





Craniopharyngioma in a young woman with symptoms presenting as mechanical neck pain associated with cervicogenic headache: a case report

Firas Mourad, PT, PhD, OMPT, Dip. Osteopractic ^{a,b,c,d,e,f}, Fabio Cataldi, PT, OMPT^{e,g}, Alberto Patuzzo, PT, OMPT, MsC^{e,h,i}, Sara Tunnera, PT, OMPT^e, James Dunning, PT, PhD, FAAOMPT^{a,b,c}, César Fernández-de-las-Peñas, PT, PhD^b, and Filippo Maselli, PT, OMPT, MSc ^{j,k}

^aEscuela Internacional de Doctorado, Universidad Rey Juan Carlos, Alcorcón, Madrid, Spain; ^bDepartment of Physical Therapy, Occupational Therapy, Rehabilitation and Physical Medicine, Universidad Rey Juan Carlos, Alcorcón, Madrid, Spain; ^cAmerican Academy of Manipulative Therapy Fellowship in Orthopaedic Manual Physical Therapy, Montgomery, AL, USA; ^dPoliambulatorio Physio Power, Brescia, Italy; ^eFacoltà di Medicina e Chirurgia, Università degli Studi di Tor Vergata, Roma, Italy; ^fFacoltà di Medicina e Chirurgia, Dipartimento di Scienze Cliniche e Sperimentali, Università degli studi di Brescia, Brescia, Italy; ^gMTLab Physiotherapy, Bari, Italy; ^hAgorà Medical, Verona, Italy; ⁱScuola di Medicina e Chirurgia, Dipartimento di Fisioterapia e Riabilitazione, Università degli studi di Verona, Verona, Italy; ^jDINOEMI Department, Genova University, Genova, Italy; ^kSovrintendenza Sanitaria Regionale Puglia INAIL, Bari, Italy

ABSTRACT

Background: Craniopharyngioma is benign neoplasm thought to be caused by mal-development, which occurs in both children and adults in the sellar and suprasellar regions of the brain. Typical manifestations in adults are visual and endocrine system symptoms followed by signs and symptoms of increased intracranial pressure (i.e., headache). The management of this rare condition is complex and requires life-long surveillance by a multidisciplinary team of health-care professionals.

Objective: To present a rare clinical presentation of craniopharyngioma mimicking nonspecific neck pain usually associated with cervicogenic headache recognized by a physiotherapist in a direct access setting as a condition requiring medical referral.

Case Presentation: This case report describes the history, examination findings, and clinical reasoning used in the initial examination of a 33-year-old female with neck pain and cervicogenic headache as chief complaints. Several key indicators in the patient presentation warranted further and urgent investigation: 1) the recent onset of a “new-type” headache; 2) the phenotype headaches change; 3) the rapid progression of the symptoms; 4) the presence of associated neurological signs and symptoms; and 5) the worsening of the symptoms during Valsalva-like activities. The decision was made to refer the patient for further evaluation. An MRI revealed a craniopharyngioma. After a surgical removal of the tumor mass, the patient participated in a rehabilitation program and reached a full recovery after 6 months.

Conclusion: This case report highlights the need of more research regarding red flags and warning signs during examination of in the head-neck region, and the central role of primary care clinicians such as physiotherapists in differential diagnosis of life-threatening conditions.

ARTICLE HISTORY

Received 28 October 2017
Revised 22 March 2019
Accepted 25 May 2019

KEYWORDS



Craniopharyngioma; red flags; differential diagnosis; neck pain; headache; physiotherapy

Introduction

Life-threatening pathologies of the head/neck region are rare events. The prevalence of serious pathologies (e.g., cervical aneurysm, tumor, and unsuspecting fracture) ranges from 0.4% to 6% (Bogduk, 2011). However, physical therapists may still encounter these serious conditions (Mourad et al., 2016; Müller, 2014). The incidence of delayed diagnosis ranges from 5% to 20% (Platzer et al., 2006) and this delay may be related to the paucity of red flags for head-neck pain in the literature (Côté et al., 2016). Moreover, this lack of early recognition and

diagnosis can have life-threatening consequences (Sizer, Brismee, and Cook, 2007).

Craniopharyngioma has an incidence of 0.5 to 2 cases per million persons per year (Bunin et al., 1998; Nielsen et al., 2011). The peak incidence rates are observed in the age groups of 5–9 year olds and 40–44 year olds. The absolute male/female ratio varies from 0.75 to 1.50 (Nielsen et al., 2011). Craniopharyngioma is a benign neoplasm and is thought to be caused by brain maldevelopment that can occur in both children and adults in the sellar and/or suprasellar regions (Miller, 1994). Both computerized tomography (CT) and magnetic resonance imaging (MRI) reveal that craniopharyngioma is typically

CONTACT Firas Mourad  firmas.mourad@me.com  Escuela Internacional de Doctorado, Universidad Rey Juan Carlos, Avenida de Atenas s/n, Alcorcón, Madrid, Spain

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/iptp.

© 2019 Taylor & Francis Group, LLC

a cystic tumor of the intra- and/or suprasellar region. The most common localization is suprasellar with an intrasellar portion; however, only 20% are exclusively suprasellar, and even less (5%) are exclusively intrasellar (Famini, Maya, and Melmed, 2011; Hald, Eldevik, and Skalpe, 1995; Müller, 2012; Warmuth-Metz, Gnekow, Müller, and Solymosi, 2004).

Based on a biopsy of the tumor, craniopharyngioma can be classified into two main histological subtypes: the adamantinomatous (ACP) and the papillary type (PCP). Although these two subtypes are pathologically distinct (Larkin and Ansorge, 2013), mixed variants of craniopharyngioma have also been reported (Crotty et al., 1995; Louis et al., 2007; Weiner et al., 1994). The ACP variant occurs predominantly in the pediatric population, whereas the PCP variant is seen mostly among adults. Nevertheless, the ACPs are much more common than PCP (9:1). Due to slow growth of the tumor, symptoms of craniopharyngioma may develop gradually, and a delay of 1–2 years between symptom onset and the actual diagnosis is common (Garnett, Puget, Grill, and Sainte-Rose, 2007). The suspicion of a craniopharyngioma is initially based on clinical and radiological findings. However, the final diagnosis is made using histologic findings (Zoicas and Schöfl, 2012).

Typical manifestations in adults are visual and endocrine symptoms followed by signs and symptoms of increased intracranial pressure or mass effect (i.e., headache, nausea, increased thirst, and hydrocephalus) (Bülow et al., 1998; Gupta et al., 2018). Notably, morning headaches, or headache that goes away after vomiting, are commonly reported in patients with craniopharyngioma. Additionally, loss of peripheral visual field, rather than central, is commonly experienced by individuals with craniopharyngioma. Among adult-onset patients with craniopharyngioma, hormonal deficits at the time of diagnosis are much more pronounced when compared with childhood-onset. Endocrine deficits are frequently caused by disturbances to the hypothalamic–pituitary axes that affect Growth hormone (GH) secretion (75%), gonadotropins (40%), Adrenocorticotrophic hormone (ACTH) (25%), and Thyroid-stimulating hormone also known as thyrotropin or thyrotrophic hormone (TSH) (25%) (Khan et al., 2013).

In a series of 78 adults with craniopharyngioma, 57% of the female patients reported menstrual irregularities or amenorrhea and 28% reported impaired sexual function (Karavitaki et al., 2005). Other symptoms like nausea and vomiting (26%), poor energy (32%), and lethargy (26%) are also frequent in the adult patient (Karavitaki et al., 2005). Headache is a common presentation in patients with a brain tumor, and it is usually associated with other transient neurologic signs and symptoms; nevertheless, headache can be the only symptom in some individuals

with a brain tumor (Schankin et al., 2007). Typically, headache presentations in patients with a brain tumor may mimic migraine, cervicogenic headache and tension-type headache as defined by the International Headache Society (Bülow et al., 1998; Erfurth, 2015; Forsyth et al., 1993). The pathophysiology of headaches in cases of a brain tumor is not completely understood. However, the potential traction of pain-sensitive intracranial structures, including basal arteries, venous sinuses, and basal meninges (Khan et al., 2013; Ray and Wolff, 1940) from the expanding tumor mass and hydrocephalus may play a role (Goffaux and Fortin, 2010).

Despite high survival rates (i.e., 20-years for 87% to 95% of individuals with childhood-onset craniopharyngioma), quality of life is frequently impaired in long-term survivors due to the consequences caused by the anatomical proximity of the tumor to the optic nerve/chiasma and hypothalamic–pituitary axes (Karavitaki, Cudlip, Adams, and Wass, 2006; Müller, 2008, 2010a, 2010b, 2013, 2014; Wisoff and Donahue, 2006). The resultant reduction in hypothalamic–pituitary-axis function may require cortisol and thyroid hormone replacement therapy. Individuals with craniopharyngioma may also develop diabetes insipidus and thus require nasal administration of desmopressin (Nishizawa, Ohta, and Oki, 2006).

The treatment for benign craniopharyngioma is surgical (i.e., without involvement of hypothalamic or optical structures), with the objective to completely resect the tumor mass with the intention of preserving visual and hypothalamic function (Buchfelder, Schlaffer, Lin, and Kleindienst, 2013; Choux and Lena, 1979; Fahlbusch et al., 1999; Flitsch, Müller, and Burkhardt, 2011). The management of craniopharyngioma is complex and life-long surveillance by a multidisciplinary team of health-care professionals (i.e., neurosurgeon, endocrinologist, neuro-oncologist, and neuro-ophthalmologist) is required for a positive prognosis (Fahlbusch et al., 1999). Previous case reports on craniopharyngioma describe the surgical management of this condition (Carleton-Bland et al., 2016; Jaggon et al., 2009; Shah, Bhaduri, and Misra, 2007).

The patient described in this case report had chief complaints of unilateral, side-dominant, oculo-fronto-temporal headache associated with neck pain that could have been misdiagnosed by the physiotherapist and treated as a musculoskeletal condition (i.e., cervicogenic headache (CGH)). To the best of the author's knowledge, this is the first reported case of craniopharyngioma recognized by a physiotherapist in a direct access setting. Therefore, the purpose of this case report is to describe the screening and referral process followed by a physiotherapist for a patient presenting with neck pain and cervicogenic headache with an undiagnosed case of craniopharyngioma.

Case description

History

A 33-years-old housewife presented to an outpatient physiotherapy clinic with the chief complaint of neck pain with no history of recent or past trauma. The resting baseline neck pain level was reported to be 8/10 on the Numeric Pain Rating Scale (NPRS) (Young et al., 2019) at the time of the initial visit.

The patient reported neck pain with insidious onset but with sudden and recent progressive worsening of the symptoms. She noticed a reduction in her neck mobility and an upper trapezius myalgia, mainly on the right side (resting NPRS 6/10) associated with episodes of tingling and numbness in the right upper limbs. She reported a deep constant resting pain (NPRS 5/10) that was described as stabbing pain during neck movements (NPRS 7/10). She also complained of a right-sided headache that started a few days ago in the occipital area and had suddenly progressed to the frontal area with a rapid change in the quality of pain (i.e., the pain becomes a diffuse throbbing and oppressive pain) (NPRS 8/10) associated with right face paresthesia feeling (Figure 1).

Her pain was aggravated by postural changes, sustained sitting position, neck movements, and coughing and sneezing (i.e. Valsalva-like maneuvers).

Notably, the individual was previously successfully treated for the diagnosis of cervicogenic headache with a complete symptom resolution following several physiotherapy sessions. Nevertheless, and subsequently, the patient becomes concerned because the frontal headache pain intensity was rapidly worsening. The patient admitted controlling symptoms with the use of non-steroidal anti-inflammatory drugs (NSAIDs) and other pain medication (i.e., paracetamol).

With rapidly changing headache symptoms and with the goal to reduce the likelihood of missing sinister pathological disorders underlying secondary headache symptoms a systematic approach including a detailed history taking to evaluate the headache was therefore performed (Cady, 2014). The patient reported common clinical craniopharyngioma features including lethargy, dizziness, blurred vision, mood changes (i.e., increased irritability), fatigue and nausea. Moreover, the patient reported a drop-attack episode just a few days prior to the initial visit.

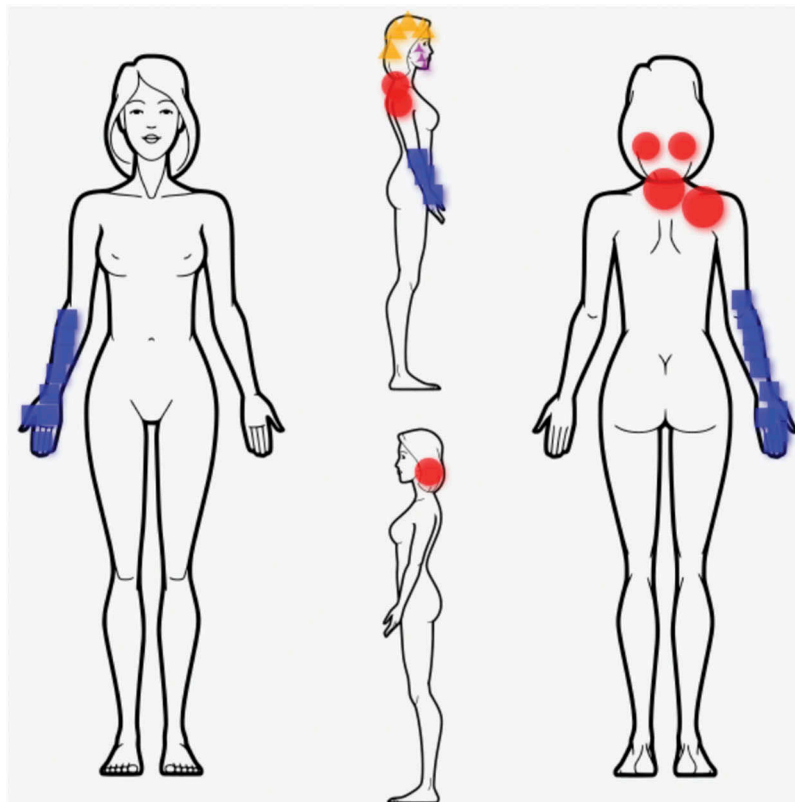


Figure 1. Symptoms at the first visit.

In Red: Progressive worsening Neck Pain described as constant deep pain (NPRS 5/10) associated with right upper trapezius myalgia (NPRS 6/10). In Yellow: diffuse throbbing and oppressive unilateral headache (NPRS 8/10). In Purple: right face paresthesia feeling associated with the headache. In Blue: tingling and numbness on the right forearm and hand.

Review of the past medical history, including a review of systems, was performed. The patient reported poor sleep. She denied unexplained recent weight loss and any changes in bowel or bladder function. In addition, the patient reported a family based hypothyroidism and a 3-year history of amenorrhea. The patient also recently underwent uterine surgery due to the presence of bicornuate uterus. Due to the worsening of head and neck pain, and also lethargy, the patient was progressively attempting to reduce her work activities and activities of daily living. Therefore, the patient was seeking treatment from the physiotherapist for her neck pain and headaches that reportedly were getting rapidly more intense and disabling.

Examination

Although there are no valid and reliable screening tests for serious pathology (i.e., red flags) in head and neck disorders (Côté et al., 2016), many authors agree that rapid changes in the characteristics of headaches are a warning sign (Cadý, 2014).

In this case, the recent complaint of “a new headache or another type of headache” associated with the presence of systemic disorders (i.e., fatigue, lethargy, and blurred vision) led the physiotherapist to suspect an underlying sinister disorder (i.e., secondary headache). Therefore, due to the presence of neurological symptoms (i.e., mood changes, dizziness, and lethargy) a neurological examination was undertaken (Gupta et al., 2018).

A more comprehensive set of neurological tests including: ankle clonus; Hoffman’s reflex (Sung and Wang, 2001); Rhomberg’s test (Cook, Hegedus, Pietrobon, and Goode, 2007; Sizer, Brismee, and Cook, 2007); upper extremity deep tendon reflexes; light touch sensory testing in the dermatomes of the upper extremities; and motor strength of the upper extremity muscles (Saguil, 2005) were performed and found to be normal. Moreover, cranial nerve (CN) testing of CNs III, IV and VI was recorded as normal. There was no nystagmus, facial asymmetry, deviation of the tongue, or slurring of words. However, during the testing of the CNs II a slight bilateral reduction of the visual field into a restricted area of the nasal quadrant was recorded.

In order to rule out craniocervical junction involvement, an objective examination was performed. Due to the symptom’s being reported to immediately worsen with neck movement, active range of motion (ROM) testing was performed, which revealed a reduction of the active cervical ROM in all three planes. Moreover, the headache intensity was reported to increase during active end range cervical movements, especially extension.

The examination continued with the assessment of the craniocervical structures. A set of cervical spine instability tests of the craniocervical junction were performed. The Sharp-Purser, anterior shear and the tectorial membrane tests were recorded as normal (Hutting et al., 2013). Moreover, a palpatory examination including passive physiological intervertebral movements was performed over the cervical spine. These provocative tests did not reproduce any familiar symptoms identified by the patient.

The history and physical examination of the patient were consistent with a condition for which more definitive head and cervical spine diagnostic imaging was likely necessary. Because the clinical presentation did not fit with a non-specific musculoskeletal condition, the physical therapist was primarily concerned with the possibility of a serious pathology that would preclude the use of manual therapy and/or exercise to the craniovertebral region. At the time, the physiotherapist made the decision to refer the patient to the hospital emergency department for further examination and potential imaging.

Diagnostic imaging and intervention

At the emergency department, an imaging investigation appeared necessary and a brain CT scan was immediately performed. The CT scan revealed a hydrocephalous. A 16 mm × 8 mm hematic hyper-dense area at the right internal capsule close to the third ventricle was reported. A dilatation of both the lateral ventricles associated with a hypo-density of the periventricular white substance was also noticed. An external ventricular and a peritoneal-Ventricular shunt were immediately placed. A T1- and T2-weighted MRI using a conventional Fluid Attenuated Inversion Recovery (FLAIR) technique and post-contrast was performed. The findings of signal intensity and location suggested the presence of a craniopharyngioma (Figure 2, 3(a), and 4(a)). The signal intensity of a craniopharyngioma observed on MRI is highly variable because it depends on the protein concentration of the cystic fluid. Solid tumor portions and cystic membranes appear isointense in T1-weighted MRI and are often associated with mild heterogeneous structure. The combination of solid, cystic and calcified tumor components is an important radiological clue to the diagnosis of craniopharyngioma (Müller, 2014). The differential diagnosis in imaging of sellar masses includes hypothalamic glioma and optic glioma, Langerhans cell histiocytosis, Rathke’s cleft cyst, xanthogranuloma, intracranial germinoma, epidermoid tumor, thrombosis and arachnoid cysts, colloidal cyst of the third ventricle, pituitary adenoma, an aneurysm and rare inflammatory variations (Müller, 2012; Warmuth-Metz, Gnekow, Müller, and Solymosi, 2004).

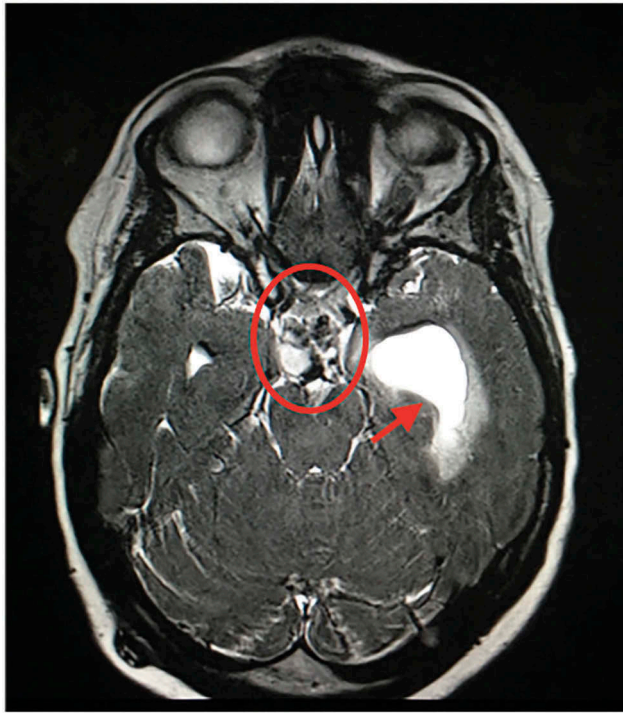


Figure 2. A pre-contrast 3D constructive interference in steady state (CISS).

T2-weighted MRI highlights the relation between the volume of the tumor and the nervous structures. The axial-plane showed an inhomogeneous tissue formation made of solid, fluid, hyper-proteic and calcic components which were compressing the third ventricle and the optic chiasm (red circle). Note the dilatation of the left ventricle (red arrow) due to compression of the foramen of Monro.

The local neurosurgeon suggested a surgical removal of the mass. As the case appeared too complex for the local hospital resources, a further consultation of an expert neurosurgeon in a major hospital was scheduled in order to better evaluate and be properly managed.

Because of a delay in admitting the patient to the other hospital and the unstable condition of the patient, two weeks later a fronto-temporal craniotomy was performed on the right side without biopsy. The Sylvian fissure was dissected by a microsurgical technique that exposed the carotid, anterior and middle cerebral arteries, the optic chiasma, and the II and III cranial nerves. voluminous mass was found to be compressing the surrounding vasculo-nervous structures and the third ventricle. The mass was successfully and totally removed, preserving the anatomical integrity of the neurovascular structures and the pituitary lobe.

The histological samples collected during the surgery confirmed the diagnosis of ACP. Two weeks after surgery, another MRI was performed, using a conventional FLAIR technique and post-contrast, that confirmed the removal of the neoplasm and revealed a moderate cerebral edema. The ventricular system was normal

(Figure 3(b), 4(b), 5(a, b)). For a more detailed management history see the timeline (Figure 6).

Follow-up and outcome

The patient was hospitalized for two weeks in an intensive care unit as she experienced several short-term adverse events including diabetes insipidus, partial memory loss, mood alteration, sleeping disturbance, and left-sided strength loss. An additional 2 weeks of hospitalization in the neurosurgery unit was required in order to monitor the patient's progress. Daily blood samples were taken to monitor electrolyte (i.e., sodium and potassium) and hormone (i.e., for endocrine function) levels for the proper medication dosage in order to best manage the diabetes.

Two months after the surgery, the patient was monitored by a team of specialists (i.e., endocrinologist, neurologist, neuro-oncologist, and neuro-ophthalmologist) that suggested physical therapy management in order to reduce disability (i.e., force and resistance retraining) and improve cervical pain and mobility (Gupta et al., 2018). The patient was treated with a progressive rehabilitation program 2 times per week during the first month and 1 time per week for the following 2 months (Table 1). Five months after the cranial microsurgery, the patient showed a stabilization of both endocrinological and neurological parameters (Table 2) and a progressive recovery of the bilateral nasal quadrant visual field deficit. At the final six-month follow-up, the patient reported no headaches or neck pain and showed a complete restoration of the cervical ROM with an almost full return to activities of daily living.

Discussion

The aim of this case report was to discuss the relevant aspects of the pathophysiology, screening and differential diagnosis of a rare pathologic tumor presenting as headache and neck pain in a direct access physiotherapy setting. Diagnosis of craniopharyngioma is usually suggested by clinical and radiological findings that should be confirmed histologically by biopsy (Venegas, Concepcion, Martin, and Soto, 2015). Clinical presentation is often variable in cases of craniopharyngioma; therefore, an incomplete history and examination could lead to misdiagnosis (i.e., non-specific neck pain with CGH). However, a comprehensive history supported by the clinical reasoning led the physiotherapist to undertake an oriented objective examination with the goal of clearing the cervical spine. The comprehensive history and findings during physical examination led the physiotherapist to suspect a non-musculoskeletal cause to the sinister

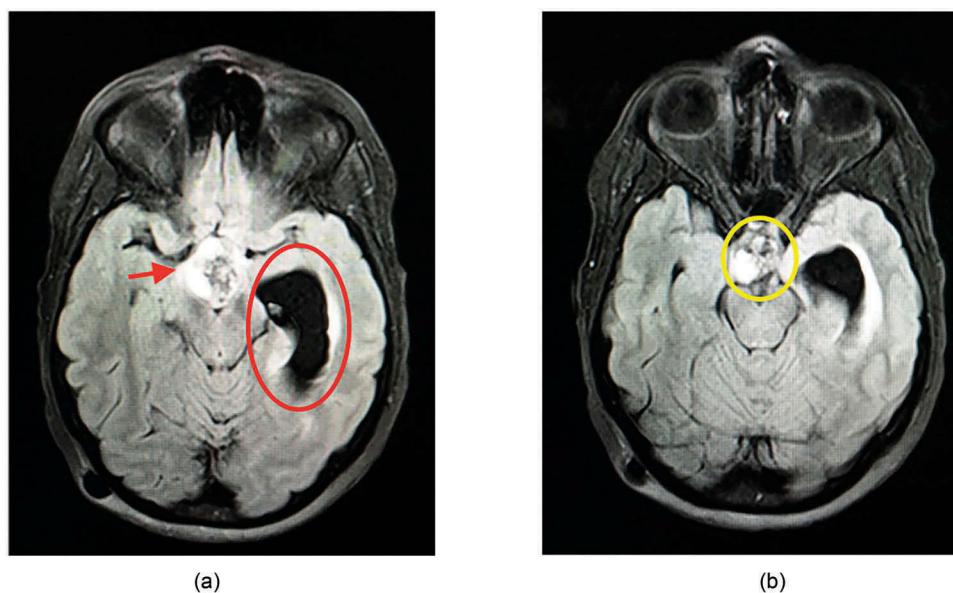


Figure 3. (a) (pre-surgery) and (b) (post-surgery).

The Fluid Attenuated Inversion Recovery (FLAIR) technique decrease the fluid signal and permit to better evaluate the inflammatory process and edema (i.e., hyper-intense signal). Note in the T1-weighted pre-surgery axial plane FLAIR MRI the inflammatory process of the tumor (red arrow) and the edema on the left ventricle (red circle). The two weeks after surgery control T1-weighted MRI in FLAIR technique confirmed the removal of the neoplasm (yellow circle).

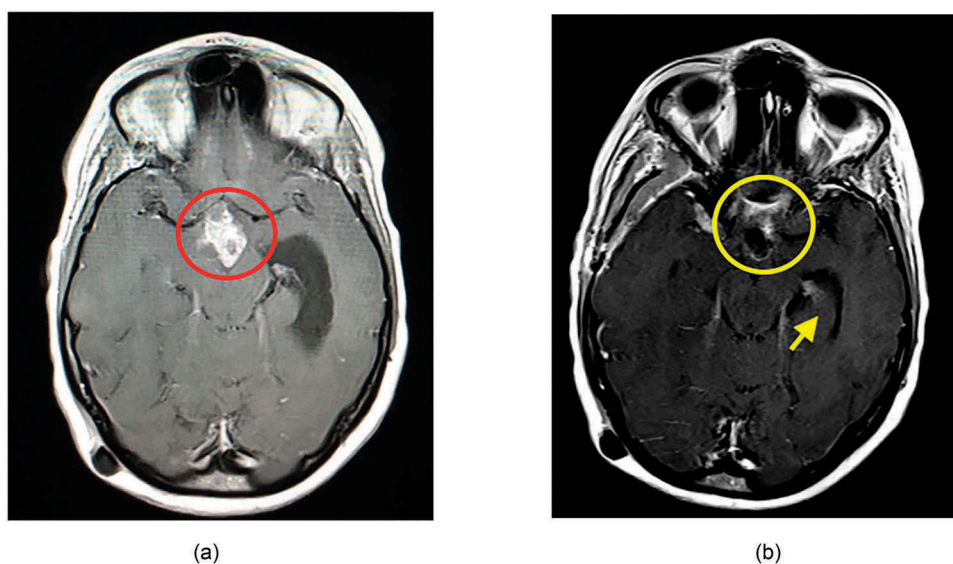


Figure 4. (a) (pre-surgery) and (b) (post-surgery).

A post-contrast T1-weighted MRI permits a higher anatomical resolution. Note on the axial plane the tumor location on the pre-surgery image (red circle). The two weeks after surgery control T1-weighted post-contrast MRI confirmed the removal of the neoplasm (yellow circle) and the reduction of the left ventricular (yellow arrow).

symptoms reported by the patient. Like the case described herein, clinical presentation in adults is often dominated by nonspecific manifestations of intracranial pressure (e.g., headache and nausea). Furthermore, primary manifestations include visual impairment (62–84%) and endocrine deficits (52–87%). Among patients with adult-onset craniopharyngioma, hormonal deficits at the time

of diagnosis are much more pronounced when compared with childhood-onset patients with craniopharyngioma.

In our case report, neck pain and unilateral, occipito-fronto-oculo-temporal headache were the main symptoms that lead the patient to seek treatment from a physiotherapist. This case also supports the concept that physiotherapists must be prepared and

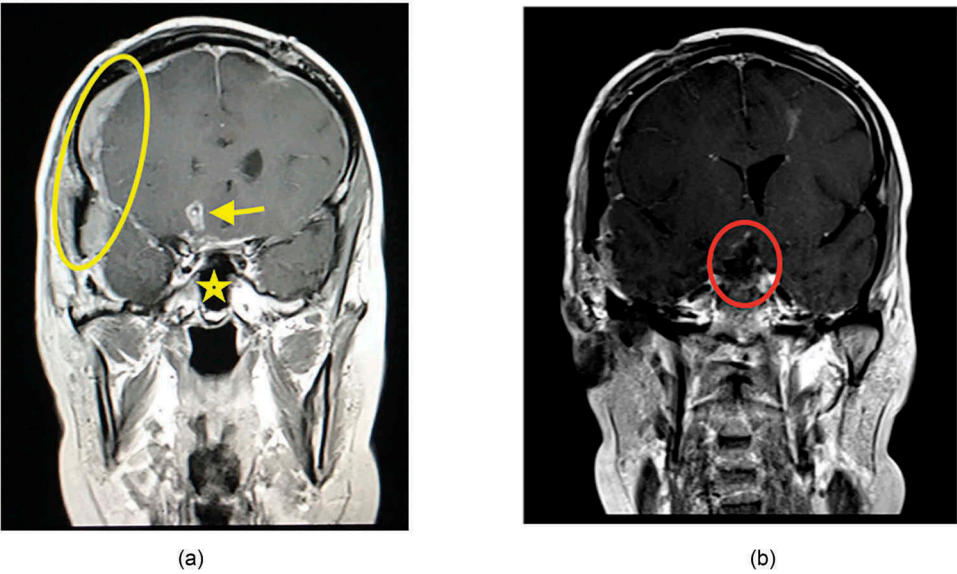


Figure 5. (a) and (b) (post-surgery). The coronal plane post-surgery post-contrast T1-weighted image highlights the shunt placement (yellow arrow) and post-surgical edema due to the craniotomy (yellow circle). Note also the complete mass removal (yellow star). The coronal plane post-surgical T1-weighted MRI post-contrast in [Figure 5\(b\)](#) permits to better evaluate the cranio-caudal extension of the tumor removal (red circle).

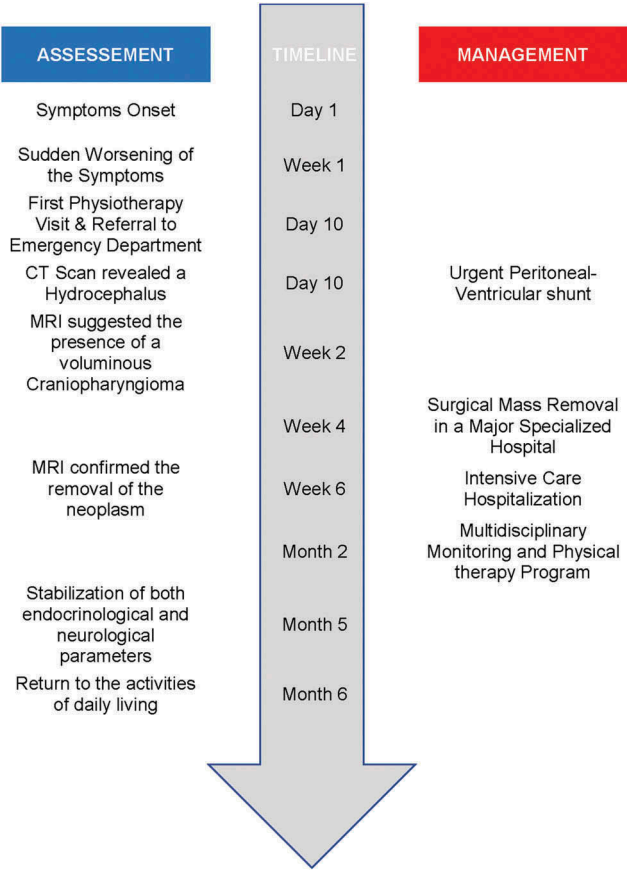


Figure 6. Detailed timeline of the management history.

capable of screening for pathologic medical conditions (Mourad et al., 2016; Müller, 2014). The complaint of a “new headache or another type of headache”, and the recent and rapid increase in the intensity of headaches that appeared not related to any cervical findings, along with the systemic symptoms of fatigue, lethargy, blurred vision, reduced visual field, and mood changes (Gupta et al., 2018), and in the absence of other musculoskeletal impairments led the physiotherapist to conclude that the patient’s condition was outside his scope of practice and required an appropriate medical referral for further examinations (Mourad et al., 2016; Ojha, Snyder, and Davenport, 2014; Pendergast, Kliethermes, Freburger, and Duffy, 2012; Piano et al., 2017). The referral by the physiotherapist to the emergency department appeared to positively impact the prognosis of the patient considering that the symptoms were progressively worsening before the diagnosis of craniopharyngioma by imaging investigation and a consecutive biopsy (Zoicas and Schöfl, 2012).

Surgery is the treatment of choice for most patients with craniopharyngioma. The goal of surgery is to relieve compressive symptoms and to remove as much tumor as safely as possible. Radiation therapy is the usual treatment to control postoperative tumor remnants and local recurrences (Venegas, Concepcion, Martin, and Soto, 2015). The majority of patients

Table 1. Post-surgical physiotherapy management and rehabilitation program.

PHASE	OBJECTIVES	STRATEGIES
PHASE 1 2nd to 3rd months after surgery	Protecting phase	<ul style="list-style-type: none"> Gradual exposure to from supine to sitting position.
	General muscle activation	<ul style="list-style-type: none"> General Passive and assisted Stretching and flexibility exercises in order to increase mobility and avoid immobilization sequelae of the spine and extremities; General Isometric and isotonic exercises of the spine and extremities; Functional exercises for the fine activities (e.g., hands function).
	Neuromuscular control	<ul style="list-style-type: none"> Sitting and standing balance exercises; Progression to balance single leg standing control; Upper and Lower limbs coordination exercises.
	Neurocognitive Recovery	<ul style="list-style-type: none"> Space-Time orientation; Eye discrimination exercises; Logical reasoning; Short and long-term memory exercises; Specific activities of daily living rehabilitation.
	Cardiovascular Conditioning	<ul style="list-style-type: none"> Assisted and supervised walking; Aerobic Training; Core stability exercises
	Diet Program	<ul style="list-style-type: none"> Control of the calorie count.
PHASE 2 3rd month to 1 year after surgery	Neurocognitive Recovery Progression	<ul style="list-style-type: none"> Gradual progression of the first phase exercises; Reading and memorization; Autonomous execution of the activities of daily living.
	Progression of general strength and conditioning	<ul style="list-style-type: none"> Increased intensity, duration, and complexity of phase one exercises; Resistance progression of the Aerobic Training.
	Diet Program	<ul style="list-style-type: none"> Control of the calorie count.

Table 2. Hormonal values between pre and post-surgery.

	Pre-surgery	Post-surgery 3months later	Normal Values
Sodium	140 mM/L	152 mM/L	136–145
Potassium	4.6 mM/L	3.89 mM/L	3.4–5.5
Chlorides	110 mM/L	114 mM/L	98–109
GH	0.120 ng/mL	0.14 ng/mL	0.05–16.00
Cortisol	2.8 µg/dL	17.6 µg/dL	5.1–22.4
Prolactin	24.7 ng/mL	46.59 ng/mL	2.70–13.1
TSH	5.25 µU/mL	0.01 µU/mL	0.38–5.33
C-reactive protein	0.36 mg/dL	1.46 mg/dL	< 0.80
FSH	4.4 UI/L	1.33 UI/L	1.3–19.3
LH	2.3 UI/L	0.16 UI/L	1.2–8.6

GH: Growth Hormone; TSH: Thyroid-Stimulating Hormone; FSH: Follicle-Stimulating Hormone; LH: Luteinizing Hormone; mM/L: millimole/liter; ng/mL: nanograms/milliliter; µg/dL: micrograms/deciliter; µU/mL: microunits/milliliter; mg/dL: milligrams/deciliter; UI/L: International Unit/liter

undergo a transcranial resection compared to the endo-nasal approach. That is, in a systematic review with meta-analysis Dandurand et al. (2018) found that 11 patients underwent subtotal resection; nine underwent gross total resection; 1 had gross total resection plus adjuvant radiotherapy; and 1 had subtotal resection plus adjuvant radiotherapy. Although the rates of recurrence are favoring gross total resection, difference in risk of recurrence did not reach significance.

According to Mrowczynski, Langan, and Rizk (2018) the use of intratumoral therapy may lead to a delay in treatment with definitive surgery or radiation, both of which are associated with significant morbidities. Out of the intratumoral agents utilized, intratumoral alpha interferon seems to provide the best response and least side effects for the treatment of craniopharyngiomas. The role of intratumoral therapy is unclear, multiple studies have reported efficacy in the treatment of craniopharyngiomas, and current results appear promising (Mrowczynski, Langan, and Rizk, 2018). In our case report, the patient was treated only by surgery with the goal to remove the mass by a side frontal access by fronto-temporal craniotomy.

Craniopharyngioma requires multidisciplinary management (Gupta et al., 2018); furthermore, the mortality rate is markedly elevated highlighting the potential serious side effects if not promptly diagnosed and surgically treated (Bailey and Parkes, 2015). The patient in this case report made an almost full recovery to a normal life after 6 months following the surgical intervention.

To the best of the authors knowledge, this is the first case report that describes the clinical reasoning and

decision-making process that led a physiotherapist to suspect the presence of a serious pathology (i.e., craniopharyngioma) mimicking a benign condition, presenting as neck pain associated with CGH. This case also underlines the importance that physiotherapists, especially those working in direct access outpatient musculoskeletal/orthopedic settings, must be alert and screen for the presence of pathologic medical conditions.

In order to guarantee the most favorable prognosis for those patients at risk of life-threatening pathologies, suspicions driven on a systems analysis not medical diagnosis should lead the physical therapist to refer the patient to the appropriate physician for further medical and/or surgical investigation and intervention (Ojha, Snyder, and Davenport, 2014; Pendergast, Kliethermes, Freburger, and Duffy, 2012; Saguil, 2005).

A thorough knowledge of the relevant pathophysiology and a keen understanding of the clinical presentation of rare and serious pathologies is needed for those patients in need of complex and multidisciplinary management. Furthermore, it is essential to allow and expect different professions to share overlapping scopes of practice in order to allow all health-care professionals to provide services to the full extent of their current knowledge, training, experience, and skills (Finocchio, Dower, McMahon, and Gragnola, 1995).

Disclosure statement

The authors declare no conflict of interest.

ORCID

Firas Mourad  <http://orcid.org/0000-0002-8981-2085>

Filippo Maselli  <http://orcid.org/0000-0001-9683-9975>

References

- Bailey S, Parkes J 2015 Intracystic interferon therapy in childhood craniopharyngioma: Who, when and how? *Clinical Endocrinology* 82: 29–34.
- Bogduk N 2011 The anatomy and pathophysiology of neck pain. *Physical Medicine and Rehabilitation Clinics of North America* 22: 367–382.
- Buchfelder M, Schlaffer SM, Lin F, Kleindienst A 2013 Surgery for craniopharyngioma. *Pituitary* 16: 18–25.
- Bülow B, Attewell R, Hagmar L, Malmstrom P, Nordstrom CH, Erfurth EM 1998 Postoperative prognosis in craniopharyngioma with respect to cardiovascular mortality, survival, and tumour recurrence. *Journal of Clinical Endocrinology and Metabolism* 11: 3897–3904.
- Bunin GR, Surawicz TS, Witman PA, Preston-Martin S, Davis F, Bruner JM 1998 The descriptive epidemiology of craniopharyngioma. *Journal of Neurosurgery* 89: 547–551.
- Cady RK 2014 Red flags and comfort signs for ominous secondary headaches. *Otolaryngologic Clinics of North America* 47: 289–299.
- Carleton-Bland N, Kilday JP, Pathmanaban ON, Stivaros S, Kelsey A, Kamaly-Asl ID 2016 Ventricular metastatic dissemination of a paediatric craniopharyngioma: Case report and literature review. *British Journal of Neurosurgery* 31: 474–477.
- Choux M, Lena G 1979 Bases of surgical management of craniopharyngioma in children. *Acta Neurochirurgica Supplement* 28: 348.
- Cook CE, Hegedus E, Pietrobon R, Goode A 2007 A pragmatic neurological screen for patients with suspected cord compressive myelopathy. *Physical Therapy* 87: 1233–1242.
- Côté P, Wong JJ, Sutton D, Shearer HM, Mior S, Randhawa K, Ameis A, Carroll LJ, Nordin M, Yu H, et al. 2016 Management of neck pain and associated disorders-A clinical practice guideline from the Ontario Protocol for Traffic Injury Management (OPTIMA) collaboration. *European Spine Journal* 25: 2000–2022.
- Crotty TB, Scheithauer BW, Young WF, Davis DH, Shaw EG, Miler GM, Burger PC 1995 Papillary craniopharyngioma: A clinicopathological study of 48 cases. *Journal of Neurosurgery* 83: 206–214.
- Dandurand C, Sepehry AA, Asadi Lari MH, Akagami R, Gooderham P 2018 Adult craniopharyngioma: Case series, systematic review, and meta-analysis. *Neurosurgery* 83: 631–641.
- Erfurth EM 2015 Endocrine aspects and sequel in patient with craniopharyngioma. *Journal of Pediatric Endocrinology and Metabolism* 28: 19–26.
- Fahlbusch R, Honegger J, Paulus W, Huk W, Buchfelder M 1999 Surgical treatment of craniopharyngiomas: Experience with 168 patients. *Journal of Neurosurgery* 90: 237–250.
- Famini P, Maya MM, Melmed S 2011 Pituitary magnetic resonance imaging for sellar and parasellar masses: Ten-year experience in 2598 patients. *Journal of Clinical Endocrinology and Metabolism* 96: 1633–1641.
- Finocchio LJ, Dower CM, McMahon T, Gragnola C; Taskforce on Health Care Workforce Regulation 1995 Reforming health care workforce regulation: Policy considerations for the 21st century. San Francisco: Pew Health Professions Commission. https://www.leg.state.nv.us/74th/Interim_Agendas_Minutes_Exhibits/Exhibits/Lasers/E011008E.pdf.
- Flitsch J, Müller HL, Burkhardt T 2011 Surgical strategies in childhood craniopharyngioma. *Frontiers in Endocrinology* 2: 96.
- Forsyth PA, Shaw EG, Scheithauer BW, O'Fallon JR, Layton DD, Katzmann JA 1993 Supratentorial pilocytic astrocytomas. A clinicopathologic, prognostic, and flow cytometric study of 51 patients. *Cancer* 72: 1335–1342.
- Garnett MR, Puget S, Grill J, Sainte-Rose C 2007 Craniopharyngioma. *Orphanet Journal of Rare Diseases* 2: 18.
- Goffaux P, Fortin D 2010 Brain tumor headaches: From bedside to bench. *Neurosurgery* 67: 459–466.
- Gupta S, Bi WL, Giantini Larsen A, Al-Abdulmohsen S, Abedalthagafi M, Dunn IF 2018 Craniopharyngioma: A roadmap for scientific translation. *Neurosurgical Focus* 44: E12.

- Hald JK, Eldevik OP, Skälpe IO **1995** Craniopharyngioma identification by CT and MR imaging at 1.5 T. *Acta Radiologica* 36: 142–147.
- Hutting N, Scholten-Peters GG, Vijverman V, Keessenberg MD, Verhagen AP **2013** Diagnostic accuracy of upper cervical spine instability tests: A systematic review. *Physical Therapy* 93: 1686–1695.
- Jaggion J, Abrikian S, Gibson T, Johnson P, Liburd J **2009** Malignant craniopharyngioma: A case report and comprehensive review. *Internet Journal of Pathology* 11: 1.
- Karavitaki N, Brufani C, Warner JT, Adams CB, Richards P, Ansorge O, Shine B, Turner HE, Wass JA **2005** Craniopharyngiomas in children and adults: Systematic analysis of 121 cases with long-term follow up. *Clinical Endocrinology* 62: 397–409.
- Karavitaki N, Cudlip S, Adams CB, Wass JA **2006** Craniopharyngiomas. *Endocrine Reviews* 27: 371–397.
- Khan RB, Merchant TE, Boop FA, Sanford RA, Ledet D, Onar-Thomas A, Kun LE **2013** Headaches in children with craniopharyngioma. *Journal of Child Neurology* 28: 1622–1625.
- Larkin SJ, Ansorge O **2013** Pathology and pathogenesis of craniopharyngiomas. *Pituitary* 16: 9–17.
- Louis DN, Ohgaki H, Wiestler OD, Cavenee WK, Burger PC, Jouvet A, Scheithauer BW, Kleihues P **2007** The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathologica* 114: 97–109.
- Miller DC **1994** Pathology of craniopharyngiomas: Clinical import of pathological findings. *Pediatric Neurosurgery* 21: 11–17.
- Mourad F, Giovannico G, Maselli F, Bonetti F, Fernández de las Peñas C, Dunning J **2016** Basilar impression presenting as intermittent mechanical neck pain: A rare case report. *BMC Musculoskeletal Disorders* 17: 7.
- Mrowczynski OD, Langan ST, Rizk EB **2018** Craniopharyngiomas: A systematic review and evaluation of the current intratumoral treatment landscape. *Clinical Neurology and Neurosurgery* 166: 124–130.
- Müller H **2014** Craniopharyngioma. *Endocrine Reviews* 35: 513–543.
- Müller HL **2008** Childhood craniopharyngioma. Recent advances in diagnosis, treatment and follow-up. *Hormone Research* 69: 193–202.
- Müller HL **2010a** Childhood craniopharyngioma - Current concepts in diagnosis, therapy and follow-up. *Nature Reviews Endocrinology* 6: 609–618.
- Müller HL **2010b** Childhood craniopharyngioma: Current controversies on management in diagnostics, treatment and follow-up. *Expert Review of Neurotherapeutics* 10: 515–524.
- Müller HL **2012** Craniopharyngioma - A childhood and adult disease with challenging characteristics. *Frontiers in Endocrinology* 3: 80.
- Müller HL **2013** Paediatrics: Surgical strategy and quality of life in craniopharyngioma. *Nature Reviews Endocrinology* 9: 447–449.
- Nielsen EH, Feldt-Rasmussen U, Poulsen L, Kristensen LO, Astrup J, Jørgensen JO, Bjerre P, Andersen M, Andersen C, Jørgensen J, et al. **2011** Incidence of craniopharyngioma in Denmark (n=189) and estimated world incidence of craniopharyngioma in children and adults. *Journal of Neuro-oncology* 104: 755–763.
- Nishizawa S, Ohta S, Oki Y **2006** Spontaneous resolution of diabetes insipidus after pituitary stalk sectioning during surgery for large craniopharyngiomas. *Neurologia Medico Chirurgica* 46: 126–135.
- Ojha HA, Snyder RS, Davenport TE **2014** Direct access compared with referred physical therapy episodes of care: A systematic review. *Physical Therapy* 94: 14–30.
- Pendergast J, Kliethermes SA, Freburger JK, Duffy PA **2012** A comparison of health care use for physician-referred and self-referred episodes of outpatient physical therapy. *Health Services Research* 47: 633–654.
- Piano L, Maselli F, Viceconti A, Gianola S, Ciuro A **2017** Direct access to physical therapy for the patient with musculoskeletal disorders, a literature review. *Journal of Physical Therapy Science* 29: 1463–1471.
- Platzer P, Hauswirth N, Jandl M, Chatwani S, Vecsei V, Gaebler C **2006** Delayed or missed diagnosis of cervical spine injuries. *Journal of Trauma* 61: 150–155.
- Ray BS, Wolff HG **1940** Experimental studies on headache: Pain-sensitive structures of the head and their significance. *Archives of Surgery* 41: 813–856.
- Saguil A **2005** Evaluation of the patient with muscle weakness. *American Family Physician* 71: 1327–1336.
- Schankin CJ, Ferrari U, Reinisch VM, Birnbaum T, Goldbrunner R, Straube A **2007** Characteristics of brain tumour-associated headache. *Cephalalgia* 27: 904–911.
- Shah GB, Bhaduri AS, Misra BK **2007** Ectopic craniopharyngioma of the fourth ventricle: Case report. *Surgical Neurology* 68: 96–98.
- Sizer PS, Brismee JM, Cook C **2007** Medical screening for red flags in the diagnosis and management of musculoskeletal spine pain. *Pain Practice* 7: 53–71.
- Sung RD, Wang JC **2001** Correlation between a positive Hoffmann's reflex and cervical pathology in asymptomatic individuals. *Spine* 26: 67–70.
- Venegas E, Concepcion B, Martin T, Soto A; En representación del área de conocimiento de Neuroendocrinología de la SEEN **2015** Practice guideline for diagnosis and treatment of craniopharyngioma and parasellar tumors of the pituitary gland. *Endocrinología Y Nutrición* 62: e1–13.
- Warmuth-Metz M, Gnekow AK, Müller H, Solymosi L **2004** Differential diagnosis of suprasellar tumors in children. *Klinische Pädiatrie* 216: 323–330.
- Weiner HL, Wisoff JH, Roseberg ME, Kupersmith MJ, Cohen H, Zagzag D, Shiminski-Maher T, Flamm E, Epstein FJ, Miller DC **1994** Craniopharyngiomas: A clinicopathological analysis of factors predictive of recurrence and functional outcome. *Neurosurgery* 35: 1001–1011.
- Wisoff JH, Donahue BR **2006** Craniopharyngiomas. In: Albright AL, Pollack IF, Adelson PD (Eds) *Principles and practice of pediatric neurosurgery* (2nd ed), p. 560–577. New York, Stuttgart: Thieme.
- Young IA, Dunning J, Butts R, Cleland JA, Fernández-de-las-Peñas C **2019** Psychometric properties of the numeric pain rating scale and neck disability index in patients with cervicogenic headache. *Cephalalgia* 39: 44–51.
- Zoicas F, Schöfl C **2012** Craniopharyngioma in adults. *Frontiers in Endocrinology* 3: 46.