

NEUROMYELITIS OPTICA (DEVIC'S DISEASE) IN A 10 YEARS OLD BOY.

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ABSTRACT

Neuromyelitis optica (NMO) also known as Devic's disease is an acute demyelinating disorder combined with optic neuritis and transverse myelitis. A 10 years old boy presented in the ER with the complaints of fever and back pain for past 10 days and inability to walk for 6-7 days. He had developed urinary retention and constipation for the past 5 days along with abdominal distension. There was also blurring of vision in the left eye with only light perception and rapid afferent papillary defect was present while the right eye was normal. The provisional diagnosis was Transverse myelitis vs Neuromyelitis optica (NMO). CSF revealed TLC 4, protein 54mg/dl, glucose 66mg/dl. Oligoclonal bands were negative. There was raised CPK. Visual evoked potential (VEP) showed prolongation of P100 latency along with amplitude loss, in left eye. His MRI spine showed extensive involvement of the spinal cord especially the cervical cord and there was no involvement of the brain. Left eye had optic neuritis. He was treated with steroid pulse therapy and later Plasmapheresis and was discharged home on azathioprine with no motor deficit but the visual loss was irreversible

KEY WORDS: optic neuritis, myelitis, Devic's disease

INTRODUCTION

Neuromyelitis optica (NMO) also known as Devic's disease is an acute demyelinating disorder comprising of optic neuritis and transverse myelitis.¹ NMO predominantly affects middle aged adults, while case reports from the pediatric population have been increasing in past few years. A recent case series of pediatric NMO revealed strong female predominance.² NMO has specific diagnostic criteria and unique pathologic features when compared with multiple sclerosis (MS) ³. Pediatric NMO has comparatively poor visual and motor outcomes.¹ Traditionally, the term NMO was applied to those patients who experienced a monophasic event consisting of bilateral simultaneous optic neuritis and acute myelitis.⁴

CASE REPORT

A 10 years old boy presented in the ER with the complaints of fever and back pain for past 10 days and inability to walk for 6-7 days. He had developed urinary retention and constipation for the past 5 days along with abdominal distension. For the past two days he had been complaining of blurring of vision in the left eye. There was no history of any recent viral illness, vaccination or trauma. He had been to a hospital

where he was catheterized and started on broad spectrum antibiotics for the past 4 days but there was no improvement they came to this hospital.

His birth and development was normal and he was a student of class III. There was no history of any allergies or surgery. Immunization was up to date. Family history included two sisters and three brothers who were well and healthy. There was no family history for any neurological disease or unexplained visual loss. On examination the patient was fully alert, interactive and oriented. His anthropometric measures were on the 50th centile. He was afebrile, with stable vitals. There was no rash or lymphadenopathy. He was well hydrated and well nourished. His chest was clear with normal vesicular breathing while abdomen was full with slit like umbilicus and urinary bladder was palpable at the level of umbilicus, there was no shifting dullness or visceromegaly and gut sounds were audible. His GCS was 15/15 and higher mental functions were intact. Cranial nerves were intact. Tone was normal in all four limbs; power was 4/5 in both upper limbs and 1/5 in lower limbs. Deep tendon reflexes in upper limbs were +2 and in lower limbs +3. Planters were up going. Superficial reflexes were absent. On sensory examination pain, temperature, vibration and proprioception were intact. There were no signs of meningeal irritation. He was unable to sit and

complained of pain on movement. His left eye had only light perception and showed rapid afferent papillary defect while the right eye was normal. The provisional diagnosis was Transverse myelitis vs Neuromyelitis optica (NMO). Complete blood count and basic metabolic workup was normal. Inflammatory markers (C-reactive proteins and Erythrocyte sedimentation rate) were within normal limits. CSF revealed TLC 4, protein 54mg/dl, glucose 66mg/dl. Oligoclonal bands were negative. There was raised CPK. Visual evoked potential (VEP) showed prolongation of P100 latency along with amplitude loss, in left eye. MRI revealed multiple abnormal T2 hyper intense signals showing post contrast enhancement almost along the entire spinal cord. These were predominately identified in the cervical region of the spinal cord along with swelling of the cord in this region. Overall appearance was suggestive of transverse myelitis. Bilateral globes and optic nerve appeared unremarkable. The grey matter and white matter appeared normal. A diagnosis of Devic's disease was made and the patient was treated initially with intravenous methyl prednisolone (30 mg/kg/day for five days) followed by gradually tapered oral steroids. Condition of child remained static; therefore Plasmapheresis was done for 5 days. Azathioprine 2 mg/kg/day was added and limb physiotherapy started. Clinical outcome was favorable with significant reversible of power and function of limbs.

Discussion

By definition NMO is a monophasic or relapsing disorder of the optic nerves and the spinal cord, without evidence of white matter dysfunction of the brain, brainstem or cerebellum, with the exception of hypothalamic and lower brainstem dysfunction. Optic nerve and spinal cord dysfunction might be partial and it can be unilateral or even subclinical, with an abnormal visual evoked potential but no clinical signs. Partial forms of NMO are also called high-risk NMO, in which isolated transverse myelitis or optic neuritis occurs. The optico-spinal form of MS is quite similar to NMO. Hence, it appears to be a spectrum of NMO, with various degrees of involvement but course of NMO is more acute, sometimes fulminant. In contrast with the optic neuritis of MS, NMO optic neuritis can be severe, fulminant and devastating with very poor prognosis.⁵ Brain lesions have been observed in children; in one series 68% of NMO-IgG seropositive children and among them 45% had brain symptoms which corresponding to the MRI abnormalities.⁶ In contrast to MS, attacks in NMO commonly spare the brain in the early stages. Hence, normal brain MRI is a

common finding at the onset of NMO, so on follow-up scans must be performed periodically for development of later lesions in the course of the disease.⁴ Lesions in the Spinal cord are large, and extends over three or more vertebral segments in about 85-90% of patients and are mostly located in the cervical and upper thoracic region. The Current revised diagnostic criteria of NMO tells the presence of acute optic neuritis and myelitis with at least two of the three supportive criteria, which consist of spinal cord MRI lesion extending over three consecutive vertebral segments, brain MRI lesion, which does not meet the diagnostic criteria for multiple sclerosis, and NMO-IgG seropositive status. Our patient had no systemic disorder or non-organ-specific autoimmune disorder or autoantibody. At the time of the left eye's involvement, our patient fulfilled the diagnostic criteria.⁷ CSF examination of our patient showed no pleocytosis. Oligoclonal bands of IgG in the CSF are frequently seen in MS and these are detected in 15-30% of patients with NMO.⁸ Oligoclonal bands were negative in our patient's CSF examination. A number of modalities have been tried but there is no proven treatment protocol as yet either in the acute attacks or in the long term remissions in NMO. Hence Intravenous corticosteroid therapy is the commonly preferred initial treatment for acute attacks.⁷ A total of 50% of the patients, those who are unresponsive to corticosteroid treatment may benefit from plasmapheresis.⁷ The efficacy of immunomodulatory therapies (Beta-interferon) have not been proven yet. However, immunosuppressive therapy (oral azathioprine, associated with or without oral steroids; intravenous immunoglobulin; Rituximab) is an accepted method to provide clinical remission of corticosteroid resistant NMO.⁹ Our patient received both steroid pulse therapy and Plasmapheresis and was sent home on oral steroids and azathioprine. He became fully mobile with no neurological deficit in the lower limbs though his vision was lost in the left eye

Conclusion

NMO is a rare but severe devastating disease affecting vision and nervous system resulting in blindness and paraplegia in children. Hence an early intervention with the appropriate treatment modality in patients suspected with NMO decides on the favorable outcome from an acute episode



Fig. 1a



Fig. 1b

Fig 1a and b: Abnormal T2 hyper intense signals showing post contrast enhancement predominantly in the cervical region along with swelling of the cord

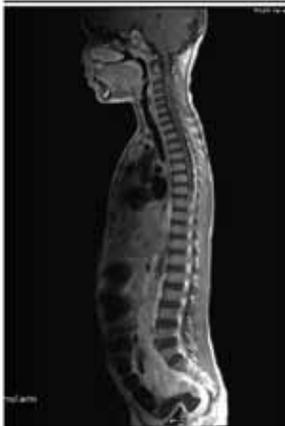


Fig. 2a



Fig. 2b

Fig 2a and b: The entire spine shows post contrast enhancement with marked hyper intense signals in the cervical cord

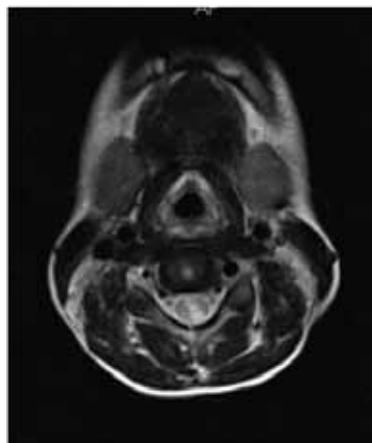


Fig. 3

Fig 3. Shows transverse section of the cervical spine with hyper intensities more marked posteriorly as compared to anterior cord

References

1. Saiz A, Zuliani L, Blanco Y, Tavolato B, Giometto B, Graus F. Revised diagnostic criteria for neuromyelitisoptica (NMO). *Journal of Neurology*. 2007;254(9):1233-7.
2. Tillema JM, McKeon A. The Spectrum of Neuromyelitis Optica (NMO) in childhood. *Journal of Child Neurology*.27(11):1437-47.
3. Barnett MH, Sutton I. Neuromyelitis optica: not a multiple sclerosis variant. *Current opinion in neurology*.25(3):215-20.
4. Wingerchuk DM, Lennon VA, Pittock SJ, Lucchinetti CF, Weinshenker BG. Revised diagnostic criteria for neuromyelitisoptica. *Neurology*. 2006;66(10):1485-9.
5. Mandler RN. Neuromyelitis optica, Devic's syndrome, update. *Autoimmunity reviews*. 2006;5(8):537-43.
6. McKeon A, Lennon VA, Lotze T, Tenenbaum S, Ness JM, Rensel M, et al. CNS aquaporin-4 autoimmunity in children. *Neurology*. 2008;71(2):93-100.
7. Wingerchuk DM, Lennon VA, Lucchinetti CF, Pittock SJ, Weinshenker BG. The spectrum of neuromyelitisoptica. *The Lancet Neurology*. 2007;6(9):805-15.
8. Bergamaschi R, Tonietti S, Franciotta D, Candeloro E, Tavazzi E, Piccolo G, et al. Oligoclonal bands in Devic's neuromyelitisoptica and multiple sclerosis: differences in repeated cerebrospinal fluid examinations. *Multiple sclerosis*. 2004;10(1):2-4.
9. Wingerchuk DM, Weinshenker BG. Neuromyelitis optica. *Current treatment options in neurology*. 2008;10(1):55-66.

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SALMONELLA MENINGITIS A RARE PRESENTATION IN ADULT

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ABSTRACT

Salmonella is a leading cause of food-borne infections worldwide. There are more than 2500 different serovars of salmonella enterica found to date, causing primarily gastroenteritis. However, the infection may occur elsewhere and produce characteristic clinical syndromes. Meningitis is a rare complication that occurs in less than 1% of clinical salmonellosis.

KEYWORDS:Gastroenteritis, Cerebritis, Meningitis, Salmonellaparatyphi b.

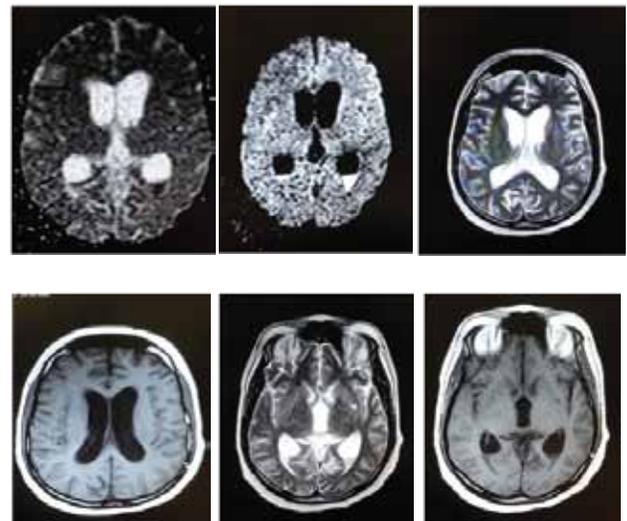
INTRODUCTION

Here we present a case of Salmonella meningitis in a 32-year man. He was admitted via emergency department with headache in the occipital region. There was associated fever, nausea, vomiting and neck stiffness. Along with other baseline investigations, lumbar puncture was done and was sent for routine investigation, microscopy, culture and sensitivity. Salmonella paratyphi-B was isolated from CSF. Salmonella rarely involves meninges and brain tissues and this report highlights the risk of meningitis/cerebritis as a presentation of salmonellosis.

CASE PRESENTATION

32 years old male, known Diabetic and bed bound secondary to Chronic inflammatory demyelinating polyneuropathy since 2013, received 5 session of plasmapheresis and 5 session of immunoglobulin IG, taking steroids and immunosuppressant, admitted through ER on 24-8-2015 with presenting complains of high grade fever with chills associated with severe sharp headache which radiate towards neck, along with 2-3 episodes of vomitings. On Examination young male, conscious, awake, following single step command vitals of Blood Pressure 115/83, pulse 125, Temperature 101 degree Fahrenheit, Clinically CHEST ABDOMEN AND CVS finding were unremarkable CNS =GCS E4M5V4, signs of meningeal irritation positive including neck stiffness and kernick's, lower limbs power 2/5 in both legs reflexes diminished.

During hospital course base line test including CBC, UCE, LFT,PT,INR are within normal limits, URINE D/R shows numerous pus cells BLOOD CULTURE and URINE CULTURE were sent and MRI brain with Contrast done



MRI brain shows increase signals in bilateral posterior horn of lateral ventricles and fluid levels, restriction in ADC along with Meningeal Enhancement and Hydrocephalus. Findings are due to Meningitis. On Lumbar puncture opening pressure of CSF was 7mm. Empirically injection Imipenem 1gm TDS and InjVancomycin 1gm BD started. CSF D/R shows Sugar 09, Proteins 475, RBC 160, WBC 670 Monos 20%, polys 80%.gs, Wet mount negative. Urine C/S, Blood C/S and CSF C/S all shows salmonella paratyphi

sensitive to ceftriaxone then antibiotic switched from Meropenem to Ceftriaxone and then it was treated on line of Salmonella Meningitis ,patient responded well ,his repeat CSF D/R shows decrease in Protein count from 475 to 43, WBC count reduces from 670 to 15 with Repeat Cultures including Blood, Urine and CSF become Negative.He remained Afebrile during hospital stay, signs of meningeal irritation resolved and was finally discharged home after 13 days in a better condition.

DISCUSSION

Salmonella enterica are motile, non-lactose fermenting, non-spore forming, gram-negative, rod-shaped bacterium. Salmonella enterica has the ability to ferment glucose resulting in the production of acid and gas. Within the subspecies, S. enterica, there are three serotypes; Paratyphi A, B, and C. These serotypes are human pathogens that cause paratyphoid fever. Paratyphi A and B are responsible for more cases of disease than infection from Paratyphi C. Salmonella Paratyphi, causes 3% of invasive Salmonella infections and is correlated to poor sanitation and lack of clean drinking water, contaminated from feces from an infected individual or an asymptomatic carrier of the disease. Salmonella enterica serovars Paratyphi is transmitted primarily through humans, although there are rare cases of transmission from domestic animals. Milk, raw vegetables, salads, shellfish, and ice can also transmit the pathogen if not properly washed or prepared. Also, there are rare reports of the disease being transmitted sexually ^[1]Salmonellosis is classified into four manifestations: enteric infections, sepsis, non-enteric focal infections (including meningitis) and a chronic carrier state. Salmonella meningitis presents as acute onset of fever, headache and one of the following signs: neck stiffness, altered consciousness or other meningeal signs. in our case patient present with 1 week history of high grade fever, occipital headache, neck pain which was actually neck stiffness and irritability. The first case of Salmonella meningitis in the literature was reported in 1907 by Ghon [2][3]. In a study of 7,779 infections identified at the New York Salmonella Centre, meningitis accounted for only 0.8%] hence salmonella meningitis is rare manifestation of salmonella infection it is common in childhood and if in adults, is most commonly seen in patients with intercurrent illness or immunosuppressive states[8], as in our case patient is known case of CIDP (chronic inflammatory demyelinating polyneuropathy)

secondary to GBS since 3 years and having history of 2 to 3 episodes of exacerbation for which he took multiple sessions of IVIG and plasmapheresis and taking Steroids and CellCept (mycophenolatemofetil) which is an immunosuppressant, a medicine that lowers your body's immunity other host risk factors for nontyphoidal Salmonella bacteremia include extremes of age and chronic or immunosuppressing conditions, including malignancy, rheumatological disease, TNF blockade (e.g., agents such as etanercept or infliximab), transplantation, HIV infection, and congenital immune defects. Other predisposing comorbidities include liver disease, hemoglobinopathies (especially sickle cell disease), schistosomiasis, and chronic granulomatous disease. Alteration of the GI tract also predisposes to progression from enteric to systemic salmonellosis (e.g., by suppression of gastric acid, malnutrition, recent antibiotic use, or rotavirus infection). The incubation period of nontyphoidal salmonellosis is 6–72 hours, but illness usually occurs within 12–36 hours after exposure. Illness is commonly manifested by acute diarrhea, abdominal pain, fever, and sometimes vomiting. The illness usually lasts 4–7 days, and most people recover without treatment. Approximately 5% of people develop bacteremia or focal infection (such as meningitis or osteomyelitis). Salmonellosis outcomes differ by serotype. Infections with some serotypes, including Dublin and Choleraesuis, are more likely to result in invasive infections. Rates of invasive infections and death are generally higher among infants, older adults, and people with immunosuppressive conditions (including HIV), hemoglobinopathies, and malignant neoplasms. Diagnosis is based on isolation of Salmonella organisms. About 90% of isolates are obtained from routine stool culture, but isolates are also obtained from blood, urine, and material from sites of infection. Isolates of salmonellae are needed for serotyping and antimicrobial susceptibility testing

REFERENCES:

1. ncbi.nlm.nih.gov/PubMed/12830419 (Sexual transmission of typhoid fever: a multistate outbreak among men who have sex with men.)
2. Ghon J. Bericht über den XIV. Internationalen Kongress für Hygiene und Demographie. Berlin. 1907;4:21–23,
3. ncbi.nlm.nih.gov/pmc/articles/PMC3039577/ (Clinical features, acute complications, and outcome of Salmonella meningitis in children)

4. under one year of age in Taiwan)
ncbi.nlm.nih.gov/pmc/articles/PMC4031895 (Salmonella entericaserovar Virchow meningitis in a young man in Italy: a case report)
5. msdmanualsprofessional/infectious-diseases/gram-negative-bacilli/nontyphoidal-i-salmonella-i-infections
6. microbewiki.kenyon.edu/index.php/Salmonella enterica_serovar_Paratyphi(Paratyphi A infections lead to complications in 10-15% of cases, such as meningitis, endocarditis, hepatic abscess, gall bladder cancer, and pancytopenia)
7. cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/salmonellosis-nontyphoidal
8. eurosurveillance.org/ViewArticle.aspx?ArticleId=19489(Salmonella meningitis, although rare, is most commonly seen in patients with impaired immunity, particularly in infection with human immunodeficiency virus (HIV))

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Author's contribution:

ShobhaLuxmi: data collection, data analysis, manuscript writing, manuscript review

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Saira Naeem; Study concept and design, protocol writing, data collection, data analysis, manuscript writing, manuscript review

REVIEW OF VARIOUS INTRAOPERATIVE NEUROPHYSIOLOGIC MONITORING TECHNIQUES

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ABSTRACT

IONM is used to monitor nervous tissues (including brain, spinal cord, cranial nerves and peripheral nerves) in real-time during surgeries, alert neurological injuries and corrective measures and prevent disability. There are various IONM monitoring techniques including evoke potentials (SSEP, BAEP, MEP), EMG (Free-running and triggered), NAP (Nerve action potential) and Electroencephalography (EEG) to monitor the functional integrity of neural structures. SSEP evaluates integrity of posterior column-medial lemniscus pathway. SSEP is clinical use in spinal cord surgeries, vascular surgeries (carotid endarterectomy, cerebral aneurysm surgery etc), and localization of sensor motor cortex. BAEP evaluates integrity of peripheral and central auditory pathway. BAEP is clinical use in CP angle tumors surgery (acoustic neuroma, meningioma), microvascular decompression of CN-VII for hemifacial spasm, CN-V for trigeminal neuralgia, CN-IX for glossopharyngeal neuralgia, skull base surgery, Suboccipital decompression (e.g. fractures/dislocation C-1 vertebra, Chiari malformation). MEP evaluates integrity of motor pathway. MEP is sensitive to neuromuscular blocker anesthetic medications. Clinical utility of MEP including any surgery risking motor pathway injury include tumor near the motor cortex or corticospinal tract, intracranial aneurysm clipping, posterior fossa surgery, tethered cord or cauda equina surgeries, spinal deformity or fracture surgery, vertebral tumor resections, and anterior cervical discectomy, descending aortic procedures, spinal arteriovenous malformation interventions and carotid endarterectomy. EMG (free running and triggered) evaluates integrity of innervating nerves and electrical activity of muscles. Clinical utility of facial and other cranial nerve monitoring in posterior fossa surgery (eg, acoustic neuroma), selective dorsal rhizotomy, tethered cord release, Pedicle screw placement and Anal or urinary sphincter function monitoring.

INTRODUCTION

Intraoperative neurophysiologic monitoring (IONM) aims to assess ongoing functional integrity of the central or peripheral nervous system in the operating room (OR) or other acute care units^[1]. IONM is used to monitor nervous tissues in “real time” during surgery, and to alert surgeon to potential neurological injury and implement corrective measures to prevent permanent disability, thus improving safety and surgical outcomes. Intraoperative neurophysiologic monitoring is performed using a variety of neurophysiologic techniques including; Evoked potentials (EPs), Electromyography (EMG), Nerve action potential (NAP) and Electroencephalography (EEG) to monitor the functional integrity of certain neural structures including brain, spinal cord, cranial nerves and peripheral nerves^[2]. It is performed in a variety of surgical procedures including scoliosis surgery, spinal cord surgeries, epilepsy surgery, posterior fossa

surgeries including microvascular decompression, vascular surgeries including carotid endarterectomy and aortic aneurysm surgeries^[2].

History:-

Foerster and Alternberger were first use of IONM- EEG in 1935^[3]. Herbert Jasper and Wilder Penfield using electrocorticography (ECoG) for localization and surgical treatment of epilepsy in late 1930-1950^[3]. They also performed careful mapping of cortical function by direct electrical stimulation. In 1954, Amassian's found that single-pulse Direct Cortical Stimulation (DCS) and recording from epidural space evokes several corticospinal tract volleys consisting of a bi- or triphasic sharp discharge, called a D (direct) wave, followed by polyphasic waves, called I (indirect) waves. The D wave results from direct stimulation of corticospinal neurons, whereas the I wave is generated by transsynaptic activation of

corticospinal neurons. Subsequently, Merton and Morton in 1980 and Barker et al. in 1987 described transcranial electric stimulation (TES) and transcranial magnetic stimulation (TMS) muscle MEPs. [5][6] In the early 1960s, intraoperative monitoring of the facial nerve was performed to reduce the risks of facial palsy after vestibular schwannoma surgery [7]. In the 1970s, intraoperative monitoring of spinal cord to reduced the risk of damage during scoliosis surgery using SEPs by Dr. Richard Brown [8]. Leonid Malis, who leader of the use of microneurosurgical techniques, used the recordings of evoked potentials from the sensory cortex [9]. In the early 1980s, microvascular decompression (MVD) surgery for hemifacial spasm (HFS) and trigeminal neuralgia pioneered by Betty Grundy and Peter Raudzens[10][11]. In the 1980s, IONM was introduced in surgeries for large skull base tumors monitoring many cranial nerves depending on the location of the tumor [12][13][14]. During the 1990s with the development of techniques using magnetic and electrical stimulation of the motor cortex and stimulation of the spinal cord [15][16][17].

Dr. Gaston Celesia, mapped the auditory cortex in humans and studied SEP from the thalamus and primary somatosensory cortex [18][19][20]. Fred Lenz has studied the responses from nerve cells in the thalamus in awake humans using microelectrodes and mapped the thalamus with regard to the involvement in painful stimulation as well as in response to innocuous somatosensory stimulation[21][22][23].

Various IONM modalities:-

(A) Evoked Potentials:-

(i) Somatosensory Evoked Potentials (SSEP)

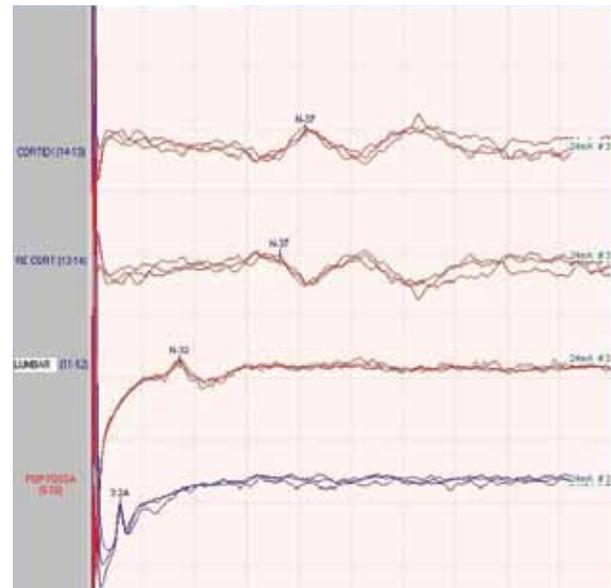
Technique:-

SSEP evaluates the integrity of the large fiber sensory system (Posterior column-medial lemniscus system). SSEPs are obtained by direct electrical stimulation of peripheral nerves (e.g. posterior tibialis at ankle, median, or ulnar nerves at the wrist) and recording at different levels within the neuraxis (e.g. brachial or lumbar plexus, cervical spine, parietal somatosensory cortex) of the far- and near-field potentials generated by the transmitted electrical volley. By assessing the electrical transmission through the large fiber sensory system, SSEPs have also an important role in monitoring its integrity or mapping its location, during a variety of surgeries that could result in its damage.

Parameters and interpretation:-

Amplitude and latencies of the responses are

monitored. Serially recorded responses are compared with laboratory norms. Establishing a reproducible baseline recording prior to any positioning or surgical manipulations is important. Changes from the baseline responses are the most important indicators of neurological dysfunction. Baseline values may need to be reestablished if changes in anesthetic medications or other physiological parameters occur during the case.



Normal post tibial nerve SSEP

Warning Criteria:-

For SSEPs, there are two general approaches to interpreting intraoperative changes.

- 1) Use predefined limits (commonly a 50% decrease in amplitude or 10% increase in latency).
- 2) Changes in waveform amplitude, latency, and morphology that exceed baseline variability, even in these changes are small or represent a change from prior consistent values)[24].

Clinical utility

1) Spinal surgery:

Changes in latency and amplitude can be monitored during positional manipulations, including open or closed reduction of spinal deformities. Extradural, intradural and intramedullary lesions can be monitored.

2) Cranial/vascular surgery:-

i) Carotid surgery including Endarterectomy: Changes

in SSEP recordings are sensitive for detection of cerebral ischemia and helpful in determining the need for shunting during the surgical procedure.

- ii) Cerebral aneurysm surgery: Changes may indicate occlusion of parent vessel branches, which potentially could be reversed by repositioning of aneurysm clips. SSEP monitoring can signal changes prior to irreversible cerebral ischemia.^[25]
- iii) Aortic cross-clamping: Changes in SSEP indicate a high risk of neurological injury, especially if the changes are immediate.

3) Localization of sensorimotor cortex:

Localization of the motor cortex is important to minimize the risk of contralateral motor deficits resulting from surgical procedures in its surrounding area. When recording SSEP, the primary sensory cortex and motor cortex generate potentials that are mirror images of each other. This "phase reversal" across the central sulcus is a highly reproducible characteristic that can aid in the localization of primary motor cortex. Unfortunately, motor pathways may be injured while sparing sensory pathways by SSEP. The lack of direct anterior cord monitoring with SEP is difficult and cases of isolated anterior cord injury with preserved SEP spinal cord monitoring have occurred.

- ii) Brainstem Auditory Evoked Potentials (BAEP) BAEPs are short-latency potentials reflecting the depolarization of several structures within the auditory pathways, because they are traversed by electrical volley triggered by the peripheral stimulation of the cochlear nerve. These evoked responses are far-field potentials, being recorded by electrodes placed on the scalp, with the exception of wave I, which is a near-field potential.

By assessing the amplitudes and latencies of these evoked responses, one can thus analyze the functional integrity of the corresponding anatomic structures. By recording the electrical transmission within the lower parts of the auditory pathways, from the cochlea to the upper pons, BAEPs are a good tool in assessing the integrity not only of the eighth nerve, but also of the brainstem structures involved in hearing, thus indirectly of the brainstem itself (as the name suggests).

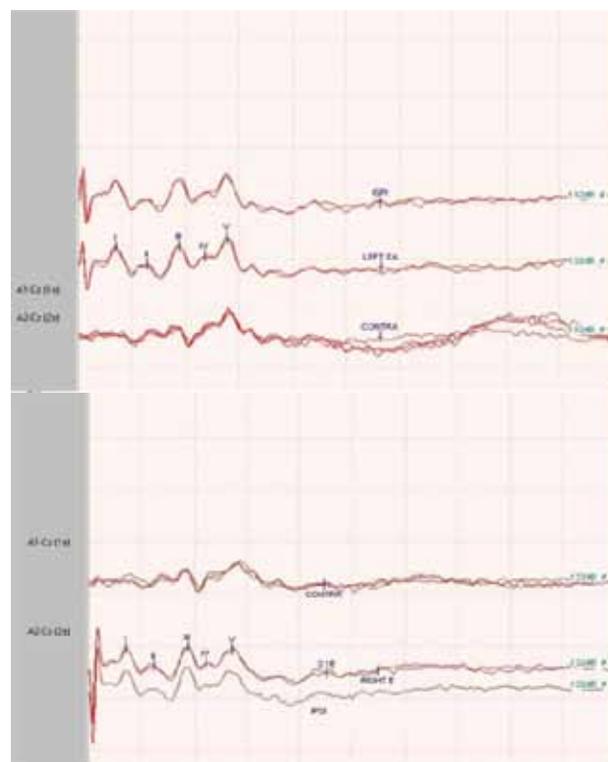


Figure: Schematic representation of the auditory pathways. Notice the neurophysiological-neuroanatomical correlation between BAEPs and different levels within the auditory pathway.

Name Wave	Anatomical location (probable)
I (P1)	Distal acoustic nerve (Action potential)
II (P2)	Proximal acoustic nerve / Cochlear nucleus
III (P3)	Lower pons
IV (P4)	Mid/upper pons
V (P5)	Lower midbrain

Anatomical localization of BAEP Waves

Technique:-

Recordings are obtained by stimulating with auditory clicks in the ear. Click intensity of 100 dB pe SPL or 60-70 dB HL is commonly utilized. Standard EEG cortical montage is used with recordings obtained from scalp electrodes. Best responses are obtained from electrodes near the ears (A1, A2) referenced to the vertex (Cz)^[26].

Parameters and interpretation:-

Positive deflections are termed wave -I to wave-VII. Waves I, III, and V are the waves most consistently seen in healthy subjects (obligate waves). Wave V is the most reliably seen wave, particularly in patients with hearing impairment or undergoing surgery. Measurements of absolute latencies and amplitudes of waves I and V and I-V interpeak latency should be made on baseline recordings. It is essential that these baseline BAEPs be recorded using the same parameters for stimulation and recording that are to be used for intraoperative monitoring. Complete measurements of the all the various waves and their interpeak latencies are time consuming during intraoperative monitoring. However, continuous monitoring of the absolute latency and amplitude of wave V should be carried out. Significant changes in the wave V latency should be reported to the surgeon. Interpretation of intraoperative BAEPs is performed by comparing each sequential average to the baseline obtained at the start of the surgery. Each patient serves as his or her control.

Warning Criteria:-

Typical criteria of BAEP change used for alerting the surgeon are a 1 ms latency prolongation or a 50% drop in amplitude of the wave V. This criterion is somewhat arbitrary. [26]

Clinical utility:-

1) CN-VIII: - Changes in latency, interlatencies difference and amplitude of BEAP waves I, III and V can be monitored during CPA tumors surgery (e.g. acoustic neuroma, meningioma), microvascular decompression (MVD) of seventh nerve for hemifacial spasm, fifth nerve for trigeminal neuralgia and Ninth nerve for glossopharyngeal neuralgia.

2) Brainstem: - Changes in latency, interlatencies difference and amplitude of BEAP waves I, III and V can be monitored during CPA tumors, Skull base surgery, Suboccipital decompression (e.g. fractures/dislocation C-1vertebra, chiari malformation) and Vascular surgeries of posterior circulation.

Limitations:-

1)The stimulus use for BAEP is click which is broad band sound (500-4000 Hz) delivering a wide range

of audio frequencies so BAEP cannot exclude specific frequency hearing deficit or mild hearing deficit (<500hz).

2) BAEP can change dramatically in neonates and infants before the age of two year. There is variation in latency and amplitudes values as age progress before of 2 year.

3) Physiologic changes include decreased body temperature, cold water irrigation and decreased blood pressure can cause latency prolongation and amplitude decrement of the BAEP.

4) Technical problem can occur due to problems with the recording or stimulating electrodes, kinking of tubing delivering acoustic stimuli, equipment malfunction, or operator error.

(iii) Motor Evoked Potentials:-

Somatosensory evoked potential (SSEP) monitoring was used in the past to reduce the risk of motor system injury. [27] However, significant motor deficits have been seen in patients undergoing spinal surgery despite normal SSEPs. [27][28] This was inevitable because the two systems have distinct anatomy and vascular supply so that smaller lesions can damage only one or the other. Thus, the rationale for MEP monitoring is to directly test the motor system during surgery. In conjunction with SEPs, the anterior and posterior portions of the spinal cord can be monitored together. MEPs are sensitive to anesthetics and, especially, neuromuscular blockade.

Technique:-

MEPs are elicited by either electrical or magnetic stimulation of the motor cortex or the spinal cord. Recordings are obtained either as neurogenic potential in the distal spinal cord or peripheral nerve, or as myogenic potentials from the innervated muscle. Transcranial electrical stimulation involves stimulation of electrodes on the scalp, or if the brain is exposed by a craniotomy, stimulation of electrodes placed directly on the brain surface. [29]

Transcranial electrical motor evoked potentials (TceMEP) have been used more frequently in spinal surgery. Motor evoked potentials (MEPs) are obtained by electrically stimulating the brain and recording the response over the spinal cord (Direct = D and Indirect = I waves), peripheral nerves (nerve action potentials), or muscles (compound muscle action potentials, CMAP). Usually, recordings are made from small hand and foot muscles. Spinal

recordings (for D and I waves) are seldom used owing to the invasive methods required for recording. When recording MEPs from muscles, a train of high voltage (200 to 1000 V) stimuli is applied to the scalp to peripherally produce a CMAP. Large series have demonstrated the safe use of MEPs, and they are a useful adjunct to SEP monitoring. Using both modalities (MEP and SSEP), both the anterior and posterior aspects of the spinal cord can be monitored. Inhalational anesthetics suppress the anterior horn cells, and consequently their use makes obtaining MEPs more difficult. Intravenous anesthetics (propofol and opioids TIVA) are preferred when MEP monitoring is to be used.

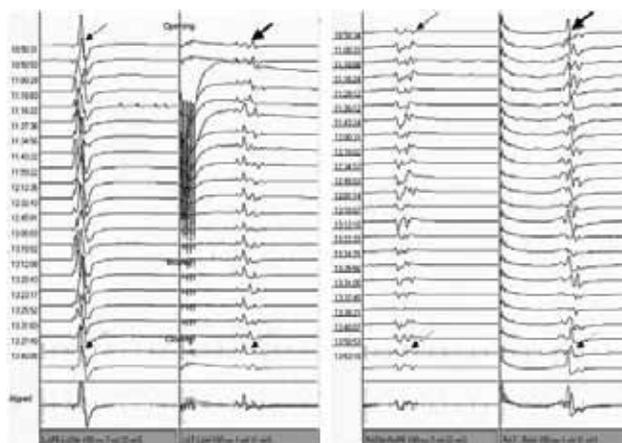


Figure: Intraoperative MEP monitors showing stable responses in the upper and lower extremities during a biopsy of a cervical lesion.

Parameters and interpretation:-

For robust MEP signals, complete loss of MEP signal or abrupt significant decrease in amplitude of 80% or more in the absence of an explanation other than surgical injury. Gradual changes in MEP signals more commonly reflect systemic factors or an “anesthetic fade” phenomenon, so gradual changes might be given less weight unless the onset of the change can be related to a surgical event that may result in gradual dysfunction^[30].

Warning Criteria:-

Warning criteria for D-waves:-

1. Intramedullary spinal cord tumor surgery: - >50% amplitude reduction
2. Brain surgery with DCS cervical D-waves: - >30–40% amplitude reduction.^[31]

Warning criteria for muscle MEPs:-

1. Spinal cord: - Disappearance is always a major criterion
 - i) For IMSCT surgery: - marked amplitude reduction, acute threshold elevation or morphology simplification could be additional minor criteria.
 - ii) For orthopedic spine surgery: - marked amplitude reduction or acute threshold elevation could be additional moderate criteria
 - iii) For descending aortic surgery: - marked amplitude reduction could be an additional moderate criterion
2. Brain and brainstem: - Major criteria include disappearance or consistent >50% amplitude reduction when warranted by sufficient response stability. Acute threshold elevation might be relevant
3. Facial nerve: - Major criteria include disappearance or consistent >50% amplitude reduction when warranted by sufficient response stability.^[31]

Clinical utility:-

Indications for MEP monitoring include any surgery risking motor system injury. The most common indications arise during neurosurgical, orthopedic and vascular interventions. Neurosurgical indications include tumor or epileptic focus resections near the motor cortex or corticospinal tract, intracranial aneurysm clipping, posterior fossa surgery, craniocervical junction and spinal operations, spinal cord procedures and tethered cord or cauda equina surgeries. Orthopedic indications include spinal deformity or fracture surgery, vertebral tumor resections, and anterior cervical discectomy. Vascular indications include descending aortic procedures, spinal arteriovenous malformation interventions and carotid endarterectomy.

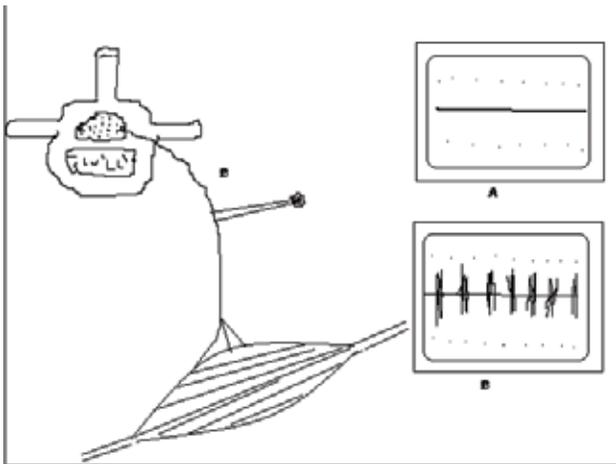
Safety and complications:-

Intraoperative MEP monitoring is sufficiently safe for clinical use in expert hands using appropriate precautions, but could involuntarily cause harm. Safety issues include hazardous output (excitotoxic, electrochemical or thermal injury of the brain or scalp), bite injuries, seizures, invasive electrode complications, movement-induced injury, arrhythmia, and relative contraindications include epilepsy; cortical lesions; skull defects; intracranial vascular clips, shunts, or electrodes; and pacemakers or other implanted bioelectric devices.

(B) Electromyography (EMG):-

(i) Free-running and Triggered EMG (f-EMG AND CMAPs):-

EMG is the recording of electrical activity of muscle. Changes in EMG recordings are indirect indicators of function of the innervating nerve. Intraoperative uses have stressed localization and assurance of the integrity of peripheral nerves, including cranial nerves. Free-run EMG (f-EMG) consists of recording spontaneous muscle activity, thus allowing its real-time assessment. In IONM we use this technique as a monitoring tool for detecting surgically driven mechanical irritation of the peripheral nervous system and of the cranial nerves, hopefully before irreversible damage to these structures had occurred. Triggered EMG consists of applying an electrical stimulus, directly on the peripheral motor nerves or roots, for eliciting CMAPs to be recorded in the corresponding muscle channels. Thus, it can be used as a mapping tool for detecting the location of peripheral or cranial nerves that may be difficult to distinguish from tumor, fibrous, and fatty tissues. Triggered EMG can also be used in checking the functions of injured (or that are at risk for injury) nerves, roots, or trunks by assessing the electrical transmission through such structures and comparing it with a healthy (or presurgical) baseline.



Free-running EMG activity for nerve root monitoring. A. EMG monitoring should be quiescent under normal conditions. B. Blunt mechanical nerve root irritation activates the motor nerve fibers, is transmitted down the nerve and across the neuromuscular junction, and evokes recordable motor unit potentials in the monitored muscle

Technique:-

Multiple EMG needles typically are placed into the muscles to be examined. Practically any muscle can be monitored, including face, tongue, and sphincter musculature. EMG is recorded continually with a low noise amplifier. Recordings are displayed visually and usually also sent to a speaker to provide auditory feedback. Changes in muscle electrical activity then can be seen and heard. When a peripheral nerve is to be localized intraoperatively, a sterile stimulating probe is used during the operation.

Interpretation:-

Free-running and Triggered EMG activity is monitored. Additionally, direct electrical stimulation of the nerve can help localize the neural structure. Note that Free-running EMG activity does not assure the integrity of the peripheral nerve. If Triggered EMG activity can be elicited consistently, integrity of the distal nerve and muscle can be assured.

Clinical Uses:-

Facial nerve/other cranial nerve monitoring:-

Cranial nerve monitoring is useful for surgical procedures in which the facial nerve is at risk, including posterior fossa surgery (eg, acoustic neuroma), vestibular neurectomy, surgery in the temporal bone, and parotid gland surgery.[32] Trigeminal, glossopharyngeal, vagus, spinal accessory, and hypoglossal nerve functions can be monitored similarly by EMG. Electrical stimulation in the operative field can evaluate the integrity of peripheral nerves. Spontaneous EMG activity suggests manipulation in the vicinity of the cranial nerve.

Selective dorsal rhizotomy:-

Selective dorsal rhizotomy (SDR) is a procedure that is used to reduce debilitating spasticity in conditions such as cerebral palsy by selectively transecting spinal rootlets. Overactive excitatory influence on motor nerves is believed to be reduced by removing facilitatory afferent input from muscle spindles. The procedure consists of stimulating spinal rootlets and monitoring EMG and motor function. Those rootlets that are associated with an abnormal motor response are sectioned selectively.

Tethered spinal cord release:-

Patients who undergo a tethered cord release procedure require dissection of scar tissue and possibly section of the filum terminale.

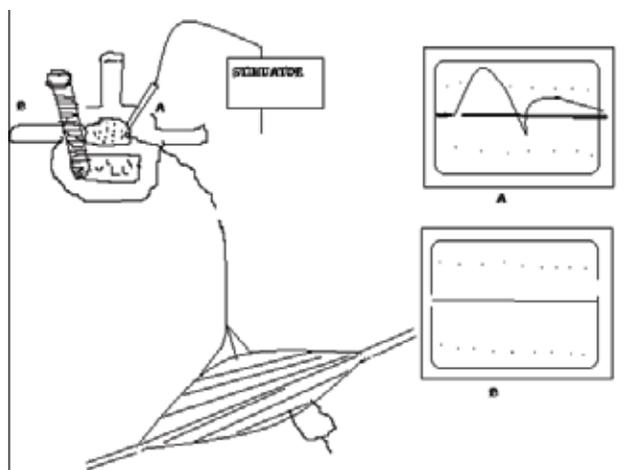
Distinguishing functional neural elements from nonfunctioning tissue is important. Stimulation of the roots of normally functioning nerves in the cauda equina elicits EMG activity. Monitoring lower extremity musculature, as well as anal and urethral sphincters, is important if the sacral roots are involved.

Pedicle screw placement:-

Use of pedicle screws as a fixation device in posterior spinal instrumentation in the lumbar region has become increasingly common. Various techniques to assure correct placement of the screws are advocated currently. EMG monitoring makes use of the fact that improperly placed screws that breach the cortical confines of the bony pedicle or vertebral body cause low impedance between the screw and the exiting nerve root underneath the pedicle. Properly placed screws that remain entirely within the bone have high impedance. If the screw is stimulated with constant current greater than 10 mA for pedicle screw without EMG activation, the screw is unlikely to have perforated the vertebral cortex. However, a response to stimulation at less than <7mA for pedicle screw suggests a bony defect that provides a low impedance pathway to the nerve root. [33]

	Perforation probable	Perforation Possible	Perforation Unlikely
Pedicle Screw	< 7 mA	7-10mA	>10mA
Hole	<5mA	5-7Ma	>7mA

Threshold Values Indicating the Likelihood of Pedicle Screw Malpositioning



Stimulus-triggered EMG for detecting pedicular wall breach. A monopolar stimulator is inserted into a pedicle hole or touched against a pedicle screw. A. Holes or screws that have perforated the bony pedicle wall will lie directly against adjacent nerve roots and stimulation activates the adjacent nerve root, evoking a CMAP response. B. Holes or screws that are correctly positioned within the pedicle wall are separated from the adjacent nerve roots by a cortical bony layer, with high impedance to the passage of electrical current and no evoked CMAP responses.

Sphincter Function Monitoring:-

Anal or urinary sphincter dysfunction is a devastating complication of cauda equina surgery. By monitoring sphincter function, the risk of this complication can be reduced. The anal and external urethral sphincters and Detrusor muscle can be monitored. Anal sphincter monitoring is the easiest and is performed most commonly. Monopolar subdermal needle electrodes (similar to those used to perform EMG monitoring) are inserted percutaneously in the anal sphincter muscle after the patient has been anesthetized. These electrodes can record free-running EMG activity, including neurotonic discharges and triggered EMGs. The external urethral sphincter surrounds the proximal part of the urethra and is not accessible percutaneously. Consequently needle electrodes cannot be inserted into this sphincter. To monitor the external urethral sphincter, a specially made ring electrode is attached to a Foley catheter 1 to 2 cm distal to the bulb. This ring electrode serves as a bipolar surface electrode that records stimulated and free-running EMGs. The detrusor muscle can be monitored. Changes in bladder pressure are used as surrogate markers for muscle integrity. Prior to surgery, a cystometrogram is performed to determine the capacity of the bladder. At the time of surgery, a Foley catheter is inserted and attached to a three-way flow adapter, which is attached to a manometer. The bladder is filled with fluid to capacity. Contraction of the detrusor muscle causes an increase in bladder pressure, which is measured by the manometer. Additionally, during surgery, sustained high frequency stimulation in the operative field is needed to induce detrusor muscle contraction. When the contraction occurs, it is delayed for several seconds. This results in a delay in providing feedback to the surgeon. [34][35]

Combination of tests: Applications in IONM

Surgical procedure	Combination of tests
Cervical and low thoracic/lumbar surgeries (e.g. decompressive surgery for trauma, spondylosis, extradural tumors, tethered cord, intraduralextramedullary tumors such as schwannomas, etc.)	i) SSEPs/MEPs. ii) Free and triggered EMG.
Brainstem surgery (e.g. suboccipital decompression: Chiari malformation, tumor resection, vascular surgery of the posterior fossa)	i) SSEPs/MEPs. ii) Cranial nerve monitoring (CN IX, X, XI, and XII for medulla; V, VII, and VIII for pons; III, IV, and VI for midbrain).
CPA tumors, microvascular decompressions (MVD) of CN V and CN VII	i) BAEP. ii) Monitoring of CN V and VII.
Functional cortical mapping	i) Median SSEPs for central sulcus localization via phase reversal technique. ii) MEPs triggered by direct electrical cortical stimulation for motor mapping. iii) ECoG for appreciating the baseline cortical excitability prior to stimulation and for monitoring of after-discharge.
Epilepsy surgery	i) ECoG for mapping of the irritative zones. ii) Functional cortical mapping.
Peripheral nervous system surgery (e.g. brachial plexus exploration, nerve repair)	i) SSEPs to rule out root avulsion, ii) MEPs. iii) Nerve-to-nerve recording (NAP). iv) nerve-to-muscle recording (triggered CMAPs).
Aortic aneurysm repair	i) SSEPs/MEPs. ii) EEG to monitor for cerebral ischemia.

References

1. <http://www.asnm.org>.
2. Husain AM, editor. ed. A Practical Approach to Neurophysiologic Intraoperative Monitoring. New York: Demos; 2008
3. Penfield W, Jasper H. Epilepsy and the Functional Anatomy of the Human Brain. 1954.
4. Patton HD, Amassian VE. Single and multiple unit analysis of cortical stage of pyramidal tract

- activation. *J Neurophysiol* 1954; 17:345–63.
5. Merton PA, Morton HB. Stimulation of the cerebral cortex in the intact human subject. *Nature* 1980;285:287
 6. Barker AT, Freeston IL, Jalinous R, Jarratt JA. Magnetic stimulation of the human brain and peripheral nervous system: an introduction and the results of an initial clinical evaluation. *Neurosurgery* 1987; 20:100–9.
 7. Hilger J (1964) Facial nerve stimulator. *Trans Am Acad Ophthalmol Otolaryngol* 68:74–6.
 8. Brown RH and CL Nash (1979) Current status of spinal cord monitoring. *Spine* 4:466–78.
 9. Malis LI (1995) Intra-operative monitoring is not essential. *Clin Neurosurg* 42:203–13.
 10. Grundy B (1983) Intraoperative monitoring of sensory evoked potentials. *Anesthesiology* 58:72–87.
 11. Raudzens PA (1982) Intraoperative monitoring of evoked potentials. *Ann N Y Acad Sci* 388:308–26.
 12. Møller AR (1987) Electrophysiological monitoring of cranial nerves in operations in the skull base, in *Tumors of the Cranial Base: Diagnosis and Treatment*, LN Sekhar and VL Schramm Jr, Editors. Futura Publishing Co: Mt. Kisco, New York. 123–32.
 13. Sekhar LN and AR Møller (1986) Operative management of tumors involving the cavernous sinus. *J Neurosurg* 64:879–89.
 14. Yingling C and J Gardi (1992) Intraoperative monitoring of facial and cochlear nerves during acoustic neuroma surgery. *Otolaryngol Clin North Am* 25:413–48.
 15. Barker AT, R Jalinous and IL Freeston (1985) Non-invasive magnetic stimulation of the human motor cortex. *Lancet* 1:1106–7.
 16. Marsden CD, PA Merton and HB Morton (1983) Direct electrical stimulation of corticospinal pathways through the intact scalp in human subjects. *Adv Neurol* 39:387–91.
 17. Deletis V (1993) Intraoperative monitoring of the functional integrity of the motor pathways, in *Advances in Neurology: Electrical and Magnetic Stimulation of the Brain*, O Devinsky, A Beric and M Dogali, Editors. Raven Press: New York. 201–14.
 18. Celesia GG, RJ Broughton, T Rasmussen et al (1968) Auditory evoked responses from the exposed human cortex. *Electroencephalogr Clin Neurophysiol* 24:458–66.
 19. Celesia GG and F Puletti (1969) Auditory cortical areas of man. *Neurology* 19:211–20.
 20. Celesia GG (1979) Somatosensory evoked potentials recorded directly from human thalamus and Sm I cortical area. *Archives of Neurology* 36:399–405.
 21. Greenspan JD, RR Lee and FA Lenz (1999) Pain sensitivity alterations as a function of lesion localization in the parasyllian cortex. *Pain* 81:273–82.
 22. Lenz FA and PM Dougherty (1995) Pain processing in the ventrocaudal nucleus of the human thalamus, in *Pain and the Brain*, B Bromm and JE Desmedt, Editors. Raven Press: New York. 175–85.
 23. Lenz FA, JI Lee, IM Garonzik et al (2000) Plasticity of pain-related neuronal activity in the human thalamus. *Prog Brain Res* 129:253–73.
 24. <http://www.acns.org>; Guideline 11A: Recommended standards for Neurophysiologic intraoperative monitoring-Principles.2009
 25. Goryawala M, Yaylali I, Cabrerizo M, Vedala K, Adjouadi M. An effective intra-operative neurophysiological monitoring scheme for aneurysm clipping and spinal fusion surgeries. *J Neural Eng. Apr* 2012; 9(2):026021. [Medline].
 26. <http://www.acns.org>; Guideline 11 C: Recommended standards for intraoperative Auditory Evoked Potentials.2009.
 27. Nuwer MR, Dawson EG, Carlson LG, Kanim LE, Sherman JE. Somatosensory evoked potential spinal cord monitoring reduces neurologic deficits after scoliosis surgery: results of a large multicenter survey. *Electroencephalogr Clin Neurophysiol* 1995; 96:6–11.
 28. Lesser RP, Raudzens P, Luders H, Nuwer MR, Goldie WD, Morris 3rd HH, et al. Postoperative neurological deficits may occur despite unchanged intraoperative somatosensory evoked potentials. *Ann Neurol* 1986; 19:22–5.
 29. Li F, Gorji R, Allott G, Modes K, Lunn R, Yang ZJ. The usefulness of intraoperative neurophysiological monitoring in cervical spine surgery: a retrospective analysis of 200 consecutive patients. *J Neurosurg Anesthesiol. Jul* 2012; 24(3):185-90. [Medline].
 30. Lyon R, Feiner J, Lieberman JA. Progressive suppression of motor evoked potentials during general anesthesia: the phenomenon of “anesthetic fade”. *J Neurosurg Anesthesiol* 2005; 17:13–19.
 31. MacDonald DB, Skinner S, Shils J, Yingling C. Intraoperative motor evoked potential monitoring – A position statement by the American Society of Neurophysiological Monitoring. *Clin Neurophysiol* (2013), <http://dx.doi.org/10.1016/j.clinph.2013.07.025>.

32. Kircher ML, Kartush JM. Pitfalls in intraoperative nerve monitoring during vestibular schwannoma surgery. *Neurosurg Focus*. Sep 2012; 33(3):E5.
33. Calancie B, Madsen P, Lebowitz N. Stimulus evoked EMG monitoring during transpedicular lumbosacral spine instrumentation. Initial clinical results. *Spine* 1994; 19:2780–2786.
34. Krassioukov AV, Sarjeant R, Arkia H, Fehlings MG. Multimodality intraoperative monitoring during complex lumbosacral procedures: indications, techniques, and long-term follow-up review of 61 consecutive cases. *J Neurosurg Spine* 2004; 1:243–253.
35. Shinomiya K, Fuchioka M, Matsuoka T, et al. Intraoperative monitoring for tethered spinal cord syndrome. *Spine* 1991; 16:1290–1294.

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Author's contribution:

Liaquat Ali: Study concept and design, protocol writing, data collection, data analysis, manuscript writing, manuscript review

Ambreen Iqrar: data collection, data analysis, manuscript writing, manuscript review

Bhojo Khealani: Study concept and design, data analysis, manuscript writing, manuscript review

10TH ANNUAL NEUROLOGY RESEARCH DAY, MAY 2016 ABSTRACTS SHIFA INTERNATIONAL HOSPITAL, ISLAMABAD

HEADACHE ATTRIBUTED PROBLEMS IN PUPILS OF AGES 11-18 YEARS.

Rohaam Noor, Komal Gilani, Umer Farooq, Sabul Zafar, Fatima Aurangzaib.

Foundation University Medical College, Islamabad.

Background: Burden of headache has been assessed in adults in countries worldwide, and is high, but data for children and adolescents is sparse. The objective of this study is to fill the information gap for adolescents.

Aim/Objective: To evaluate the headache attributed problems in pupils of ages 11-18 years.

Methodology: Consenting adolescents of the ages 11-18 years from a local school in Islamabad, Pakistan, took part in the study. Screening of the participants was dependent on the fact if upon questioning they complained of having experienced a headache, ever, in any stage of life. A structured questionnaire that assessed various aspects of burden of headache was then distributed to the screened individuals.

Results: Data were collected from 286 pupils (174 female, 112 male) of ages 11-18 years (mean=14.39). 40.9% students had headaches for less than one hour while others had for more than an hour. 29.9% reported it as "not bad" 57.7% as "quite bad" 12.5% as "very bad". 28.5% said it is usually "on one side", 23.5% "in the middle" and 48.0% "on both sides". 64.1% described it as "throbbing" and 35.9% as "pressing". 49.5% said that exercise made it worse and 57.3% avoid exercise. 49.6% usually felt sick with a headache while only 20.4% actually got sick. 55.2% preferred darkness. 92.5% preferred to be in the quiet. 6.8% "never", 37.9% "sometimes", 26.8% "often" while 28.6% "always" had trouble concentrating. 46.1% "never", 36.4% "sometimes", 11.4% "often" and 6.1% "always" had parents stop them from doing things with a headache. 24.9% "never", 39.4% "sometimes", 18.4% "often" and 17.3% "always" were unable to cope with headaches.

Conclusion: Headache attributes to restriction, disability, social handicap & impairment in participation of pupils of ages 11-18 years

SLEEP DISTURBANCE IN CANCER PATIENTS UNDERGOING CHEMOTHERAPY, RADIOTHERAPY OR BOTH

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Foundation University Medical College, Islamabad

Objective: To identify patterns of sleep disturbances and their possible causes in cancer patients admitted in Fauji Foundation Hospital (FFH) and CMH Oncology Ward.

Methodology: After the ethical approval, this cross-sectional study was conducted in a period of 1 month. A total of 40 cancer diagnosed patients receiving chemotherapy, radiotherapy or both were included. A self-administered modified internationally accepted sleep survey questionnaire (Pittsburgh Sleep Quality Index, PSQI) was used. It has 15 items focusing on sleep pattern and its duration. Closed ended questions regarding possible contributing factors and effects of sleep disturbance in these patients were inquired. Responses were of dichotomous variables (yes or no). Questions with more than two options were rated by the PSQI scoring method.

Results: Response rate was 95% and final sample size was 33. Insomnia (85%), was recorded, trouble falling asleep (55%), waking up at night several times (30%), staying up at night for a long time after falling asleep (9%) and others (6%). Hyper somnolence was also observed. Possible causes of sleep disturbances as perceived by the patients were found to be excessive fatigue (82%), treatment (79%) and concern of having "cancer". In addition, only 9/33 cancer patients were counseled by the doctors regarding possible sleep disturbances.

Conclusion: Results of this study suggests high frequency of various sleep disturbances in cancer patients due to disease itself or concern of having it. Management with appropriate counseling of these patients may lessen the distresses 11-18 years

ATTENTION SPAN, PROCESSING SPEED AND WORKING MEMORY IN VIDEOGAME ADDICTED MEDICAL UNDERGRADUATES

Hamna Shah, Hadia Asif, Faiza Ayyub, Zohak Sarfraz, Saad Mahmood, Riyan Fakhri

Background: Video game usage amongst adolescents has increased dramatically in recent years owing to its rising popularity. The increased prevalence of addiction to computer games is a cause of major concern. However since videogames have the capacity to engage one in learning experiences, this has led to the rise of “edutainment” media, an increasingly preferred learning modality in today’s generation. The rapid mind and body coordination needed in video gaming has been proposed to enhance certain domains of cognitive functions. Since medical undergraduates undergo one of the most rigorous and tedious courses, a fresh tool for the enhancement of their cognitive functions may prove beneficial to their learning aptitude .

Aim/Objective: The purpose of this research is to highlight the influence of video game addiction on a medical undergraduate's attention span, processing speed and working memory.

Methodology: A total of 50 medical undergraduates between the ages of 19-23 studying in CMH LMC were randomly selected from all years of MBBS and BDS. Using the core criteria on Gaming Addiction Scale (GAS), 15 male students turned out to be addicts and 15 more were included in the control group. Attention span was tested using the Schulte table, processing speed by the Digit Symbol Substitution Test (DSST) and working memory by the Digit Span Test (DST). All three of the tests were performed on both groups and the results were analyzed using SPSS v23.

Results: The video game addicts had significantly better attention span, processing speed and working memory when compared to controls ($p < 0.05$)

Conclusion: The video game addicts showed an improvement in above mentioned cognitive domains which can be beneficial for them to process and retain information as compared to their peers and can aid in coping with the high pressure studies ahead. Recommendations: Appropriate and judicious use of videogames as an educational tool for medical undergraduates.

FREQUENCY OF COGNITIVE IMPAIRMENT AMONG TYPE 2 DIABETICS WITH CONTROLLED VERSUS UNCONTROLLED BLOOD GLUCOSE LEVELS

Jamshaid, Dr Nadeia Younes, Dr Tahir Iqbal, Prof. Arsalan Ahmed, Dr Osama Ishtiaq
Shifa International Hospital

Introduction: Diabetes Mellitus, one of the leading

causes of morbidity and mortality is associated with high rates of hospitalization, blindness, renal failure and non-traumatic amputation. Estimated prevalence of diabetes in adults worldwide was 4.0% in 1995 and ranges from 7.6 to 11% in Pakistan, according to a survey done in 2010. Studies have shown that there is a direct link between glucose dysregulation with neuro-degeneration leading to cognitive impairment. Exact mechanism still unclear, proposed ones include changes in glucose metabolism, insulin signaling, alteration of blood brain barrier and mitochondrial function in the brain.

Objective: This study was aimed at comparing the frequency of cognitive impairment among type 2 diabetics with controlled vs. uncontrolled diabetes in order to establish an association between cognitive impairment and blood glucose levels.

Methodology: A comparative cross sectional study was conducted in Endocrine clinic of SIH. 150 diagnosed Type 2 diabetics, between the ages of 40 to 65 were inducted in the study. Based on their HbA1C levels, patients were divided in two equal group i.e. HbA1c of $< 7\%$ was categorized as good glycemic control whereas $> 7\%$ as poor control. Patients with history of previous stroke, any neurological or psychiatric disease, use of illicit drugs and language barrier were excluded. Urdu version of Montreal cognitive assessment (MoCA) was used to assess cognitive impairment, considering scores of 26 and above as normal and < 26 as mild cognitive impairment. The data was entered in a standardized Performa, analyzed using SPSS version 20 and Chi-square test was used to establish the association between cognitive impairment and blood glucose levels. **Results:** 54 patients out of 75 i.e. 72% with uncontrolled diabetics had cognitive impairment. On the other hand, only 23 patients out of 75 i.e. 30.6% with controlled blood glucose levels had cognitive impairment. ($P < 0.05$)

Conclusion: a significant association between uncontrolled blood glucose levels and cognitive impairment.

THE DIAGNOSTIC VALUE OF ELECTROENCEPHALOGRAPHY IN PATIENTS WITH ALTERED MENTAL STATUS

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Introduction: EEG is a diagnostic tool for assessing functional status of the brain and reflects the relation

between the patient's level of consciousness and functional status. It helps to narrow down the differential diagnosis of altered mental status (AMS) when routine screening tests are unable to determine the cause.

Methods: We conducted a retrospective, descriptive study in the department of neurology, Shifa International hospital, Islamabad, Pakistan. EEG studies of admitted patients with altered mental status were reviewed from January 1, 2014 to December 31, 2014 and correlated with the discharge diagnosis and clinical data. Data was entered on a standard Performa and analyzed on SSPV V 20.

Results: 95 patient's EEGs were reviewed out of which 50.5% were females. Seventy three percent patients with AMS had a GCS of 10-14 with 20% patients with GCS 13. The main reason for AMS was electrolyte disturbances (57.9%) followed by electrolyte disturbances plus uremia 14.7%. The diagnosis of most of the patients prior to EEG was encephalopathy (31.9%), meningoencephalitis (26.6%) and subclinical seizure (18.1%). 80.9% of EEGs were abnormal. The EEG findings of 34% of patients showed theta and delta activity and theta activity alone in 29.8%. The conclusive diagnosis after performing EEG's of most patients was encephalopathy 59.6% while 19.1% had normal EEGs.

Conclusion: EEG is a good diagnostic test for patients with AMS. Further larger studies are needed.

SEASONAL VARIATION OF CEREBRAL VENOUS SINUS THROMBOSIS PRESENTING TO A TERTIARY CARE HOSPITAL IN ISLAMABAD

Memoona Nasir, Nabeel Muzaffar Syed, Salman Mansoor, Farhan Khan, Maimoona Siddiqui, Yousuf Choudhary
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Introduction: Cerebral venous sinus thrombosis (CVT) is a less known entity compared to arterial ischemic stroke. Studies on epidemiology and risk factors of the disease found a seasonal variation in the occurrence of the disease with various studies reporting peaks in different seasons. Our study aims to study the chronobiology of CVT in our region.

Objectives: To determine the seasonal variation of CVT in patients in our tertiary care hospital
Methods: It was a retrospective chart analysis which included patients from April 2002 to February 2016. Patients with established diagnosis of CVT by CTV or MRV were included in the chart analysis. Data was analyzed

using SPSS v21 for demographic variables and the month of presentation during one calendar year.

Results: 107 patients were included from April 2002 to February 2016. The mean age was 34.1 yrs. 46% were males and 54% were females. The greatest percentage of patients had onset of symptoms in February and April. The lowest incidence was seen in March followed by June. The seasonal incidence was highest in Summer (32%) followed by Winter (30%) and least in Autumn (13%).

Conclusion: The incidence of cerebral venous sinus thrombosis varies throughout the year. The higher frequency in February and April may be due to the inability to adapt to the changing climate in individuals with an underlying predisposing condition leading to relative dehydration and hypercoagulability. Our study showed results that differed from the other studies when seasons were studied. The overall increased frequency in summer may be due to the longer duration of the season as defined.

PATTERNS OF NEUROLOGICAL COMPLICATIONS IN THE IMMEDIATE POST-OPERATIVE PERIOD IN LIVER TRANSPLANT RECIPIENTS AT SHIFA INTERNATIONAL HOSPITAL, ISLAMABAD, PAKISTAN

Nabeel Muzaffar Syed, Memoona Nasir, Salman Mansoor, Faleha Zafar, Mohammad Salih, Faisal Saud Dar, Arsalan Ahmad, Maimoona Siddiqui
Shifa International Hospital

Introduction: Neurological complications occur frequently in liver transplant recipients. These include seizures, osmotic demyelination syndrome, movement disorders, neuromuscular disorders, stroke and CNS infections. Almost 75% of the neurological complications occur within the first month after the transplant. No studies have been done to evaluate the neurological complications in patients undergoing liver transplant at Shifa International Hospital. Studying the associations and possibly causes of such complications may help us take measures to avoid them.

METHODS: Approval was taken from the IRB of Shifa International Hospital. The liver transplant recipients were identified using the Liver Transplant Registry of the hospital. All cases liver transplant recipients were included till the date of the study. Patients who did not survive 1 week after the transplant were excluded. Each patient's chart was reviewed for documented neurological complications within 30 days of the liver

transplant. A Performa was filled for each patient. For qualitative variables, frequencies were calculated and Chi-square test was applied to compare the frequencies of categorical variables. P-value of < 0.05 was considered significant. For quantitative variables, mean \pm SD was calculated.

Results: The data collection process is underway. So far the charts of 39 patients have been reviewed. We are submitting the preliminary results of these 39 patients. Seizures occurred in 5.1% of patients and 2.6% of patients developed tremors and CNS tuberculosis. The rest of the neurological complications have not been observed so far. The complete results will be analyzed once the data collection is completed.

Conclusion: Will be made after the collection of data is completed.

Frequency And Types Of Epilepsy In Children With Cerebral Palsy At A Tertiary Care Hospital In Karachi.

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Background: Very limited local data is available for the types of cerebral palsy in children and their association with epilepsy which results in high levels of psychosocial difficulties for children and all family members.

Objectives: To determine the frequency and types of epilepsy in children with cerebral palsy at a tertiary care hospital in Karachi.

Methods: All children up to the age of 16 years in pediatric neurology clinic were included. Patient's demographics and history was recorded. The type of epilepsy in cerebral palsy and EEG and Brain imaging findings were recorded.

Results: 215 cerebral palsy children till age of 16 years were included. Mean age, 64 months \pm 46 months. 56% males, 44 % females. 32% had Epilepsy and 68% were without Epilepsy. 84% had generalized seizures and 16% had partial seizures. 33% of the cerebral palsy were Diplegic, 29.3% hemiplegic, 24.7% Quadriplegic, 8.4% Mixed and 4.7 % were Ataxic/Hypotonic. Hemiplegic type 63% had maximum presentation with epilepsy. OR = 7.37, 95% CI (3.8-14.1).

Conclusion: 32% of the Cerebral Palsy children had epilepsy with maximum hemiplegic type 63%. OR = 7.37, 95% CI (3.8-14.1).

The Mcdreamy Mania Or A Choice Of Sane Minds

Rahy Farooq, Neha Siddiqui, Salman Mansoor, Hamza Hassan Khan, Naveen Zaidi, Sehrish Javed
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Introduction: Neurology is a specialty which encompasses bewildering aspects and perplexed diseases. It is not possible for a general physician to treat such myriads of diseases with highly variable diagnostic techniques and its implications. Being a complex field, neurology is naturally the choice of inquisitive, progressive and intelligent people. This study aims to evaluate the influence of personality traits of future doctors, in choosing Neurology as a career option.

METHODS: A cross-sectional survey was conducted amongst 453 medical students and house officers in Islamabad, Pakistan. Using the Big Five Inventory scale, the questionnaire reflected 5 personality traits namely openness, conscientiousness, extroversion, agreeable, and neuroticism. Data was analyzed using SPSSv23. Independent sample t-test was used to compare the personality traits of participants opting for neurology to those choosing other specialties.

Results: A total of 284 (62.69%) females and 169 (37.3%) males responded to the questionnaire. The mean difference of percentages for conscientiousness was significantly greater for males ($p=0.019$), whereas for neuroticism it was higher in females (p value=0.000). The means for extroversion and openness were significantly higher in participants opting neurology than those choosing internal medicine; openness also being higher in comparison to all other groups combined. Similarly for neuroticism the mean difference was significant in Dermatology and General surgery as compared to Neurology ($p<0.05$).

Conclusion: In developing countries where subspecialties are still evolving, there is a prodigious void. Neurological disorders contribute to an ever-increasing burden on the healthcare framework which goes unaddressed. Hence a deeper exploration into these intricate personality traits is needed. We recommend installation of career counselling programs addressing specialty choices in medical schools.

SLEEP PROBLEMS: A ROMANTICIST DILEMMA YOU MIGHT NOT BE IN LOVE, IT'S YOUR MEDICAL CONDITION!

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Introduction: Aging is associated with several well-described changes in patterns of sleep. Little is known about the effect of smoking and various comorbidities on quality of sleep and daytime functioning in elderly. Sleep disorders result in increased risk of morbidity and mortality.

OBJECTIVE: To determine the frequency of sleep disorders, effect of various demographic variables and comorbidities on the quality of sleep, in elderly.

METHODS: This study was conducted in elderly at two tertiary care centers. A pre-designed questionnaire was administered combining two standard scales; The Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). The scales determine sleep quality and level of daytime sleepiness respectively. Data was analyzed using SPSSv21.

Results: There were 1000 elderly subjects, of them 51.6% had PSQI score of 5 or more. 26.5% of the subjects had ESS score of more than 10. Sleep disturbances were more in females (p value=0.007). Majority of the participants who smoked, had coronary artery disease, renal disease or arthritis had a higher mean on PSQI with a statistically significant correlation (p value < 0.05). A significant mean difference was also identified in subjects who had asthma, obesity, psychiatric illnesses and dementia on ESS.

Conclusion: Our study suggests a significant burden of sleep related disorders in the elderly which indirectly implies a poor quality of life. We recommend using PSQI and ESS scales in an outpatient setting to identify and address these disorders in order to elate the quality of life in elderly.

PUBLIC AWARENESS ABOUT RISK FACTORS AND WARNING SYMPTOMS OF STROKE

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King Edward Medical University, Mayo Hospital

Background: Timely arrival at the hospital after stroke onset and adherence to primary prevention depend on public awareness about warning symptoms and risk factors of stroke.

Objectives: To assess and compare public awareness about risk factors and warning symptoms of stroke among different sectors of population based on the level of education.

METHODS: A survey was conducted from August 2015 to October 2015 by the Neurology department of Mayo

Hospital, Lahore, Pakistan. The study subjects were the relatives of patients coming to the outpatient department of the hospital and first year MBBS students of King Edward Medical University.

Results: A total of 500 individuals were interviewed during the study period (49.8% males, mean age 31.85). Of these, 99.4% had heard about stroke. 73.6% correctly listed at least one warning symptom of stroke. The most frequently noted symptom was weakness of any body part (36.7%), followed by unilateral weakness (24.3%) and numbness of any body part (5.9%). The illiterate people were least likely to know about the warning symptoms of stroke (p -value < .001). Regarding the risk factors of stroke, 63.6% had no knowledge about them and 25.6% knew at least one. The most commonly identified risk factor was hypertension (22.1%) followed by stress (10%) and diabetes mellitus (6.1%). The illiterate people and students of first year MBBS were least likely to know about the risk factors (p -value < .001).

Conclusion: Considerable effort is needed to increase public awareness especially about risk factors of stroke so that they can be prevented.

SEVERITY OF DEPRESSION IN EPILEPTIC PATIENTS

Ashar Sami, Fatima Farahi, Mohammad Aizaz Imtiaz Khan
Foundation University Medical College, Islamabad

Background/introduction: Depression is one of the most common psychiatric disorders in epilepsy¹. Former researches have produced a significant relationship between depression and epilepsy². Although it has a high prevalence, depression is not easily identified nor cured in the patients³. Depression adversely affects the quality of life in epileptic patients and may alter the clinical course of the disorder⁴.

Objective/aim: The objective of the study was to determine the rate of severity of depression among the epileptic patients.

Methodology: A cross-sectional analysis was done on a total of 69 patients over a course of 3 months from December 2015 to February 2016 which comprised of seven visits to the Neurology Out-Patient Department [OPD] at Fauji Foundation Hospital, Rawalpindi [FFH] and Federal Government Services Hospital (Polyclinic) Islamabad [FGSH] and assessment was done through questionnaires supervised under medical consultants within the respective hospitals. The tool of the study was the Hamilton Rating Scale for Depression (HAMD)⁵.

Results: The mean age of the patients categorized

according to us are as follows: under 20 years of age (both male and female) : 15.44 years , above 20 years of age (both male and female) : 32.33 years .The percentage of patients according to gender are: males only : 40.5% (28 in number) and females only: 59.5% (41 in number) .The scale provided in the HAMD indicates that scores between 0 and 7 are taken to be normal, scores equal to or above 20 indicate moderate, severe or very severe depression. We considered scores between 8 and 19 as indicating a mild form of depression. The results are as follows: ,0-7 (normal)= 2.9% , 8-19 (mild)= 31.9% and Above 20 (moderate to severe) = 65.2% .

Conclusion: The study establishes an essential link between depressive symptoms and epilepsy. Patients who present to neurology OPDs with epilepsy should be referred to a psychiatrist for treatment of their depression.

QUALITY OF SLEEP IN PREGNANCY AND SOCIO-DEMOGRAPHIC FACTORS ASSOCIATED WITH POOR SLEEP QUALITY

Usama Bin Zubair, Zaib Asfandyar, Usman Ali
Foundation University Medical College

Objective: To determine the Quality of sleep among pregnant ladies and analyze the associated socio demographic factors.

Subjects and Methods; The sample population comprised of 114 pregnant ladies reporting for ante natal checkup at Military Hospital (MH) Rawalpindi. Quality of sleep was assessed using Pittsburgh Sleep Quality Index (PSQI). Age, gestation, parity, planned or unplanned pregnancy, education, level of family income and tobacco smoking were related with sleep disturbances.

Results: Out of 114 ladies screened through PSQI, 26.3% had good sleep quality while 73.7% had poor sleep quality. With logistic regression we found that increasing age, third trimester and low family income had significant association with poor sleep quality.

Conclusion: This study showed a high Prevalence of poor sleep quality among pregnant ladies. Special attention should be paid to ladies with more age, from low socio economic background and those who are in third trimester

AWARENESS OF FINAL YEAR MBBS STUDENTS AND HOUSE OFFICERS ABOUT DIAGNOSIS AND MANAGEMENT OF STROKE: A CROSS SECTIONAL SURVEY

Mohammad Umar Khubaib, Mohsin Masud Jan, Sana Sohail, Ahmad Waqas, Farooq Azam Rathore.
Affiliated institute: CMH Lahore Medical College.

Background. Stroke is the leading cause of neurological disability worldwide. In Pakistan, House Officers (HO's) are usually the first contact for stroke patients in the Emergency Department (ED), having to quickly diagnose and manage it. Many Final Year students will also face this situation soon.

Objectives. To document the knowledge and confidence of Pakistani Final Year students and HO's regarding diagnosis and management of stroke.

Methods. Ethics Review Committee's approval was obtained. Questionnaire was constructed using two standard textbooks of medicine and current American Heart Association guidelines. The questionnaires were distributed to 800 Final Year students and HO's in thirteen medical colleges/hospitals in four cities. Data was analyzed using SPSS V.20.

Results. The respondents (31.4%) who had managed stroke were more confident in its diagnosis ($p < 0.001$) and management ($p < 0.001$). Those with family member/s suffering from stroke were more confident in diagnosing it ($p < 0.05$) but not managing it ($p = 0.41$). Most knew about the best initial test (88.1%), aspirin's dosage (64.9%), time-limit for thrombolysis (67.4%) and the risk of deep vein thrombosis in immobilized patients (85.4%). Significantly fewer knew the most accurate test (25.9%), the initial intervention in acute ischemic stroke (44.5%), the first management step for hemorrhagic stroke (58.1%) or when to prescribe statins in a stroke patient (31.5%).

Conclusion. This survey shows that knowledge and confidence of Final Year students and HO's in Pakistan regarding stroke is mostly inadequate. Weak areas need to be identified and medical personnel trained in stroke management.

PREVALENCE OF POST-STROKE DEPRESSION IN FEMALES

Tashfeen, Maida Khalid, Kiran Bukhari, Zainab Farooq, Shaarikh Pasand, Faiza Batool
Foundation University Medical College

Background: Depression, feelings of hopelessness and dejection is more prevalent among post-stroke survivors. PSD (post-stroke depression) affects the emotional health and slows down the recovery rate of post-stroke survivors.

Aim/objective:The objective of the study is to: a) Rate the severity of post-stroke depression in females b) Identify the underlying cause of PSD prevalence in females

Methodology:A phq-9 health questionnaire was deployed to assess the severity of depression in 71 female patients who were 55 to 80 years old (mean age = 64). They were admitted to Fauji Foundation Hospital (FFH), Rawalpindi. The diagnosis of a patient with a phq-9 total score of 5-9 is "minimal symptoms", 10-14 is "minor depression", 15-19 is "major depression-moderately severe" and >20 is "major depression-severe"

Results:Only 2 females had "minimal symptoms", 19 females had "minor depression", 38 females had "major depression-moderately severe" and 12 females had "major depression-severe". Therefore, 53.5% females lied in the "major depression-moderately severe" category, 26.8% females had "minor depression", and 16.9% females had "major depression-severe" and only 2.8% females showed "minimal symptoms". This shows that most of the females (apart from those in the "minimal symptoms" category) required Antidepressant therapy or psychomotor therapy after one or more incidence of stroke. All of the females showed at least some depressive symptoms mainly due to "increased dependence on others".

Conclusion:Pervasiveness of post-stroke depression in females due to racial, ethnic and economic divides, increased dependence on men associated with marital problems and family responsibilities.

"ANTI-NMDA RECEPTOR ENCEPHALITIS: A RARE IMMUNOLOGICAL DIAGNOSIS"

Salman Mansoor, Ahmed Shah bukhari, Nabeel Muzaffar Syed, M.Amjad, Tahir Aziz
Shifa International Hospital

ABSTRACT:Anti-N-methyl-D-aspartatereceptor (anti-NMDA-R) encephalitis is an immune-mediated syndrome that remains under-recognized despite a growing body of literature. This syndrome has been predominantly described in young females with a constellation of symptoms, including personality changes, autonomic dysfunction and neurologic decompensation. We describe a case of anti-NMDA-R encephalitis in a female lady who presented with drowsiness, disorientation, dystonic movements and signs of severe depression. Her past medical history was significant for intractable resistant unexplained seizures 1.5 years back for which she remained in an

intensive care unit on mechanical ventilation for a month at another healthcare facility. She remained seizure free since that time. On presentation in emergency department patient was disoriented, confused and had jerky movements. There was a sudden drop in her conscious level for which she was intubated and received empiric treatment for meningoencephalitis. CSF analysis showed high white cell count with predominant lymphocytic picture. Her cultures and HSV-PCR were negative. In lieu of her significant past medical history and current admission vasculitic or an underlying autoimmune etiology were suspected. So the workup was sent which was positive for NMDA antibodies. So final diagnosis of anti-NMDA-R encephalitis was finally made. After confirmation, plasmapheresis was initiated and patient received 4 sessions, after which she was shifted to another health care facility for further management. This case emphasizes a need for high diagnostic suspicion for autoimmune encephalitis in patients with signs of suspected encephalitis with unexplained etiologies. So a prompt treatment should be started.

COLORECTAL CANCER METASTASIZING TO BRAIN WITH PRESENTATION OF NEUROPSYCHIATRIC

Ahsan Zil E Ali, Syed Muhammad Hammad Ali, Asma Waheed
Fatima Memorial Hospital

ABSTRACT:Metastatic brain tumors from colorectal cancer is a very rare condition and ominous for health. Almost 0.3% to 9% of colorectal cancers metastasize to brain which requires extensive surgical resection with whole brain radiation therapy which results in poor prognosis and median survival up to 12 months or less. A case of 80 years old, hypertensive man presented in ER with altered sensorium and malaise for past 2 days. Patient could not respond to his attendants along with disorganized conversation. Patient had long lasted constipation and abdominal discomfort. 3 months back patient had mild dementia with multiple episodes of leaving home without telling the caregivers, he also had couple of suicidal attempts, a road accident while running confused on road, usage of abusive language and defiant behavior. T1 and T2 weighted images on MRI showed enhancing ringed lesions, cerebral edema and inflammatory foci of embolic origin. The provisional diagnosis including infectious and vascular causes was ruled out by appropriate tests which were followed by FDG-PET scan. This scan detected colorectal cancer and multiple malignant foci in liver as well. Increased CEA levels (42 ng/mL) confirmed the site of origin of cancer. Consent was taken by the patient's caregivers and appropriate counseling was done. Hartmann's procedure was operated with formation of ileostomy. The case was referred to panel of oncologists for further management

ANTERIOR SACRAL MENINGOCYSTOCELE; AREPORT OF TWO CASES AND REVIEW OF LITERATURE

Tayyaba Saif, Adil Aziz Khan, Shafaq Mahmood
Rawalpindi Medical College

ABSTRACT: Anterior sacral meningocele is a rare congenital anomaly. This condition arises in association with a congenital or acquired defect in the sacrum and coccyx, through which the caudal part of the meninges may herniate to form a cyst like structure. We report here two cases of anterior sacral meningocele, a 65 years old male with urinary retention, chronic constipation and backache for two weeks and a 17 years old girl with abdominal heaviness and backache for the past four years. MRI pelvis and lumbosacral spine was done which showed anterior sacral meningocele. A posterior midline approach for the defect repair was done which involved identification and closure of the defect. The symptoms of both the patients were successfully alleviated without any recurrence. The puncture or aspiration of a meningocele can lead to fatal complications, therefore proper evaluation of every doubtful cyst in the pelvis is important before treatment.

TWO CASES OF SPONTANEOUS VERTEBRAL ARTERY DISSECTION PRESENTING AS POSTERIOR CIRCULATION STROKE IN YOUNG PATIENTS

Dr Memoona Nasir, Dr Waseem Tariq Malik, Dr Raja Farhat
Shoaib
Shifa International Hospital

ABSTRACT: Ischemic stroke secondary to vertebral and carotid artery dissection accounts for 2% of ischemic strokes overall and 10-25% of stroke in young individuals. Spontaneous vertebral artery dissection is even rarer but potentially underdiagnosed cause of stroke in young. We present two cases of spontaneous vertebral artery dissection presenting as posterior circulation stroke. **Cases:** Our first patient was a 32 year old gentleman who presented with sudden vertigo, vomiting and tendency to fall towards right side. On examination he had features of right lateral medullary syndrome which was confirmed on MRI DWI sequence. CT angiography revealed dissection of right vertebral artery. Our second patient was a 30 year old gentleman who came with sudden onset left hemiparesis followed by right hemiparesis with swallowing and speaking difficulty. His MRI revealed brainstem and cerebellar infarcts and CTA was suggestive of left vertebral artery dissection. Both patients had no history of trauma, had neck pain preceding the symptoms and had no other risk factors for stroke. MRA did not reveal dissection in either patient and thus it could have been missed

unless suspected. After initial treatment in acute stroke unit they were started on anticoagulation therapy. They had physiotherapy and rehabilitation and both improved significantly. **Conclusion:** Vertebral artery dissection should be considered as a cause of posterior circulation stroke in young patients even without history of trauma and in absence of other risk factors.

CEREBRAL VASOSPASM ASSOCIATED WITH SUBARACHNOID HEMORRHAGE TREATED SUCCESSFULLY WITH INTRA-ARTERIAL VERAPAMIL.

Muhammad Farhan Khan, Raja Farhat Shoaib, Almas Ashraf,
Memoona Nasir
Shifa International Hospital

ABSTRACT: The incidence of SAH is approximately 9 cases per 100,000 patients. Cerebral vasospasm is one of the complications of subarachnoid hemorrhage that is associated with significant mortality and morbidity. Systemically administered nimodipine and hemodynamic therapy are the mainstays of vasospasm prevention and treatment. Endovascular therapies including angioplasty and selective intra-arterial vasodilator infusion are typically used when conventional measures fail. Intra-arterial use of calcium channel antagonists, including verapamil has gained interest. We report a case of female who developed vasospasm secondary to subarachnoid hemorrhage and was treated with intra-arterial verapamil. **Case Description:** A 63 years old female presented with history of subarachnoid hemorrhage presented with headache and weakness of the right half of the body. O/E she was confused and power in the right upper limb was 2/5 and 3/5 in the right lower limb. Follow up MRI showed cerebral vasospasm. She was given intra-arterial verapamil 15 mg daily for two consecutive days and she improved. **Discussion:** Intra-arterially administered verapamil can be effective for cerebral vasospasm. Intra-arterial route has little effect on hemodynamics which include changes in mean arterial pressure, intracranial pressure, cerebral perfusion pressure and cerebral blood flow. In brain, its exact mechanism of action is unknown but believed to act through calcium channel antagonism. Use of other calcium channel blockers to treat cerebral vasospasm has also been proven effective for example nimodipine. **Conclusion:** For its efficacy, quick action and less changes in parameters of blood flow, intra-arterial verapamil is proven to be more effective treatment of cerebral vasospasm.

SPINAL CORD INJURY WITHOUT RADIOGRAPHIC ABNORMALITY (SCIWORA) IN ADULTS: A CASE REPORT OF TWO CASES.

ABSTRACT: Spinal cord injury without any radiological abnormality (SCIWORA) is rare in adults. We describe here two case reports of adult patients, who presented to us with quadriplegia, following a road traffic accident. Plain radiography and computed tomography of cervical spine were normal. Hence the patients were diagnosed as cases of adult SCIWORA. However, subsequent magnetic resonance imaging (MRI) of the two patients revealed cervical cord injury in the form of cord contusion and disc protrusion, respectively. Patient with cord contusion was managed medically, whereas the patient with disc lesion was treated with discectomy. Patient treated with discectomy showed marked improvement. Therefore, patients having no osseous injury on X ray and CT scan should have an MRI study done to look for surgically correctable pathology. As in such rare patients of SCIWORA an early diagnosis and timely intervention is crucial; with MRI playing a pivotal role.

DUAL PATHOLOGY OF BRAIN LESION

Aleesha Gul, Nayab Zahra, Nawal Talib, Naila Mughal
Rawalpindi Medical College

ABSTRACT: The hypothalamus can be affected by a wide range of lesions. Hypothalamic lesions can extend to involve the surrounding structures, and similarly, the hypothalamus can be involved by lesions affecting the sellar-suprasellar cistern, third ventricle, or thalamus. We present here a case of 15 year old girl who presented with headache, decreased vision, slurring of speech and right sided weakness for 20 days. Multiplanar and multi sequential imaging done through brain acquiring T1/T2 W1 sequences with axial and sagittal reformatting. Findings include a large lobulated area of decreased to intermediate intensity in sellar and suprasellar region on T1W1, heterogeneously hyper intense on T2W1 and heterogeneously hyper intense on FLAIR sequences while on post contrast T1W1 this lesion is showing enhancement of its inferior component while its superior component is not showing any significant enhancement. The enhancing component measures 2.7*2.0*2.0cm. Inferiorly the lesion is extending into sella abutting the compresses pituitary gland while superiorly the large non enhancing component is extending into 3rd ventricle. Posteroinferiorly the lesion is lying closely with basilar artery at the superior most part of the pons also minimally extending into interpeduncular cistern while anteroinferiorly the mass is abutting the frontal lobes in midline while anterosuperiorly the mass is stretching the optic chiasma. Lesion is causing expansion of sella and is abutting the carotids in bilateral cavernous sinuses

however it is not invaginating into cavernous sinuses. There is diffuse area of abnormal signal intensity seen in left cerebral peduncle and also in left half of midbrain and minimally the superior most part of pons appearing hypo intense on T1W1 and hyper intense on T2W1 and FLAIR sequences and is not showing enhancement on post contrast T1W1 suggesting ischemia. Bilateral lateral ventricles are significantly dilated with transependymal seepage. Following the case report, all relevant literature, differential diagnosis, and treatment of this rare tumor is reviewed.

ANUSUAL CASE OF EWING'S SARCOMA OF CERVICAL SPINE: A CASE REPORT AND LITERATURE REVIEW

Sehrish Nadeem, Adil Aziz Khan, Iqra Kanwal, Sameer Raja
Rawalpindi Medical College

ABSTRACT: Ewing's sarcoma of spine is quite unusual and has been very rarely seen in cervical spine. 0.9% of all cases represent non sacral spine involvement. We report this rare lesion in 16 years old male who presented with progressively increasing posterior cervical swelling, local pain and dysphagia to solids. His CT-scan revealed mixed lytic and sclerotic lesion with typical moth eaten appearance in C1 and C2 vertebra with large extra osseous soft tissue and extradural component. MRI showed diffuse soft tissue intensity in the upper cervical spine with extension to the prevertebral region and nasopharynx. Histopathology revealed small blue round cell tumor suggestive of Ewing's sarcoma. Patient had uneventful surgery and was referred for chemotherapy. He came for follow up and was ameliorated in his condition.

INTRACRANIAL MENINGIOMA WITH EXTRA CRANIAL EXTENSION INTO THE FRONTAL SINUSES: A CASE REPORT AND REVIEW OF THE LITERATURE.

Sehrish Nadeem, Adil Aziz Khan, Iqra Kanwal, Atif Mehmood Kazmi
Rawalpindi Medical College

ABSTRACT: Extracranial meningioma is an infrequent tumor, habitually found in the head and neck area. Afore surgical removal and histopathological examination, this diagnosis is rarely well-thought-out. Our case study reports this sporadic incident in a 57 yr old lady with an intracranial meningioma with extra cranial extension. MRI scan brain showed a well circumscribed lesion in the right frontal lobe with extension in the frontal sinus as well. Histopathological examination showed meningothelial meningioma. Rt. frontal craniotomy and tumor resection was done. Post operatively, patient was well and came for follow up. She was ameliorated in her condition. A review of the literature on meningioma's extending into ExtraCranial structures is discussed.

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Reference:

1. A double-blind, placebo-controlled trial of tizanidine in the treatment of spasticity caused by multiple sclerosis. The United Kingdom Tizanidine Trial Group. *Neurology* 1994; 44(suppl):S70-e78

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