

ANALYSIS OF NEUROPHYSIOLOGIC METHODS USES IN REHABILITATION PROCESS OF 36-YERS-OLD PATIENT AFTER SUBARACHNOID HEMORRHAGE WITH THROMBUS IN GIGANTIC ANEURYSM OF BASILAR CEREBRAL ARTERY - CASE STUDY.

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The subarachnoid hemorrhage is a sudden bleeding into the subarachnoid space - between arachnoidea and leptomeninges. It usually results from a ruptured congenital intracranial aneurysm. It is a kind of brain stroke. The prognosis is grave. A part of patients die during the first or the next hemorrhage. The rehabilitation process should concentrate on functional recovering of hemiplegia/hemiparesis, the impaired 3rd, 4th, 5th, and 6th cranial nerves, aphasia and recognition disorders. The neurophysiologic methods are used for the effective rehabilitation according to the therapeutic indication and general condition of patient.

Aim

The aim of the study is to present and estimate the effects of using the neurophysiologic methods in the rehabilitation process of 36-years-old patient after the subarachnoid hemorrhage with a thrombus within a gigantic aneurysm of the basilar cerebral artery.

Material and method

36-years-old patient after the subarachnoid hemorrhage with a thrombus within a gigantic aneurysm of the basilar cerebral artery of the brain, was admitted to the Department of Neurological Rehabilitation Hospital of Brothers Hospitallers of St. John of God in Piaski–Marysin for the rehabilitation treatment. The rehabilitation process concentrated on functional recovering of the right side hemiplegia, the impaired 3rd left cranial nerve, recognition disorders and speech disorders (motor aphasia with dysarthria).

In the interview - 2011/12/28 the patient developed severe headaches and vomiting. The patient's family called an ambulance. From the District Hospital the patient with diagnosis of subarachnoid hemorrhage was transferred to the Department of Anesthesiology, Intensive Care and Pain Clinic, Medical University in Poznan. On admission, the patient was intubated, mechanically ventilated, the neurological examination hemiparesis of upper limb, anisocoria (wide left pupil). Made an urgent diagnostic investigation (DSA, MRI, CT of the head) confirmed subarachnoid hemorrhage and the vascular defect as the thrombus within the gigantic aneurysm of the basilar cerebral artery (width 26mm, height 38mm, AP dimension 23mm). The aneurysm compressed the left cerebral peduncle and the ventral surface of the upper section of the bridge. The oedematous / ischemic changes of the left side of the brain was shown (ischemic stroke of left midbrain). After neurosurgical consultation, there was no indication for the surgery. The patient was extubated in 11 times (respiratory and circulatory stable, drowsy, with a catheter in the bladder and a with established probe into the stomach). 2012/01/11 the patient was transferred to the Department of Neurosurgical Clinic, Medical University in Poznan to re cerebral angiography, which still did not show blood flow through the vascular defect.

2012/01/16 the patient was transferred to the Hospital District with Neurological Department with Stroke Unit in order to continue treatment. On admission the patient was in good condition, meet some commands in the investigation, no verbal contact, the impaired 3rd left cranial nerve (drooping left eyelid, wide and external squint of the left eyeball), right hemiplegia right-handed with the positive Babinski sign, marked neck stiffness and Kernig symptom. 2012/01/21 the patient was transferred to another Hospital District with Neurological Department with Stroke Unit in order to continue treatment where control MRI with the vascular phase was performed in which blood flow in aneurysm was not visualized. There were medication, speech therapy and exercises improved.

2012/02/15 the patient was transferred to the Department of Neurological Rehabilitation Hospital of Brothers Hospitallers of St. John of God in Piaski-Marysin. On admission the patient was in good condition. There were found plegia of right upper limb (Lovett scale 0) and paresis of left lower limb (Lovett scale 2/3), with no perceptible loss of superficial and deep sensibility in the medical examination. Tendon reflexes of the right limbs lifted and the impaired the 3rd left cranial nerve. The results of functional tests: The Bartel ADL Index - 6 scores (bowels - 2, bladder - 2, feeding - 1, transfers -1) (1), the Modified Rankin Scale (MRS) - 5 scores ("Severe disability; bedridden, incontinent and requiring constant nursing care and attention") (2). Quality of life scale assessed by the World Health Organization Quality of Life - Bref (WHOQLI - Bref) 65 points (50% of the maximum number of points) (3).

The patient has been ophthalmologically consulted. There were paresis on the 3rd left cranial nerve diagnosed. Chirurgic correction of the left eyelid and eyeball if permitted the neurological condition of the patient after neurological and rehabilitation treatment was suggested.

There was planned rehabilitation program. It included breathing exercises, passive (3) and supported exercises of right limbs (Impairment-Oriented Training [IOT] - Arm BASIS Training [ABT]) (5), the gradual tilting to sitting, massage of right limbs (4), speech therapy and psychological support. After a week of hospitalisation the rehabilitation program was expanded to passive erect on the erect table and neuromuscular reeducation exercises of right limbs (4). In the second week the rehabilitation program was supported by Kinesiology Tapping for right limbs (6). In the third week of hospital stay the passive erect was turned into active erect. In the fourth week the patient was learning to walk in parallel bars (4).

On 2012/14/03 the patient was transferred to the Department of Neurosurgical Clinic, Medical University in Poznan in order to perform the cerebral angiography, which still did not show blood flow through the vascular defect.

Since 2012/03/19 the patient had continued rehabilitation treatment in the Department of Neurological Rehabilitation Hospital of Brothers Hospitallers of St. John of God in Piaski-Marysin. In the control medical examination symptoms of spasticity as increase of muscle tone in the right limbs for 2 score in Ashworth scale, tendon hyperreflexes on both lower limbs and right upper limb.

Exercise program was extended to the Proprioceptive Neuromuscular Facilitation method (PNF) (7), and short distances (5-8m) walking with a walker bely therapist - fifth week of rehabilitation (4). In the ninth week the balance Biosway system was included to improve balance (5). In the eleventh week of rehabilitation patient started to walk up/down the stairs (4, 7).

In the sixth week of rehabilitation the contralateral exercises for left eye muscles were included (4, 9). After two weeks the patient was proposed to patch the right eye before exercises in order more effectively streamline divergent strabismus of the left eye. After two days patient dropped from this form of rehabilitation (the left eye slit was not large enough to satisfactorily seen it). In the fourteenth week of rehabilitation when patient was able to lift the eyelid to 1/2 size of the palpebral fissure this method returned (up to 2 hours after exercise) (10). The method of stimulation the ciliary muscle to work by white light was started to active the rigid pupil of left eye in last three weeks of rehabilitation in Department (5, 10, 11).

In the eleventh week of the rehabilitation the constraint inducted movement therapy (CIMT) was introduced for right upper limb (to 3 hours per day). There were set goals in the use of the right upper limb of self-feeding, preparing meals and caring for her own person. This training run in parallel with IOT- Arm Function Training (AFT) - about 20 minutes a day (5). An integral part of the rehabilitation process was a speech therapy and psychological support for 16 weeks (12, 13). According to clinical psychologist in the first 4 weeks of hospital stay reduced fresh memory and concentration (increased susceptibility to distractors) were observed. Motor aphasia in patient impeded the verbal contact, resulted the increase of emotional tension (impatience, sadness, sometimes anger). Perfecting techniques: fresh memory using, concentration, comprehension, abstract thinking and perception, exercises enriching verbal fluency, performance speech impression and articulation, naming, facial exercises and exercises to improve the function of phonation-articulation-respiratory system.

Results

2012/02/15 patient was examined and admitted to the Department of Neurological Rehabilitation Hospital of Brothers Hospitallers of St. John of God in Piaski–Marysin.

The patient had started to implement the planned program of rehabilitation from 2012/02/16. It was modified adequately to patient's clinical status.

In the control medical examination in the fifth week of stay in the department there was maintaining the complete 3rd left nerve damage, increase strength and muscle tone of the right upper limb (from 0 to 3 score in Lovett scale, the increase at 2 score in Ashworth scale), increase the muscles strength of right lower limb (from 2/3 to 3/4 score in Lovett scale). She was able to stand up alone, stand with help. The results of functional test: The Bartel ADL Index - score 7 (additional points for toilet use - 1 score), MRS- score 4 ("Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance").

In the sixth week of rehabilitation patient began to walk with a walker belaying therapist at short distances (5-8m). In the eleventh week she was able to walk up and down the stairs while holding the railing (about 15 steps)with the assistance of therapist. From nine week to the end of hospital stay was used the balance Biosway system. In each of the balance tests were obtained improvement. In the twelfth week, she was able to walk alone with the "herding stick" the distance 65m at least 8 times a day (sick room - elevator, elevator - gym).

In the seventh week of rehabilitation (one week after including the contralateral exercises for left eye muscles) appeared discrete movements of the left eyelid - self-elevation of 3mm. In the eighth week, the patient was able to lift the upper eyelid to 1/2 size of the palpebral fissure. In the ninth week of improving the left eye patient reported pain in the left eye - the one-off incident. In discharge day the pupil of the left eye was still wide, there was not indirect papillary reflex, the upper left eyelid felt to half size of the pupil, there was discreet divergent strabismus of the left eye. In examination in close distances the patient did not report diplopia. Diplopia appeared when the patient was looking right into the distance. The patient did not draw the left eyeball medially.

In discharge day the patient by paretic upper limb (right) was able independently to prepare meals (cutting, bread lubrication), feed (use fork, spoon), wash a cup and cutlery after meals and grooming (independent comb and wash the teeth). Other activities such as writing, she performed well with her left hand.

In the middle of the rehabilitation time the typical symptoms of motor aphasia withdrew. In discharge day there were discreet speech disorders like dysarthria. Facial expression was clearly improved.

In discharge day in the medical examination of patient the spastic paresis of right limbs (2 score in Ashworth scale, normal tendon reflexes of the right lower limb) were found. Muscle strength was assessed by Lovett scale for right upper limb 3/4, the right lower limb 4 +. There were also positive right Babinski's sign, positive Romberg's test. The patient walked alone, a little hemiplegic gait, there was right lower limb dysmetria observed. The results of functional test: Bartel-ADL scale of 20 points (maximum score), MRS - score 2 ("Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance"). The quality of life assessed by WHOQLI – Bref scale improved by 32 points, it means by 49% (75% of the maximum points).

Discussion

Subarachnoid haemorrhage usually arises from ruptured congenital intracranial aneurysm. Mostly occur in patients age 25-50 years, mostly in women. Subarachnoid hemorrhage typically manifests very strong and sudden headache (mostly in the head and neck), nausea, vomiting, loss of conscious, sometimes photophobia. Currently, surgery is a standard practice when aneurysms after intracranial hemorrhage is detected, or without previous bleeding (14).

There was not use surgical treatment in presented patient due to heavy condition of the patient (clinical status Group IV according to Hunt-Hess scale) (14) and spontaneous closure of the source of bleeding in the form of thrombus in gigantic aneurysm of basilar cerebral artery of the brain. Such cases are very rare. The use of teamwork and comprehensive rehabilitation in this patient was basis for being independent in family and society life (5).

In the eight week of illness the patient was qualified to the Department of Neurological Rehabilitation. The patient was examined and started to implement the planned individual for the patient's clinical status program of rehabilitation.

Tilting of this patient was performed in a conventional way (4). Improving the lower limbs and trunk muscles, mobility, coordination of movements and body balance was based on proprioceptive neuromuscular facilitation techniques (PNF) (7). PNF method is currently the base method of improvement patients with damage to the CNS, although no substantial advantage could be attributed to PNF techniques than others therapeutic approaches like the Bobath approach or conventional treatment that consisted of traditional exercises (15).

In the last eight weeks of rehabilitation process in order to assess the balance and balance training the balancing Biosway biofeedback therapy was recommended. There were progress in all the tests evaluated by Biosway balancing system. In analysis of seven trials (246 participants) performed by Barclay-Goddard et al., force platform feedback (visual or auditory) improved stance symmetry but not sway in standing, clinical balance outcomes or measures of independence in everyday life (16).

During the 16th week of rehabilitation in this patient variety of neurophysiological techniques were used in improving the right upper limb, adequately to its skills. Initially, because of the right upper limb paralysis IOT was included - Arm BASIS training. Platz and all found that even 4 weeks Arm BASIS training is enough to get limb mobility (17). Such training has been conducted to the presented patient for 11 weeks. It is based primarily on the PNF technique. With the emergence of discrete movements of the shoulder girdle, flexion of the elbow, bending and straightening the fingers and opposition of the thumb the AFT and CIMT were inducted.

In Dettmers et al study, 11 patients after stroke with the more-affected hand with range of movement (active extension of at least 20 degrees at the wrist and at least 10 degrees for each finger) were practice CIMT for 20 days, 1.5 hours twice a day. Participants showed significant improvements in more-affected arm real-world motor activity, laboratory motor activity, strength and spasticity, as well as in some QOL aspects, up to 6 months after treatment (18). In the presented patient CIMT was used as in the study of Dettmers et al. The patient had the left upper limb locked twice a day (during dinner and supper). During training, the shaping technique was used - the therapist was adapting training to the function of the patient right upper limb, feedback (back information) and motivated the patient. The results of therapy were recorded. It took 5 weeks.

In single-blind, randomized, controlled trial, Platz et al, in the representative group of 60 patients with upper limb paresis presented that 3-week intervention period of the AFT reduces focal disability (19). In the presented patient this therapy was carried out about 20 minutes a day for 5 weeks as long as the CIMT therapy but independent of it. Under the supervision patient performed by more-affected arm specific motor task adequate to abilities (19). Another Platz et al study, on anterior circulation ischemic stroke patients, showed that over 3 to 4 weeks standardized IOT, that is ABT for severe paresis or AFT for mild paresis lasted 45 minutes a day is more effective than conventional therapy (209).

In the literature there are no reports about the effectiveness of exercise in the oculomotor nerve injury after subarachnoid hemorrhage. The standard management in these cases is operational setting of the eyeball and lifting the upper eyelid 6 months after the incident (10). In presented patient, during 10 weeks of hospitalization, were taken attempts to improve the right oculomotor nerve. Training began with the contralateral exercises according to methodology specified by Zembaty (4). The use of such exercises is comparable to the mental methods (9). Once the patient lift the upper lid to the middle of the pupil there was added 3 hours a day hidden the healthy eye for correction discrete divergent strabismus. It has been suggested the effects of conservative treatment of strabismus in children (10). This was to be the kind of CIMT for the paretic right eye muscles. By the use of pulsed white light (11) there was also taken a try of activate a wide, rigid pupil - call the pupil reflex to light (10).

Conclusions

1 There were many neurophysiologic methods concentrate on functional recovering of hemiplegia/hemiparesis, improving balance and motor coordination, improving the impaired the 3rd cranial nerves, presented in this case study of the 16 weeks rehabilitation process for 36-yers-old patient after subarachnoid hemorrhage with thrombus in gigantic aneurysm of basilar cerebral.

2 The multitude of neurophysiologic methods used in this rehabilitation process were the result of individual approach to the patient's clinical condition which involves consideration of the indications and contraindications for their use and also acceptance of the method by the patient.

3 The effects of the implementation of this rehabilitation program as a significant improvement in clinical status in medical examination of patient, a significant improvement in functional tests and improved the quality of life of patient confirmed the relevance of the involved techniques.

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