"I am ashamed, to go out to eat. Because to swallow can, I must the head from my Interlocutor turn away."

Isabel, 35, had a stroke seven years ago

Illustration: S. Schaaf

About swaying and swallowing

Neuroorthopaedic therapy for ataxia Everyone thinks you're drunk - probably the worst fear of patients with ataxia. However, if there is a lack of coordination due to neurological damage, it is not only the gait that suffers. Like Isabel, many patients become stiff, lose their stamina and have problems breathing and swallowing.

Ataxia is a complex coordination disorder that can affect movement, posture, speech, swallowing and vision. However, walking is most frequently affected. Ataxia is one of the main symptoms of cerebellar diseases. In healthy people, the cerebellum receives nerve signals from the spinal cord, which are associated with locomotor patterns. The descending pathways (rubrospinal, reticulospinal and vestibulospinal) fire in the rhythm of the stance and swing leg phases and thus determine the gait rhythm [1]. In patients with cerebellar lesions, this process is impaired and they are also unable to react to changes in their gait.

> *Being able to react to changes in the support surface is necessary in order to in the environment.*

of the support surface. However, this ability is essential in order to be able to orientate oneself in the environment. It depends on how proprioceptive control loops are processed, which inform the CNS about the position and changes in position of the body's center of gravity [2]. These specific receptors are located throughout the body, especially in joints, the spine, fascia and the sole of the foot. Sufficient elasticity in the areas where these receptors are located, enables the body to react to changes [3]. This is the only way to generate sufficient muscular activity to resist gravity.

In order for people to be able to concentrate on goal-oriented actions, the brain selects essential information and automatically coordinates various motor synergies to adapt to the environment.

These processing steps are mainly unconscious [4, 5]. When patients lose their ability to hold themselves automatically against gravity, they stiffen up and find themselves in the "Do not want to fall program". The cocontraction prevents them like The ability to move in order to interact with their environment. Stamina is therefore also significantly impaired. Patients tense their arms as well as their throat and neck muscles in order to maintain stability. As a result, they often find it difficult to breathe and swallow.

Findings can reveal deficits relevant to everyday life → In the case of balance disorders, it is important to determine which sensory systems are impaired. The "Clinical Test for Sensory Interaction in Balance" (CTSIB) can be used for this purpose (👁 PHYSIOPRAXIS 3/15, p. 35) [6]. If patients are unable to organize their balance on an unstable support surface with their eyes closed, it can be assumed that the processing of the sensory system is impaired.

◀ Due to her limited balance, Isabel's throat and neck muscles are under tension and she has to turn her head to swallow.

vestibular input is disturbed. In this case, it would make little sense to result if the therapist trains with the patient on unstable support surfaces. In this case, patients would only increasingly compensate through non-eco nomic muscular tension, which in turn leads to stiffness and hinders their ability to adapt in real environmental contexts, for example when moving on a stable floor.

Using the Dynamic Gait Index (DGI), the therapist can assess various situations relevant to everyday life, such as whether the patient loses their balance when they turn their head while walking [7]. If, for example, the cervicoocular reflex (COR) or vestibulocollic reflex (VCR) is impaired, patients lose their balance when they orient themselves with their eyes in the environment. want and need to move. As a strategy, they therefore hold their head and neck rigidly to avoid losing their balance.

Muscle elasticity is a prerequisite for postural control

→ In the treatment of patients with ataxia, the physiotherapist should promote the elasticity of the muscle synergies that are in protective tension in the patient at the body structure and functional level. In the lower extremities, this often affects the hip joint flexors, adductors and internal rotators. In the trunk, the long back extensor is usually under concentric protective tension.

Case study: Ataxia after cerebellar infarction

Isabel is a 35-year-old patient who suffered a cerebellar infarction seven years ago. She had previously studied international business administration and speaks five foreign languages. She has now been working again for some time and has married. Her main problem is that she has considerable problems with swallowing. These go so far that she does not want to go out to eat in public because she has to turn her head to the weak side in order to swallow.
to swallow. In front of others, she finds it rude to have to constantly turn her head away during conversations. The aim of the therapy is therefore to strengthen Isabel's balance so that she no longer has to compensate with her throat and neck muscles. She is also currently learning,
to organize her balance when standing and walking, as she can only walk with a rollator. She completed the following exercises in three training sessions:

Exercise 1
Isabel stands in the treatment room with her back in a corner so that she feels safe and can lean against the walls at any time.
It should be a large object,
For example, she should pick up a therapy cube from the floor and place it on the couch next to her. She has to make sure that she puts weight on her front feet. At first, Isabel is unable to organize the movement. The experience of how her attempt fails enables her to try again,
to correct herself. After a few repetitions, she succeeds in the exercise. Depending on the findings and development, the therapist increases the intensity of the exercise.

Exercise 2
Isabel is sitting on the edge of a treatment table. The therapist asks her to pick up a ten-kilogram barbell bar from the floor in front of her and place it on her lap. The weight forces her to put weight on her forefoot. The exercise also promotes the elasticity of the dorsal chain and the eccentric control of this muscle synergy, consisting of plantar flexors, hip joint extensors and back extensors.

tension and causes the typical strong backward position of the upper body. The knees are often hyperextended. Only if these muscle groups are elastic can the patient actively straighten up against gravity and stabilize their muscles eccentrically. The short neck extensors and the supra- and infrahyoid muscles also require elasticity to ensure eccentric control of the head posture.

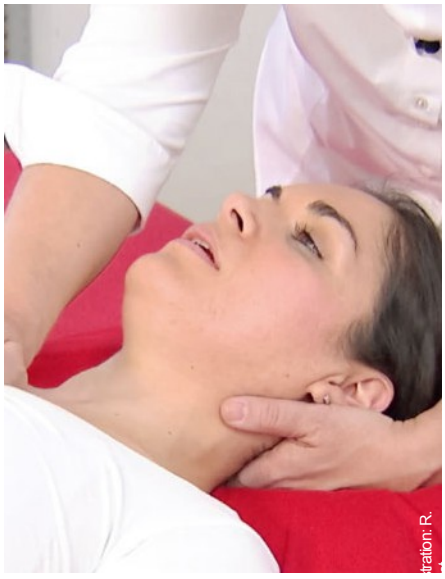
The hip joint extensors, on the other hand, are usually weak and need to be strengthened. Patients with ataxia often put most of their weight on their heels. A prerequisite for correct pelvic alignment over the femoral head when standing and walking is forefoot stability, which the peroneal muscles and the intrinsic foot muscles must provide.

ensure. So that the body is sufficiently supplied with oxygen the therapist should also perform a cardiopulmonary Instruct training.

At the activity and participation level, he should encourage the patient to be able to perform variable and relevant target motor actions with the extremities. The prerequisite for this is the unconsciously controlled preactive stability of the proximal body parts. The tongue and lower jaw can only move if the stability of the head and cervical spine is guaranteed. This stability is also a prerequisite for the hyoid bone and larynx to lift automatically during the swallowing process.

Exercise 3
In the next exercise, Isabel practises standing up and sitting down with the barbell. When standing up, she should place the bar on her shoulders in order to
reinforce the gravitational information. When sitting down, the weight forces them to lean their upper body far forward, which increases the pressure on the forefoot.

Exercise 4
Isabel and her therapist stand facing each other in a walking position and place their hands on each other's shoulders. The therapist applies pressure as Isabel moves forward downwards so that it has to push off over the ball of the big toe. Walking forwards and backwards in this posture should promote trunk support. Isabel should press her hands forward on the therapist's shoulders to avoid trunk flexion. The
The therapist centers the shoulder joints by applying traction to the ventral capsular structures and applying pressure to the joint socket via the tendon insertions of the external rotators. This also puts the fascia under tension.



Exercise 5
In the supine position, Isabel trains the elasticity of the infrahyoid and suboccipital muscles with the help of prolonged exhalation. To do this, she stabilizes her head with the tip of her tongue on the palate behind the upper row of teeth by "L" on the exhalation. At the same time, the therapist sitting above her at the end of the bench holds the head stable so that it does not move in retraction and applies pressure to the sternum caudally. This causes a longitudinal pull on the ventral neck structures during exhalation.

Last but not least, gait training should be part of the therapy. Here, walking on different support surfaces that occur in everyday life and under different sensory conditions with the necessary aids is an option.

> *If realistic and meaningful activities are trained in therapy, the brain is very adaptable.*

In therapy, promote proprioceptive feedback during voluntary actions → The cerebellum contains rapidly adapting cells, the so-called Purkinje fibers. It is
The cerebellum is therefore the area of the brain that can learn motor skills without conscious control [8]. The cerebellum does not consciously organize external muscle functions in particular – these are dependent on proprioception. The recept
The brain's brain cells are located on the joint surfaces and react to pressure. This is why the alignment and centering of the joints is a prerequisite for the brain to be able to react to pressure.
receives the necessary feedback to ensure stability during goal-oriented motor actions. In addition, there are

Proprioceptors in the muscle spindles, which are activated by pulling on the visual
are activated. As 80 percent of proprioceptors are located in the interstitial connective tissue, it seems particularly useful to bring the fascia under tension in order to provide the brain with the appropriate feedback for postural control [9]. In therapy, it therefore makes sense to relate verbal instructions and visual information to the target motor action. Proprioceptive feedback and thus the automatization of postural control can be achieved by aligning the body's posture.

"I have a lot Quality of life back- won."

Isabel after the therapy

◀ After the therapy, Isabel no longer has to turn her head to the side when swallowing.

Illustration: S. Schaaf

segments and the influence of gravity. The
The therapist's hands and activity-promoting training equipment such as Orthoses, barbell bars or weight belts can promote this.

Neurotraining - including on equipment - is essential to increase strength endurance and stamina and leads to movement economization. Patients who are in better condition are less afraid of falling and consequently make themselves less stiff. This gives them more feedback from the periphery [10].

> *The cerebellum is the area of the brain that can learn motor skills without conscious control.*

Once the goal has been achieved, the quality of life also improves → Isabel's walking is not expected to improve significantly straight away. However, the therapy with the above-mentioned focus has meant that she no longer has to rotate her head so much in order to swallow. As a result, she now has the confidence to go out to eat with friends in public. Isabel's case showed very clearly how adaptable the human brain is - provided that realistic and meaningful activities are practiced. *Renata Horst*

Bibliography
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