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Case Study

Physical Therapy Management of Acute Wernicke's Encephalopathy: A Case Study.

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Abstract

Background: Wernicke's encephalopathy (WE) is a severe, and often overlooked, neurological condition that can lead to cognitive impairment and loss of mobility. This case study emphasized the interdisciplinary approach and the integration of rehabilitation with pharmaceutical treatment. The importance of recognition and management of WE is highlighted in this case study, showcasing the pivotal role of physical therapy in the recovery process. The study also discusses the challenges encountered during rehabilitation, and the patient's response to therapy.

Case Presentation: This case study presents the physical therapy management of a 26-year-old male diagnosed with acute WE. The patient suffered from a history of gastrointestinal issues represented in recurrent vomiting whenever he eats or drinks (hyperemesis), leading to malnutrition. After that, the patient exhibited classic symptoms of WE. The patient was initially misdiagnosed, leading to condition progression until the right diagnosis was reached. Upon diagnosis, the patient was administered a high-dose of multivitamins and immediately commenced on a physical therapy regimen. However, further complications arose during his initial physical therapy program.

Management and Outcome: The therapeutic strategy focused on enhancing motor function, balance, and coordination through a combination of physical and occupational therapy. Over the course of treatment, the patient demonstrated significant improvements in cognitive function, motor skills, and overall quality of life. The patient is on track to make a full recovery.

Keywords:

Wernicke's encephalopathy, Muscle weakness, Nystagmus, Rehabilitation, Gait training, Coordination.

Introduction

Wernicke's encephalopathy (WE) is an acute neuropsychiatric syndrome caused by thiamine (vitamin B1) deficiency, which leads to severe neurological complications if not recognized and treated promptly. Despite being relatively common, WE is frequently misdiagnosed, particularly in non-alcoholic patients, with reports suggesting it is overlooked in up to 94% of such cases[1].

The pathophysiology of WE is primarily related to thiamine's role as an essential coenzyme in the tricarboxylic acid (TCA) cycle. Deficiency impairs pyruvate metabolism, resulting in excess lactate accumulation and focal lactic acidosis, which subsequently induces cerebral edema, oxidative stress, inflammation, and white matter damage [2]. These pathological changes can often be reversed with immediate thiamine supplementation.

Neuroimaging and pathological findings typically show symmetrical lesions in the periaqueductal gray matter, midbrain, hypothalamus, and cerebellar vermis. Brainstem involvement may affect cranial nerve nuclei (most commonly the abducens nerve), the medial thalamic nuclei, and the dorsal nucleus of the vagus. Chronic cases are often associated with mammillary body atrophy[3].

Clinically, WE is characterized by the classical triad of ocular abnormalities (nystagmus, ophthalmoplegia), gait and coordination disturbances, and mental status changes. While originally described in alcohol-dependent populations, WE is now increasingly reported in non-alcoholic groups, including patients after bariatric or gastrointestinal surgery, as well as those with cancer, pancreatitis, or other conditions that predispose to malnutrition or recurrent vomiting [4].

Although the cornerstone of WE management remains thiamine administration, there is limited evidence regarding the role of physical therapy in functional recovery. Recent case studies have suggested that individualized rehabilitation may provide additional benefits, highlighting the need for further investigation in this area[5].

Case Presentation

A 26-year-old male was referred for his present physical therapy intervention with a diagnosis of Wernicke's encephalopathy and complaining of a total loss of sitting and ambulation along with the inability to hold

his phone. The patient was morbidly obese with a BMI of 44, he's a non-smoker and a non-alcoholic, and he didn't suffer from any chronic diseases.

However, to get a deeper understanding of this case, the timeline of the patient's history and diagnosis process has to be further explained:

August 2023: The patient started showing symptoms. Initially, he suffered from recurrent hyperemesis, nausea, and a loss of appetite, leading to a diagnosis with a gastric ulcer.

September 2023: However, just a month after that, the patient showed signs of jaundice along with elevated liver enzymes and a fatty liver, leading to a second diagnosis with hepatitis A, but serology for the IgM anti-HAV antibody turned out negative and the patient was prescribed antiemetics only, masking the symptoms and creating a false sense of improvement.

Late November 2023: The patient started exhibiting neurological symptoms represented in bilateral lower and upper limb (UL) weakness, and numbness; these symptoms started with the patient falling for no apparent reason and needing assistance to get up, demonstrating lower limb (LL) weakness. This is when the third misdiagnosis occurred, with the patient receiving the diagnosis of Guillain-Barre Syndrome and receiving plasmapheresis sessions for treatment (**Figure** 1).

Late December 2023: The patient symptoms kept on exacerbating, showing nystagmus, ataxia, and mild cognitive affection. Only by this time, the correct diagnosis of Wernicke's encephalopathy was reached, and a physical therapy referral was issued (**Figure** 2).

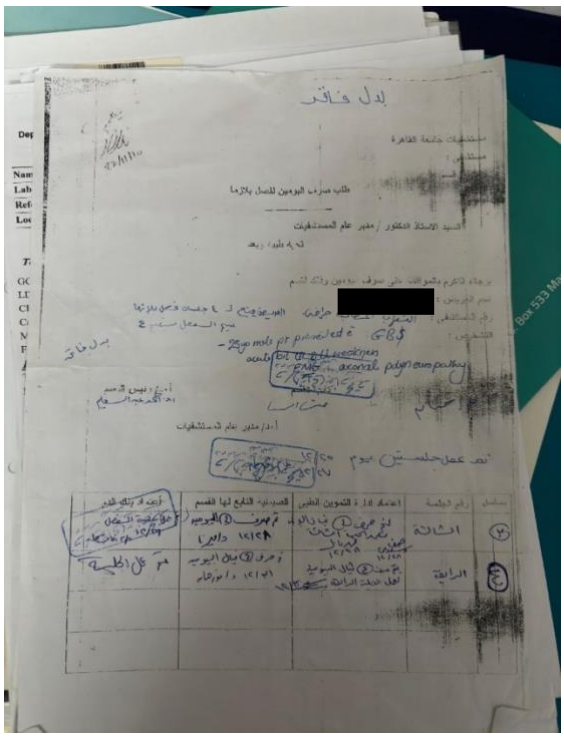

Figure 1. Patient's Referral for Plasmapheresis as a TTT for Guillain-Barre Syndrome

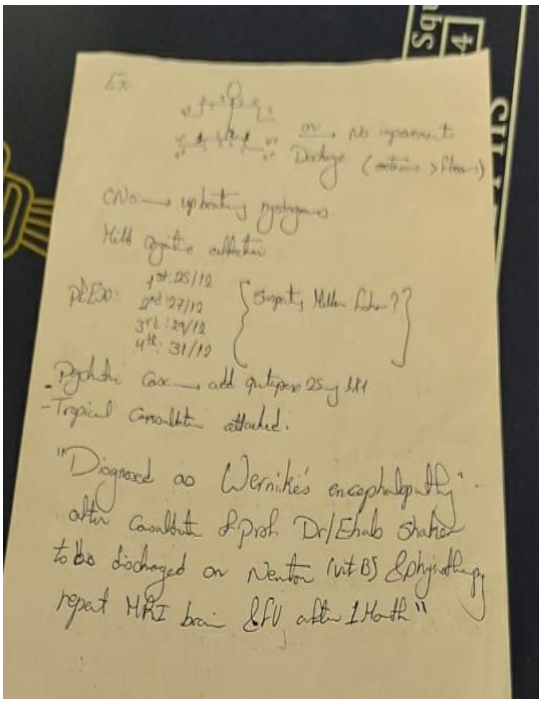

Figure 2. Physical Therapy Referral for Wernicke's Encephalopathy

The patient had received past interventions represented in pharmaceutical and physiotherapeutic treatment. The pharmaceutical treatment focused on elevating the thiamine levels as soon as possible by administering Neuroton [8]. Other drugs administered included Movigit as an antiemetic, and Amipride for the cognitive affection. As for the physiotherapeutic intervention, unfortunately the intervention applied previously wasn't tailored to the patient's needs as it was based on passive movement of the limbs only; this helped avoid articular stiffness and muscle tightness but didn't help a lot when it came to functional recovery and the patient proved to be weaker by the time of the current physical therapy intervention.

Medical Diagnosis:

The patient's latest medical neurological examination was on the 24th of the past December. It showed areflexia, hypotonia, ataxia in the UL with the LL assessment "inapplicable", and nystagmus.

As an abdominal CT scan showed evidence for gastro-duodenitis and fatty liver changes. Nerve conduction studies showed asymmetrical axonal sensorimotor polyneuropathy affecting LL more than UL. Additionally, the brain MRI showed periaqueductal, midbrain, and mammillary bodies hyperintensity (**Figure** 3).

A diagnosis of Wernicke's encephalopathy, according to Caine criteria for diagnosis of Wernicke's encephalopathy, should be considered in any patient with two or more of the following symptoms:[1]

- Nutritional deficiency.
- Altered mental state or memory impairment.
- Oculomotor abnormalities.
- Cerebellar dysfunction.

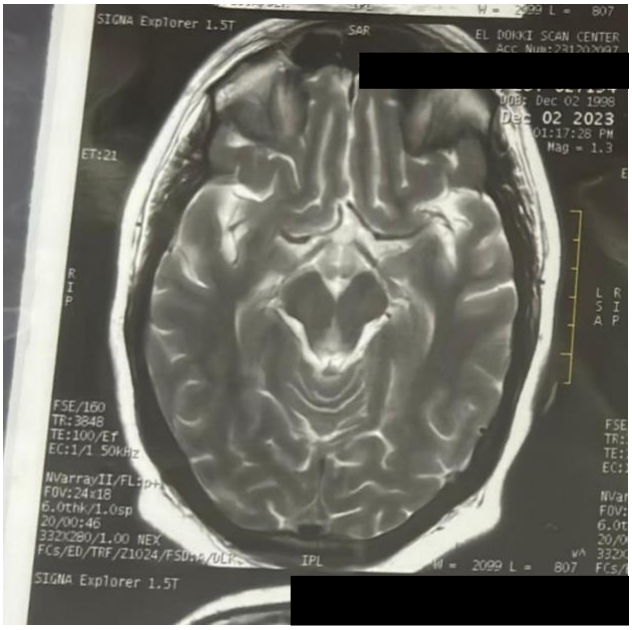

Figure 3. Periaqueductal area & mammillary bodies hyperintensity

The patient exhibited all of the four symptoms included in Caine Criteria.

After the patient went through the diagnosis timeline mentioned previously, a diagnosis of WE was agreed upon and the patient was put on a medication course for Neuroton, which successfully eliminated his nystagmus within a week from hospital discharge. The patient was also referred for physical therapy at the January the 1st of this year. This past physical therapy intervention, unfortunately, didn't improve the patient's functional abilities nor decrease the ataxia and lack of coordination due to its passive nature. The patient started his current physical therapy intervention at the beginning of March.

Initial Physical Therapy Assessment (2/3/2024):

A) Mental State: The patient showed complete consciousness and was able to communicate properly. Memory wise, the patient had localized

B) amnesia, where he couldn't properly recall any of his time during the hospital stay.

C) Visual Field Test: Normal

D) Reflex Assessment: Generalized hyporeflexia.

E) Functional muscle testing was inapplicable since the patient was unable to perform any functional movements, especially in the LL.

F) Manual Muscle Tests:

- UL: Shoulder Flexors (4/5), Shoulder abductors (3-/5), Shoulder external rotation (4-/5), Shoulder internal rotation (4-/5) Rt. Elbow flexors (4-/5), Lt. Elbow flexors (3/5), Elbow extensors (4-/5).
- LL: Hip flexors (2/5), Hip extensors (2/5), Hip adductors (3-/5), Rt. Hip abductors (4-/5), Lt. Hip abductors (3/5) Knee Extensors (1/5), Knee flexors (2/5), Dorsiflexors (4+/5), Plantar flexors (4/5).

G) Functional Ambulation Classification: 0 (Non-ambulatory).

H) Motor Functional Independent Measure (mFIM): See **Table** 1.

Physical Therapy Interventions:

In this case, a program is planned through emphasizing problem identification, setting goals, and applying the suitable interventions. The intervention is planned through putting a problem list for each period, whenever a list was solved, an updated plan is put in place to allow positive progression.

A) 3 weeks (2/3/2024 – 24/3/2024):

1- **Problem:** Lack of knowledge and understanding of the condition, leading to irrational fear and a loss of motivation.

Goal: Increase the patient's knowledge and awareness

Intervention: The condition was explained to the patient, and he was made aware how his physical therapy program is to be applied.

2- **Problem:** Inability to hold a pen, a spoon to eat, or to hold the phone for more than five minutes.

Goal: Restore the fine movements of the hands to increase the patient's independence.

Intervention: Strengthening the muscles of the forearm and the hand were a crucial part of solving this issue (Focused on for 20 minutes each session).

However, the most important interventions were coordination training and occupational therapy. The patient benefitted from training on how to hold a pen and write (training on the dynamic tripod grasp by using the thumb, index finger, and middle finger to hold small items, progressing to using the pen), how to coordinate movements of the whole arm in order to use a spoon (mainly hand to mouth movements), and how to hold the phone without getting tired.

3- **Problem:** Inability to sit up.

Goal: Enable the patient to transition from supine position to sitting up independently.

Intervention: Arm strengthening exercises, targeting the shoulder flexors, shoulder adductors, and elbow extensors, were performed in order to give the patient a chance to assist himself in sitting up. In addition, Core strengthening was crucial to solve this problem. Beginning with performing assisted sit ups while pulling a bar with both hands (3 Sets of 15 repetitions), this progressed to sit ups while assisted with only one hand to introduce a rotational aspect that involved the abdominal oblique muscles. The final progression was independent sit ups.

Self-care	
Eating	**3**
Grooming	**3**
Bathing	**2**
Dressing upper	**4**
Dressing Lower	**2**
Toileting	**1**
Spincter control	
Bladder	**7**
Bowel	**7**
Transfers	
Bed, Chair, Wheelchair	**2**
Toilet	**1**
Tub, Shower	**1**
Locomotion	
Walk, Wheelchair	**2 (Wheelchair)**
Stairs	**1**
Total mFIM Score	***36***

Table 1. Patient's mFIM at his 1st assessment at the beginning of the current PT intervention

4- **Problem:** Needing professional help (paramedics) to transfer due to lack of knowledge on the techniques needed and the patient's obesity.

Goal: Educating the patient and his relatives on how to transfer from the bed to his wheelchair and vice versa.

Intervention: Using bed sheets as transfer sheets was taught and demonstrated to the patient's relatives in order to provide a method for transferring the patient horizontally. As for transferring the patient from the bed to his wheelchair, the patient was taught how to sit on the edge of the bed, hold onto the wheelchair's handles, and shift onto the wheelchair in order to reduce the assistance needed.

5- **Problem:** Tightness of the hips' lateral rotators and ankle plantar flexors.

Goal: Restore the neutral position of both the hip and ankle to avoid further complications in the upcoming stages of rehabilitation.

Intervention: A regimen of prolonged muscular stretching for the tight muscles and facilitation of the antagonistic muscles was followed. Positional education for the patient and his relatives was imperative for solving this problem, and for the tight plantar flexors, an Ankle-Foot orthosis was prescribed.

6- **Problem:** LL muscle weakness.

Goal: Strengthening the LL muscles to progress to weightbearing.

Intervention: The patient received muscular facilitation through electrical stimulation (Faradic current) and other facilitatory techniques for his LL muscles and especially the quadriceps and gluteus maximus due to their utmost importance in the weight-bearing stage.

The goal for these 3 weeks was to provide the patient with relative independence through his ADLs, improve transferring and mobility, and strengthen the LL muscles enough to progress to weightbearing in the upcoming weeks.

B) 5 weeks (25/3/2024 – 1/5/2024):

1- **Problem:** Lack of weightbearing.

Goal: Partial weightbearing with support, progressing to weightbearing without support.

Intervention: The patient needs to start weightbearing on his LL as to avoid complications and improve stability and proprioception, enabling the patient to progress in regaining his functional abilities. To achieve this, the patient would sit in the edge of his bed and hold onto the walker placed in front of him for support. Then, the patient attempts to push his feet to

the ground and push his waist forward while pushing down with his hands on the walker; this, along with support to the knees to keep them locked assisting the patient in getting up, the patient reaches a standing position and is asked to maintain it with gradual increases in time as much as the patient can endure.

2- **Problem:** Lack of postural stability and trunk control.

Goal: Improve postural stability in sitting and standing

Intervention: Core exercises are increased in time (30 minutes). The patient's newfound ability to perform fully independent sit ups was utilized, Russian twists were done, and glute bridges were performed. In addition to that, the patient's balance was challenged through gentle pushes in random directions while gradually progressing to one handed support on the walker (10 seconds with one hand, then switches to the other).

3- **Problem:** Weak dorsiflexion and eversion.

Goal: Strengthening the Tibialis anterior and foot evertors in order to prepare for the gait training stage.

Intervention: The strengthening interventions started with low manual resistance while the patient performed the targeted action, which then progressed to increased resistance by a TheraBand (3 sets of 10 repetitions).

C) Final Stage (2/5/2024 – 18/10/2024):

1- **Problem:** Lack of independent standing.

Goal: Strengthening the quadriceps enough to withstand standing with knee support.

Intervention: Gradual increase in the quadriceps strengthening intensity, finally reaching to grade 4- muscle strength.

2- **Problem:** Lack of ambulation. (3 weeks after the "Lack of independent standing" problem).

Goal: Starting the patients gait training.

Intervention: After the patient was able to independently stand, taking a step forward was what's next. The patient needed to improve his balance during one-leg-stance and successfully did so through continuous core and balance exercises. Then, the patient took forward steps, using his walker, starting with a single meter of walking -with external support by the therapist- and progressed to more than 10 meters of gait without the therapist's support.

3- **Problem:** Foot placement and LL coordination.

Goal: Educate the patient regarding the required stride length and the right position of the step.

Intervention: The patient was instructed to walk in a slow pace and avoid excessive or

insufficient stride length as to avoid imbalance and subsequent falling. Using rings to specify the specific spot for foot placement, stride length was initially specified to be around 40 cm and intended to increase as the patient progresses. As for coordination, the patient performed exercises for placing the foot at a specific spot as well as exercises to improve joint position sense (Joint matching tasks).

4- **Problem:** Fear of falling.

Goal: Eliminate the fear and encourage the patient to do his best.

Intervention: Several interventions were applied:

- Patient education to let him know that the uncertainty he's feeling is normal. Also, telling the patient other success stories seemed to improve his mood and alleviate the fear.
- Gradual exposure and psychological support from the relatives.
- Positive reinforcement and proving to the patient that he's in a safely controlled environment that eliminates the probability of harm.

Outcomes:

To clarify the outcomes derived from the physical therapy intervention at this stage of treatment, the reassessment conducted on June 11, 2024, would be pivotal.

Latest Physical Therapy Assessment (11/6/2024):

A) Mental State: The patient showed complete consciousness and was able to communicate properly. Memory wise, the patient's localized amnesia persisted, where he couldn't properly recall any of his time during the hospital stay.

B) Visual Field Test: Normal

C) Reflex Assessment: Normal. Functional muscle testing:

- 30 seconds sit-to-stand test: The patient scored 14; there's room for improvement

D) Manual Muscle Tests:

- UL: Shoulder Flexors (5/5), Shoulder abductors (5-/5), Shoulder external rotation (5/5), Shoulder internal rotation (5/5) Rt. Elbow flexors (5/5), Lt. Elbow flexors (5/5), Elbow extensors (5/5).
- LL: Hip flexors (4-/5), Hip extensors (4-/5), Hip adductors (4+/5), Rt. Hip abductors (4/5), Lt. Hip abductors (4/5) Knee Extensors (4-/5), Knee flexors (4-/5), Dorsiflexors (5/5), Plantar flexors (5/5).

E) Functional Ambulation Classification: 3 (Ambulator, dependent on supervision: can ambulate on level surface without manual contact of another person but requires

standby guarding of one person either for safety or verbal cueing.).

F) Motor Functional Independent Measure (mFIM): See **Table 2**.

The improvement in the patient's manual muscle test scores can showcase his progress clearly. However, the increase of mFIM by 28 points (from 36 to 64 points) shows a glaring improvement in his functionality, with a room for further improvement.

Treatment Outcomes:

When comparing the patient's initial and final assessments using the Modified Functional Independence Measure (mFIM), substantial improvement was observed across all domains. The most notable progress was seen in the locomotion category, which was also the primary therapeutic target. At baseline, the patient required maximum assistance for basic ambulation, reflecting severe functional dependence. By the end of the rehabilitation program, the patient had regained the ability to ambulate independently with minimal supervision.

This transition represents a clinically significant change, as restoration of ambulation not only improves mobility but also enhances independence in daily activities, reduces caregiver burden, and lowers the risk of secondary complications associated with immobility (e.g., pressure sores, deconditioning). Such improvements underscore the effectiveness of an individualized, active rehabilitation program in addressing functional limitations in Wernicke's encephalopathy.

Although improvements were noted in other categories of the mFIM (e.g., transfers, self-care), the recovery of locomotor ability is particularly meaningful given that ambulation is often the most disabling impairment in acute neurological conditions. The patient's ability to transition from dependency to independent walking highlights the clinical value of targeted physical therapy interventions in complementing medical management.

Self-care	
Eating	**7**
Grooming	**7**
Bathing	**4**
Dressing upper	**7**
Dressing Lower	**5**
Toileting	**4**
Spincter control	
Bladder	**7**
Bowel	**7**
Transfers	
Bed, Chair, Wheelchair	**4**
Toilet	**4**
Tub, Shower	**2**
Locomotion	
Walk, Wheelchair	**5 (Walk)**
Stairs	**1**
Total mFIM Score	***64***

Table 2. Patient's mFIM at his latest assessment at the current PT intervention

Discussion

Key Findings

This case study demonstrates the potential role of individualized physical therapy in the management of acute Wernicke's encephalopathy (WE). The patient's rehabilitation program, focused on restoring functional mobility and ambulatory ability, highlights that tailored, active interventions can lead to meaningful recovery even in the presence of severe neurological impairment. While the benefits of thiamine supplementation in WE are well established, evidence regarding the role of rehabilitation remains scarce. Existing literature regarding rehabilitation often emphasizes chronic variants such as Wernicke–Korsakoff syndrome, where cognitive decline is more pronounced and the scope of physical therapy is reduced. Reports from institutions such as Ankara University Faculty of Medicine and Ravi Nair Physiotherapy College describe rehabilitation in chronic WE, but early-stage interventions remain underexplored [3,5]. In addition, when studies focus specifically on WE, the physical therapy regimen is often only briefly mentioned or overlooked, as seen in reports by Eric Oudman et al. and Ashley Cantu-Weinstein et al [6,7]. This case adds to the limited evidence supporting the value of early, patient-specific rehabilitation in acute WE.

Limitations

The findings of this case are subject to important limitations. First, as a single case, generalizability is inherently restricted. Second, the absence of standardized outcome measures and long-term follow-up limits the ability to assess sustained efficacy of the intervention. Additionally, the patient's recovery was likely influenced by multiple concurrent factors, including thiamine supplementation and natural neurological recovery, which makes it difficult to isolate the independent effect of physical therapy.

Implications

Despite these limitations, the case underscores two critical implications. Clinically, it suggests that rehabilitation should not be overlooked in acute WE and may play a complementary role alongside medical therapy in optimizing outcomes. From a therapeutic perspective, the observed improvement after shifting from a passive to an active, individualized program emphasizes the importance of early intervention and adaptive strategies in neurorehabilitation.

Future Directions

Regarding the upcoming phase in the patient's physical therapy program:

Up till now the patient is making considerable progress and is notably getting closer to his goal, which is completely independent ambulation.

The next and final phase of the program would have the following list of general goals:

1- Further improving balance and postural stability.

2- Reaching independent ambulation by progressing from using a walker to using crutches in a four-point gait and finally to a completely independent ambulatory state.

3- Enhancing cardiovascular endurance would be crucial as the patient attempts to walk for further distances.

Having thoroughly examined the intricacies and context of the case, it is now imperative to shift our focus to the outcomes. By exploring them, we can gain a deeper understanding of the impact and significance of the actions and decisions made throughout the process.

When it comes to the academic aspect, further research is needed to strengthen the evidence base for rehabilitation in WE. Prospective studies and controlled trials should investigate the timing, intensity, and specificity of physical therapy interventions, as well as their interaction with pharmacological management. Establishing standardized rehabilitation protocols may improve recovery rates and reduce long-term disability in this under-recognized population.

Acknowledgments

I would like to express my gratitude to Dr. Mohamed Abo-Bakr for his valuable assistance throughout this case study.

Abbreviations

Wernicke's encephalopathy (WE), Upper limb (UL), Lower limb (LL), Motor Functional Independence Measure (mFIM).

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A) Patient's Brain MRI:

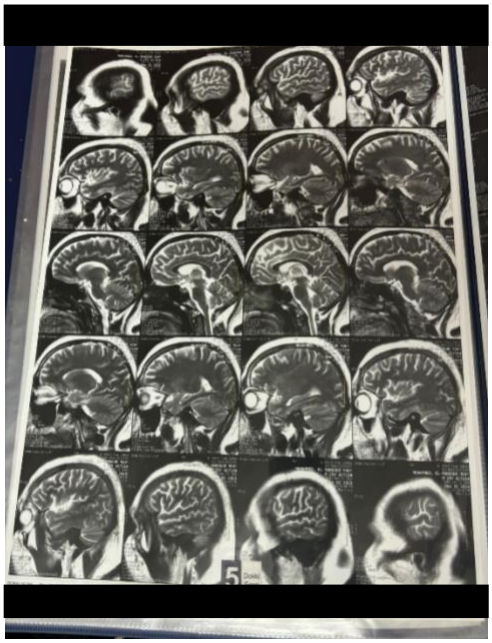


Figure 2

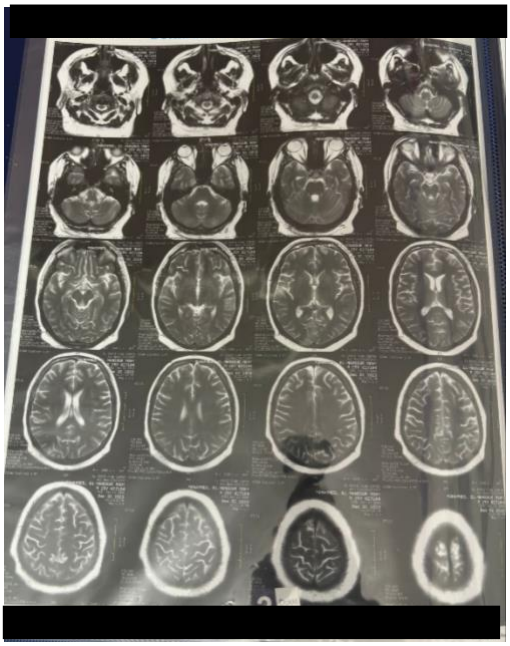


Figure 3

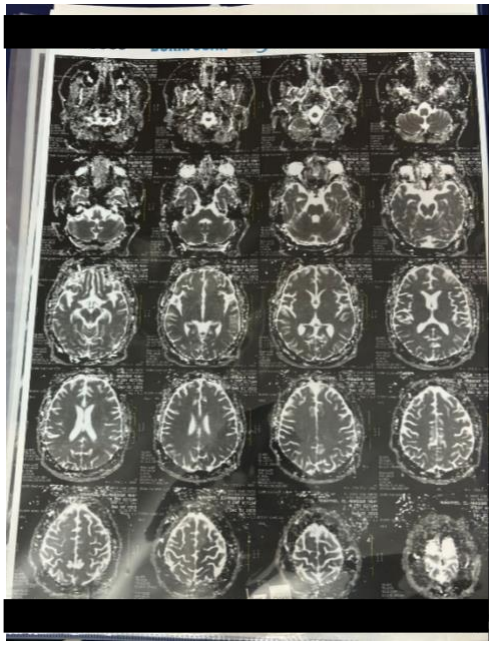


Figure 4

B) Plasmapheresis referral with a Guillan Barre diagnosis on 22/11/2023:

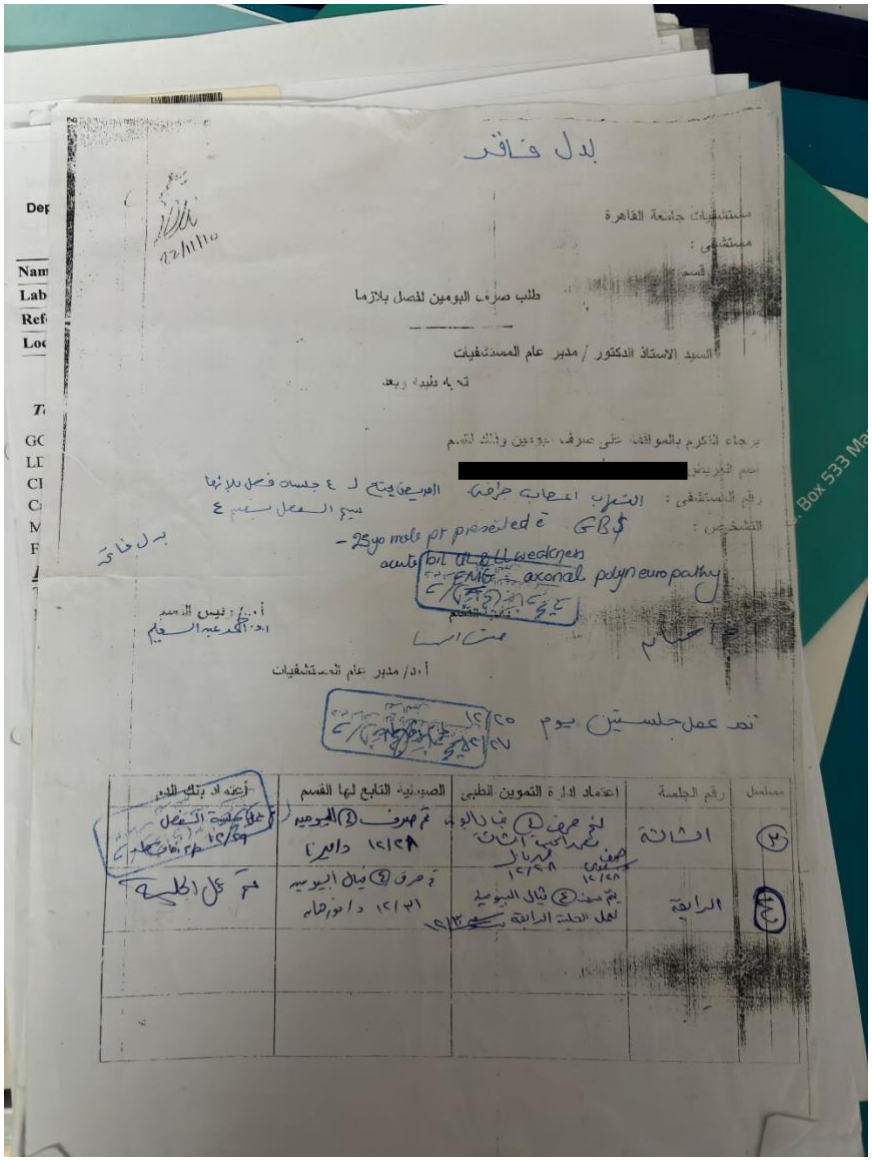
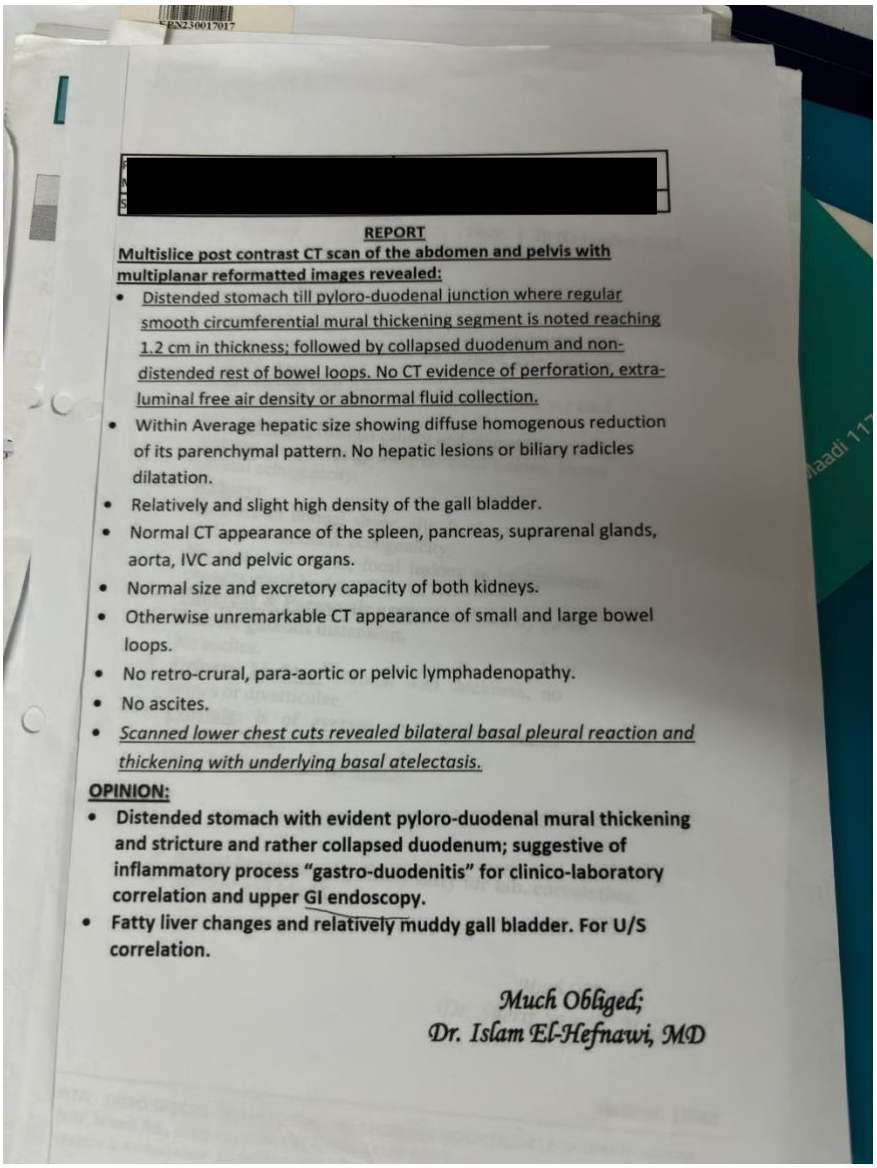


Figure 5

C) Abdominal CT Report:



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REPORT

Multislice post contrast CT scan of the abdomen and pelvis with multiplanar reformatted images revealed:

- Distended stomach till pyloro-duodenal junction where regular smooth circumferential mural thickening segment is noted reaching 1.2 cm in thickness; followed by collapsed duodenum and non-distended rest of bowel loops. No CT evidence of perforation, extra-luminal free air density or abnormal fluid collection.
- Within Average hepatic size showing diffuse homogenous reduction of its parenchymal pattern. No hepatic lesions or biliary radicles dilatation.
- Relatively and slight high density of the gall bladder.
- Normal CT appearance of the spleen, pancreas, suprarenal glands, aorta, IVC and pelvic organs.
- Normal size and excretory capacity of both kidneys.
- Otherwise unremarkable CT appearance of small and large bowel loops.
- No retro-crural, para-aortic or pelvic lymphadenopathy.
- No ascites.
- *Scanned lower chest cuts revealed bilateral basal pleural reaction and thickening with underlying basal atelectasis.*

OPINION:

- **Distended stomach with evident pyloro-duodenal mural thickening and stricture and rather collapsed duodenum; suggestive of inflammatory process "gastro-duodenitis" for clinico-laboratory correlation and upper GI endoscopy.**
- **Fatty liver changes and relatively muddy gall bladder. For U/S correlation.**

Much Obliged;
Dr. Islam El-Hefnawi, MD

Figure 6

D) PT referral with a Wernicke's encephalopathy diagnosis:

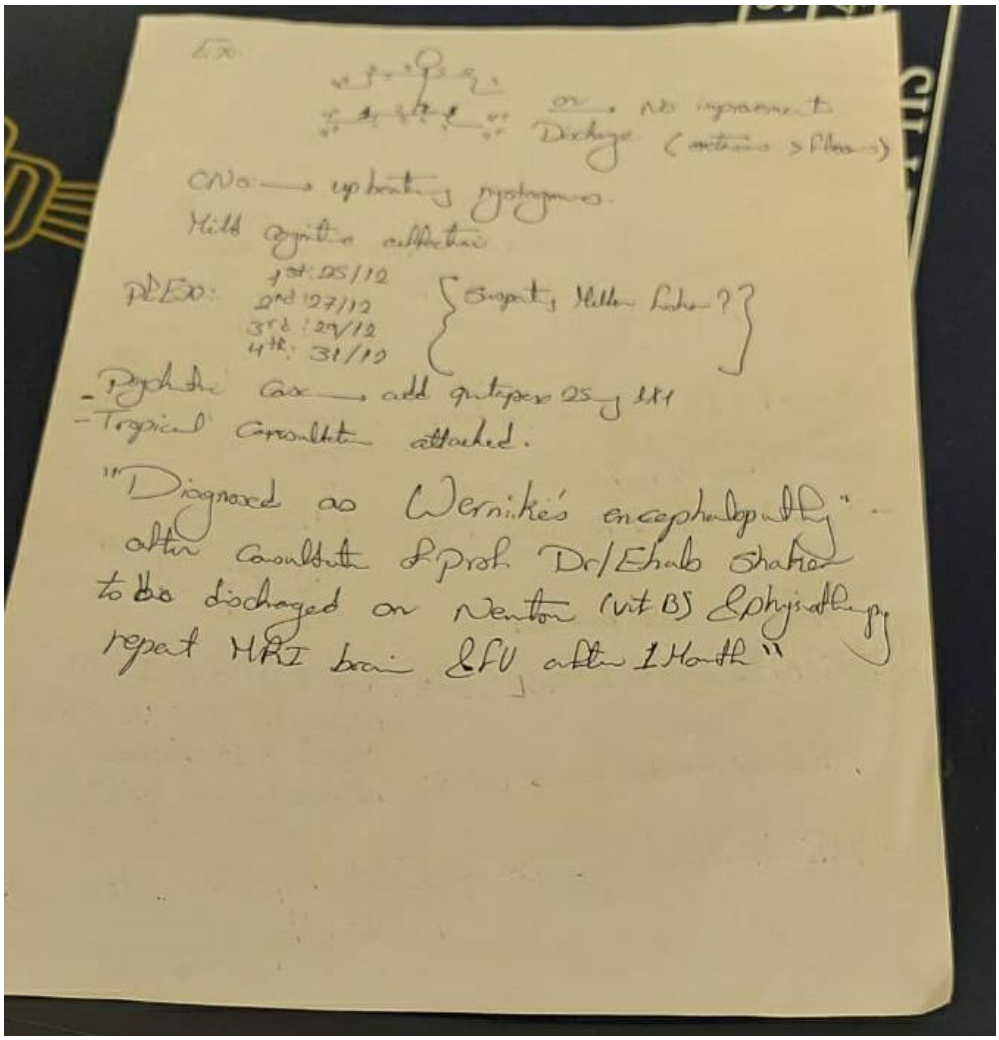

Figure 7