mostly diagnosed clinically. Electrophysiological studies help to localize the site of the lesion and

confirm the presence of BN. Whereas MRI is useful for excluding focal pathology. Serological tests for the Epstein-Barr virus, Varicella Zoster virus, cytomegalovirus, and other viruses that are commonly associated with INA can be done but carry little diagnostic value. Prompt diagnosis of the condition is important because immunotherapy is usually more effective in the early stage of the disease.⁷ The long-term prognosis for children is still controversial as few studies mentioned it favorable whereas others found unfavourable.^{8,9}

Although INA is well documented in adults, it has rarely been documented in children. Relatively few cases have been reported worldwide.^{1-2,8,10} In the following we reported three cases of INA where clinical spectrum, electrophysiological findings, treatment strategies, and outcome are discussed. This report will help to gain a better understanding of the disease in children and thereby ensure proper treatment and better prognosis.

Case 1:

A previously well 7-year-old boy presented to the emergency department with complaints of pain and subsequent weakness of the left shoulder girdle for 5 days. He was unable to raise his left arm above the shoulder. He had a history of fever 10 days before this illness. But there was no history of trauma and recent vaccination. His past medical and family history was unremarkable. On physical examination, his left arm was adducted and internally rotated. No visible muscle wasting was observed. He had reduced strength in the

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Deltoid (Medical Research Council [MRC] score, 2/5), Supraspinatus (MRC 2/5), Infraspinatus (MRC 2/5), and Biceps (MRC 3/5) muscles. All the reflexes were reduced. A hypaesthetic area was identified in the left arm corresponding to the area of the axillary nerve. The other limbs showed no abnormalities. His blood counts were within the normal limit. Later, nerve conduction study (NCS) and electromyography (EMG) revealed damage to the upper trunk of the left brachial plexus, but MRI showed no obvious abnormalities. Intravenous immunoglobulin (IVIg) (400 mg/kg daily) was given for 5 consecutive days followed by oral prednisolone (2mg/kg) for 1 month with gradual tapering over the next 1 month. After 4 months, there was an improvement in muscle strength but wasting was observed in Deltoid, Supraspinatus, and Infraspinatus muscles (Fig 1B).

Case 2:

A young boy presented at the age of 4 years and 6 months with an acute limp of the right arm for 7 days. He did not complain of pain. There was no history of antecedent trauma, recent immunizations, illness, or fever nor any history of the same kind of illness before. Abnormalities on neurological examination were restricted to the right arm and involved both the proximal muscles (MRC 2/5) and distal muscles (MRC 3/5). Reduced tendon reflexes were identified along the entire right upper limb. The child was not very cooperative for sensory examination. His complete

blood count and ESR were within the normal limit. EMG was done 20 days after the onset of illness which revealed injuries to the upper, middle, and lower trunk of the right brachial plexus. MRI showed no abnormality. He was given methylprednisolone at a dose of 30 mg/kg for 5 days followed by oral prednisolone. Supportive physical therapy was also given. In the last follow-up after 6 months of illness, there was marked atrophy and weakness of proximal limb muscles. He could grasp an object but still had wrist drop and shoulder paresis.

Case 3:

An 8-year-old girl was referred for an NCS for the weakness of her right upper limb for 15 days. She had a history of upper respiratory tract infection 7 days before this illness. She faced dull aching pain in her right shoulder for 3 days preceding the limb weakness. On examination, there was no muscle wasting but the weakness was observed in the right Deltoid (MRC 3/5), Biceps (MRC 3/5), and Supraspinatus (MRC 3/5) muscles. Biceps reflex was reduced and clinically no sensory deficit was detected. NCS showed involvement of the right Axillary, Musculo-cutaneous, and Lateral antebrachial cutaneous nerve of the forearm. MRI of the brachial plexus was not done. She was getting oral prednisolone (2mg/kg) for the last 10 days. After 6 months of follow-up, she had nearly complete recovery without any obvious muscle wasting.



Fig.-1: A. Unable to lift right arm. B. Wasting of the infraspinatus, supraspinatus, and deltoid muscles.

Table-I
Summary of clinical profiles, diagnostic tests, treatment, and outcome of the reported cases.

Variables	Case 1	Case 2	Case 3
Age of onset	7 year	4 years 6 months	8 years
Sex	Male	Male	Female
Affected side	Left	Right	Right
Preceding event	Fever	Absent	Upper respiratory tract infection
Pain	yes	Absent	yes
Proximal weakness	yes	Yes	yes
Distal weakness	no	yes	no
NCS and EMG findings	Upper trunk injury	Upper, middle, and lower trunk injury	Upper trunk injury
MRI findings	Normal	Normal	Not done
Drugs given	IVIg, Prednisolone	Methylprednisolone Prednisolone	Prednisolone
Outcome	Incomplete recovery	Incomplete recovery	Nearly complete recovery

Discussion

INA is a syndrome with a wide range of clinical spectrum with diverse etiology. Patients can present with isolated nerve palsy to severe paresis of both upper limbs.³ INA is considered to be autoimmune in origin.¹¹ The first described case by Feinberg in 1897 was associated with influenza.¹² Subsequently literature states that in the pediatric population, 33% of cases have a history of upper respiratory tract infection, 22% have osteomyelitis and 8% have vaccination preceding the attack.¹

Individuals of any age can be affected by the disease but onset usually occurs between 20-60 years of age.⁸ In children, it is less commonly encountered and forms a distinct subgroup within its clinical spectrum than adults. There is a biphasic peak of onset of the disease in the pediatric population. The first peak is in the neonatal period (less than 8 weeks old) and the second one is in adolescence (7-15 years). It is more frequent in males than females in all age groups.⁸ In our reported cases, the age range was between 4 and 8 years and the male to female ratio was 2:1. Typical clinical features may not be present in children. Only two-thirds of children experience pain whereas 95% of adults present with neuralgic pain. Thus the absence of pain does not exclude the disease. In a review of 58 children with BN, it is described that pain was present in 47% and absent in 25% of cases.⁸ Sensory involvement is also unusual or difficult to

assess in children.² Most attacks (53-95%) occur on the right side in all age groups and 12-34% of the attacks are bilateral. However, in children bilateral involvement is rare.¹³ All of our reported cases had unilateral involvement and the right arm was affected more.

INA is a clinical diagnosis. However electro-physiological studies and imaging are considered in less clear-cut cases. In the early course of the illness (10-15 days) NCS and needle EMG findings may be normal. Typically it reveals multifocal involvement dominated by axonal degeneration. In few cases, demyelination has also been found.¹⁴ Sensory NCS is found to have limited value because a normal sensory finding does not preclude the diagnosis.¹⁵ Upper trunk of the brachial plexus is most frequently affected. Extensive damage to all the trunks is less common. Rarely extra-brachial nerves could also be involved.¹⁶ One of our reported cases had extensive involvement in all the trunks of the right brachial plexus although MRI findings were normal. Usually, no abnormal findings are identified on conventional MRI. However, gadolinium-enhanced MRI shows high signal intensity in the involved nerves which can assist the diagnosis.^{17,18} Recently it is suggested that in the acute stage, Magnetic Resonance Neurography (MRN) is superior to MRI.¹⁹ Cerebrospinal fluid (CSF) analysis may show mild protein elevation without pleocytosis.²⁰ However CSF analysis was done in none of our reported cases.

Evidence-based treatment of INA in children is still lacking. A combination of analgesics, corticosteroids, rest, and physiotherapy are considered standard treatments.¹⁰ As the disease is immune-mediated, immunotherapy may play a role. Some authors describe that oral prednisolone (60mg/day) may shorten the duration of symptoms when it is given in the 1st month.⁷ In a study by Naito *et al.*, intravenous immunoglobulin (IVIG) (400 mg/kg daily for 5 consecutive days) and methylprednisolone pulse therapy (1g daily for 3 consecutive days) showed motor improvement and decrease the length of symptoms in 9 out of 10 patients.²¹ The efficacy of IVIG has been confirmed in some reports but none of them were of high quality.¹⁶ The overall prognosis of INA in children is good. Recurrence is very rare.² Host *et al.*, described that out of 58 pediatric cases, 63% made a complete recovery, 25% partial, and 13% no recovery. The mean period of recovery was 11.1 months.⁸ Another study states that children have less favorable recovery. But when they fully recovered, in comparison to adults, they do it in a short period.¹ Therefore INA in children has a variable outcome. Therefore, long-term follow-up is needed to determine the actual prognosis of INA in children.

Conclusion

The herein studied cases described the classical clinical spectrum of INA in children. However, the pediatric phenotype is diverse but seems to have a slightly better outcome than the adult form. INA should be suspected in a child presented with sudden weakness of the shoulder or arm region, even if it is painless. Diagnosis is often made clinically supported by EMG and MRI for less clear-cut cases. Although the effective treatment protocol is still lacking, it should be started as early as possible for a better outcome.

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