

## INTRODUCTION

Headache is both a symptom and a disorder in its own right, hence classification of headache is important to ensure that correct treatment is administered (Dodick, 2010). The International Headache Society (IHS) has broadly classified headache as primary where there is no other causative factor, or secondary where the headache occurs in close temporal relationship to another disorder to which it is attributed (*The International Classification of Headache Disorders*, 2004). Cervicogenic headache (CGH) is one form of secondary headache, which arises from disorder of the cervical spine.

Current medical teaching indicates that each form of headache has a different pathological basis, the majority of which does not have a musculoskeletal cause (Dodick, 2010). Hence, it is critical that the individual presenting for treatment has their type of headache correctly identified. This is particularly important for the manual therapist's considering physical intervention for headache, where such intervention is unlikely to be effective for disorders other than those affecting the musculoskeletal system (Hall, 2011).

Mechanisms underlying CGH are those of convergence of afferent input from the upper three cervical segments with input from trigeminal afferents in the trigeminocervical nucleus (Bogduk & Govind, 2009). Hence input from sensory afferents in the cervical spine may be mistakenly perceived as pain in the head (Bogduk & Govind, 2009). Classification of headache disorders based on patient-reported symptoms and history is problematic owing to the overlap of features between CGH and migraine and other headache forms. Headache classification is therefore based on physical examination. The cervical flexion-rotation test (FRT) has been found to be a useful test to discriminate CGH from migraine or mixed headache forms (Hall et al., 2010a). The positive cut-off point is 32°–33° (Hall et al., 2010b, 2010c; Ogince et al., 2007). An MRI study revealed that a positive test primarily indicates limitation of movement at the C1/2 level (Takasaki et al., 2011). The degree of limitation on this test has been shown to correlate with the severity, frequency and duration of headache symptoms (Hall et al., 2010b), as well as being independent of other physiological and lifestyle factors (Smith et al., 2008). Consequently, the test has utility regardless of the age, gender or lifestyle of the person tested. Further study is required to identify the FRT's sensitivity to change as an outcome measure.

In the presence of a positive FRT, a C1/2 self-SNAG can be applied as a treatment technique to attempt to restore normal ROM and reduce symptoms. However, if a patient presents to the clinic experiencing a CGH at the time of consultation and has a positive FRT, then a trial of headache SNAG, reverse headache SNAG, or upper cervical traction should be administered first. On subsequent visits, if symptoms are reduced but the FRT remains positive, then a C1/2 self-SNAG should be considered at that point.

## Levels of evidence

### Level 2: four RCTs and one case report

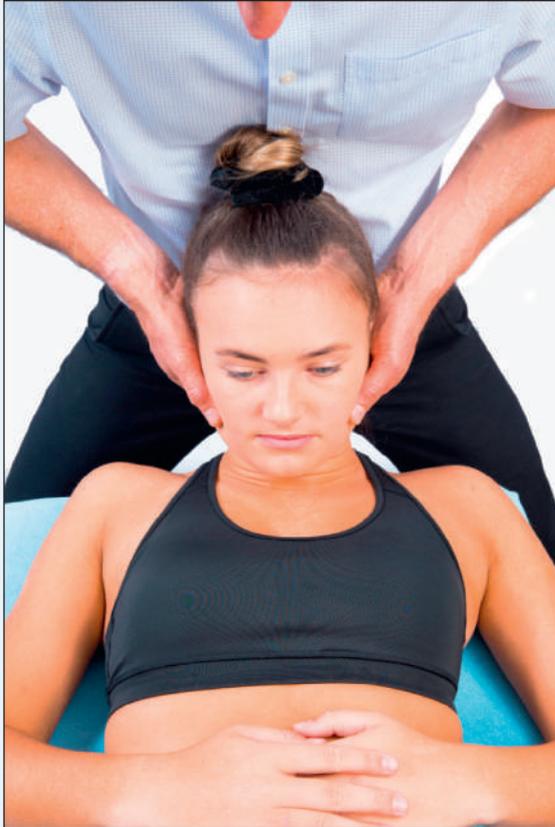
The available evidence suggests that application of the SNAG technique improves cervical ROM in patients with CGH and positive FRT. The application of a self-SNAG to people with chronic CGH and a positive FRT was shown to be superior to a placebo treatment in a randomised controlled trial (RCT) (Hall et al., 2007). Hall and colleagues (Hall et al., 2007) showed that when compared with the placebo the self-SNAG improved range recorded during the FRT by 10° (95% confidence interval (CI): 4.7–15.3°) immediately after application and that at 12 months the treated group were 22 (13–31) points superior on the headache severity index (baseline headache severity index approximately 54/100). When investigating the effectiveness of different types of manual therapy techniques in information technology professionals with a positive FRT and CGH, Neeti (2017) also reported a  $9.3^{\circ} \pm 2.1$  improvement in cervical ROM in the group who received SNAG treatment. Such improvement was significantly superior to that of the group that received Maitland treatment ( $6.6^{\circ} \pm 1.6$ ) and of the control group ( $2.9^{\circ} \pm 1.0$ ) after 1 week of treatment.

Similarly, Shin and Lee (2014) demonstrated a significant reduction in pain (VAS 27.12 mm+14.66), Neck Disability Index (NDI) (3.20+1.39) and headache duration (3.20+1.39) after 4 weeks of treatment in patients who received SNAG treatment compared with the control group who received a placebo SNAG treatment. An RCT comparing the efficacy of C1–C2 SNAG with posterior anterior vertebral mobilisations (PAVMs) in the management of cervicogenic headaches revealed superior outcomes after the sixth treatment session for patients who received the SNAG treatment (Khan et al., 2014). Khan and colleagues (Khan et al., 2014) demonstrated that the group who received SNAG treatment had a 20% greater reduction in the NDI compared with the PAVMs group. The reduction in pain, assessed through the visual analogue scale (VAS), for the SNAG group was 15.5% greater than that perceived by the PAVMs group (Khan et al., 2014).

## FLEXION–ROTATION TEST

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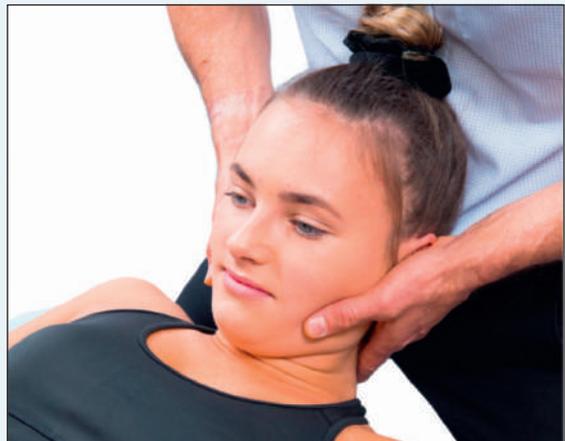
### TECHNIQUE AT A GLANCE



**Figure 1.1**  
Flexion–rotation test: start position



**Figure 1.2**  
Flexion–rotation test: normal end range



**Figure 1.3**  
Flexion–rotation test: side view

- The patient lies supine with shoulders level with the end of the plinth.
- The patient's head is supported by the therapist's abdomen.
- The therapist passively carefully moves the patient's neck into end-range flexion, translating the head forwards.
- The patient's head is held in this position and then passively rotated to each side and the range recorded.
- See [Figs 1.1–1.3](#).

**INDICATION**

Headache of possible cervical spine origin or upper cervical symptoms.

**POSITIONING**

<b>Patient:</b>	Lying supine, shoulders level with the end of the couch.
<b>Treated body part:</b>	Relaxed end-range cervical spine and upper thoracic spine flexion.
<b>Therapist:</b>	Standing at the head of the patient facing their feet with the patient's head supported on the therapist's abdomen.
<b>Hands/contact points:</b>	The therapist maintains end-range cervical spine flexion with hand contact on each side of the mandible together with forward pressure applied through the therapist's abdomen.

**APPLICATION GUIDELINES**

- End-range flexion is essential to apply the test.
- At end-range cervical spine flexion and with the head translated forwards, cervical rotation to the left and right is noted. Make sure rotation of the head/neck is as pure as possible and no lateral flexion is allowed.
- The end point is either resistance or pain, whichever comes first.
- The normal range is on average 44° to each side (Hall & Robinson, 2004).
- An estimation of loss of range more than 10° confirms a positive test (Hall & Robinson, 2004; Schäfer et al., 2018).
- When using a compass goniometer, the positive cut-off point is 32° with a mean positive predictive value of 86% (Ogince et al., 2007).
- The degree of limitation is correlated with the severity of the headache symptoms (Hall et al., 2010c).
- Typically range is restricted towards the side of the headache. However, in approximately 20% of cases the limitation may be to the opposite side of the headache.
- Range may be limited to both sides.

**VARIATIONS**

- The FRT may be performed actively in a seated position (Amiri et al., 2003); however, the validity of this test variant to measure upper cervical impairment has not been determined and the ROM is known to be different to that determined in supine (Bravo Petersen & Vardaxis, 2015). The supine position is also preferred because of the ease of measuring ROM, and potentially there will be less stress on the neuromeningeal system in a supine position.

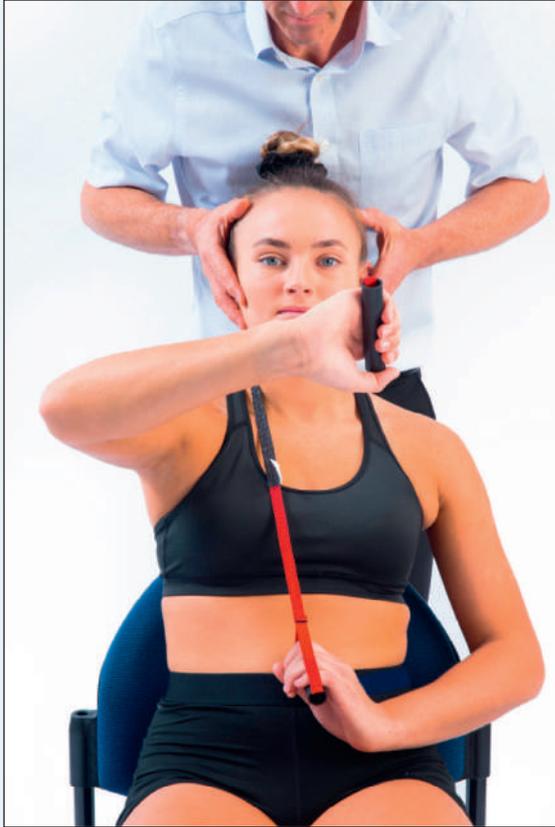
**COMMENTS**

- Ensure that there is no axial compression force applied through the patient's head/neck. Translate the head/neck forwards, but don't lean down on the head. The purpose of holding the neck in flexion is to constrain movement to only the C1/2 vertebral level (Takasaki et al., 2011). Failure to maintain the end-range flexed position may give a false-negative finding, as movement may occur at other cervical levels.
- The ROM is much greater in children. In general there is on average 9° greater range to each side in children between the ages of 6 and 12 years (Budermann et al., 2016). However, the FRT can still be used to identify asymmetry in those children who suffer from CGH (Budermann et al., 2013).
- In the presence of a sensitised neuromeningeal system, it is advisable to perform the FRT with the patient's knees flexed to 90°.
- ROM during the test may be impacted by the presence of temporomandibular dysfunction (Grondin et al., 2015; von Piekartz & Hall, 2013).

## C1/2 SELF-SNAG

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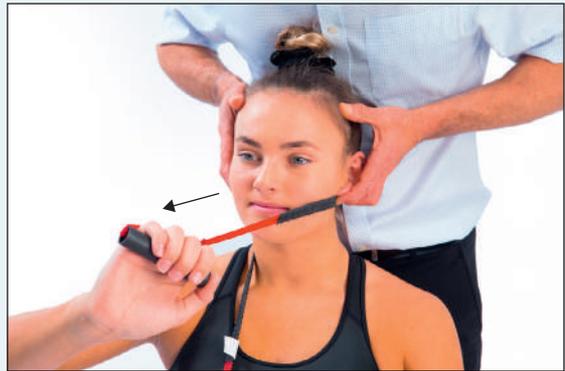
### TECHNIQUE AT A GLANCE



**Figure 1.4**  
C1/2 self-SNAG: start position



**Figure 1.5**  
C1/2 self-SNAG: end-range position



**Figure 1.6**  
C1/2 self-SNAG: side view

- The patient sits in a chair with their back supported.
- The patient places a self-SNAG strap on the posterior arch of C1, below the mastoid process on the contralateral side of the restriction.
- With the hand on the side of the restriction, the patient pulls the strap horizontally forwards to the corner of their mouth.
- While the strap pressure is sustained, the patient rotates the head/neck towards the restricted side.
- Apply over-pressure only if symptom-free at end range.
- See [Figs 1.4–1.6](#).

**INDICATION**

Headache, neck pain or restriction of C1/2 rotation, together with a unilateral or bilateral restriction on the FRT.

**POSITIONING (See Figs 1.4–1.6)**

<b>Patient:</b>	Sitting with their back supported against a hard-backed, upright chair.
<b>Treated body part:</b>	Relaxed neutral position of the head and neck. For a right rotation restriction, the patient holds one end of the self-SNAG strap with their right hand. The left elbow hooks over the back of the chair to stabilise the trunk and prevent trunk rotation. The left hand holds the opposite end of the strap loosely, with the left hand resting on the abdomen.
<b>Therapist:</b>	Standing behind the patient's left shoulder.
<b>Hands/belt contact points:</b>	Position the cervical strap immediately below the left mastoid process of the occiput. The strap should be directed horizontally forward, towards the corner of the patient's mouth. The strap lies on the posterior arch of C1 and then angles around the right side of the neck, and is held loosely by the patient with their left hand on their abdomen.  The therapist directs the patient to ensure that the strap is in the correct position and the direction of force is maintained during the movement.

**APPLICATION GUIDELINES**

- Prior to applying the technique, the patient is advised about what to expect.
- The patient should feel a strong stretching sensation, but there should be no pain or other symptoms.
- The patient pulls on the strap with their right hand in a horizontal direction towards the corner of their mouth (Figs 1.4–1.6). The patient provides a gentle counterforce pressure with the left hand on the other end of the strap. At the same time the patient will actively rotate their head towards the right for a positive FRT to the right side. At the end of range of rotation the therapist, or as a home exercise a trusted family member, will apply gentle over-pressure to the rotation movement while the patient maintains force along the strap. The over-pressure is maintained for 1–2 seconds before the patient returns the head and neck to the neutral position.
- On the first occasion it is advisable to perform the movement only 2 times, and on subsequent visits increased repetitions can be used, but only if 2 repetitions do not produce lasting headache relief. The technique is repeated as a home exercise in the morning and evening.
- The patient is advised that no symptoms should be provoked during the technique. In addition, this technique would be contraindicated in the presence of vertebrobasilar artery insufficiency or craniocervical ligament instability. The therapist should be familiar with routine testing procedures for vertebrobasilar artery insufficiency and craniocervical ligament stability.
- Very occasionally the patient may feel dizziness soon after the first application of the technique. In that case it is advisable to treat the dizziness using the techniques described in Chapter 2 of this book (p. 45). This may be caused by a sudden increase in range at the C1/2 level. Hence, following a C1/2 self-SNAG to the right, as in this example, it would be advised to trial a right side C1 unilateral SNAG with right rotation as the first option to relieve dizziness.

(continued next page...)

## VARIATIONS

- Rather than using the self-SNAG strap, it is also possible to use the selvage edge of a towel to perform the C1/2 self-SNAG (see Fig. 1.7). Alternatively, it is also possible for the therapist to use their thumbs to exert pressure on the C1 transverse process, on the contralateral side (see Chapter 2, C1 dizziness technique, p. 45). A strap or towel is preferred, as the patient will gain optimal benefit from self-treatment, both at the time of treatment and also in the event of later recurrence.



**Figure 1.7**  
Towel C1/2 self-SNAG

## COMMENTS

- If the patient presents with significant symptoms on the day of treatment, it is preferable not to use the C1/2 self-SNAG. Rather, the patient should be treated using the other headache techniques in this chapter.
- On occasions the patient may report pain or other symptoms if the strap is not located correctly, or if the angle of the strap is inappropriate. In this case, reposition the strap and correct the angle of force. If pain or other symptoms persist then stop the technique.
- The technique may induce a mild headache in the evening that the technique is first applied. It is advisable to warn the patient of this potential. If headache symptoms are aggravated by the technique on subsequent days then the patient is advised to stop doing the exercise and return for evaluation by the therapist.
- In the situation where there is bilateral restriction, the mobilisation technique is best applied to the most restricted side first and then if required to the other side after the first occasion.
- This technique has been shown to be very efficacious when compared with a placebo treatment in a clinical trial with 12-month follow-up (Hall et al., 2007). There have been three other RCTs showing the benefits of this technique over other forms of treatment including Maitland mobilisation and neck motor control exercises (Khan et al., 2014; Nambi et al., 2014; Neeti, 2017).

## ANNOTATIONS



- sit C1 self belt SNAG Rot R×2
- sit C1 self belt SNAG Rot R +OP(therapist)×2
- sit C1 self belt SNAG Rot R +OP(partner)×2
- sit C1 self towel SNAG Rot R×2

# HEADACHE MWM

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## TECHNIQUE AT A GLANCE



**Figure 1.8**  
Headache MWM: start position



**Figure 1.9**  
Headache MWM: end position



**Figure 1.10**  
Headache MWM: bone view

- The patient sits in a chair with their back supported.
- The therapist places their left thumb on the posterior arch of C1, below the mastoid process on the ipsilateral side of restriction. The medial edge of the right thumb contacts the left side of the spinous process of C2.
- Forward pressure is exerted on C1 with counterforce against the spinous process.
- While the pressure is sustained, the patient rotates the head/neck towards the restricted side.
- Apply over-pressure only if the patient is symptom-free at end range.
- See [Figs 1.8–1.10](#).