Manual therapy in headache

活水神經內科診所
謝鴻偉物理治療師

Outline of presentation

(1) Definition of CGH and TTH

(2) Physical impairments and examinations of CGH and TTH

1.Forward head posture & upper crossed syndrome

2.Articular impairments

3.Muscular impairments — Myofascial dysfunction and muscular imbalance

(3) Proposed mechanisms of manual therapy for treating headaches

Mobilization and spinal manipulative therapy (SMT)

(4) Review researches about manual therapy in headaches

(5) Adverse effects of spinal manipulation

(6) conclusion

(1)Definition of CGH and TTH

Definition of CGH

1. The term cervicogenic headache was first introduced by Sjaastad et al.(1983). The definition of cervicogenic headache is described as “referred pain perceived in any region of the head caused by a primary nociceptive source in the musculoskeletal tissues innervated by the cervical nerves.” (Alix,1999)
2. Sources of this pain lie in the structures innervated by the C1-C3 spinal nerves and include the : (Bogduk , 2001)
   ◎upper cervical synovial joints, ligaments
   ◎muscles of the sub-cranial spine
   ◎discogenic (C2-C3)
   ◎pain-sensitive dura matter

Definition of CGH

3. Headache due to disorders of the cervical spine is more than a century old, but the underlying mechanisms, signs, symptoms and treatment are debatable.
4. The typical cervicogenic headache is unilateral provoked by neck movement, awkward head positions or pressure on tender points in the neck. It can last hours or days, with pain that is dull or piercing.
5. The most commonly accepted neurophysiological explanation is the convergence of the upper cervical roots on the nucleus caudalis of the trigeminal tract.
6. Most cases the CGH is caused by pathology in the upper cervical spine. Anesthetic blocks may be used to confirm the diagnosis and determine the source of pain in the neck.

(Antonaci F, et al, 2006)

Clinical characteristics of CGH

(J Am Osteopath Assoc. 2000)

- Unilateral head or face pain without sideshift; the pain may occasionally be bilateral
- Pain localized to the occipital, frontal,temporal or orbital regions
- Moderate to severe pain intensity
- Intermittent attacks of pain lasting hours to days, constant pain or constant pain with superimposed attacks of pain
- Pain is generally deep and nonthrobbing; throbbing may occur when migraine attacks are superimposed
- Restricted active and passive neck range of motion; neck stiffness
- Head pain is triggered by neck movement, sustained or awkward neck postures; digital pressure to the suboccipital, C2, C3, or C4 regions or over the greater occipital nerve; valsalva, cough or sneeze might also trigger pain
- Associated signs and symptoms can be similar to typical migraine accompaniments including:
  - nausea; vomiting;
  - photophobia, phonophobia, dizziness;
  - others include ipsilateral blurred vision, lacrimation and conjunctival injection or ipsilateral neck, shoulder or arm pain

Definition of TTH

1. Tension-type headache (TTH) is the most prevalent form of benign primary headache with a reported prevalence varying from 10% to 65%, depending on the classification, description, and severity of headache features.
2. The psychosocial impacts of TTH include disruptions of daily activities, quality of life & work and are accompanied by the costs of these disruptions.
3. The International Headache Society (IHS) characterizes TTH as bilateral headaches of mild-to-moderate intensity that experienced with an aching, tightening, or pressing quality of pain.
4. Headaches may last from 30 minutes to 7 days, are not accompanied by nausea or vomiting, and may have photophobia or phonophobia (but not both).

(Vernon H, 2009)

Definition of TTH

5. Headache frequency is classified as “episodic” ($<$15 headaches per month) or “chronic” ($>$15 per month).
6. Episodic TTH is by far the more prevalent category.
7. The chronic TTH patient has a higher frequency of both active and latent triggers points in the suboccipital mm.
8. The chronic TTH patient ***with active trigger points*** may have a greater headache intensity and frequency and forward head posture than those with latent trigger points.

(Vernon H, 2009)

Prevalence

	Cervicogenic headache	Tension-type headache
General population(%)	0.4%-2.5%	3%
Headache clinics (%)	15%-20%	40%
Mean age	42.9 y/o (all ages are affected)	Onset any age but most commonly during adolescence or young Adulthood
Gender	4x more prevalent in female (79.1% ♀ and 20.9% ♂)	88% female and 69% male
Other	CGH is a common symptom after neck trauma; 54%-66% of patients with whiplash-associated disorder	Chronic TTH commonly occur during periods of stress and emotional upset.
Intensity	Moderate to severe	Mild to moderate

(2)Physical impairments and examinations of CGH and TTH

1. Forward head posture & Upper crossed syndrome
2. Articular impairments
3. Muscular impairments

   Myofascial dysfunction and muscular imbalance

1.Forward head posture & Upper crossed syndrome

Upper Crossed Syndrome

- Upper crossed syndrome was originated by Vladimir Janda

→ the "Father of Czech rehabilitation".

- This is a typical posture produces overstress & muscle imbalance of the :
  - ◎thoracic kyphosis
  - ◎rounded shoulder
  - ◎flexion of the lower cervical spine (flattened normal lordosis curve)
  - ◎extension of upper cervical spine
  - ◎anterior head carriage (forward head posture)

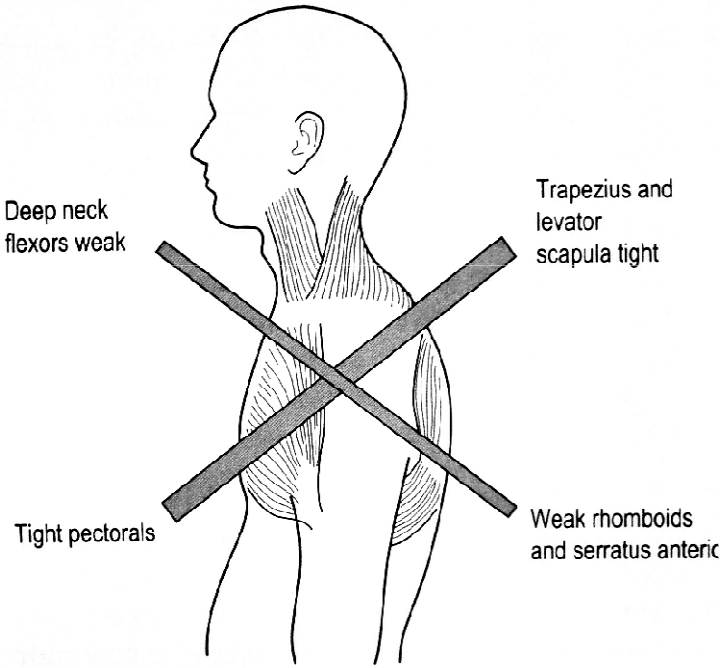
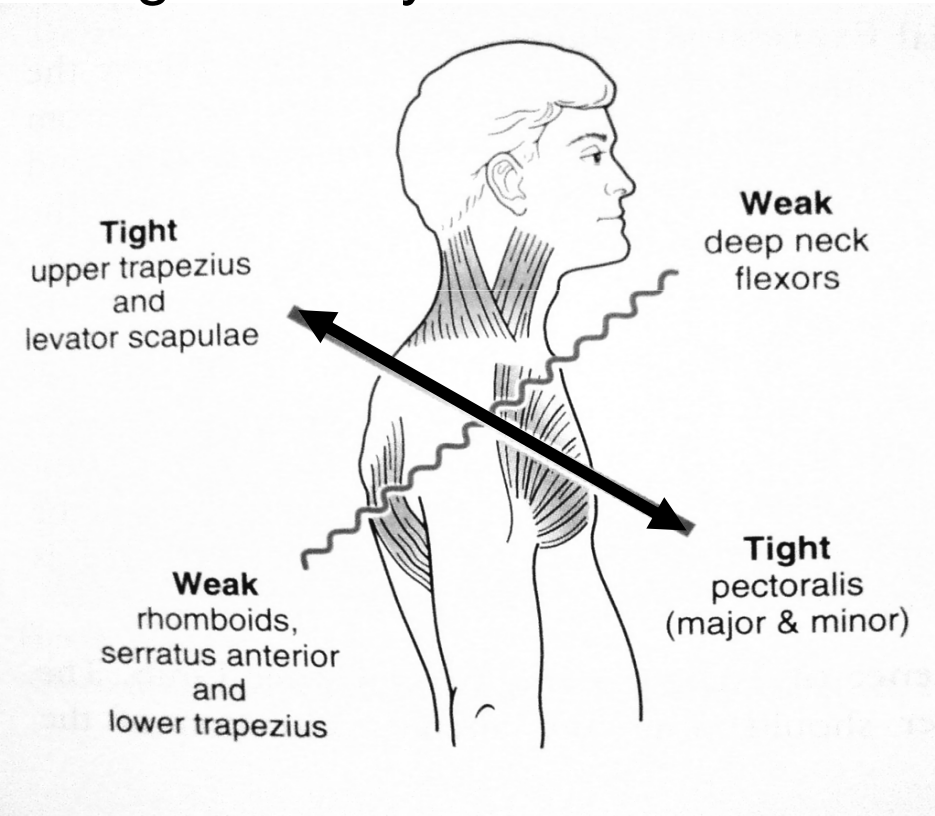


Figure 3.2 Upper (or shoulder) crossed syndrome. (From Chaitow 1996, with permission.)

Upper Crossed Syndrome

originated by Vladimir Janda



***Weak Muscles** (overstretched)*

1. Rhomboids
2. Serratus Anterior
3. Low/Mid Trapezius
4. Deep neck flexors

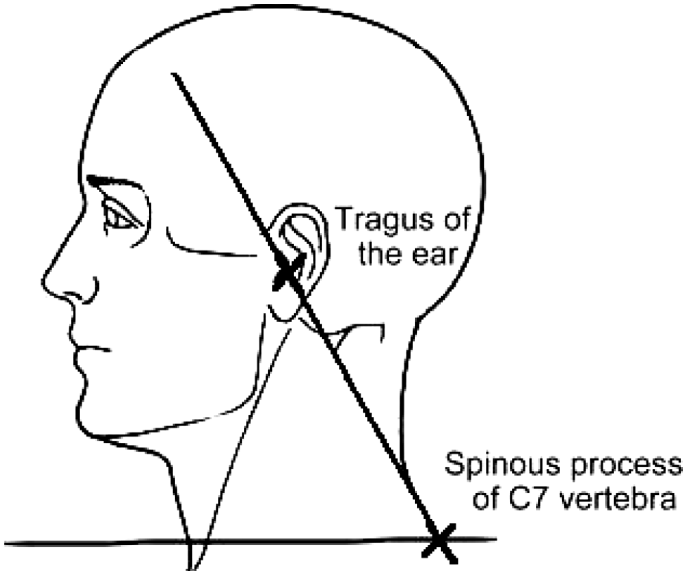
***Tight Muscles** (shortened)*

1. Pectoralis Major/minor
2. Levator Scapulae
3. Sternocleidomastoid
4. Upper Trapezius

Clinical assessment of FHP

craniocervical angle measurement

→smaller craniocervical angle indicates greater FHP.



TTH (Fernandez-de-las-Penas, 2006)	
	Mean C-C angle
Healthy sub.	54.1° ± 6.3°
Chronic TTH	45.3° ± 7.6°
CGH (Trott,1993)	
Healthy sub.	49.1° ± 2.9°
CGH	44.5° ± 5.5°

Forward head posture and CGH

Occiput and C1/2 hyperextend with the fattened lordosis →↓***craniocervical angle*** →↑Forward head posture (FHP)

--***trend to develop cervicogenic headache***.

a. facet joints dysfunction → abnormal afferent information affecting the tonic neck reflex → encourage gradual adaptation of forward head posture.

b. upper cervical extension →compression of craniocervical structures including greater & lesser occipital nerves, hance contributing to cervical headache. (Darnell,1983)

Forward head posture and TTH

--***trend to develop tension-type headache*** :

a. Simons et al.(1999) stated that postural abnormalities in the cervical spine might be responsible for the activation of myofascial trigger points in the neck muscles.

b. FHP can result in shortening of the posterior cervical extensor muscles (suboccipital, semispinalis, splenii, and upper trapezius) and active trigger points.

c. chronic TTH with active MTrPs in the SCM / suboccipital / scalene showed smaller craniocervical angle than with latent MTrPs. (Fernandez-de-Penas et al, 2006 & 2007)

2.Articular impairments

1. **Active screening movements**
2. **Passive Physiologic Intervertebral Movement tests (PPIVM)**
3. **Passive Accessory Intervertebral Movement tests (PAIVM)**

1. Nichoson G, Cervical Headache,JOSPT,2001;31(4):184-193
2. Shannon M et al, Articular and muscular impairments in cervicogenic headache: a case report, JOSPT, 2003;33:21-30
3. Tension-type headache and cervicogenic headache--pathophysiology, diagnosis, and management, Cesar Fernandez-de-penas et al,2009, p153-170

Active screening movements

1. Active screening movements for cervical ROM are performed for :

   Flexion / extension / lateral flexion / rotation.

2. Overpressure may be added to test end-feel.

   Headache patients have only minimal symptoms with active movements, the therapist may need to ***apply overpressure at the end of ROM*** to increase the localized stress to the upper/middle/lower cervical spine.

Active physiologic motion with overpressure (end-feel): (seated)

1. Manual overpressure for flexion of Upper/middle/lower cervical spine
   -- detect separation of spinal process

2. Manual overpressure for extension of U/M/L cervical spine
   -- detect approximation of spinal process

3. Manual overpressure for SB to R U/M/L cervical spine
   --detect resistance of R facet joint approximation and L side-flexors elongation (and then SB to L)

4. Manual overpressure for Rot. to L U/M/L cervical spine
   (and then Rot. to R)

5. Rotation in full flexion test--manual overpressure for Rot. to L for C1-2
   (and then Rot. to R)

Passive Physiologic and Accessory Intervertebral Movement tests (PPIVM & PAIVM)

1. Upper cervical joints are examined with passive physiologic and accessory movement tests (PPIVM & PAIVM) for the **amount and quality of movement** and **reproduction of symptoms**.

2. During the examination movements :

◎Patient is continually questioned about symptom response.

→***whether or not pain or symptom is reproduced or intensified***

◎ The available ROM is evaluated for quantity and quality.

◎ Abnormal resistance or end-feels are noted.

Passive Physiologic and Accessory Intervertebral Movement tests (PPIVM & PAIVM)

3. PAIVMs are the most important tests for implicating the cervical spine as contributing to headache.

   Therapist should continuously analyze the behavior of tissue resistance and symptoms with any examination procedure. (Hanten et al. 2002)

4. As segmental mobility increased through the course of manual treatment, the accessory movements become less provocative. (Shannon M,JOSPT,2003)

Passive Physiologic Intervertebral Movement tests (PPIVM) (supine)

(1) C0-1

Flexion / Extension —

feel the post./ant. gliding of mastoid on C1 TP

Lateral flexion to L —

feel the separating on the right side and a translatory movement of C1 to left. (then lateral flexion to R)

(2) C1-2

Rotation in full flexion test —

manual overpressure for Rot. to L of C1 on C2. (then Rot. to R)

(3) C2-3

Side-shift to L under flexion —

detect opening movement of L C2-3 facet joint) (then side-slide to R)

Side-shift to L under extension —

detect closing movement of R C2-3 facet joint (then side-slide to R)

Passive Accessory Intervertebral Movement tests (PAIVM)

(1) C1

1. Transverse pressure on the tip of the TP of C1
2. Central PA pressure on the tip of the SP of C1
3. Unilateral PA pressure on the Articular pillar of C1

(2) C2

1. Central PA pressure on the SP of C2
2. Unilateral PA pressure on the L Articular pillar of C2 (then R)
3. Unilateral PA pressure on the R Articular pillar of C2 in 30° Rot. to R

→ differentiate C1-2 from C2-3 dysfunction

3.Muscular impairments

1. Trigger points
2. Muscle length (flexibility)
3. Muscle strength
4. Muscle imbalance

Muscular impairments

1. Common trigger points associated with headaches are located in the upper trapezius, SCM, masseter, temporalis, suboccipital and other muscles of the face and neck.
2. The muscles are examined for ***trigger points*** by direct palpation when possible. Refer to ***Travell and Simons*** for detail about pain reference zones for each muscle.
3. The myofascia is also examined as an indirect contributor to headache symptoms by assessing ***length*** and ***strength***. Imbalances of muscle length and strength may create mechanical stress on other pain sensitive tissues.
4. Physiologic mobility is used to test muscle length. It is often difficult to discern muscle from capsular tightness, and they may coexist. Generally, the muscles are not well placed to limit joint glide, so comparing accessory movement to physiologic movement may help ***differentiate muscle and joint restrictions***.

Muscular impairments—
Altered motor control strategy

5. The ***craniocervical flexion test*** (CCF test) (Jull,1999) is designed to provide a clinic indicator of impaired activation of the deep cervical flexor muscles.
6. Several studies have demonstrated an ***altered motor strategy*** when patients with CGH perform the clinical CCF test, and greater activation of the SCM muscle has been observed.
7. Patients with Chronic TTH also showed reduced holding capacity of the deep neck flexor muscles as assessed with CCF test.

   (Zito et al.,2006 ; Jull et al., 2007)
8. Low-load therapeutic exercise emphasizing motor control rather than muscle strength are advocated for an effective management of patients presenting with CGH &TTH.

   (Jull, 2004 ; Fernandez, 2008)

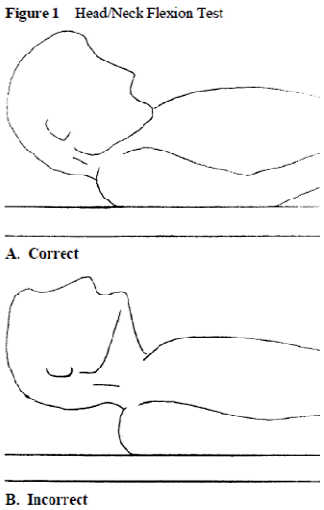
"***Muscle imbalance***" should be taken into consideration (Janda,1983)

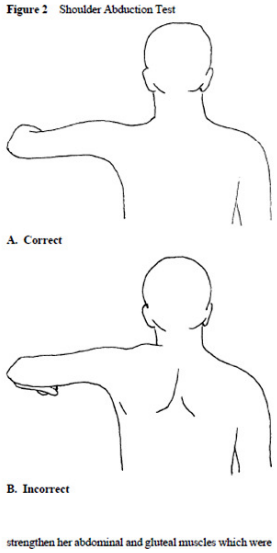
- The quality of muscle function was evaluated through
  1. head/neck flexion
  2. shoulder abduction
  3. push up tests

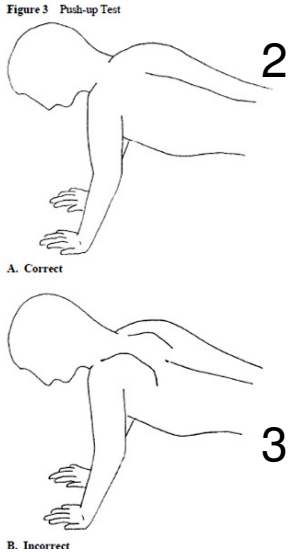
  (Janda V. Muscle Function Testing. London: Butterworth,1983)

- The purpose of these tests is to *detect abnormal movement patterns* indicating muscle imbalance.

Detect abnormal movement patterns indicating muscle imbalance







1. **Head/neck flexion** -- POSITIVE chin poking indicates tight SCM and suboccipitals and inhibited deep neck flexors (Figure 1).
2. **Shoulder abduction test**--POSITIVE shoulder elevation or rotation prior to 60 degrees abduction indicates overactive upper trapezius and/or levator scapulae and inhibited lower scapular stabilizers (Figure 2)
3. **Push-up test** -- POSITIVE winging of the scapula indicates inhibited serratus anterior and tight pectoralis muscles (Figure 3).

Myofascial Trigger Point Examination

TrP diagnosis was performed following the diagnostic criteria described by Simons et al (1999).

(1) Presence of a palpable taut band in a skeletal muscle.

(2) Presence of a hypersensitive tender spot in the taut band.
(via ***flat palpation / pincer palpation***)

(3) Local twitch response (LTR) ("jump" sign) elicited by the ***snapping palpation*** of the taut band, and/or needling of the MTrP (Hong, 1994).

(4) Reproduction of the typical referred pain pattern of the TrP in response to compression.

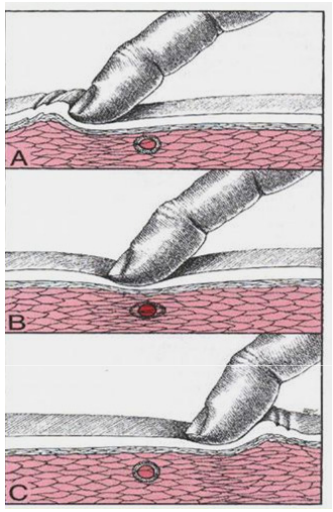
(5) Others
restricted range of motion (ROM) of the affected tissues;
muscular fatigue and autonomic phenomena.

Myofascial Trigger Point Examination

Active TrP -- subject recognized the evoked referred pain as familiar, ie, similar to the sensations that he/she was used to perceive.

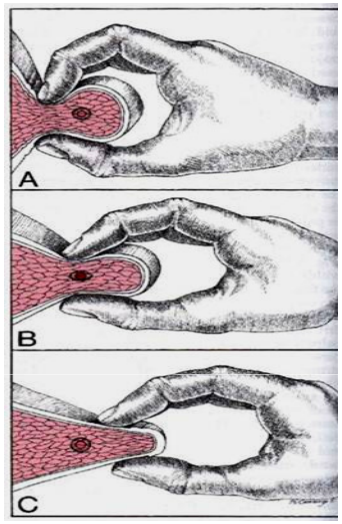
Latent TrP -- subject did not recognize the evoked referred pain as a familiar pain.

Palpation for identify MTrPs



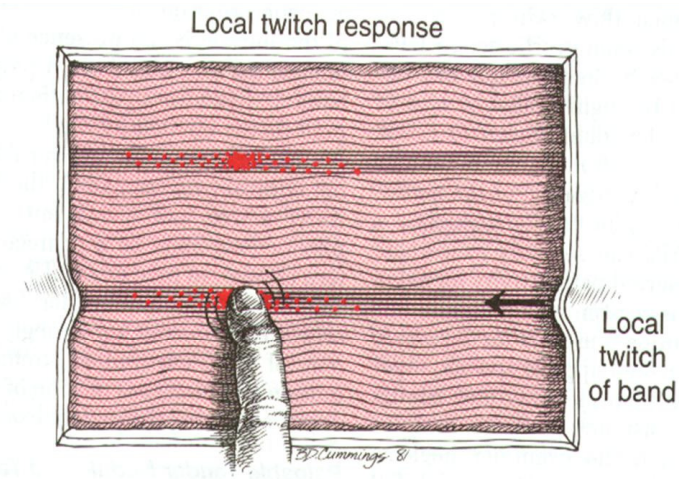
Flat palpation

(against underlying bone)



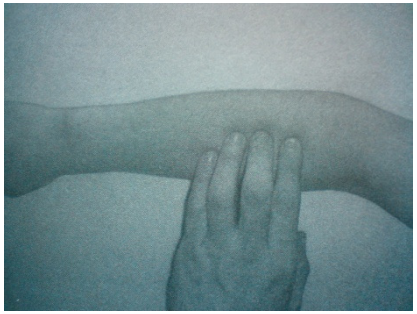
pincer palpation

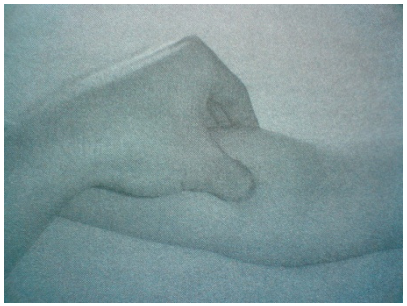
(m. rolled between finger tips)

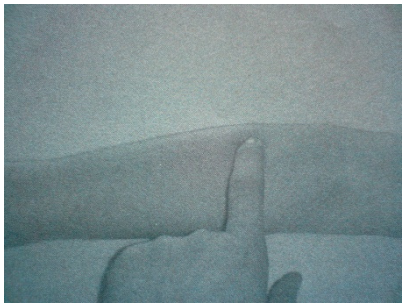


snapping palpation

(move the fingertip back & forth)







Testing of muscle flexibility

1. Sternocleidomastoid (SCM)
2. scalenes
3. pectoralis major / minor
4. suboccipital
5. levator scapulae
6. upper trapezius

Testing of muscle strength

1. Deep neck flexor
2. Serratus anterior
3. Rhomboid muscle
4. Middle/lower trapezius

(3)Proposed mechanisms of manual therapy for treating HA

Basic concepts

1. Manual therapy has become a popular choice for patients with common and benign forms of headaches, such as CGH & TTH, because these two conditions are often associated with ***mechanical neck pain ,*** they are commonly seen by clinicians who treat the spine, rather than those who treat headache. (Haldeman & Dagenais,2001)

2. The manipulable lesion, or "***somatic dysfunction***", characterized by the palpatory discrimination of tissue texture changes, abnormalities (swelling, edema), limitation of movement, asymmetry, and tenderness. (Greenman, 2003)

Barrier concepts & Grades of joint mobilization

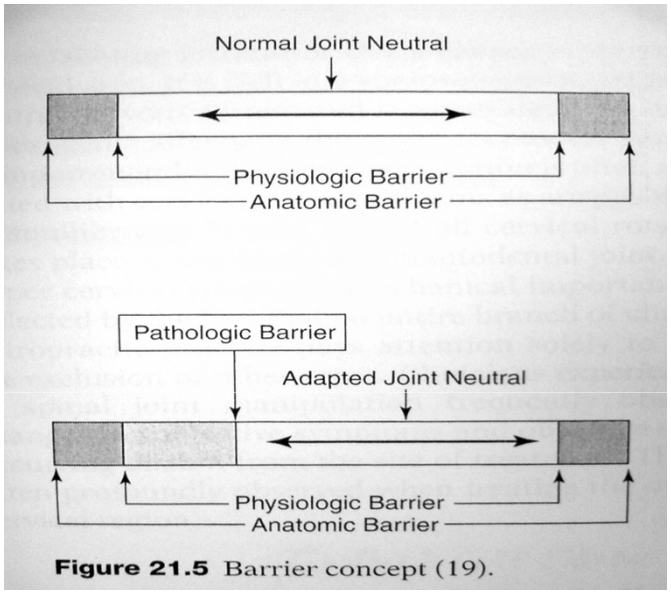
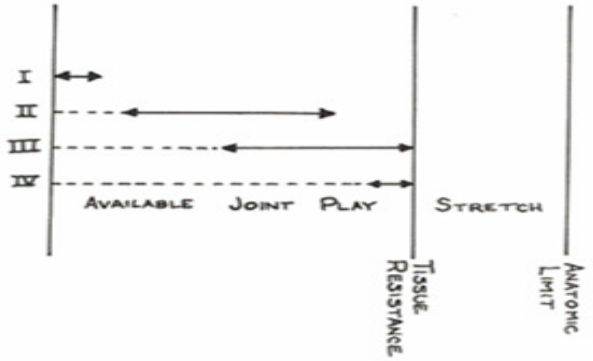


Figure 21.5 Barrier concept (19).



Mobilization

(Maitland's grades of oscillatory mobilization)

- ***Grade I*** : Small amplitude movement performed at the beginning of the range.
- ***Grade II*** : Large-amplitude movement performed within the range but not reaching the limit of the range.
- ***Grade III*** : Large amplitude movement performed up to the limit of the range.
- ***Grade IV*** : Small amplitude movement performed at the limit of the range .

Manipulation

(non-oscillatory motion)

- ***Grade V*** : High velocity low amplitude (HVLA) thrust performed at the limit of the range.

Mechanism of spinal manipulation

(1) Mechanical effects

1.Intra-articular effects

a. joint gapping (cavitation)

b. releasing entrapped synovial folds / plicae /meniscoids

c. disruption of intra-articular adhesion

2.Extra-articular effects

→stretching and disruption of peri-articular adhesion.

(2) Neurophysiological effcets

1.Neuromuscular effects

2.Hypoalgestic effects

Soft tissue mobilization techniques

- Massage
- Stretch and spray
- Muscle Energy Technique
- Myofascial release
- ischemic compression (Deep pressure massage)
- Transverse friction massage

(4) Review researches about manual therapy in headaches

Spinal manipulation vs. amitryptyline for the treatment of CTTH—A RCT (Bonline,1995)

■Objective:

To compare the effectiveness of spinal manipulation and pharmaceutical treatment (amitriptyline) for chronic tension-type headache.

■Design:

The study consisted of a 2-wk baseline period, a 6-wk treatment period and a 4-wk post-treatment, follow-up period.

■Patients:

150 patients between the ages of 18 and 70 with a diagnosis of tension-type headaches of at least 3 months' duration at a frequency of at least once per wk.

■Interventions:

6 wk of spinal manipulative therapy provided by chiropractors or 6 wk of amitriptyline treatment managed by a medical physician.

■Main Outcome Measures:

Change in patient-reported daily headache intensity, weekly headache frequency, over-the-counter medication usage and functional health status (SF-36).

(Journal of Manipulative and Physiological Therapeutics. 1995; 18 (3): 148-154.)

Spinal manipulation vs. amitryptyline for the treatment of CTTH—A RCT (Bonline,1995)

Result

1. During the treatment period, both groups improved at very similar rates in all primary outcomes.
2. In relation to baseline values at 4 wk after cessation of treatment, the spinal manipulation group showed a reduction of 32% in headache intensity, 42% in headache frequency, 30% in over-the-counter medication usage and an improvement of 16% in functional health status.
3. By comparison, the amitriptyline therapy group showed no improvement or a slight worsening from baseline values in the same four major outcome measures. Controlling for baseline differences, all group differences at 4 wk after cessation of therapy were considered to be clinically important and were statistically significant.
4. Of the patients who finished the study, 46 (82.1%) in the amitriptyline therapy group reported side effects that included drowsiness, dry mouth and weight gain. Three patients (4.3%) in the spinal manipulation group reported neck soreness and stiffness.

(Journal of Manipulative and Physiological Therapeutics. 1995; 18 (3): 148-154.)

Spinal manipulation vs. amitryptyline for the treatment of CTTH—A RCT (Bonline,1995)

■Conclusion

1.Spinal Manipulation is an effective treatment for Tension Headaches.

2.Amitriptyline was slightly more effective in reducing pain at the end of the treatment period but was associated with more side effects.

3.four weeks after the cessation of treatment, the patients who received SMT experienced a sustained therapeutic benefit in all major outcomes in contrast to patients that received amitriptyline, who reverted to baseline values.

4.The sustained therapeutic benefit associated with SMT seemed to result in a decreased need for over-the-counter medication.

(Journal of Manipulative and Physiological Therapeutics. 1995; 18 (3): 148-154.)

SMT in the treatment of ETTH

A Randomized Controlled Trial (Bove/Nilsson,JAMA,1998)

- Bove and Nilsson assessed whether the addition of SMT to soft tissue therapy would improve outcomes of ETTH.
- There were 2 tx groups. (26 men & 49 women/ 20-59y/o)

  ◎Deep friction massage with SMT (manipulation group)

  ◎Deep friction massage with placebo laser tx. (control group)

  →***Both groups had similar results***.
- The study did not look at SMT alone therefore it can not support or refute the efficacy of SMT as a separate therapy.
- Conclusion

  SMT, when combined with soft tissue massage, is no better that soft tissue therapy alone for ETTH.

(Journal of the American Medical Association 1998;280(18):1576-1579.)

Chiropractic and medical prophylactic treatment of TTH— A RCT, placebo-controlled (Vernon,2009)

■Objectives:

Only 2 clinical trials of spinal manipulation for adult tension-type headache have been reported, neither of which was fully controlled. In 1 trial, spinal manipulation was compared to amitriptyline. There is an urgent need for well-controlled studies of chiropractic spinal manipulation for TTH. This trial was stopped prematurely due to poor recruitment.

■Methods:

A randomized clinical trial was conducted with a factorial design in which adult TTH sufferers with more than 10 headaches per month were randomly assigned to 4 groups:

(1) real cervical manipulation + real amitriptyline,

(2) real cervical manipulation + placebo amitriptyline,

(3) sham cervical manipulation + real amitriptyline,

(4) sham cervical manipulation + placebo amitriptyline.

A baseline period of four weeks was followed by a treatment period of 14wks

(J Manipulative Physiol Ther 2009;32:344-351)

Chiropractic and medical prophylactic treatment of TTH— A RCT, placebo-controlled (Vernon,2009)

■Outcome measurement
headache frequency obtained from a headache diary in the last 28 days of the treatment period.

■Results:

1. 19 subjects completed the trial. In the unadjusted analysis, a statistically significant main effect of chiropractic treatment was obtained (–2.2 [–10.2 to 5.8], P = .03) which was just below the 3-day reduction set for clinical importance.
2. a clinically significant effect of the combined therapies was obtained (–9 [20.8 to 2.9], P =.13), but did not achieve statistical significance.

(J Manipulative Physiol Ther 2009;32:344-351)

Chiropractic and medical prophylactic treatment of TTH— A RCT, placebo-controlled (Vernon,2009)

3. In the adjusted analysis, neither the main effects of chiropractic nor amitriptyline were statistically significant or clinically important; however, the effect of the combined treatments was –8.4 (–15.8 to –1.1) which was statistically significant (P = .03) and reached our criterion for clinical importance.

■Conclusion:

1. Although the sample size was smaller than initially required, a statistically significant and clinically important effect was obtained for the combined treatment group.

2. ***The combination of chiropractic cervical manipulation and amitriptyline appears promising as a prophylactic treatment for TTH***.

(J Manipulative Physiol Ther 2009;32:344-351)

Spinal manipulative therapy for CGH

(Nilsson,1997)

- 53 subjects were chosen from 450 headache sufferers who fulfilled the IHS criteria for cervicogenic headache.
  1. 28 people received spinal manipulation twice weekly for 3 wks.
  2. 25 people received low-level laser in the upper cervical region and deep friction massage (including trigger points therapy) for the same treatment frequency (twice weekly for 3 weeks).

- Results
  1. ***Use of analgesics*** decreased by ***36%*** in the spinal manipulation group and was not changed in the soft tissue group.(p=.04)
  2. ***Headache hours per day*** decreased in the manipulation group by ***69%*** compared with 37% in the soft tissue group. (p=.03)
  3. ***Intensity of headache per episode*** decreased by 36% in the manipulation group and 17% in the soft tissue group.(p=.04)

(J Manipulative Physiol Ther 1997;5:326-331)

Spinal manipulative therapy for CGH

(Nilsson,1997)

■Conclusion

1. The manipulation group reported a 36 % decrease in headache intensity and a 69% decrease in headache duration.
2. ***spinal manipulation had a significant effect on cervicogenic headache***.

Exercise and manipulative therapy for CGH

--A randomized controlled trial (Jull G, 2002)

■ Background

Headaches arising from cervical musculoskeletal disorders are common. Conservative therapies are recommended as the first treatment of choice. Evidence for the effectiveness of manipulative therapy is inconclusive and available only for the short term.

There is no evidence for exercise, and no study has investigated the effect of combined therapies for cervicogenic headache.

(Spine ,2002; 27(17): 1835-1843)

Exercise and manipulative therapy for CGH

--A randomized controlled trial (Jull G, 2002)

- 200 cervicogenic headache participants randomized into 4 groups:
  1. Manipulative therapy:
     Maitland low-velocity mobilization and spinal manipulation
  2. Exercise therapy:
     Low -load endurance to train muscle control of cervicoscapular area. craniocervical flexion exercise using biofeedback with airfilled pressure sensor.
  3. Combined therapy (a + b)
  4. Control group: receive no physical therapy intervention.

- Outcomes [Post-treatment 6 weeks, 3 months, 6 months, 12 months]:
  1. Frequency.
  2. Intensity [VAS].
  3. Duration [hours].
  4. Neck pain [Northwick Park Neck Pain Questionnaire].

(Spine ,2002; 27(17): 1835-1843)

Exercise and manipulative therapy for CGH

--A randomized controlled trial (Jull G, 2002)

- Results:
  1. Each active intervention showed significant reduction in all measures
  2. Combined therapies not significantly superior to either therapy alone, but 10% more patients gained relief with the combination.
  3. Effect sizes were moderate and clinically relevant.

(Spine ,2002; 27(17): 1835-1843)

Exercise and manipulative therapy for CGH

--A randomized controlled trial (Jull G, 2002)

■ Discussion

1. The therapeutic exercise intervention was a new program. In contrast to strength training, this program used low load endurance exercises to *train muscle control of the cervicoscapular region*.

2. The muscles of the scapula, particularly the ***serratus anterior*** and ***lower trapezius***, were trained using inner range holding exercises of scapular adduction and retraction.

3. Craniocervical flexion exercises, performed in supine lying using biofeedback with airfilled pressure sensor, aimed to target the ***deep neck flexor*** (longus capitus and colli), which have an important supporting function for the cervical region.

(Spine ,2002; 27(17): 1835-1843)

Dose response for chiropractic care of CGH -- A Randomized Pilot Study (Haas M, 2004)

- 24 adults with chronic CGH reported to chiropractic practice
  —1/2 in college outpatient,1/2 in the community, fulfill IHS criteria
  — have a history of at least 5 CGHs / month, for a minimum 3 months
  1. Randomly allocated to 1,3 or 4 visits/wk over 3- week period.
  2. All patients received spinal manipulative therapy (HVLA).
  3. Chiropractors could apply up to 2 physical modalities at each visit, including heat and soft tissue therapy (including massage and trigger point therapy).
  4. Chiropractors could also recommend rehabilitative exercises, modifications of daily activities.
- Outcomes:
  1. 100-point Modified Von Korff (MVK) pain and disability scales. (lower scores indicate better health)
  2. Headaches in last 4 weeks.

(J Manipulative Physiol Ther 2004;27:547–553)

Dose response for chiropractic care of CGH -- A Randomized Pilot Study (Haas M, 2004)

■ Results:

Substantial benefit in pain relief for 9 and 12 treatments v.s. 3 visits:

1. At 4 weeks:
   a. decreased 13.8 for 3 visits/week.
   b. decreased 18.7 for 4 visits/week.
2. At 12-weeks follow-up:
   a. decreased 19.4 for 3 visits/week.
   b. decreased 18.1 for 4 visits/week.

■ Conclusion:

1. A large clinical trial on the relationship between pain relief and the number of chiropractic treatments is feasible.
2. This implies that more treatments may be required to achieve maximum benefit

(J Manipulative Physiol Ther 2004;27:547–553)

(5) Adverse effects of spinal manipulation

- **Is Cervical Spinal Manipulation Dangerous?**
- **Can these side effects be Predicted?**

Adverse effects of spinal manipulation

(Atchison,physical therapy,1999)

- The percentage of risk for those who have spinal manipulation performed to their ***upper cervical spine*** is very low.
  - ◎Mild: 1 in 40,000;
  - ◎Severe (Fx, VBI) : 5-10 per 10 million;
  - ◎Death : < 3 per 10 million
- ***Vertebral artery compromise*** is the most common concern during the application of spinal manipulation.
- literatures has not identified one clinical screening test as best for ruling-in or ruling-out the possibility of vertebral artery problems to help identify those at risk from a manipulative procedure.

Adverse effects of spinal manipulation

(Barbar. Cagnie et al., Manual Therapy,2004)

1. Severe injuries may occur after spinal manipulation, mainly after treatment of the :
   - ◎ neck : cerebrovascular accidents (CVA)
   - ◎ mid-back : rib-fractures
   - ◎ lumbar spine : cauda equina lesions

(Haldeman and Rubinstein, 1992; Powell et al., 1993; Assendelft et al.,1996; Di Fabio, 1999)

2. Fortunately, the incidence of serious complications is generally considered to be low.

(Hurwitz et al., 1996; Klougart et al., 1996; Rivett and Milburn, 1996)

Adverse effects of spinal manipulation

(Barbar. Cagnie et al., Manual Therapy,2004)

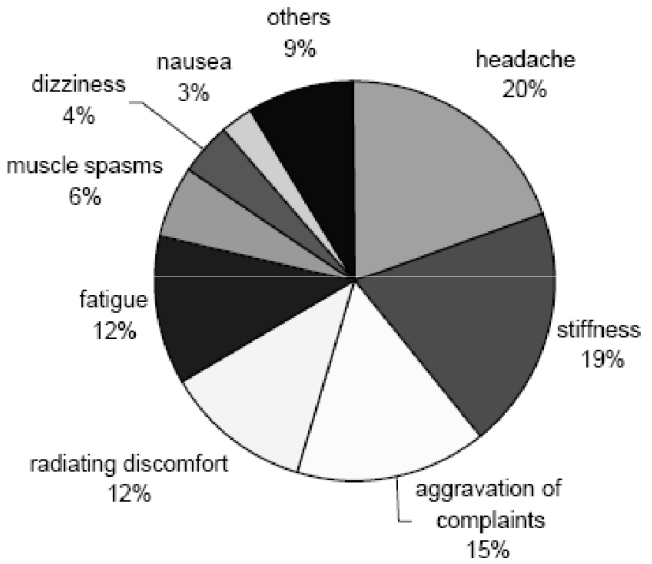


Fig. 1. Types and frequency of reactions following spinal manipulative therapy.

The most commonly reported side effect :
(465 patients who submitted their questionnaire)

1.headache (19.84%)
2.stiffness (19.46%),
3.aggravation of complaints (15.18%),
4.radiating discomfort (12.06%)
5.fatigue (12.06%).
6.muscle spasm (5.84%)
7.dizziness (4.28%)
8.nausea (2.72%) were uncommon.

Predictors of side effects

(Barbar. Cagnie et al., Manual Therapy,2004)

Uni-variate analysis revealed that :

1. ***Women*** were more likely to report adverse effects than men (p=0.001).
2. Women complained significantly more of stiffness (P=0.038), headache (P=0:016), fatigue (P=0.036) and local discomfort (P=0.030).
3. ***Smokers*** registered significantly more headache after spinal manipulation than people who had never smoked (P=0.045)
4. Patients who ***used medication on a regular basis*** reported significantly more headache after treatment than people who did not (P=0.011).

Predictors of side effects

(Barbar. Cagnie et al., Manual Therapy,2004)

5. The use of oral contraceptives did not show any difference in type of symptoms.
6. People with a ***medical history of migraine*** experienced significantly more headaches than people without this complaint (P<0.001).
7. ***Headache*** : cervical (p=0.007) >lumbar ≒ thoracic (p=0.037)
8. The less common reactions such as dizziness (P=0.022) and nausea (P=0.031) were also significantly more present after cervical manipulation.

(6) Conclusion

Thanks for your attention !!