

CASE STUDIES

The role of physical exercise therapy in the rehabilitation of a patient with a thoracic spine tumor

Rolul kinetoterapiei în recuperarea unei paciente cu tumoră la nivelul coloanei toracale

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Abstract

Background. Giant cell tumor (myeloplax) of the spine is benign, rare, but very aggressive, with an unknown prognosis. Surgery is the election treatment, but, according to its localization, in-patient rehabilitation can have an important role in the healing of these patients.

Aims. The purpose of this study was to evidence the evolution of a female patient diagnosed with a giant cell tumor of the thoracic spine, operated and thereafter sent to the physical medicine rehabilitation service.

Methods. The patient presented to Bradet Rehabilitation Hospital for the rehabilitation of a motor deficit of both lower limbs, self-care and walking deficit, and painful knees. After clinical exam and history taking, we decided that the rehabilitation program should be continued.

Results. The patient's evolution was significantly favorable, with a reduction of disability and the regaining of functional independence.

Conclusions. Continuous kinesiotherapy along with other functional rehabilitation methods and family support demonstrated an important role in the medical and social rehabilitation of this patient.

Key words: giant cell tumor (myeloplax), physiotherapy, kinesiotherapy, Brunnstrom.

Rezumat

Premize. Tumora cu celule gigant (mieloplax) a coloanei vertebrale este benignă, rară, dar foarte agresivă, cu prognostic imprevizibil. Chirurgia este tratamentul de elecție, dar, în funcție de localizare, recuperarea poate avea un rol determinant în vindecarea acestor pacienți.

Obiective. Scopul acestui studiu a fost acela de a evidenția evoluția unei paciente diagnosticate cu tumoră cu celule gigant la nivelul coloanei toracale, operată și trimisă ulterior spre serviciile de medicină fizică și reabilitare medicală.

Metode. Pacienta s-a prezentat la Spitalul de Recuperare Brădet pentru recuperarea unui deficit motor al membrelor inferioare, disfuncție de autoîngrijire și mers grad moderat, precum și gonalgii mecanice. În urma anamnezei amănunțite și evaluării clinico-funcționale s-a decis continuarea programului de recuperare.

Rezultate. Evoluția pacientei a fost semnificativ favorabilă, cu diminuarea dizabilității și redobândirea independenței funcționale.

Concluzii. Kinetoterapia în formă continuă alături de celelalte metode de recuperare funcțională și suportul familial au avut un rol determinant în reabilitarea medicală și socială a pacientei.

Cuvinte cheie: tumoră cu celule gigante, fizioterapie, kinetoterapie, Brunnstrom.

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Introduction

Giant cell tumor of the spine is an uncommon but most aggressive benign tumor of the spine with unexpected outcome (Shekhar et al., 2007; Christopher & Edward, 2010). It typically affects the extremities, and when involving the spine, the tumor is predominantly localized in the sacrum. However, it determines significant disability and morbidity (Luther et al., 2008).

Giant cell, also termed myeloplax, is defined as a large cell with multiple nuclei obtained by the confluence of other similar cells. They probably derive from histiocytes within the bone marrow (1).

Giant cell tumor is a benign epiphyseal-metaphyseal bone tumor of young adults aged between 20 and 40 years, which is more or less extensive, but locally aggressive, as described by Nelaton E, a French surgeon, in 1860 (DiGrazia S et al., 2013; Murphey et al., 2008). The tumor is formed around highly vascularized tissue, by large multinuclear cells, known as myeloplaxes. Giant cell tumors of the spine have been described as the most challenging benign bone tumors (McDonald, 1998). Although benign, giant cell tumor shows a tendency for significant bone destruction, local recurrence, and occasionally metastasis.

It is an epiphyseal-metaphyseal bone tumor that is likely to develop in young adults aged 20-40.

In the United States of America and Europe, giant cell tumors represent 5% of all bone tumors and 21% of all benign bone tumors, with a female predominance, the female to male ratio being 1.3-1.5 to 1. It appears that only 5% of giant cell tumors occur in patients who are skeletally immature, while 84% occur in patients older than 19 years (Unni, 1996).

Prognosis remains generally good. However, lung metastases have been cited as the cause of death in 16-25% of the reported cases (Kay et al., 1994).

Hypothesis

This study aimed to manage the changes in physical condition, and disability of a young female patient suffering from a giant cell tumor of the thoracic spine, surgically excised and healed, with palsy of both lower limbs.

Material and methods

The subject's written informed consent was obtained before enrollment in the study.

Research protocol

a) Period and place of the research

On 9.01.2017, the patient presented to Bradet Rehabilitation Hospital for complex rehabilitation of deficits in motor control of the lower limbs, impaired walking, balance and self-care.

b) Subject

We analyzed the case of a 31-year-old female patient with spastic motor deficit of the lower limbs, impaired balance and walking, and moderate disability of self-care and activities of daily living.

By the time she was 18 years old, in May 2003, the patient presented to the Neurosurgery Department of "Bagdasar Arseni" Clinical Emergency Hospital in Bucharest, suffering from vertebral-thoracic pain, motor

deficit of the lower limbs, sensitivity deficit, with an insidious onset within the last month. Neurological clinical examination evidenced a patient with impossibility of standing or walking, complete motor deficit of the lower limbs, normal coordination tests, with complete T3 level of sensitivity, and impaired urinary and anal sphincters.

c) Tests applied

Magnetic resonance imaging of the thoracic spine revealed a tumor mass developed from bony structures of the posterior arch of T4 vertebral body. The tumor mass was extended within the medullary space over a 4 centimeter surface, and was compressible on all adjacent structures, including cord compression.

d) Treatment

The tumor was completely excised, and the patient was referred to a rehabilitation center, with complete motor deficit of the lower limbs, independence of micturition control, and T4 level of sensitivity.

The histopathological examination of the tumor mass revealed a giant cell tumor (myeloplax).

Following the first rehabilitation session of four weeks, the patient was progressively mobilized to sitting and walking in the wheelchair, but with urinary retention and important spasticity of the lower limbs. She received baclofen 50 mg per day.

The next rehabilitation session, three months later, revealed a patient with a high degree of adductors, sural triceps and psoas spasticity in both lower limbs, ¾ on Ashworth scale, osteotendinous reflexes were not testable, the level of sensitivity was T4. A urinary tract infection overlapped this hospital presentation. The aims of the rehabilitation program were:

1. Decrease of spasticity
2. Initiation of walking
3. Treatment of urinary tract infection
4. Recovery of sensitivity

Treatment consisted of kinesiotherapy programs, stretching and relaxing techniques, neuro-proprioceptive facilitation techniques (cryotherapy), specific sensitivity recovery techniques, baclofen and antibiotics.

Over the following years, the patient continued the rehabilitation program at home and in hospital 4 times a year. Important postural changes of the spine occurred with the standing position, and as the rehabilitation programs became more complex, the new objectives were:

1. Decrease of spasticity
2. Improvement of walking
3. Improvement of balance
4. Improvement of spine alignment
5. Sensitivity recovery
6. Gain of motor independence
7. Gesture relearning
8. Gain of optimal independence in daily life activities

The rehabilitation techniques included the Brunnstrom method to favor sensorimotor recovery, electrical stimulation, and sensitivity recovery techniques in order to achieve all the complex objectives.

Brunnstrom's kinesiotherapy technique includes:

a) Encouraging whatever movement is possible and building on it, through: strengthening, sensory stimulation, positive reinforcement, verbal feedback, and the use of

reflexes.

b) Treatments will involve tasks that are difficult but achievable. As soon as the task is achieved, new goals will be set. Patients are taught to use the voluntary movement that is available to them to achieve goals/tasks.

c) Movement will be progressed in the correct sequence. Abnormal movement always comes first following injury and there is a normal pattern of recovery before normal patterns of movements are obtained.

d) The Brunnstrom approach acknowledges that before normal movement can be restored, there will be a period of abnormal movement. It is the job of physiotherapists to get their patients through the stages of abnormal movement to achieve normal movement and function.

Electrical stimulation was applied in the same rehabilitation center to reduce spasticity of antagonist muscles, and improve contraction of agonist muscles. For knee pain, we used ultrasound and TENS (transcutaneous electrical nerve stimulation).

Neurotropic medication, B-group vitamins, muscle relaxants, and central antispastic baclofen; special massage techniques were also used.

Results

After 1 year of intense rehabilitation, the patient was able to stand, maintain balance, to walk using assistive walking devices, sensory recovery decreased to L3 level bilaterally, and the patient was able to perform tasks of daily living. Spasticity decreased to 2/4 on Ashworth scale, and baclofen doses were reduced.

Unfortunately, urinary tract infections recurred for another 3 years, although sphincter function was recovered.

In 2009, the patient was 24 years old, and she presented to the usual rehabilitation program with mild spasticity, dysesthesia felt in both calves, free of sphincter impairment, with important hypotonicity of gluteal muscles, and she was able to walk using the Canadian crutch (walking stick). The patient was able to perform most of the activities of daily living. She started to feel pain in her knees.

The patient's last visit in rehabilitation, in our hospital, in January 2017, revealed a 31-year-old female with important cervical hyperlordosis, thoracic scoliosis, with genu recurvatum of both knees while walking using one single crutch, painful knees and calves, and an increase in spasticity when walking. She used no medication, and magnetic resonance imaging showed no signs of locoregional recurrence.

Each of the rehabilitation sessions lasted maximum 3 weeks. The patient continued kinesiotherapy at home, supervised and helped by her family. The patient now has a social life, and has started to look for a job, too.

Discussion

The aims of physiotherapy techniques used for the treatment of spasticity are to favor sensorimotor recovery and gesture relearning and to lead to an optimal independence in daily life activities (2). According to Brunnstrom's concept, the goal of exercise is to strengthen spastic paralysis and the associated reactions to enable the upright position and walking as soon as possible. This technique is especially used in very severe deficiencies

where the aim is to avoid the bedridden situation. The Brunnstrom approach emphasizes the ability to recover normal movement by facilitating reflexes, basic muscle synergies and sensory stimulation. This type of treatment will help:

1. Increase muscle strength
2. Stretch tight muscles
3. Regain motor control
4. Recover voluntary movement
5. Improve functional tasks such as sit to stand, walking, reaching, grasping and hand to mouth
6. Improve the sequence of functional activities in order to achieve a specific aim
7. Improve posture
8. Increase independence

The Brunnstrom approach is also based on the principle that the treatment chosen should match the stage of recovery. Furthermore, it recognizes the need for goals set to be achievable. Each goal needs to be attained before further goals are set (Fugl Mayer et al., 2007; Wade et al., 2005). This approach also highlights the importance of verbal and visual commands and repetition to enhance recovery (O'Sullivan, 2007).

Three active principles can be identified for neurological rehabilitation. Electrical stimulation is not used routinely by rehabilitation teams. It allows to reduce the spasticity of antagonist muscles working against stimulated muscles. It participates in improving the strength of contraction of weak muscles, notably in subjects with incomplete paraplegia. Finally, it can be used to improve or replace a functional command (lifting the foot during walking, for example). Nevertheless, electrical stimulation cannot replace basic rehabilitation exercises.

The giant cell tumor of the bone tends to appear in young adults over 20 years old, but the patient we presented was 18 years old at the onset of the disease.

Although benign, these tumors show a tendency for bone destruction, local recurrences, and even metastasis to the lungs, lymph nodes (Connel et al., 1998); however, the patient whose case we describe here has had no recurrences over the last 13 years.

When involving the spine, tumors predominantly occur in the sacrum. They carry a significant potential of disability (Luther et al., 2008), as described above.

Some reports presented only few cases of giant cell tumor of dorsal vertebral body (Rakesh & Rajpal, 2012; Shekhar et al., 2007), as we also describe in this case report.

The involvement of the mobile spine segment is seen in only 1-1.5% of all giant cell cases. Symptoms are common and include back pain, neurological deficit due to compression of the spinal cord, bladder and bowel dysfunction, and structural deformity of the spine. All these signs and symptoms appeared in the case presented above.

Various modalities of treatment are recommended for spinal giant cell tumors such as surgery, radiotherapy, embolization, cryosurgery, cementation, and chemical adjuvants such as phenol or liquid nitrogen. Total en bloc surgical excision is the treatment of choice (Rakesh & Rajpal, 2012), as it was in this patient, followed by continuous rehabilitation.

Conclusions

The findings of this case indicate the important role of early rehabilitation, followed by home rehabilitation, as an alternative to long-term hospitalization. Physiotherapy, especially kinesiotherapy, massage, family support all together helped the patient to:

1. Improve walking
2. Decrease spasticity
3. Recover sensorimotor function
4. Improve spinal alignment
5. Gain control on activities of daily living and social life

Conflicts of interest

There are no conflicts of interests.

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