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Cervical musculoskeletal comorbidities in migraine patients

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ABSTRACT

This manuscript provides clinical recommendations for assessing and managing cervical musculoskeletal (MSK) comorbidities in patients with migraine. It explores the reciprocal influences between migraine and the cervical MSK system and proposes a theoretical model to explain the high prevalence of these comorbidities, emphasizing the need for proper assessment and targeted management. The text provides a detailed explanation of tests commonly used in clinical and research settings to identify cervical MSK involvement. Furthermore, it reports reference cut-off values to help clinicians profile patients based on the presence and relevance of these comorbidities. The role of neck pain in guiding the execution and interpretation of cervical MSK assessment is discussed in detail. These findings require careful clinical reasoning and an individualized understanding of their roles in each patient's presentation. Finally, the manuscript presents therapeutic guidelines for the effective management of cervical MSK comorbidities in the migraine population.

Key words: cervical musculoskeletal impairments, migraine, physiotherapy.

Introduction

Migraine is a complex neurovascular disorder affecting approximately 15% of the global population. (1) It is ranked among the top three causes of disability worldwide and is the leading cause of disability for individuals under the age of 50. (2,3) Although a new class of drugs specifically developed for migraine (monoclonal antibodies or orally available small molecules that block the calcitonin gene-related peptide signaling pathway) has shown promising results in recent years, (4) these medications remain effective in a proportion but not all migraine patients. (5,6) Consequently, there is a critical need to enhance migraine management strategies to reduce its health, social, and economic impact.

One frequently proposed yet insufficiently studied solution is a multidisciplinary approach incorporating both pharmacological and non-pharmacological modalities. (7,8) Among these non-pharmacological options, physiotherapy is widely utilized and has demonstrated efficacy in treating migraine. (9-12) However, since a multidisciplinary approach involving physiotherapy is resource-intensive, it is essential to identify the specific patient subgroups most likely to benefit. Given that physiotherapy for migraine typically targets the cervical musculoskeletal (MSK) system, (13) identifying the involvement of this system is necessary to justify its clinical application. This paper serves as a guide to the assessment, interpretation, and management of cervical MSK comorbidities in patients with migraine.

The role of musculoskeletal comorbidities in migraine patients

Approximately 37-39% of migraine patients present with a comorbid disorder of the MSK cervical system (14,15) during the interictal phase. These numbers increase further (up to 80%) when patients are assessed near or during a migraine attack. (14,16) This high prevalence, combined with evidence supporting a bidirectional interaction between migraine attacks and the cervical MSK system, likely mediated by their convergence within the trigeminocervical complex (TCC), (17,18) suggests that cervical MSK dysfunction is more plausibly an integral component of a complex pathophysiological process that exacerbates a pre-existing condition, rather than a para-physiological finding occasionally observed in affected individuals (**Figure 1**). Consequently, when a disorder of the cervical MSK system is identified in migraine patients, it is often difficult to determine whether the primary driver is the MSK condition or the migraine itself. For this reason, throughout this article, we will refer to the presence of cervical MSK disorders in migraine patients as "cervical MSK comorbidities". Cervical MSK comorbidities are defined by the concomitant presence of reduced MSK system functionality and increased pain sensitivity within the MSK system.

Migraine attacks are characterised by the activation and sensitisation of the TCC, (19) where cervical afferents also converge. (17,18) Therefore, the ictal sensitisation of the TCC may lead to pain and increased pain sensitivity within the cervical MSK system, (17,18) potentially altering the system's motor function. (20) In support of this hypothesis, research has shown that during migraine attacks, patients exhibit increased sensitisation of the cervical MSK system. (21,22) and a reduction in cervical MSK functionality. (23-26) When ictal patients are profiled according to the presence of cervical MSK comorbidities, defined as a combination of the cervical MSK impairment and increased sensitisation of the cervical MSK system, 80% of migraine patients demonstrate such involvement. (14,16)

Even if the direct influence of migraine on the cervical MSK system appears to be related to the migraine attack itself, and therefore is transitory, in a smaller proportion of individuals, cervical MSK involvement persists also outside the migraine attack. (26) When interictal migraine patients are profiled according to

the presence of cervical MSK comorbidities, more than one-third of patients show such involvement. (14-16)

When present outside the headache attack, cervical MSK comorbidities may represent a nociceptive input able to directly trigger a migraine attack. (27) Furthermore, they may indirectly facilitate the occurrence of an attack by increasing the afferent nociception and sensitisation of the TCC. (17,18) It has been shown that patients with interictal cervical MSK comorbidities have higher headache frequency and worse disability due to headache (16) and that worse cervical MSK comorbidities are correlated with higher headache frequency or disability. (26,28,29)

In summary, a vicious cycle occurs where a migraine attack may affect the cervical MSK system, which, in turn, may facilitate the occurrence of a subsequent migraine attack, increasing headache frequency and disability (**Figure 1**). Thus, it is important to properly assess and potentially manage cervical MSK comorbidities in migraine patients.

The cervical MSK assessment in migraine patients should be performed in line with a biopsychosocial model, considering the whole person (age, gender, comorbidities, and medication usage), lifestyle factors (sleep, exercise, diet, hobbies, and work), psychological factors (mood, personality trails, phycological features, and cognitive factors), and social factors (education, socioeconomic status, family, and social support) (**Figure 2**). (30)

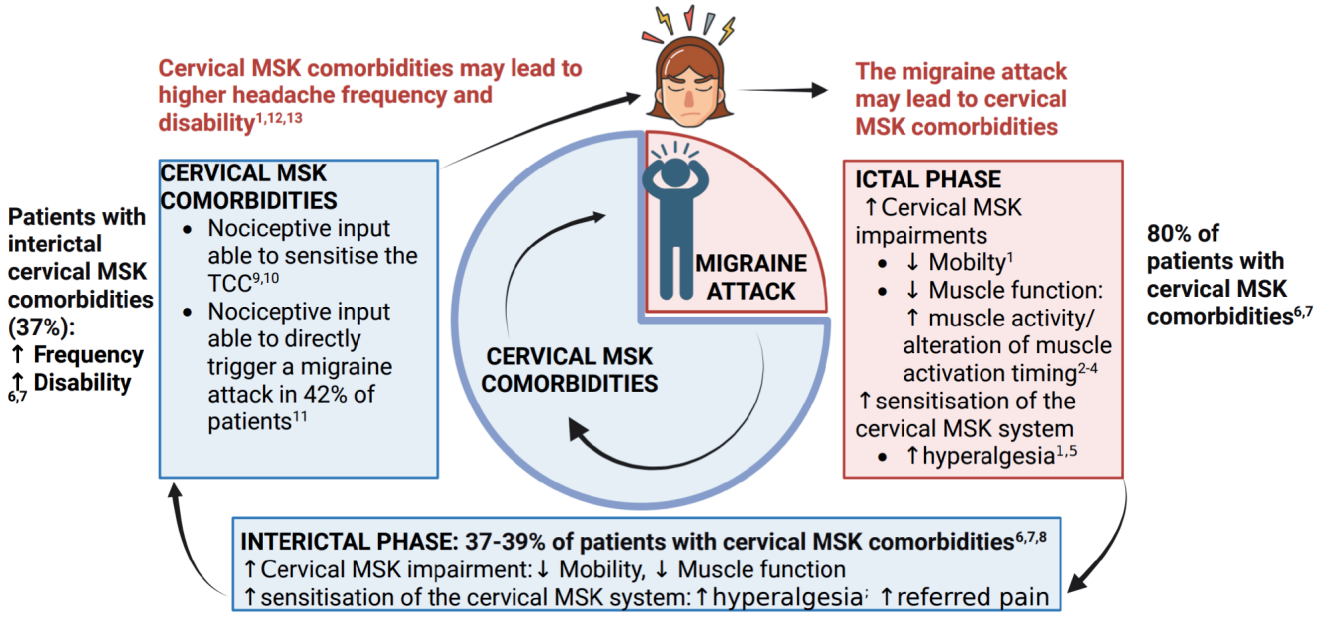
How to perform and interpret cervical musculoskeletal assessment in migraine patients

Cervical MSK comorbidities in migraine patients can be identified using tests aimed at assessing cervical MSK impairments, cervical MSK impairments, such as posture, movement restrictions, or muscle function impairments, and tests aimed at assessing increased pain sensitivity of the cervical MSK system (local hyperalgesia and referred pain) (**Figure 3**, **Table 1**). (13)

Cervical musculoskeletal impairments: movement restriction and muscle function impairment

Posture. A frequently found abnormal posture in migraine patients is an excessive forward-head position, or forward-head posture (FHP), in a standing position (**Figure 3**, **Table 1**). (31) The patient is asked to stay in a relaxed standing position, and FHP is assessed by measuring the cranio-vertebral angle (the angle between the horizontal line passing through C7 and a line extending from the tragus of the ear to C7). The presence of FHP could be considered an indirect indicator of both movement restriction (32) and muscle function impairment (**Figure 1**). (33) Normative values to define the presence of FHP are <37°. (34) Even though a recent systematic review reported greater FHP in patients with migraine in the standing position, only one of the five included studies had a mean FHP value in migraine patients below this threshold, suggesting that only a small proportion of migraine patients may present a clinically relevant increase in FHP. (31) FHP assessment has been shown to have good to high (>0.8) intra- and inter-rater reliability. (35,36)

Active range of motion (ARoM). The patient is asked to sit upright, with head and neck in a neutral position, before moving the neck in extension, flexion, left/right rotation, and left/right lateral flexion. Maximum cervical ARoM in each direction could be recorded in degrees of movement using the cervical range of motion device (CRoM), (26) a goniometer, or a smartphone application (**Figure 3**, **Table 1**). (37) Cervical ARoM is a valid test to identify the quantity of movement impairment in migraine patients; (26,31) normative cut-off values to identify movement



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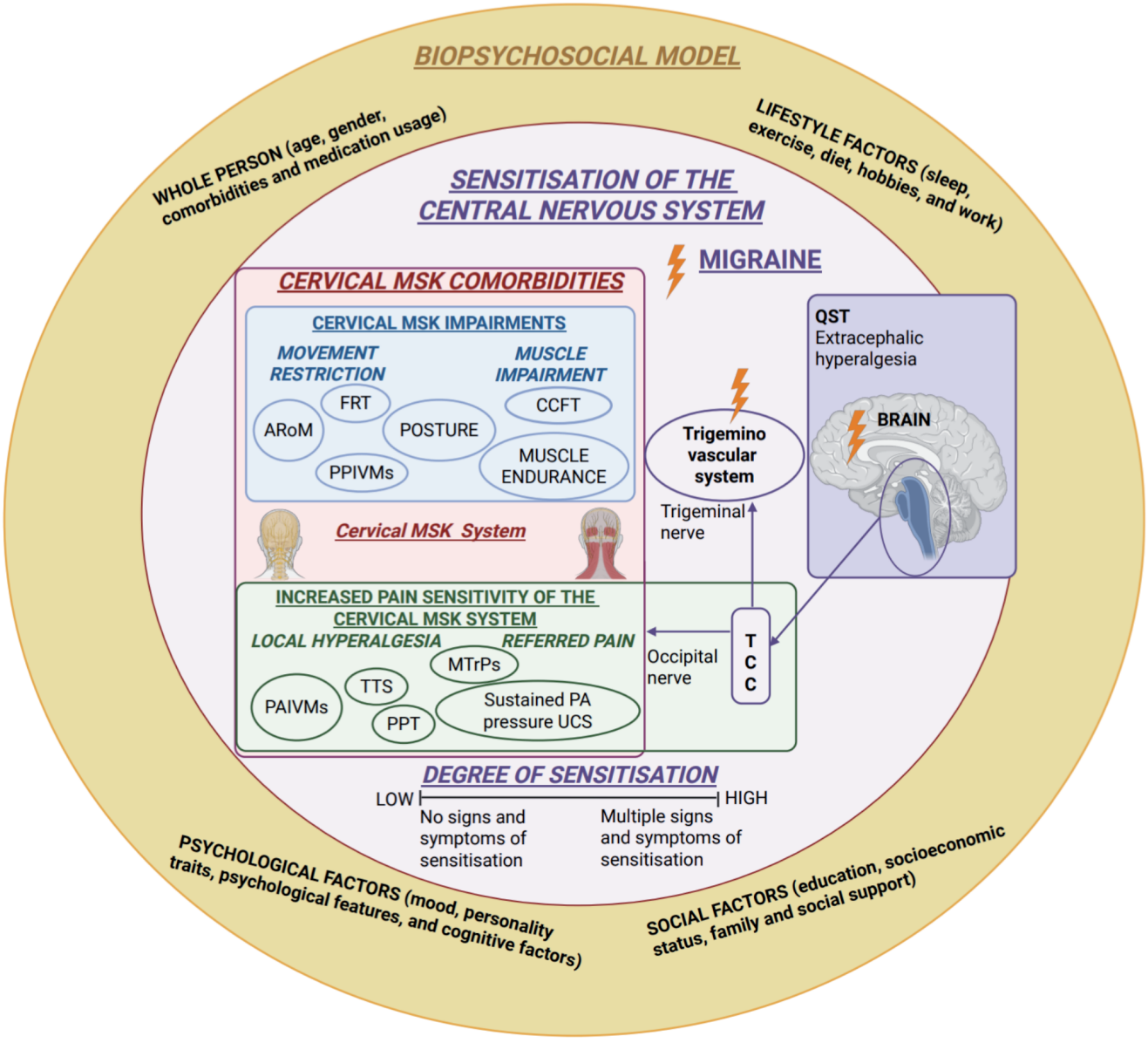
MSK, musculoskeletal; TCC, trigeminocervical complex.
1: Di Antonio *et al.*, 2022[26]; 2: Bakke *et al.*, 1982[23]; 3: Clifford, 1982[24]; 4: Hatef *et al.*, 2012[25]; 5: Scholten-Peeters, 2020[21]; 6: Di Antonio *et al.*, 2023[14]; 7: Di Antonio *et al.*, 2023[16]; 8: Liang *et al.*, 2021[15]; 9: Basedau *et al.*, 2022[17]; 10: Bartsch *et al.*, 2003[18]; 11: Carvalho *et al.*, 2021[27]; 12: Tolentino *et al.*, 2018[29]; 13: Florencio *et al.*, 2015[28].

Figure 1. The role of musculoskeletal comorbidities in migraine patients.

restrictions during cervical ARoM are reported in **Figure 3**. (34) Although no studies have specifically used these normative cut-off values to categorize the proportion of migraine patients with reduced cervical ARoM, a recent study showed that approximately 60% of migraine patients present a clinically relevant movement restriction, reporting values below these thresholds. (14,16) Cervical ARoM recorded with CRoM, goniometer, and a smartphone application has demonstrated substantial to excellent (>0.6) intra- and inter-rater reliability. (37-39)

Passive range of motion. Movement restriction of specific cervical vertebral joints could be assessed using passive physiological intervertebral movement (PPIVMs) at each vertebral level.

i) PPIVMs: passive mobility of C0-C1 (40) and C2-C4 (41) intervertebral segments can be manually assessed with PPIVMs. With the patient in a supine position, the therapist performs a lateral glide of the targeted cervical vertebral joint. These tests rely on a clinician's subjective interpretation of the passive mobility, which is categorized as "normal" or "hypomobile" (**Figure 3**, **Table 1**). These assessments have demonstrated poor to substantial intra- and inter-rater reliability. (42,43) Between 20% and 61% of patients with migraine have been shown to exhibit hypomobility at the C0-C1 and C2-C4 intervertebral segments. (44,45)
ii) Flexion rotation test (FRT): it is used to assess passive mobility in rotation of the C1-C2 intervertebral segment. With the patient in a supine position, the therapist maximally



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AROM, active range of motion; CCFT, cranio-cervical flexion test; FRT, flexion rotation test; MSK, musculoskeletal; MTrPs, myofascial trigger points; PAIVMs, passive accessory intervertebral movements; PPIVMs, passive physiological intervertebral movement; PPT, pressure pain threshold; QST, quantitative sensory testing; TCC, trigeminocervical complex; TTS, total tenderness score.

Figure 2. Interpretation of cervical musculoskeletal examination in migraine patients.

flexed the cervical spine. In this flexed position, the head is passively rotated as far as possible within comfortable limits to the left and then to the right. Passive range of motion could be recorded in degrees of movement with the CRoM device (**Figure 3**, **Table 1**). The test is considered positive for values below 33° to either left or right rotation, (46,47) with 38-53% of patients with migraine testing positive. (48,49) The FRT has demonstrated substantial to excellent (>0.7) intra- and inter-rater reliability. (38)

Muscle functionality could be assessed with tests aimed at evaluating motor control or muscle endurance.

Cranio-cervical flexion test (CCFT). It can be used to assess motor control of deep cervical flexor muscles (**Figure 3**, **Table 1**). (50) The patient lies supine on the couch, with the neck in a neutral position, and a pressure biofeedback unit of 20-30 mmHg is placed behind the neck, adjacent to the occiput. Then, the subject is asked to perform a cranio-cervical flexion in five incremental stages (22-30 mmHg, one stage every 2 mmHg), and the maximum mmHg value that is held for 10 seconds without compensation (*i.e.*, loss of cranio-cervical flexion with compensatory retraction, or signs of fatigue such as tremor) or pain is recorded as the activation pressure score (APS). The test is considered positive if APS is below 26 mmHg level, (34) with 59-71% of patients with migraine testing positive. (48,49) CCFT has demonstrated substantial to excellent (>0.6) intra- and inter-rater reliability. (50)

Cervical muscle endurance test. The muscle endurance test of cervical extensor and flexor muscles is used to assess impairment in the functionality of these muscles in migraine patients (**Figure 3**, **Table 1**). (28,51) It has been shown to have fair to excellent intra- and inter-rater reliability. (50,52)

i) Cervical flexors: the patient lies supine and is instructed to flex the upper cervical spine and raise the head just above the examination table, holding the position as much as they can. The test is terminated when the patients cannot maintain the position or decide to stop the trial due to pain or fatigue. Subnormal values are 23 seconds for women and 56 seconds for men. (28,51)
ii) Cervical extensors: the patient lies prone with the head outside the couch. A load (4 kg for men and 2 kg for women) is applied around the head, and the patient extends and raises the head, holding the position as much as they can. The test is terminated when the patients cannot maintain the position or decide to stop the trial due to pain or fatigue. Subnormal values are 173 seconds for women and 157 seconds for men. (28,51)

As it has been observed that cervical extensor and flexor endurance tests could trigger a migraine attack in the 24 hours following the assessment, (27) clinicians should perform these tests with caution, in particular if the patient is in a premonitory phase.

Table 1. Cervical musculoskeletal assessment.

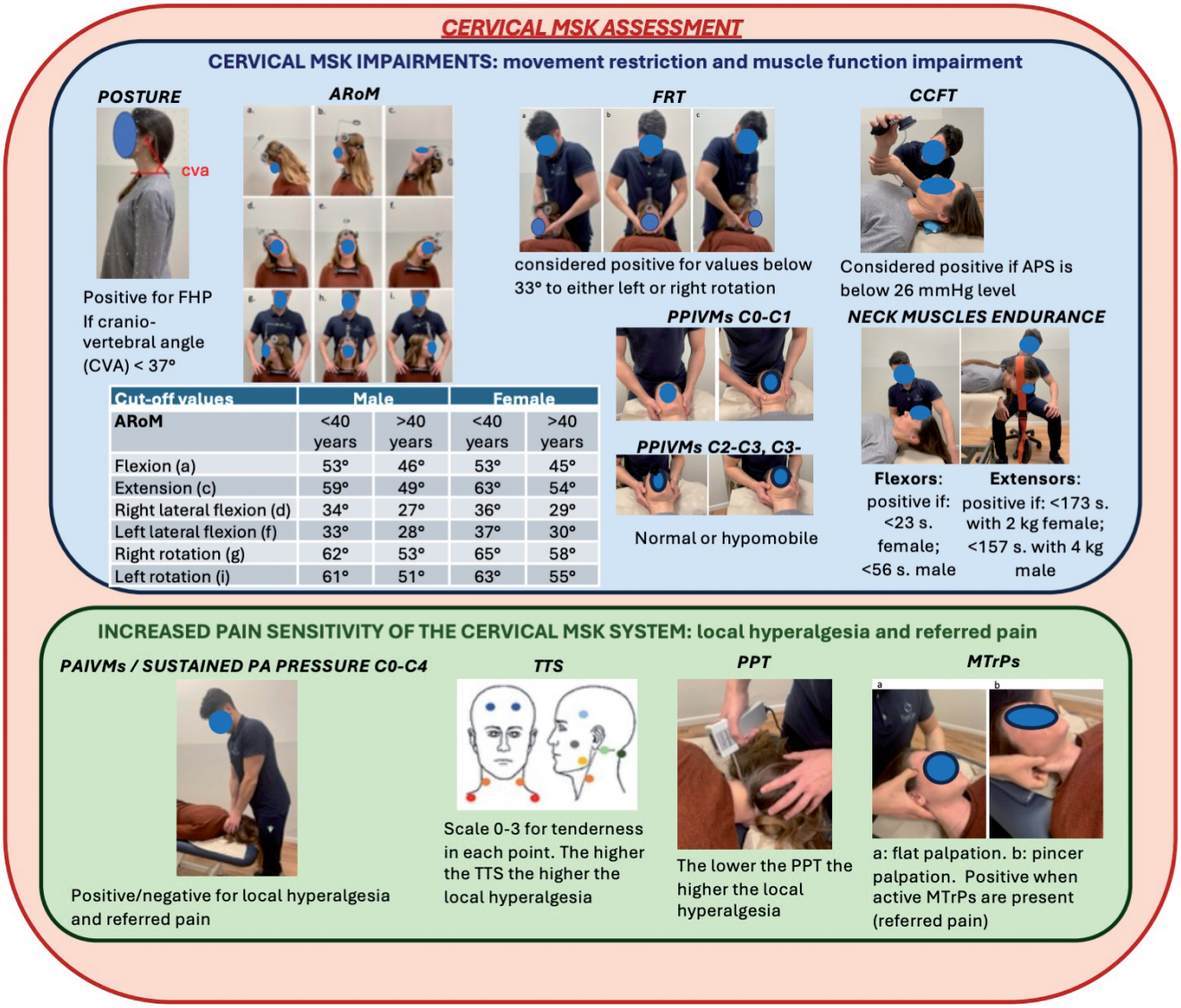
Test	Purpose/Domain	Description and positive finding
Forward head posture	Posture	Standing assessment of CVA (C7-tragus). Positive if CVA <37°
Active cervical range of motion	Active mobility	Active flexion, extension, rotation and lateral flexion measured in degrees. Positive if below age/sex cut-offs
Passive physiological intervertebral movement (C0-C1/C2-C4)	Passive segmental mobility (C0-C1/C2-C4)	Manual lateral glide to assess segmental mobility. Positive if hypomobile
FRT	Passive segmental mobility (C1-C2)	Supine, cervical spine maximally flexed, passive rotation. Positive if <33° to either side
Cranio-cervical flexion test	Motor control (deep neck flexors)	Supine with pressure biofeedback (20-30 mmHg). Positive if Activation pressure score <26 mmHg
Cervical flexor endurance	Muscle endurance	Supine head lift. Positive if <23 s (women) or <56 s (men)
Cervical extensor endurance	Muscle endurance	Prone head hold with load. Positive if <173 s (women, 2 kg) or <157 s (men, 4 kg)
Passive accessory intervertebral movements (C0-C4)	Local hyperalgesia	PA pressure over C0-C4. Positive if pain >2/10 with restriction
Sustained PA pressure over C0-C4	Referred pain	Sustained PA pressure (5-10 s) over C0-C4. Positive if familiar headache is reproduced
MTrPs	Local hyperalgesia & referred pain	Palpation of head/neck muscles. Positive if active MTrPs is present (reproduction of familiar pain)
TTS	Local hyperalgesia	Palpation scored 0-3 in each site; 0: no visible reaction; denial of tenderness; 1: no visible reaction; verbal report of discomfort/mild pain; 2: verbal report of painful tenderness; facial expression of discomfort or no reaction; 3: marked grimacing or withdrawal; verbal report of marked painful tenderness and pain. Higher score = higher hyperalgesia
PPT	Local and/or widespread hyperalgesia	Algometer assessment. Lower PPT indicates increased hyperalgesia

CVA, craniovertebral angle; FRT, flexion-rotation test; PA, posterior-anterior; MTrPs, myofascial trigger points; TTS, total tenderness score; PPT, pressure pain threshold.

Increased pain sensitivity of the cervical musculoskeletal system: local hyperalgesia and referred pain

Passive accessory intervertebral movements (PAIVMs). These techniques are used to manually assess increased local hyperalgesia to pressure of the upper cervical spine. (53) The patient lies prone, and the therapist performs a gentle and gradual posteroanterior pressure over the cervical facet joint (C0-4), rating the perceived motion/tissue compliance while the patient verbally rated the perceived pain. A joint segment is considered positive when the examiner rates motion or tissue compliance as moderately or markedly restricted, and the patient reports pain greater than 2/10, (53) with 39-55% of patients with migraine testing positive in at least one joint segment (**Figure 3**, **Table 1**). (15,44,45) This assessment demonstrated substantial to excellent intra- and inter-rater reliability. (54)

Total tenderness score (TTS). It is a reliable method to assess mechanical hyperalgesia (pain sensitivity) to manual palpation in cervical and trigeminal areas. (55) Eight pairs of muscles and tendon insertions are palpated, and a tenderness score is given at each location using a 0-3 scale (0 = no visible reaction and denial of tenderness; 1 = no visible reaction but a verbal report of discomfort or mild pain; 2 = verbal report of painful tenderness, a facial expression of discomfort or no reaction; 3 = marked grimacing or withdrawal, verbal report of marked painful tenderness and pain). The higher the value, the higher the tenderness and the higher the pain sensitivity (**Figure 3**, **Table 1**). (56,57) In a research setting, a palpometer could be used to standardize the clinician's manual pressure (80 kPa). (55) However, the use of external tools is not always possible in a clinical scenario. In such cases, TTS could be evaluated with manual palpation without a palpometer. (58)



Cut-off values	Male		Female	
AROM	<40 years	>40 years	<40 years	>40 years
Flexion (a)	53°	46°	53°	45°
Extension (c)	59°	49°	63°	54°
Right lateral flexion (d)	34°	27°	36°	29°
Left lateral flexion (f)	33°	28°	37°	30°
Right rotation (g)	62°	53°	65°	58°
Left rotation (i)	61°	51°	63°	55°

AROM, active range of motion; CCFT, cranio-cervical flexion test; FHP, forward-head posture; FRT, flexion rotation test; MSK, musculoskeletal; MTrPs, myofascial trigger points; PAIVMs, passive accessory intervertebral movements; PPIVMs, passive physiological intervertebral movement; PPT, pressure pain threshold; TTS, total tenderness score.

Figure 3. Assessment of cervical musculoskeletal system.

Pressure pain threshold (PPT). Local hyperalgesia of the cervical region could be assessed by measuring the PPT using an algometer. PPT has been shown to be reduced in migraine patients both over an area corresponding to the cervical vertebral joints (26) and in multiple muscles. (21) The lower the PPT, the higher the local hyperalgesia and the sensitization of the cervical region (**Figure 3**, **Table 1**).

Sustained posterior-anterior pressure over the upper cervical spine. Sustained posterior-anterior pressure could be used to detect referred pain on the head (reproduction of headache similar to the headache patients usually experience) with sustained pressure on the C0-C4 vertebral joint (**Figure 3**, **Table 1**). (59) The test starting position and execution are like the PAIVMs assessment. Following the PAIVMs, the therapist sustains the pressure over the vertebral joint for 5 to 10 seconds. The test is considered positive if it reproduces a headache similar to the one usually experienced by the patient, with the proportion of patients with migraine testing positive in at least one joint segment ranging from 45% to 95%. (16,59-62)

Myofascial trigger points (MTrPs). They are defined as hypersensitive spots in a taut band in the muscle belly that result in referred pain and, therefore, should be considered both a sign of local hyperalgesia and referred pain. (63) MTrPs can be detected through flat or pincer palpation, depending on the muscle being examined. The following muscles should be assessed in migraine patients: (26,32) temporalis, masseter, sternocleidomastoid, suboccipital, splenius capitis, and the upper trapezius (**Figure 3**, **Table 1**). MTrPs could be considered active (referred pain is recognized by the patient as the usual headache) or latent (referred pain is not recognized by the patient as the usual headache), with patients with migraine presenting a higher total number of MTrPs (active and latent) compared with healthy controls. (31) MTrPs assessment of the head/neck muscles demonstrated a substantial to excellent (>0.6) intra- and inter-rater reliability. (64)

How to interpret the findings of the cervical musculoskeletal assessment in migraine patients

For a cervical MSK comorbidity to be considered present and be relevant to migraine pathophysiology, a combination of MSK impairment, local hyperalgesia, and referred pain should be identified during examination. (13) The presence of functional impairments, alongside local hyperalgesia in the dysfunctional area, may suggest that the affected MSK structure could represent a source of peripheral nociception. (53) The occurrence of familiar referred pain when stimulating the affected MSK area may indicate a sensitisation of the TCC, the main mechanism proposed to explain how peripheral nociception from the cervical region can influence headache. (17,18) Familiar pain is defined as a headache that is similar to the one usually experienced by the patient. Importantly, the patient's recognition of the elicited pain as familiar suggests that the neural networks activated by the external mechanical stimulus may overlap with those involved in migraine symptomatology.

As migraine itself can affect the functionality of the MSK system, due to the recurrence of attacks and the TCC (**Figure 1**), a combination of positive tests should be identified with the clinical examination. If only cervical MSK impairments are present, without local hyperalgesia and referred pain, it is unlikely that the dysfunction observed could represent a relevant finding able to influence migraine symptoms. (13,15,34,53) Conversely, if only signs of increased pain sensitivity of the cervical region are found, these could be entirely attributable to the migraine itself. (13,26) In fact, local hyperalgesia and referred head pain from a cervical MSK structure could also be signs of central nervous system sensitisation, particularly of the TCC (**Figure 2**). (13,17,26) Therefore, cervical MSK impairments, local hyperalgesia, and referred pain should be present together for the cervical MSK comorbidity to be present and be relevant to migraine pathophysiology.

When a reduction in mechanical pain threshold is observed using pressure algometry in a localized cervical MSK area (local hyperalgesia), peripheral sensitization mechanisms of the tested MSK area may be present. (22) However, when extracephalic (widespread) hyperalgesia is also present, this more strongly suggests the involvement of central sensitization mechanisms extending to higher cortical and thalamic regions (**Figure 2**). (65)

To assess sensitization mechanisms in greater detail, clinicians may apply a battery of quantitative sensory testing (QST) procedures. QST consists of a series of tests that apply external stimuli (*e.g.*, mechanical, thermal, or electrical) to detect the presence of sensory gain or loss of function. The presence of sensory gain of function may be considered a proxy for increased sensitization. A complete description of how to perform and interpret a complete battery of QST assessment is beyond the scope of this manuscript; readers should refer to other literature for a more in-depth address of this subject. (13,66)

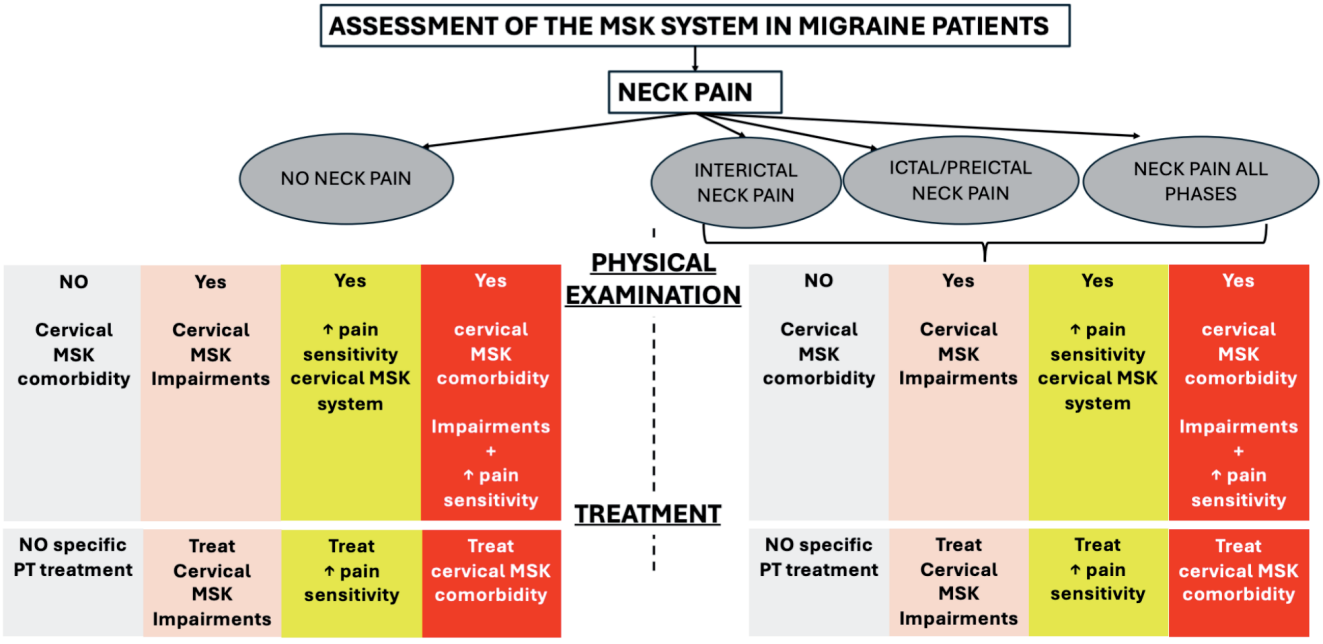
The role of neck pain in performing and interpreting cervical musculoskeletal assessment in migraine patients

The presence of cervical MSK comorbidities may or may not be associated with neck pain; indeed, between 32% and 56% of patients without cervical MSK comorbidities reported neck pain, (15,16) while approximately 30% of patients with cervical MSK comorbidities reported not having neck pain. (16) Neck pain is a primary symptom in migraine patients (67) and may be present in the preictal phase (being considered as a premonitory symptom) during the migraine attack or all phases of the migraine cycle. (68,69)

In migraine patients, neck pain could be related to cervical MSK comorbidities or to increased central sensitization mechanisms that characterize the migraine pathophysiology. (70) In the latter scenario, the increased pain sensitivity of the MSK system mediating neck pain is not due to a peripheral nociceptive stimulus from the cervical MSK system, but is rather a manifestation of central sensitization. In these cases, the patient usually complains of neck pain, yet the clinical examination of the cervical region reveals no MSK impairments.

Cervical MSK comorbidities and neck pain may occur together or independently. (26,48,49,71,72) Therefore, a detailed physical examination should be performed on migraine patients, regardless of whether neck pain is reported. Patients should be phenotyped into distinct subgroups according to: i) the presence and timing of neck pain (preictal/ictal neck pain, interictal neck pain, a combination of the previous, none of the previous); ii) the presence or absence of MSK impairments alone; ii) the presence or absence of increased MSK pain sensitivity alone; iv) the presence or absence of cervical MSK comorbidities: defined as concurrent identification of MSK impairment, local hyperalgesia, and referred pain (**Figure 4**). (14-16,48,70)

The authors propose that this classification should guide a physiotherapist's clinical reasoning and tailored management. When cervical MSK impairments are present in patients both with and without neck pain, treatment should involve specific physiotherapy interventions such as manual therapy and exercises, to address the identified impairments. Specific exercises



MSK, musculoskeletal; PT, physiotherapy.

Figure 4. The role of neck pain in performing and interpreting cervical musculoskeletal assessment in migraine patients.

of cranio-cervical muscles may be used to improve muscle function, (73,74) while manual therapy techniques and mobilization exercises can be used to restore neck mobility. (75-77)

Conversely, if only increased pain sensitivity of the MSK system is present (independent of neck pain), the physiotherapy approach should involve non-specific manual techniques and exercises, performed to treat the pain system to increase its tolerance. It has been demonstrated that manual therapy techniques targeting the cervical spine have a hypoalgesic effect, increasing the pain threshold of the cervical MSK system (75,78-80) and reducing sensitisation mechanisms of the TCC in migraine patients. (81,82) Additionally, exercises targeting the neck and shoulder muscles have also been shown to increase the pain threshold across the cervical MSK system. (83,84) However, as neck exercises performed to the point of fatigue may induce a subsequent migraine attack in approximately 40% of migraine patients, (27) caution should be taken while prescribing and dosing neck exercises in migraine patients. Overall, when applying mechanical stress (manual therapy or exercise) to modulate the pain system and enhance its tolerance, clinicians should carefully titrate the intensity and the duration of the stimulus to avoid exacerbating the patient's symptoms. Treatment should therefore be individualized according to the phase of the migraine cycle and the patient's overall level of sensitization. It must be acknowledged that patients currently experiencing an attack, those in a premonitory phase, or those with higher baseline levels of sensitization may have reduced tolerance for mechanical loading.

When a combination of cervical MSK impairment and increased pain sensitivity (cervical MSK comorbidities) is found, both aspects should be addressed. Finally, if neither cervical MSK impairments nor increased pain sensitivity of the MSK system is present, regardless of the presence of neck pain, specific physiotherapy interventions are not indicated (**Figure 4**). However, even in this scenario, physiotherapy can benefit patients through self-management strategies, education, lifestyle management, and physical activity.

Implications for clinical management

The role of physiotherapy in migraine management is to identify cervical MSK comorbidities and modify the vicious cycle described in **Figure 1** and prevent its (re)occurrence. Even if the migraine attack appears to be the "cause" of cervical MSK comorbidities, an intervention specifically aimed at addressing them is required once they are established. It has been shown that the pharmacological treatment used to manage migraine has no effect on cervical MSK comorbidities. (75,80) Conversely, physiotherapy interventions have been shown to reduce these comorbidities (75,78,80,85) and exert a positive effect on migraine symptomatology. (9-12) Physiotherapy intervention for migraine patients should be multimodal and individualized. Different treatment approaches, such as pain science education, manual therapy, and exercise, should be integrated to maximise the therapeutic effect. (86,87) The decision on which specific techniques to apply for each patient should be guided by the examination results, tailoring the approach to the specific profile of the individual (**Figure 4**). (34)

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