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Original Research Article

Evaluation of causes of acute onset paraparesis in a tertiary care centre in South India

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ABSTRACT

Background: Paraparesis is a complex condition that presents with unique challenges and people living with paraparesis can lead fulfilling lives with the right support and rehabilitation. This study aimed to determine the causes of acute onset paraparesis presenting to emergency department.
Methods: A hospital-based cross-sectional study done for a period of 12 months in 90 people attending a tertiary care hospital in Siddipet, Telangana. Patients aged less than 14 years, pregnant and lactating mothers and patients who were not willing to participate in the study were excluded. Preliminary data was recorded, followed by clinical examination and necessary relevant laboratory and radiological investigations were done.
Results: After complete evaluation, 33% of the people were found to have hypokalemic periodic paralysis, 30% were having Guillain Barre syndrome, 4% people were diagnosed with traumatic vertebral fractures and 3% of the people were found to have polymyositis. Rest of the people were having extramedullary Tumors, intervertebral disc prolapses, cauda equina syndrome, conus medullaris, paraneoplastic syndromes, neuromyelitis optica, transverse myelitis and multiple sclerosis.
Conclusions: Acute onset paraparesis must be evaluated swiftly starting with metabolic abnormalities which seem to be the most commonly encountered cause followed by imaging modalities, keeping in mind a few conditions related to spinal cord. Early detection and treatment are important to avoid grave consequences. It is imperative that atraumatic causes must also be taken into account besides the traumatic etiology, as there can be a significant improvement in their quality of life with timely medical attention and prompt treatment.

Keywords: Cauda equina syndrome, Guillain Barre syndrome, Hypokalemia periodic paralysis, Neuromyelitis optica, Paraparesis, Polymyositis

INTRODUCTION

Paraparesis is an important neurological condition having a profound impact on person's physical, emotional and social well-being.

Paraparesis is impairment in motor function of both lower extremities with or without sensory involvement. It is caused by involvement of cerebral cortex, spinal cord, peripheral nerves, neuromuscular junction, or muscles. It can present with spastic paralysis (upper motor neuron-UMN type) or flaccid paralysis (lower motor neuron-LMN type).[1]

Upper motor neuron causes

Cerebral causes

These include: 1) traumatic: subdural hematoma, 2) vascular: superior sagittal sinus thrombosis, thrombosis of unpaired anterior cerebral artery distal to Huebner's artery, AICA aneurysm going into spasm.[2,3] 3) Inflammatory:

meningoencephalitis, 4) neoplasm: parasagittal meningioma, 5) degenerative: cerebral palsy.

Spinal causes (non- compressive)

These include: 1) vascular: APLA, AV malformation, thrombosis of anterior spinal artery, 2) inflammatory: multiple sclerosis, neuromyelitis optica, transverse myelitis, SLE related myelopathy, sarcoidosis, Sjogren related myelopathy, vasculitis, post vaccination, 3) infections: viral (HSV, HIV, CMV), Bacterial (syphilis, TB), parasitic (schistosomiasis, toxoplasmosis), 4) developmental: syringomyelia, meningomyelocele, 5) metabolic: vitamin B_{12} deficiency, copper deficiency, 6) NPH- normal pressure hydrocephalus.

Spinal causes (compressive)

These include: 1) trauma: epidural hemorrhage, fractured or displaced vertebra, herniated disc, hematomyelia, 2) infection: epidural abscess, 3) neoplasm: epidural (metastasis) or intradural (meningioma, neurofibroma) or intramedullary (hemangioblastoma, glioma, AV malformation).

Lower motor neuron causes

These include: 1) UMN in neuronal shock: acute transverse myelitis, spinal injury 2) anterior horn cells: infections (polio, HIV, HTLV), motor neuron disease, 3) nerve roots: infections (tabes dorsalis, HZV, EBV, CMV), Guillain Barre syndrome, cauda equina syndrome, prolapsed disc, diabetic amyotrophy, 4) peripheral nerves: neuropathy or neuritis, 5) myo neuronal junction: myasthenia gravis, organophosphorus poisoning, 6) muscles: polymyositis, myopathy (alcohol or vitamin deficiency), periodic paralysis due to electrolyte abnormalities (hypo or hypercalcemia, hypo or hyperkalemia, hypomagnesemia, thyrotoxicosis), drugs (statins, steroids, laxatives, beta blockers, diuretics, antipsychotics), Muscular dystrophy.

Approach

UMN- hypertonia and hyperreflexia. LMN- hypotonia and hyporeflexia; UMN causes evaluation; cortex- GCS and raised ICT signs; spinal cord- sensory level, bowel and bladder involvement, dissociative sensory loss; LMN causes evaluation; nerve roots- radicular pain; nerves- sensory symptoms and distal involvement; NMJ- fatiguability, bulbar and ocular symptoms involvement; muscles- proximal to distal progression (electrolyte imbalance- onset of few hours to days that resolve spontaneously).

Paraparesis is a challenging condition that requires comprehensive care and support. Majority of the current studies were based on the traumatic causes of paraparesis and thus this study aims to elucidate the atraumatic etiology causing paraparesis. Also, this study might help one intervene at the earliest possible which improves the quality of life significantly.

METHODS

The current study was a cross sectional study conducted at RVM charitable trust hospital, a tertiary hospital in Telangana over a period of 12 months from August 2023 to July 2024. Total 90 patients were studied during the period.

All the patients presenting with the complaints of weakness of both lower limbs ≤4 weeks, age >14 years and those willing to participate were included in the study. Pregnant women and lactating mothers, age <14 years and those not giving consent were not included in the study.

Preliminary data was collected and a structured proforma including detailed case history has been used for the evaluation of patients. General physical examination was done which was followed by an extensive neurological examination including higher mental functions, cranial nerve examination, motor examination (bulk, tone, power, reflexes, gait, coordination), sensory examination (sensory level and type of sensation lost) and proper examination of skull and spine was done. Other system examinations (CVS, GIT, respiratory) were done.

Relevant laboratory investigations and imaging modalities were performed accordingly. The routine investigations which were done are complete hemogram, liver function tests, renal function tests, serum electrolytes and random blood sugar level. The specific investigations done were brain imaging (CT/MRI brain, venogram, angiography), spinal cord imaging (CT/ MRI, venogram, angiography), serum vitamin B^{12}, serum vitamin D, serum creatine phosphokinase, thyroid profile, erythrocyte sedimentation rate, ANA profile, serum pseudocholinesterase, serum cortisol, Nerve conduction studies, Electromyography (EMG), serum aquaporin 4 IgG antibodies, Doppler ultrasonography and CT angiography.

RESULTS

In our study 90 patients with paraparesis were included. Among 90 patients 34 of them had hypokalemic periodic paralysis, 30 patients were diagnosed with Guillane Barre syndrome, 4 patients had traumatic vertebral fractures and 3 patients had polymyositis. Extramedullary tumor, vitamin D deficiency, intervertebral disc prolapse, cauda equina syndrome, transverse myelitis and alcoholic myopathy were seen in 2 patients each. Few patients were diagnosed with hematomyelia, neuromyelitis optica spectrum disorder (NMOSD), conus medullaris, multiple sclerosis, thyrotoxic periodic paralysis and paraneoplastic myelitis.

It was observed that most of the patients belong to 30-50 years age group (Figure 1) with male preponderance (Figure 2).

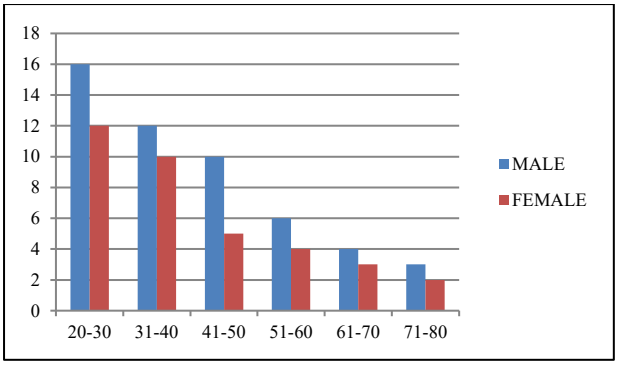

Figure 1: Data in relation to age in years.

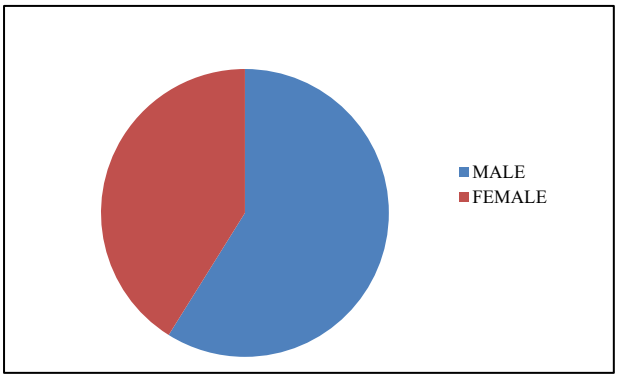

Figure 2: Data in relation to sex.

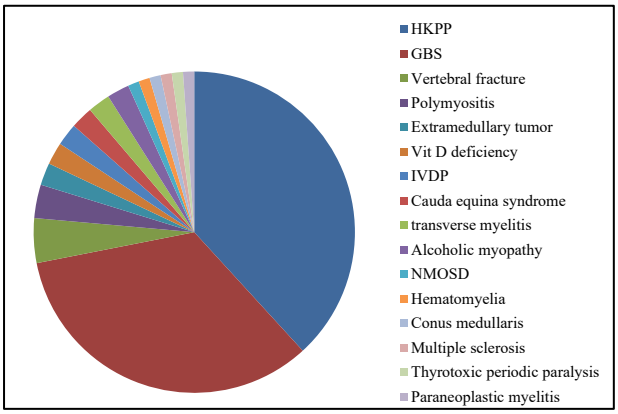

Figure 3: Causes of paraparesis.

From the above chart, the most common cause of paraparesis is observed to be hypokalemic periodic paralysis followed by Guillain Barre syndrome, traumatic vertebral fractures and polymyositis.

DISCUSSION

This study was conducted among 90 patients with the aim to identify the common causes of acute onset paraparesis in patients coming to emergency department in RVM charitable trust hospital, Mulugu.

Hypokalemic periodic paralysis (HKPP) patient presented with sudden onset of episodic, hyporeflexic weakness of both lower limbs with normal strength in between attacks and on evaluation, was found to have low serum potassium.[2]

Guillain barre syndrome is an acute, progressive, autoimmune, inflammatory demyelination of peripheral nerves presenting with weakness of both lower limbs and areflexia. Traumatic vertebral fractures occur commonly due to motor vehicle accidents followed by falls affecting D12 and L1 level.[3]

Polymyositis is idiopathic inflammatory myopathy presenting with symmetrical proximal muscle weakness, elevated serum creatine kinase level and EMG showing abnormal electrical activity.[4] Affected Muscle biopsy is the gold standard for diagnosing polymyositis.

Extramedullary tumors accounts for about 40% of spinal tumors which can be meningioma, neurofibroma, schwannoma or subarachnoid metastasis. They grow in the membrane (dural sheath) surrounding the spinal cord or the nerve roots that reach out from spinal cord. They present with sensory symptoms, pain, stiff back, bowel and bladder incontinence.

Vitamin D deficiency is an important treatable cause of osteomalacic proximal myopathy with 25-hydroxy vitamin D <20 ng/ml. Intervertebral disc prolapse is common in lumbar spine and they present with root pains associated with tingling sensation.

Cauda equina syndrome involves lumbosacral nerve roots characterized by gradual onset of asymmetric and areflexic weakness of both lower limbs, radicular pain and saddle anaesthesia with late involvement of bladder (urinary retention LMN type of bladder). [5]

Conus medullaris involves most distal bulb of spinal cord situated at L1-L2 vertebral bodies with S1-S5 sacral nerve roots.[5] It is characterized by sudden onset of symmetrical hyper reflexia weakness of both lower limbs with early bladder involvement (spastic bladder- UMN type of bladder).

Alcoholic myopathy is characterized by weakness, pain, tenderness and swelling of affected muscles and often occurs after alcohol binge and resolves within 1-2 weeks of abstinence from alcohol.[6] Hematomyelia is intramedullary spinal cord hemorrhage occurring in patients with history of trauma, bleeding disorders or AV malformations.[7] It presents as sudden severe low back pain.[8]

Transverse myelitis is a rare, acquired focal inflammatory disorder often presenting with rapid onset weakness, sensory deficits, and bowel bladder dysfunction.[9] It often occurs as a complication of infection; however, it may also exist as part of a continuum of other neuro-inflammatory disorders like multiple sclerosis, neuromyelitis optica

spectrum disorder, acute flaccid myelitis, etc.[10] It can occur at any level but most commonly affects thoracic region.

Neuromyelitis optica (NMO) is also called as neuromyelitis optica spectrum disorder (NMOSD) or Devic's disease. It is an uncommon inflammatory and demyelinating disorder of central nervous system which primarily targets the optic nerves, brainstem and spinal cord.[11] IgG antibodies against aquaporin-4 (AQP 4) are noted in more than 60% patients with NMOSD. AQP 4 is a transmembrane water channel found on foot processes of astrocytes and certain areas of central nervous system such as optic nerve, the spinal cord, the area postrema and circumventricular organs. The clinical characteristics of NMOSD include optic neuritis, acute myelitis, area postrema syndrome (unexplained hiccups, nausea, vomiting).

Multiple sclerosis is a chronic autoimmune disease affecting central nervous system and is characterized by inflammation, demyelination, gliosis and neuronal loss which manifests with wide range of neurological symptoms such as vision impairment, numbness, tingling sensation, focal weakness, cognitive impairment, bowel and bladder dysfunction.

Thyrotoxic periodic paralysis (TPP) is characterized by abrupt onset of hypokalemia and paralysis primarily affecting lower limbs and is secondary to thyrotoxicosis.[12] Hypokalemia in TPP results from an intracellular shift of potassium induced by thyroid hormone sensitization of Na-K-ATPase. Thyrotoxic periodic paralysis need not necessarily have features of Graves' disease.

Leriche syndrome-commonly referred to as aortoiliac occlusive disorder (AIOD), is a product of atherosclerosis affecting the distal abdominal aorta, iliac arteries, and femoropopliteal vessels which classically presents with a triad of claudication, impotence, and absence of femoral pulses.

Paraneoplastic myelitis is an unusual manifestation of systemic malignancy, mostly seen with lung cancers and lymphoproliferative malignancies.[13] They present with acute onset of weakness of both lower limbs along with retention of urine.[14]

CONCLUSION

Metabolic abnormalities are commonly seen in paraparesis, hence all the paraparesis patients should be evaluated for metabolic causes besides the imaging modalities. Acute onset of paraparesis must make you think of lesions involving spinal cord and superior sagittal sinus thrombosis. Cauda equina and conus medullaris are the two conditions pertaining to spinal cord that must be kept in mind while dealing with paraparesis as they must be treated promptly to preserve fertility especially in males. Early detection and treatment of diseases like neuromyelitis optica and Leriche syndrome is crucial to avoid grave consequences. In alcoholics presenting with paraparesis, GBS and alcoholic myopathy are the two important clinical entities that must be considered.

When a paraparesis patient presents with thrombocytopenia, fever and leukemia, haemetomyelia must be taken into consideration. While evaluating young females with paraparesis, multiple sclerosis must be borne in mind. It is important to understand that paraparesis can be caused by lesions involving cerebral cortex, spinal cord, peripheral nerves, neuromuscular junction, or muscles with the most common type of presentation being flaccid paralysis and it must be noted that metabolic abnormalities are equally important to be considered besides imaging modalities while treating a patient with paraparesis.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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