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Rehabilitation of lateral gaze palsy in a patient with 'Choroid Plexus Papilloma'

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ABSTRACT

Choroid Plexus Papilloma (CPP) is infrequent, neuroectodermal originated, intraventricular tumour of central nervous system that develops from lining of choroid plexus lining. Choroid plexus is responsible for production of cerebrospinal fluid. Patient with CPP therefore presents with symptoms of hydrocephalus due to increased intracranial pressure (ICP). In this case report we have presented an 11-year-old female patient who developed CPP mimicking meningioma in third ventricle. She came with complain of headache, vomiting and diplopia. MRI and CT scan results confirmed the diagnosis. She was initially operated on for ventriculoperitoneal shunting to reduce the elevated intracranial pressure after approximately 25 days of onset of symptoms. Her tumour was removed subsequently, 10 to 15 days after the initial surgery, using a supracerebellar infratentorial approach, with an incision running from her occiput to 6 cm downward. Her primary complaints after surgery included loss of lateral eye movement, poor coordination and balance problems. Early evaluation and rehabilitation for the same were initiated. Exercises for lateral gaze palsy comprised of eye movement exercises by utilising radium objects and target-oriented gaze stabilisation exercise using colourful peg board pieces. The regimen also includes upper and lower limb coordination exercises and balance training. The effects of our treatment strategy were observed during post-rehabilitation follow-up, including improvements in gaze, balance and coordination.

Keywords: Choroid plexus carcinoma (CPC), Meningioma, Third ventricle, lateral gaze palsy, physiotherapy.

1. INTRODUCTION

A densely vascularized structure that is present in the ventricles of the brain is called the choroid plexus (CP). It is a secretory layer that is present in every ventricle of the brain and plays a primary role in the production of cerebrospinal fluid (CSF) (Lun et al., 2015). It is located at the crucial functional and anatomical areas in the brain's ventricular system. It is made up of connective tissue, arteries and epithelial cells (Shah et al., 2020). Epithelial cells of the choroid plexus produce CSF which helps in the regulation of homeostasis. It also can transmit proinflammatory signals to the

brain (Thompson et al., 2022). Neuroectodermal choroid plexus tumors are an uncommon kind of cerebral malignancy. According to WHO, there are three main classifications of choroid plexus malignancy; Grade one: Choroid plexus papilloma (CPP), Grade two: Atypical CPP and Grade three: Choroid plexus carcinoma (CPC) (Crea et al., 2020). CPP is a CNS tumor that makes up <1% of overall intracranial neoplasms, 2-6% of juvenile brain tumors, and 0.5% of adult brain tumors (Castro-Castro et al., 2020; Kabashi and Ahmetgjekaj, 2021). It is an uncommon intraventricular tumor of the choroid plexus (Crea et al., 2020). It can occur at any generation, although these are most frequent in babies. It primarily involves the lateral ventricles as well as the fourth ventricle. III ventricle tumors are infrequent and contribute to 0.6-0.9% of most brain tumors (Ahmed et al., 2018). The individual usually exhibits symptoms of elevated intracranial pressure such as vomiting, headache, horizontal gaze palsies and homonymous field of vision abnormalities. The clinical signs are mostly caused by hydrocephalus, which is caused by a direct mechanical restriction to the circulation of CSF. It is a consequence of an arachnoid granulation blockage caused by bleeding or CSF excess production (Whedon and Glassey, 2009).

Intraventricular meningiomas are primary brain tumors that account for just 0.5-5 among all meningiomas. Third ventricle meningiomas (TVMs) are considerably rarer, making for approximately 0.1-0.18% of total intracranial meningiomas (Schartz et al., 2019). Meningiomas can develop from either the dura mater in the brain or the spine. Intraventricular meningiomas are discovered seldom. Particularly in frontal or parasagittal meningiomas, changes in personality, disorientation and varying levels of awareness can be observed (Buerki et al., 2018).

CPP are best managed surgically by excising the tumor where hydrocephalus is treated using VP shunting to relief intracranial pressure although surgery comes with a bag full of post-operative complication. In this case post-operatively patient experienced symptoms like lateral gaze palsy of left eye, incoordination, loss of balance and headache. This can be managed using physical therapy to improve quality of life of patient. To deal with the illness, physical therapy post-operative rehabilitation can be quite beneficial. The patients' functional objectives were improved as a result of ultimate surgical procedure and early physiotherapy rehabilitation (Phansopkar et al., 2020). Exercises for stabilising the gaze are essential components of a rehabilitation programme for treating gaze palsies and improving balance (Ghordadekar et al., 2021). With the intention of increasing the gain of the vestibular ocular reflex, enhancing visual clarity when moving the head and minimising the symptoms of dizziness (Meldrum and Jahn, 2019). Enhancing the balance and gait characteristics with pelvic PNF is a successful therapeutic method. This case report shows effect of gaze stabilizing exercise on gaze palsy with choroid plexus papilloma.

2. CASE REPORT

An 11-year-old female patient visited the hospital with her parents with the chief complaints of headache, vomiting and diplopia for two months. Doctors examined her thoroughly and advised her investigations like CT scans and MRIs. The findings of the MRI and CT scan were suggestive of choroid plexus papilloma with some features mimicking meningioma. Doctors suggested an operation that includes the placement of a ventriculoperitoneal shunt (VPS) and the tumor excision. The surgery involved a two-stage procedure. At first, she underwent a VPS placement procedure to reduce ICP. The surgeon moved her to ICU for eight days. After an eighth day, she underwent 2nd operation that involved tumor excision and was shifted to the ICU. The Physiotherapy call was noted on postoperative day 3 (POD-3).

Clinical findings

The patient appeared conscious, cooperative and oriented to time, place and person. The body built of the patient was mesomorphic. On observation, there was a medial deviation of the left eye as (Figure 1). On further assessment, tone appeared normal in both the upper and lower limb. The range of motion of all joints of the upper limb was normal. There was a restriction of the range of motion of joints of the lower limb. Her sensation in the upper limb and lower limb were normal. On the assessment of muscle strength using manual muscle testing showed reduction in strength of lower limb muscles. Patient showed diminished superficial and deep reflexes. The patient also had bowel and bladder dysfunctions requiring a Foley's catheter placement. The physiotherapist also performed coordination tests like finger-to-nose, and therapist-finger-to-nose and found impairment in coordination.

Functional assessment

Patient was able to perform independent rolling. Patient is able to transfer from supine to sitting on her own and sit independently.

Figure 1 Showing medial deviation of left eye

Clinical Diagnosis

Preoperative MRI showed irregular lobulated soft tissue in the posterior part of the third ventricle that was suggestive of CPP or meningioma. Preoperative CT revealed an extra-axial intraventricular mass lesion in the posterior aspect of the III ventricle. It also showed obstructive hydrocephalus involving bilateral lateral and III ventricles. MRI pictures of patient (Figure 2, 3, 4) in transverse, sagittal and frontal view respectively.

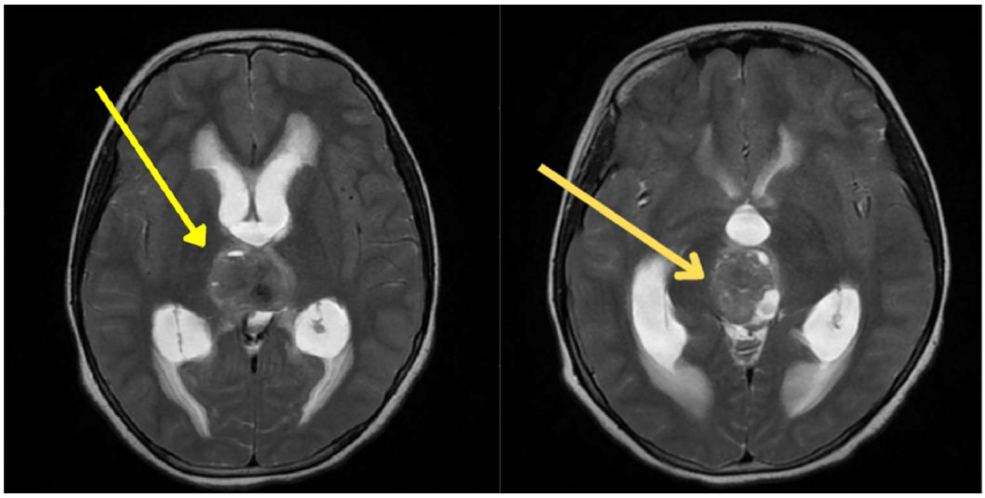
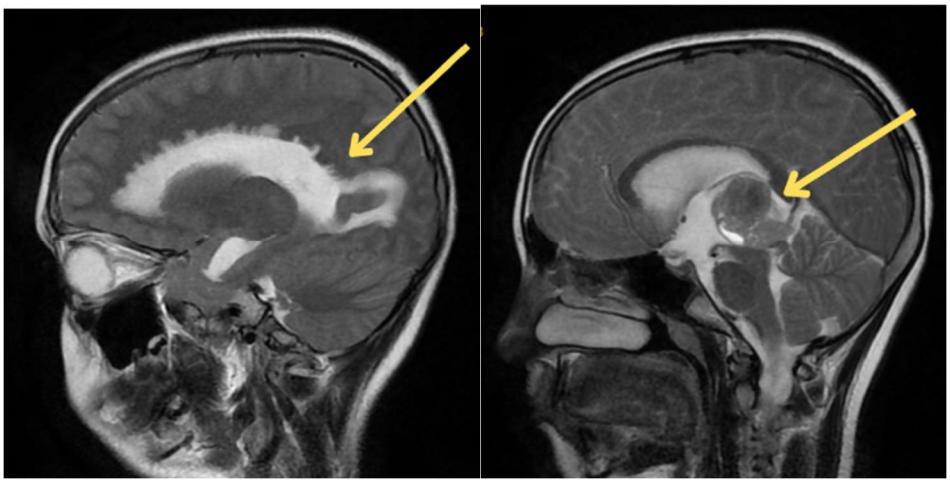


Figure 2 Showing irregular mass of soft tissue in third ventricle transverse view



(1) (2)

Figure 3 Sagital plane showing-(1-Arrow showing hydrocephelus and CSF accumulation, 2-Arrow showing CPP)

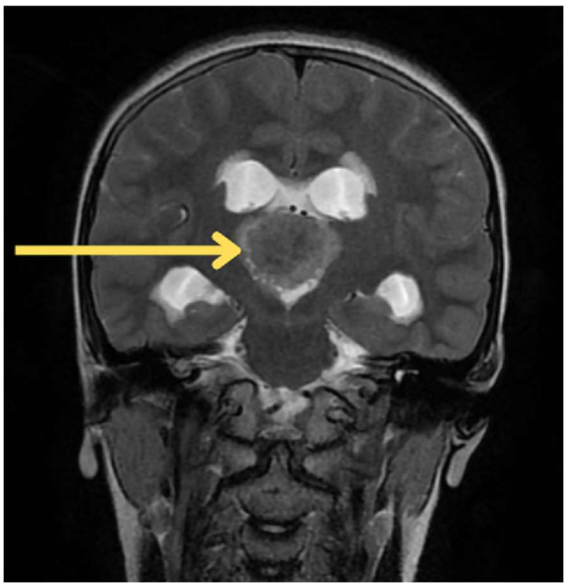


Figure 4 Arrow showing tumour in frontal plane

Timeline

OD–Once daily, BD–Twice daily, TDS–Thrice a day, SOS as needed. Series of events has shown (Table 1).

Table 1 Series of events

Sr. No	Dates	Consultation	Events	Interventions
1	2/07/2022	__	Onset of headache, diminished vision, vomiting, diplopia	420 ml IVF DNS, 80 ml Inj Mannitol 8 hourly, 1g Inj Ceftriaxone BD, 4mg Inj Emset
2	10/07/2022	Paediatric ICU	Admitted to AVBRH, Sawangi	1g Inj Ceftriaxone BD, 40mg Inj Pantop OD, 35mg Inj tramadol 8 hourly, 9mg Inj Emset SOS, 500mg Inj Neomol SOS
3	23/07/2022	Neuro ICU	1st operation–VP shunting	1g Inj Ceftriaxone BD, 40mg Pantop OD, 0.5 mg Dexa TDS, 4mg Emeset SOS, 100g Inj Mannitol TDS
4	06/08/2022	Neuro ICU	2nd operation–excision of tumor	1g Inj Ceftriaxone BD, 100ml Inj Neomol TDS, Inj Amikacin OD, 40mg Inj Pan OD, 4mg Inj Emset TDS, 500mg Inj Levepril BD, Inj Optineuron, 2mg Inj Dexa TDS, 500mg Inj Pause BD, 50ml Inj Mannitol iv

Physiotherapeutic Intervention

We started physiotherapy from the postoperative day-3. Immediate and timely rehabilitation aids in preventing post-operative complications. We provided fundamental PT intervention for the first 4-5 days due to drowsiness and reluctance. Later, the course of treatment changed to focus on lateral gaze palsy, balance and coordination as the primary issues. Table 2 represents the physical therapy management for the given case. The patient received some interventions, some of which are depicted (Figure 5, 6, 7).

Table 2 Therapeutic intervention

Sr. No	Problem Identified	Goals	Intervention
1	Weakness in muscles of upper and lower limb	To regain adequate strength in one week To achieve 4/5 on MMT	Strengthening exercise of both upper and lower limb with manual resistance Progression to strengthening exercise using weight cuff 10 repetitions (reps) * 2 sets–2 times a day
2	Reduced range of motion of knee extension in high sitting	To increase knee extension range in high sitting	Hamstring stretching by therapist. 3 repetitions * 30 sec hold – 2 times a day Passive range of motion (ROM) exercise of knee flexion and extension with slight rhythmic stretch at the end range by therapist in high sitting 10 reps * 2 sets–2 times a day Use of continuous passive movement (CPM) machine for knee extension Once a day
3	Incoordination of upper and lower limb	To improve coordination of both upper and lower limb	For upper limb Therapist's finger to nose Finger to finger (Figure 5) For lower limb Heel to shin Heel to toe Rapid tapping of foot
4	Lateral gaze palsy of left eye	To regain the normal gaze of left eye	Target oriented gaze stabilization exercises with fix head and eye movement using colourful peg board piece Environmental modification using MRP Eye movement exercise using radium object in semi-dark room
5	Difficulty in speaking	Regain the impaired speech	Oromotor facilitation Speech training
6	Reduced and abnormal gait	To make her able to walk	Walking with minimal support by therapist Tandem walking Side walking Backward walking High Intensity Functional Exercise (HIFE) protocol
7	Reduced air entry	To increase lung ventilation and perfusion and reduce dyspnoea	Purse lip breathing Thoracic expansion exercise 10 reps * 1 set–2 times a day
8	Balance training		Visual scanning exercises (Batool et al., 2022) Static sitting balance i.e., sitting without support Dynamic sitting balance with the help of perturbation and reach outs Static standing balance without support Dynamic standing balance using reach outs, tandem standing, Romberg standing, asking

			patient to lift object from floor.

Figure 5 Showing finger to nose coordination exercise (1-Patient is touching her nose, 2-Patient is touching therapist finger)

Figure 6 Target oriented gaze stabilization exercises using colourful peg board piece in half lying (1-Piece of pegboard positioned for upward gaze, 2-Piece of pegboard positioned for left side gaze, 3-Piece of pegboard positioned for downward gaze, 4-Piece of pegboard positioned for right side gaze)

Figure 7 Use of colourful peg board piece for target-oriented gaze stabilisation exercises in high sitting position (1-Using peg board piece for facilitating upward gaze, 2-Using peg board piece for facilitating both sides gaze, 3-Using peg board piece for facilitating downward gaze)

3. FOLLOW UP AND OUTCOME MEASURE

Scale for Assessment and Rating of Ataxia (SARA)

Berg Balance Scale (BBS)

Dynamic Gait Index (DGI)

With readings from days 1 and 21, Figure 8 depicts the scoring of the outcome measures that were used. Table 3 displays the outcomes of manual muscle testing (MMT) conducted before and after rehabilitation.

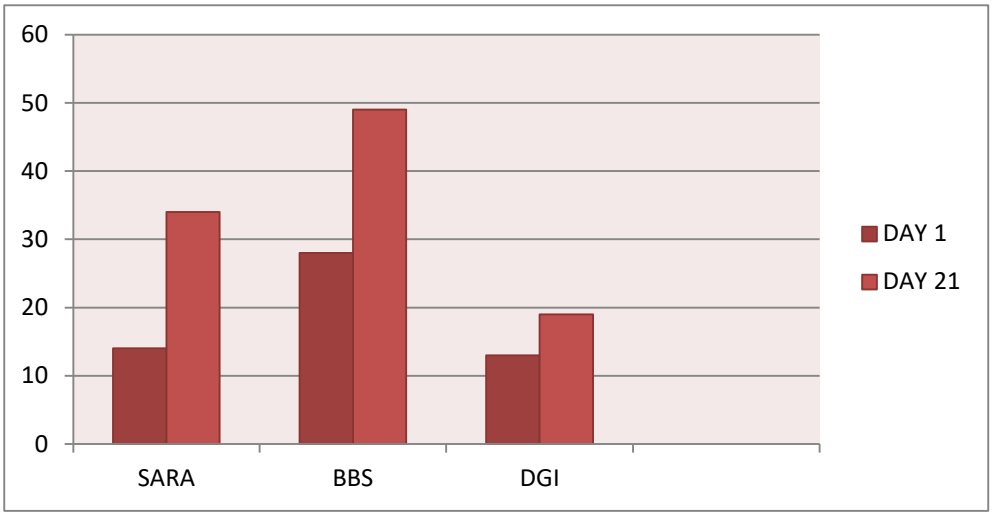


Figure 8 Outcome measure

Table 3 Manual Muscle Test (MMT)

MMT	Pre-Rehabilitation		Post-Rehabilitation	
	Right	Left	Right	Left
Shoulder	2+/5	2+/5	5/5	5/5
Elbow	2/5	2/5	5/5	5/5
Wrist	2/5	2/5	4/5	4/5

Hip	3/5	3/5	5/5	5/5
Knee	2/5	2/5	4/5	4/5
Ankle	3/5	3/5	4/5	4/5

4. DISCUSSION

Choroid plexus papilloma (CPP) is an uncommon, benign carcinoma of the CNS that develops through the lining of the ventricles' choroid plexus (Wendt et al., 2022). CPP are infrequent interventricular and neuroectodermal tumours (Mazur-Hart et al., 2022). Only about 1% of adult cerebral tumours are caused by it (Goel et al., 2022) and 3-4 % in paediatric (Wendt et al., 2022). These tumours most frequently develop in the fourth ventricle in adulthood but frequently discovered in the lateral ventricles of youngsters (Pfeifer et al., 2020). CPP in the III ventricle is unusual. One of the most common CNS tumours is meningioma accounting for nearly 36% of all CNS tumours (Buerki et al., 2018).

In this case report, we have presented a case of choroid plexus papilloma with meningioma of third ventricle. Choroid plexus is responsible for production of CSF. In CPP, there is overproduction of CSF which can lead to hydrocephalus like features. The key factor contributing to the clinical presentation of CPPs is the hydrocephalus-induced increase in intracranial pressure, which can result in headaches accompanied by nausea or vomiting, diminished mentation and lateral gaze palsies. In this case patient presented with complains of headache, vomiting and diplopia. CPP was confirmed by radiological investigations like MRI and CT scan.

Hydrocephalus was managed by ventriculo-peritonal shunt first before excision of tumour to relief the symptoms of raised intracranial pressure. CPP is best managed by surgical approach. In this patient tumour was excised by supracerebellar infratentorial approach. Incision extending from occiput to 6cm vertically down was used. It is difficult to excise CPP due to its highly vascular nature but survival rate and success rate of this operation are pretty good. Physiotherapy was started on next day after surgery. Active ROM, early mobilization, bed mobility, stretching of hamstring and calf, strengthening of upper and lower limb, breathing exercise to prevent secondary chest complication, dynamic quads, active eye movement, upper and lower limb coordination exercise, gait training are the rehabilitation protocols. Wobble Board Training with Mirror Feedback can be used for balance training (Fating and Bele, 2021). The surgical strategy and quick, coordinated physical therapy resulted in a gradual but considerable improvement in the functional goals (Bawiskar et al., 2020). It works well to preserve functional independence, raise quality of life and avoid any problems following surgery (Mishra, 2021).

Zampieri and Fabio, (2009) conducted a study showing effect of balance and eye movement training on gaze control. It was performed on 19 individuals. The study concluded that there was significant improvement in gaze control post intervention (Zampieri and Fabio, 2009). Correia et al., (2021) studied the effect of gaze stabilization exercise on balance. 79 individuals participated in the study with control group of 35 and intervention group of 33 individuals. After 3 weeks of intervention, results concluded that risk of fall and imbalance was found to be reduced in intervention group (Correia et al., 2021).

Batool et al., (2022) carried out research which showed effect of visual scanning exercise on balance and stability. Study was carried on 64 individuals divided into experimental group and control group. Vse was given to experimental group and control group was treated with task specific approach, outcomes of which was assessed using berg balance scale and barthel index scale (Batool et al., 2022). Fatima et al., (2022) conducted a comparative study showing effect of balance training with or without gaze stabilization exercise. 64 participants were randomly selected and divided into experimental and control group. The research concluded that balance training with gaze stabilization exercise is more beneficial (Fatima et al., 2022). The sole intention of this case study was to emphasise the significance of physiotherapy in the treatment of lateral gaze palsy in CPP patients. Physical therapy's impact on patients with CPP who have lateral gaze palsy has not been previously studied in this way.

5. CONCLUSION

This study shows positive effect of physiotherapy on lateral gaze palsy in CPP patient mimicking meningioma. The report emphasises the significance of the planned physical therapy regimen in the management of acute patients. No previous study has been done which shows physical therapy's effect on lateral gaze palsy in CPP patient. This intervention can be useful in further clinical setting.

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Informed consent

Written & Oral informed consent was obtained from individual participant included in the study. Additional informed consent was obtained from individual participant for whom identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. Ahmed SI, Javed G, Laghari AA, Bareeqa SB, Aziz K, Khan M, Samar SS, Humera RA, Khan AR, Farooqui MO, Shahbaz A. Third ventricular tumors: A comprehensive literature review. Cureus 2018; 10(10):e3417. doi: 10.7759/cureus.3417
2. Batool S, Zafar H, Gilani SA, Ahmad A, Hanif A. Effects of visual scanning exercises in addition to task specific approach on balance and activities of daily livings in post stroke patients with eye movement disorders: A randomized controlled trial. BMC Neurol 2022; 22(1):312. doi: 10.1186/s12883-022-02843-7
3. Bawiskar D, Dhote S, Phansopkar P. Early physical rehabilitation post-surgery in a complex type 5 Schatzker Tibial plateau fracture improves functional outcomes: A case report. Medical Science 2020; 24(104):2675-2682.
4. Buerki RA, Horbinski CM, Kruser T, Horowitz PM, James CD, Lukas RV. An overview of meningiomas. Future Oncol 2018; 14(21):2161–2177. doi: 10.2217/fon-2018-0006
5. Castro-Castro J, Lista-Martínez O, Cuevas-Álvarez EC, Iglesias-Meleiro JM, Pérez-López C. Choroid plexus papilloma of the third ventricle. A case reports. Neuro cirugia 2020; 31(3):151-154. doi: 10.1016/j.neucir.2019. 06.003
6. Correia A, Pimenta C, Alves M, Virella D. Better balance: A randomised controlled trial of oculomotor and gaze stability exercises to reduce risk of falling after stroke. Clin Rehabil 2021; 35(2):213-221. doi: 10.1177/0269215520956338
7. Crea A, Bianco A, Cossandi C, Forgnone S, Fornaro R, Crobeddu E, Marino D, Piras G, Scalia G, Saglietti C, Boldorini R, Galzio R, Panzarasa G. Choroid plexus carcinoma in adults: Literature review and first report of a location into the third ventricle. World Neurosurg 2020; 133 :302–307. doi: 10.1016/j.wneu.2019.10.051
8. Fatima SN, Tanveer F, Shoukat F, Ahmad A, Siddique K. Effects of balance training with and without gaze stabilization exercises on clinical outcomes in elderly patients with chronic dizziness: A randomized controlled trial. J Bodyw Mov Ther 2022; 32:46–50. doi: 10.1016/j.jbmt. 2022.05.007
9. Fating T, Bele AW. Effect of wobble board training with mirror feedback and computer-based balance board training on static and dynamic balance and quality of life in elderly population. Indian J Forensic Med Toxicol 2021; 15:1085–1092. doi: 10.37506/ijfmt.v15i2.14464
10. Ghordadekar D, Dhole R, Darware M, Mishra G. Physiotherapy intervention and factors affecting rehabilitation of a patient with adhesive capsulitis following mastectomy surgery. Biosci Biotechnol Res Commun 2021. doi: 10.21786/bbrc/14.6.15
11. Goel K, Birdi U, Menaker S, Bannykh SI, Patil C. Atypical choroid plexus papilloma of the fourth ventricle in an adult: A case report. Cureus 2022; 14(5):e25256. doi: 10.7759/cureu s.25256
12. Kabashi A, Ahmetgjekaj I. Choroid Plexus Papilloma: Case presentation. Curr Health Sci J 2021; 47:310–313. doi: 10.128 65/CHSJ.47.02.24
13. Lun MP, Monuki ES, Lehtinen MK. Development and functions of the choroid plexus–cerebrospinal fluid system. Nat Rev Neurosci 2015; 16:445–457. doi: 10.1038/nrn3921
14. Mazur-Hart DJ, Yaghi NK, Larson EW, Pang BW, Woltjer RL, Pettersson DR, Sayama CM. Rare case of pediatric disseminated Choroid Plexus Papilloma: Literature review and call for reclassification. Pediatr Neurosurg 2022; 57:348–357. doi: 10.1159/000525746
15. Meldrum D, Jahn K. Gaze stabilisation exercises in vestibular rehabilitation: Review of the evidence and recent clinical advances. J Neurol 2019; 266:11–18. doi: 10.1007/s00 415-019-09459-x
16. Mishra SA. Efficacy of programmed physiotherapy rehabilitation in pneumonectomy patients: A case series. Biosci Biotechnol Res Commun 2021; 14:310–319. doi: 10.217 86/bbrc/14.6.65

17. Pfeifer CM, Wong K, Malireddy R, Van Tassel D, Veltkamp DL, Cornejo P. Third ventricle choroid plexus papilloma: 2 cases. Radiol Case Rep 2020; 15:454–456. doi: 10.1016/j.radcr .2020.01.021
18. Phansopkar P, Tikhile P, Sawal R, Dhage P, Purushe D, Naqvi WM. Early physiotherapy rehabilitation approach enhances recovery in rare acute tibial osteomyelitis post-operative in a 9-year-old child. Medical Science 2020; 24(104):24 82-2486.
19. Schartz D, D'Agostino E, Makler V, Hickey WF, Bauer DF. Third ventricle World Health Organization Grade II meningioma presenting with intra ventricular haemorrhage and obstructive hydrocephalus: A case report and literature review. Surg Neurol Int 2021; 10:73. doi: 10.25259/SNI-90-20 19
20. Shah MH, Abdelhady M, Own A, Elsotouhy A. A rare case of Choroid Plexus Papilloma of the third ventricle in an adult. Cureus 2020; 12:e9582. doi: 10.7759/cureus.9582
21. Thompson D, Brissette CA, Watt JA. The choroid plexus and its role in the pathogenesis of neurological infections. Fluids Barriers CNS 2022; 19:75. doi: 10.1186/s12987-022-00372-6
22. Wendt SP, Raviskanthan S, Mortensen PW, Lee AG. Intermittent syncope and downbeat nystagmus in fourth ventricle Choroid Plexus Papilloma. J Neuroophthalmol 2022. doi: 10.1097/WNO.0000000000001492
23. Whedon JM, Glassey D. Cerebrospinal fluid stasis and its clinical significance. Altern Ther Health Med 2009; 15(3):54-60.