A COMPARISON OF THE PRESENTATION OF PATIENTS WITH CERVICOGENIC HEADACHES AND PATIENTS WITH NON-CERVICOGENIC HEADACHES

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DECLARATION

I, Abraham Pramod declare that this research report is my own unaided work, except to the extent indicated in the reference citations and acknowledgements. It is being submitted for the degree of Master of Science in Physiotherapy at the University of the Witwatersrand, Johannesburg. It has not being submitted before for any other degree or examination at this or any other University.

Signed: .....

Date:……14th**…….day of ……**February**…….2014**

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ABSTRACT

Introduction:

Headache is one of the most common disorders of the nervous system and several of its subtypes lead to substantial levels of disability. Cervicogenic headache is a condition characterised by chronic hemi-cranial pain that is referred to the head from either bony structures or soft tissues of the neck. One of the common factors associated with all forms of headaches is the presence of trigger points. The aim of this study was to compare the sensitivity of trigger points, descriptive characteristics and level of disability in patients with cervicogenic and in patients with non-cervicogenic headaches.

Methodology:

The study was conducted as a quantitative, cross sectional, descriptive study. Forty participants (20 with cervicogenic and 20 non-cervicogenic headache) were included into this study sample. The classification of patients as having cervicogenic or non-cervicogenic headache was done according to the guidelines of Zito et al (2006). The sensitivity of trigger points in the upper trapezius, sternocleidomastoid, posterior cervical and temporalis muscles were established using a hand-held digital algometer with $1cm^2$ round head. Their level of disability was compared using the Henry Ford Headache Disability Inventory (HDI). The demographic and clinical presentation of both the groups was also compared including age, sex, duration of headache and pain rate scale. The above mentioned variables were compared using student t-test and chi-square test.

Results:

Descriptive characteristics, pain intensity and level of disability did not attain a statistical significant difference between the two groups. The results found evidence of a statistically

significant difference with respect to trigger points sensitivity in right upper trapezius (p=0.02) and left upper trapezius (p=0.01). The sensitivity of trigger points of upper trapezius were higher in cervicogenic groups but none of the other muscles tested showed difference in sensitivity between both groups.

Discussion

Similarities in the descriptive characteristics, pain intensity and level of disability of both groups suggest that both types of headaches cannot be differentiated in terms of a specific age, sex, body mass index, pain intensity or level of disability. Increased sensitivity of trigger points especially in upper trapezius may be used as an additional diagnosing factor of cervicogenic headache group.

Conclusion:

The results of this study found that patients with cervicogenic headache had an increased sensitivity of the upper trapezius muscles compared to patients with non-cervicogenic headache. Since physiotherapists play an important role in the treatment of trigger points the value of physiotherapy treatment in the management of cervicogenic headache releasing the trigger points in the upper trapezius may result in a decrease in symptoms and an associated improvement in quality of life.

LIST OF ABBREVIATIONS

SCM- Sternocleidomastoid

BMI- Body Mass Index

CTTH- Chronic tension type headache

TrPs- Trigger points

ADL- Activities of Daily Living

HDI- Headache Disability Inventory

IHS- International Headache Society

NPRS- Numeric Pain Rating Scale

VAS- Visual Analogue Scale

ROM- Range of Movement

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CHAPTER 1

1.0 INTRODUCTION

The background for this study will be explained in this chapter including the problem statement, the main aims, research question, objectives and significance of the study.

1.1 Background

Headache is one of the most common disorders of the nervous system and several of its subtypes lead to substantial levels of disability (Stovner et al 2007). It is a common complaint in society and is often related to personal, biomechanical and socioeconomic circumstances (Jull and Sterling 2008). Cervicogenic headache is a condition characterised by chronic hemi-cranial pain that is referred to the head from either bony structures or soft tissues of the neck and can be provoked by neck movements (Biondi 2005). It is mostly unilateral (Biondi 2005) but can also present bilateral (Sjaastad and Faffenrath 1998). In addition, this type of headache is thought to have a marked female preponderance, occurring after whiplash trauma, and to be associated with a reduction of range of neck movements and with ipsilateral shoulder and arm pain (Fishbain et al 2003). A detailed criterion has been explained by Sjaastad and Faffenrath (1998) for the diagnosis of cervicogenic headache which is based mainly on the history, temporal pattern and aggravating factors of the headache. Zito et al (2006) developed manual examination criterion which is considered to be simple, conservative and inexpensive in diagnosing cervicogenic headaches.

One of the common factors associated with all forms of headaches is the presence of trigger points (TrPs) (Fernandez-de-las-Penas et al 2006 and Simons 2002). A myofascial trigger point (TrPs) is a hyperirritable spot associated with a taut band of a skeletal muscle that is

painful on compression or stretch, and that can give rise to a typical referred pain pattern as well as autonomic phenomena (Simons 2002). The formation of these TrPs may result from a variety of factors such as trauma, overuse, physical and psychological stress and joint dysfunction. Usually there is a taut band in muscles containing TrPs and a hard nodule can be felt. Pressing on the affected muscle can often refer pain in a distant reference zone. Trigger points are classified as either active (which causes the patient pain) or latent (tender although not much pain but causes restriction of movement and weakness of the affected muscles).

Trigger points associated with headaches are mainly present in upper trapezius, sternocleidomastoid (SCM), posterior cervical muscles and temporalis (Simons 2002). Scientific studies strongly suggest that there are myofascial TrPs points present in the cranial & peri-cranial muscles that refer pain to the head which might have a considerable role in influencing the symptoms of headache (Fernandez-de-las-Penas et al 2006). Trigger points should be considered as a possible factor of trigger of pain in many forms of headaches (Davidoff 1998). Myofascial TrPs are found in most of the patients with cervicogenic as well as in patients with non cervicogenic headaches (Bovim 1992). Fishbain et al (2003) reported patients with cervicogenic headache have a greater number of TrPs on the symptomatic side of the neck versus the other side; also patients with cervicogenic headache have been noted to have lower pressure-pain threshold measurements in the neck versus patients with migraine and tension headache.

1.2 Problem statement

A critical review of the literature has shown an ample number of studies on myofascial TrPs, cervicogenic headaches and physiotherapy treatment of TrPs (Issa & Huijbregts, 2006).

There is however a need for literature on the sensitivity of the trigger points and the comparison of presentation between the cervicogenic and non-cervicogenic headache groups.

1.3 Research question

Is there a difference in presentation of patients with cervicogenic headaches and patients with non-cervicogenic headaches?

1.4 Aim

The aim of the study is to compare the presentation of patients with cervicogenic headaches and patients with non-cervicogenic headaches.

1.5 The objectives of this study were to:

1. Determine the descriptive characteristics (using a demographic questionnaire) and level of disability [using the Headache Disability Index questionnaire (HDI)] in patients with cervicogenic headaches and in patients with non-cervicogenic headaches.
2. Determine the presence and sensitivity of trigger points in various muscles of the neck of patients with cervicogenic headaches and in patients with non-cervicogenic headaches.
3. Compare the presence and sensitivity of TrPs as well as the descriptive characteristics and; level of disability between patients with cervicogenic headaches and patients with non-cervicogenic headaches.

1.6 Significance

If the difference or similarity in presentation of patients with cervicogenic and non-cervicogenic headaches can be established, appropriate recommendations can be made with regards to the physiotherapy treatment. If painful TrPs can be found consistently and repeatedly in cervicogenic headache patients, then measurement of change in their tenderness level may be useful as a physical outcome measure (Roth et al 2007). Physiotherapy is one of the treatment regimens indicated for patients suffering from chronic headaches. The treatment regime includes orthopaedic manipulative therapy, patient education, stretching exercises and releasing the TrPs points in the muscles (Issa and Huijbregts 2006). Fernandez-de-las-Penas et al (2008) reported the improvement as a result of trigger point therapy for patients with chronic tension type headaches. The presence of TrPs is associated with cervicogenic headache (Roth et al 2007) but has also been associated with other types of headache (Davidoff 1998). The aim of the physiotherapy treatment is to reduce pain and reinstate normal function by deactivation of the trigger points. The results from this study may also lead to future research on the contribution of TrPs in pain experienced by patients suffering from cervicogenic and non cervicogenic headaches. Furthermore, this study may add to the current evidence in presentation of cervicogenic and non-cervicogenic groups and also increase the awareness amongst physiotherapists treating individuals suffering from headaches.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

The literature related to this study will be discussed in this chapter. The classification of headaches, pathology, diagnosis and characteristic features of cervicogenic headaches, trigger points and their role in headache patients and the role of physiotherapy in treating patients with cervicogenic headaches are mentioned in this chapter. A brief overview of the algometer, Numeric Pain Rating Scale and HDI is also mentioned. The databases searched include: MEDLINE via PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Controlled Trials Register in the Cochrane Library, Physiotherapy Evidence Database (PEDro), ProQuest 5000 International, ProQuest Health and Medical Complete, EBSCO MegaFile Premier, Science Direct and SCOPUS. The search for unpublished studies will include: EBSCO MegaFile Premier. The key words that were used were "cervicogenic and non-cervicogenic headaches, algometer, trigger points, headache disability index and pain rate scale".

2.2 Classification of headaches

According to The International Headache Society (2004), fourteen different types and sub classifications of headaches have being identified. There are two basic categories of headaches, namely primary and secondary headaches. Primary headaches include those of vascular origin (cluster and migraine headaches) as well as those of muscular origin (tension-type headaches). Secondary headaches result from another source including inflammation or head and neck injuries. Norwegian physician Dr.Ottar Sjaastad coined the term,

"cervicogenic headache" in 1983 by recognizing a sub-group of headache patients with concomitant head and neck pain; therefore, cervicogenic headaches are considered "secondary headaches" (Sjaastad et al 1983).

2.3 Cervicogenic headache

Cervicogenic headache is a type of secondary headache characterised by unilateral headache and symptoms and signs of neck involvement (Chaibi and Russell 2012) and is often worsened by neck movement, sustained awkward head position or external pressure over the upper cervical or occipital region on the symptomatic side (Knackstedt et al 2010). It accounts for 15–20% of all headaches and it is sometimes related to the abnormal activity of motor units in neck and shoulder girdle muscles (Huber et al 2012). This represents a heterogeneous group of disorders that commonly refer pain from structures in the cervical spine region (e.g. joints, muscle, and nerve) to various regions in the head (Roth et al 2007). Major features are unilateral pain that typically starts at the occipital-nuchal area and spreads to the ipsilateral forehead, and attack induction by neck movements and/or digital pressure over trigger points such as the greater occipital nerve or the C2 area. Additionally, there may be diffuse, vague ipsilateral arm pain or discomfort (Vincent and Lun 1997). Mean age range at onset has been reported as 33-43years, and mean duration of symptoms of 7-17yrs. Patients with cervicogenic headaches have a substantial quality of life burden (Hall et al 2008 & Van Svijlekom et al 2003) and demonstrate the greatest loss in domains of physical functioning compared to patients with migraine and tension-type headache (Hong et al 2010).

2.4 Pathophysiology of cervicogenic headache

One of the most controversial areas within the cervicogenic headache literature is the discussion of its cause, with almost every structure and pathology within the cervical spine been implicated as a cause of these headaches (Haldeman and Degenais 2001). Structures implicated in the genesis of cervicogenic headaches all have their sensory innervations through the upper cervical and mid-cervical nerve roots, which lead to the cervical cord and converge within the spinal tract of the trigeminal nucleus allowing for nociceptive input from cervical structures to be perceived as head pain, including pain to the temporal, frontal, and orbital regions. This convergence may also help to explain the systemic and sympathetic nervous system features accompanying cervicogenic headaches (Haldeman and Degenais 2001).

One theory of cervicogenic headache aetiology comes from anatomical studies showing an attachment of the sub-occipital tissues to the dura mater at the cervical–cranial junction, and the observation that mechanical traction on these tissues can cause movement of the dura mater (Haldeman and Degenais 2001). The rectus capitus posterior minor muscle and ligamentum nuchae have been shown to have direct connections to the sub-occipital dura on very delicate dissection in a small number of cadavers. This suggests a role for the dura as a nociceptive structure in cervicogenic headache (Alix and Bates 1999). Martelletti (2000) reported increased levels of pro-inflammatory cytokines interleukin-Iß and tumour necrosis factor-α during mechanically induced attacks of cervicogenic headache defining cervicogenic headache as an inflammatory consequence of cervical trauma, explaining the wide variety of pathological processes in different structures that can cause similar headaches. He postulated that this could represent a specific signal from the immune system to activate nociceptive inducing agents as substance P and calcitonin-gene–related peptide. The table below shows

the various theories for the pathology of cervicogenic headache (Haldeman and Degenais 2001).

TABLE 2.1 Theories of pathogenesis for cervicogenic headache

Structure	Pathology	Mechanism
Zygapophysial or facet joint	Irritation, Rheumatoid arthritis	Trauma or immobility stimulates the C1–C3 nerves
Cervical muscles	Myofacial trigger points, myo-spasm	Restrict joint motion. Referred symptoms from muscles innervated by C1–C3
Intervertebral disc	Trauma Herniation	Irritates the dura Stimulates sinuvertebral nerve
Nerve roots	Compression Irritation	Disk herniation, spondylosis, or scar tissue
Vertebral artery	Compress	Apophyseal exostoses impacting vertebral artery blood flow
Uncovertebral joints	Mechanical irritation	Nerve roots producing sternocleidomastoid and trapezius muscle spasm
Ponticus posterior	Articular lock, instability	Tension on the dura or vertebrobasilar artery compression
Rectus capitis muscle	Connective tissue bridge with the dura	Tension on the dura
Ligamentum nuchae	Attaches to the dura	Tension on the dura

An accurate diagnosis of the aetiology of cervicogenic headache can be challenging for the clinician due to the overlap of pain (in the neck and head) and associated symptoms between cervicogenic headache and primary headache and the multiple abnormalities of the cervical spine and musculature that can be a primary source of head pain (Roth et al 2007).

2.5 Diagnostic Criteria

The diagnosis of cervicogenic headache can be a significant clinical challenge. The first attempt at setting forth diagnostic criteria for cervicogenic headache was made in 1990 (Sjaastad and Faffenrath 1998). Although the publication of these criteria brought focus to the field of cervicogenic headache research, certain aspects have proved difficult to embrace;

these include the position that these headaches should be strictly unilateral, the inclusion of a number of accompanying symptoms, such as nausea, vomiting, flushing, dizziness, phono- and photophobia, blurred vision, and dysphagia. This made the criteria too specific and detailed for general practice (Dagenais & Haldeman 2001). This highlighted the need for clear criterion of cervical musculoskeletal impairment to identify cervicogenic headache sufferers. In addition, it appears that migraine headache demonstrate neck-associated symptoms such as occipital neck tenderness and trigger points thought to be characteristic of cervicogenic headache, making the differentiation of migraine headache from cervicogenic headache problematic (Fishbain et al 2003). According to the second edition of the International Classification of Headache Disorders [IHS (2004)], the diagnostic criteria are based on the following:

A. Pain, referred from a source in the neck and perceived in one or more regions of the head and/or face, fulfilling criteria C and D.
B. Clinical, laboratory, and/or imaging evidence of a disorder or lesion within the cervical spine or soft tissues of the neck known to be, or generally accepted as, a valid cause of headache.
C. Evidence that the pain can be attributed to the neck disorder or lesion based on at least one of the following:
    1. Demonstration of the clinical signs that implicate a source of pain in the neck
    2. Abolition of headache following diagnostic blockade of a cervical structure or its nerve supply using placebo or other adequate controls
D. Pain resolves within three months after successful treatment of causative disorder or lesion.

Zito et al (2006) in accordance with International Headache Society IHS (2004) was able to identify musculoskeletal criteria identifying physical impairments in the musculoskeletal system linked to clinical features will contribute to the justification and selection of treatment for cervicogenic headache. Zito et al (2006) manual examination criterion for identifying cervicogenic headache patients consists of:

a) measurement of cervical flexion and extension, will be decreased in cervicogenic group (according to Knackstedt et al 2010 decreased at least by 20 degrees in cervicogenic group)
b) manual assessment of O/C1, C1/C2,C2/C3 (painful segmental dysfunction in cervicogenic group)
c) muscle extensibility- Upper trapezius, Scalenes, Levator Scapulae, Short Cervical extensors, Pectoralis major & minor (muscle tightness higher in cervicogenic group)

The clinical characteristics explained by Biondi (2005) for cervicogenic headache patients are:

1. Unilateral head or face pain without side shift; the pain may occasionally be bilateral
2. Pain localised to the occipital, frontal, temporal or orbital regions
3. Moderate to severe pain intensity
4. Intermittent attacks of pain lasting hours to days, constant pain or constant pain with superimposed attacks of pain
5. Pain is generally deep and non-throbbing; throbbing may occur when migraine attacks are superimposed
6. Head pain is triggered by neck movement, sustained or awkward neck postures; digital pressure to the sub occipital, C2, C3, or C4 regions or over the greater occipital nerve; valsalva cough or sneeze might also trigger pain

7. Restricted active and passive neck range of motion; neck stiffness
8. Associated signs and symptoms can be similar to typical migraine accompaniments including nausea, vomiting, photophobia, phonophobia and dizziness.

More recently, Antonaci and Sjaastad (2011) reported that unilateral headache of posterior onset, which eventually spreads to the forehead was a free variable, but proved to be almost invariably present and for that reason should probably be included among the regular cervicogenic headache criteria. Zito et al (2006) manual examination criterion is considered to be simple, conservative and inexpensive in diagnosing cervicogenic headaches.

2.6 Trigger points

A myofascial trigger point (TrPs) is a hyperirritable spot associated with a taut band of a skeletal muscle that is painful on compression or stretch, and that can give rise to a typical referred pain pattern as well as autonomic phenomena (Simons and Travell 1999). The point is a well-circumscribed area in which pressure produces a characteristic referred pain, tenderness and autonomic phenomena (Bablis et al 2008). TrPs are considered an essential defining part of the myofascial pain syndrome, in which widespread or regional muscular pain is a cause of musculoskeletal dysfunction as well as being associated with hyperalgesia, restriction of daily function or psychological disturbance (Bablis et al 2008). The pathogenesis of TrPs is not well understood, but it is believed they arise from more than one cause and formation may result from a variety of factors such as trauma, overuse, overstress, psychological stress and joint dysfunction where a hard nodule can usually be felt in a taut band in muscles containing the trigger point (Fernandez-de-las-Penas et al 2006 and Bablis et al 2008). Often a twitch response can be felt in the muscle by running your finger

perpendicular to the muscles direction. Pressing on the affected muscle can often refer pain in a distant reference zone. Muscle tightness and triggerpoints associated with cervicogenic patients are predominently found in upper trapezius, sternocliedomastoid (SCM), scalenes, levator scapule, pectoralis major and minor and short sub-occipital extensors (Hall et al 2008 and Page 2011). Upon clinical examination, TrPs are of two major types; an active trigger point is defined as one with spontaneous pain, or pain in response to movement, it is tender on palpation, and may present with a referral pattern of pain, not at the site of the trigger point origin. A latent trigger point is a sensitive spot that causes pain or discomfort only in response to compression.

The trigger point is usually activated by acute or chronic injury to a muscle, tendon, ligament, joint, disc or nerve (Hong 1996). Pathogenesis of either referred pain or local twitch response is related to integration in the spinal cord. It has been proposed that there are multiple sensitive loci in a trigger point region. A sensitive locus may contain one or more sensitized nociceptive nerve endings. Mechanical stimulation of a sensitive locus can elicit a local twitch response which is frequently associated with characteristic referred pain. Theoretically, sensitive loci can be found in any site of a skeletal muscle, but is usually distributed with highest concentration near the endplate region where a trigger point is frequently found (Hong 1996)

Trigger points have been shown to be active in fibromyalgia as well as somatic tenderness secondary to visceral dysfunction migraine and other forms of non-pathological headache, shoulder, neck, and back pain (Bablis et al 2008). Furthermore, Rosomoff et al (1989) demonstrated that 100% of neck pain sufferers possessed the presence of trigger points and almost 53% of them had non-dermatomal referral. The studies conducted by Couppe et al (2007) concluded that subjects with chronic headaches had a higher prevalance of TrPs and

the presence of TrPs (Fig 1) may be a contributing factor in the initiation and /or prepetuation of chronic headaches. An external digital pressure of 3to 4 kg exerted with the thumb, at a 90-degree angle over TrPs in certain neck muscles, will generally lead to both local and spreading head pain outlasting the stimulus with, discomfort or pain spreading to the forehead (Antonaci and Sjaastad, 2011). Study conducted by Roth et al (2007) concluded that myofascial TrP may be an important pain producing mechanism in cervicogenic headache. Davidoff (1998) informed that TrPs of the neck and shoulder muscles contribute to or cause recurrent and chronic headaches. Referred pain from TrPs (Jull et al 2009) must be considered when evaluating patients with a number of headaches including cervicogenic headache (Davidoff 1998).

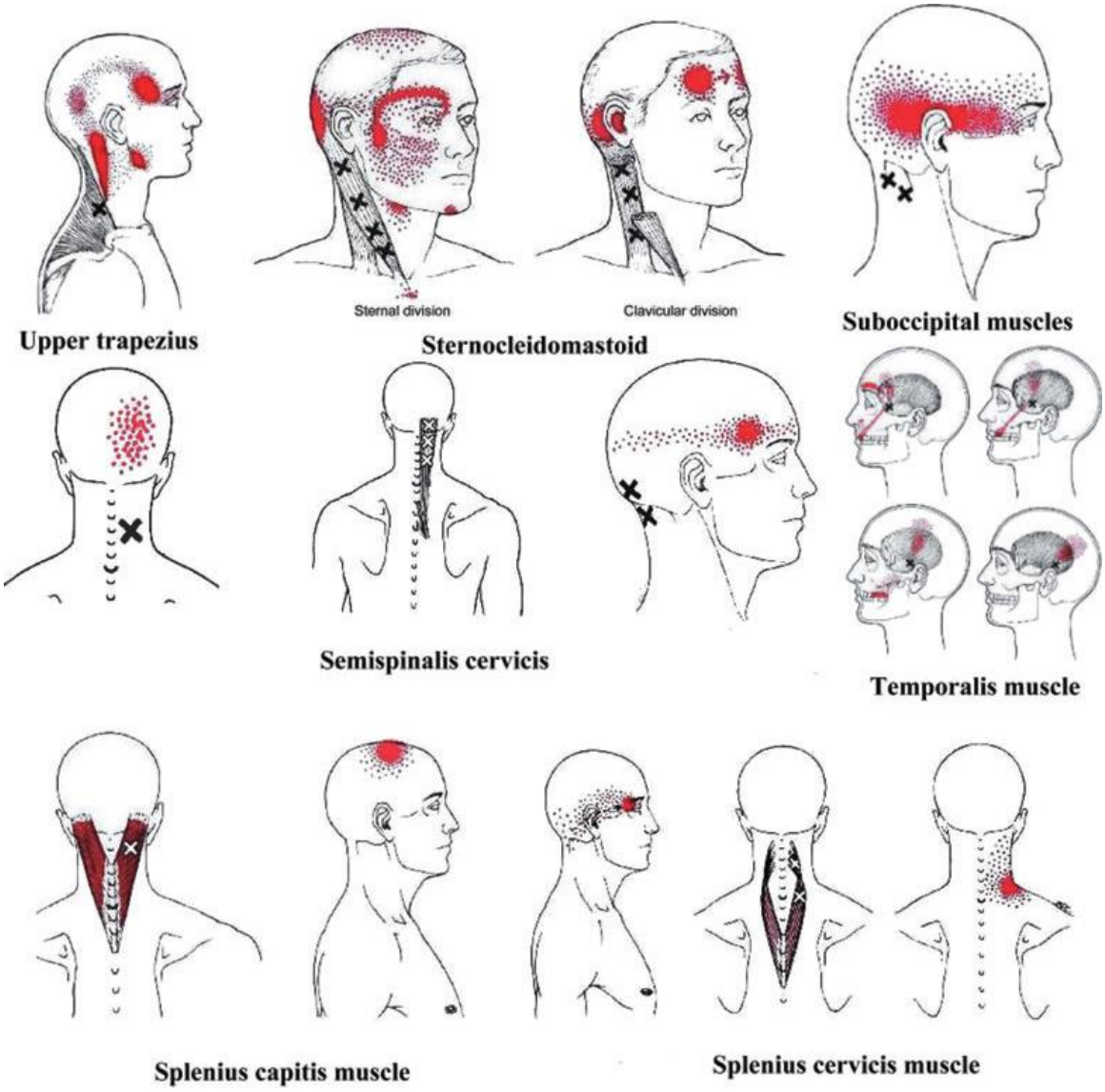

Fig 1. Referred pain patterns from upper trapezius, sternocleidomastoid, sub occipital, splenius capitis, splenius cervicis, semispinalis capitis and temporalis muscle trigger points as described by Simons & Travell (1999). Picture from Simons D, Travell J, Simons L. Travell & Simons myofascial pain and dysfunction: the trigger point manual, Vol. 1, 2nd edn. Baltimore: Williams & Wilkins, 1999.

2.7 Physiotherapy treatment of trigger points

Trigger points are potential outcomes of dysfunction in a region and conventional treatment is based around the release of this taut band of skeletal muscle. The treatment of chronic myofascial pain requires a comprehensive approach directed to the underlying TrPs source, while simultaneously addressing the central importance of perpetuating factors that maintain TrP activation (Roth et al 2007). Therapy for TrPs requires an approach that enhances the central inhibition through pharmacological or behavioural techniques, and reduces the peripheral inputs to the maintenance of the reflexes by utilising physical therapies such as exercise, needling and digital pressure (Graff-Radford 2004). Medical management usually begins with pharmacologic intervention, however cervicogenic headache patients with trigger points frequently do not respond to medications (Page 2011). The aim of physiotherapy treatment is to reduce the pain and restore normal function. Most physiotherapy treatments of myofacial pain syndrome are targeted at deactivation of trigger points. Physiotherapy techniques in trigger point therapy can be divided into three categories:

1. Manual therapies: Ischemic compression, spray and stretch, strain and counter strain, muscle energy techniques trigger point pressure release, transverse friction massage (Fernandez-de-las-Penas et al 2005).

2. Needling therapies (Fernandez-de-las-Penas et al 2005).

3. Other techniques: Thermotherapy, ultrasound therapy & laser therapy (Fernandez-de-las-Penas et al 2005).

Hou et al (2002) studies concluded that ischaemic compression therapy, hot packs, stretch with spray, TENS, interferential current myofascial release technique are effective for

easing TrP pain and increasing cervical ROM. Hong et al (1993) studied the immediate effects of various physical modalities on pain threshold of an active TrP and concluded that all four therapeutic modalities (spray and stretch, superficial heat, ultrasound, deep heat and deep pressure soft tissue massage) can be effectively applied for the treatment of myofascial pain syndrome to obtain an immediate increase of pain threshold of an active myofascial TrP, although the stretch therapy is more effective than the thermotherapy. The various physiotherapy techniques and the importance in treating TrPs to reduce pain in headache patients are evident from the above studies.

2.8 Measurement Instruments

2.8.1 Assessing Trigger points using algometer

In patients who present to the physiotherapist, the use of algometry can be used to reliably quantify the tenderness associated with a TrP (Fig 2) and can be used to diagnose their location as well as to qualify the degree of pressure sensitivity (Bablis et al 2008). Reeves et al (1986) mentions that once located the quantification of the tenderness (sensitivity) of a TrP is imprecise with manual palpation alone but using a pressure algometer adds to the validity and reliability. The results of the study conducted by Delany and McKee (1993) show that the pressure threshold meter (algometer) is highly reliable in measuring TrP sensitivity, between and within experimenters, and may be useful in the diagnosis and monitoring of treatment of myofascial pain syndrome. Reeves et al (1986) reported the algometer as a reliable instrument in measuring the myofascial trigger point sensitivity and their studies concluded significant correlations within experimenter and between experimenter ($p<0.01$). The studies conducted by Kinser et al (2009) tested the reliability and construct validity of an algometer by manually applying pressure on a force plate and the results showed average

Pearson (r) correlations between the maximum force reading of the algometer and force plate were excellent (r = 0.99) and recommended that it may be safe to claim that with practice the use of algometer is reliable and valid.

Fig 2. Suboccipital region pressure gauge algometer application (Bablis et al 2008)

2.8.2 Assesing pain using Numeric pain rating scale (NPRS)

Pain intensity is the most clinically relevant dimension of nearly all forms of headaches and accurate reliable measurement of pain is therefore critical to the evaluation of outcome measures in headache treatments (Loder and Barch 2012). Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT), twenty seven

specialists from academia, governmental agencies, and the pharmaceutical industry participated in a consensus meeting and identified core outcome domains that should be considered in clinical trials of treatments for chronic pain (Turk et al 2003). There studies concluded that chronic pain clinical trials should assess outcomes representing six core domains: (1) pain, (2) physical functioning, (3) emotional functioning, (4) participant ratings of improvement and satisfaction with treatment, (5) symptoms and adverse events, (6) participant disposition. Although consideration should be given to the assessment of each of these domains, there may be exceptions to the general recommendation to include all of these domains in chronic pain trials (Turk et al 2003).

Although pain is inherently subjective and difficult to measure a number of pain scales have been developed and are commonly used in clinical practice and research. The studies conducted by Cork et al (2004) concluded benefits of NPRS over Visual analogue scale (VAS). The draw backs of VAS in their studies included increased time consumption, ability to understand the abstract concept of the VAS line and then relate it to distance from a zero mark (Cork et al 2004). On the other hand NPRS according to their studies is relatively simple to understand and thus provide a co relation which is more definitive than a distance mark and they recommended it more over VAS on a clinical setting. The 11-point (NPRS) is a measure of pain in which patients rate their pain ranging from 0 (no pain) to 10 (worst imaginable pain) and it has been shown to have concurrent and predictive validity as a measure of pain intensity (Childs et al 2005). The studies conducted by Childs et al (2005) to examine the responsiveness characteristics of the numerical pain rating scale (NPRS) in patients with low back pain suggested that clinicians can be confident that a two-point change on the NPRS represents clinically meaningful change that exceeds the bounds of measurement error.

2.8.3 Assessing disability using The Henry Ford Headache Disability Inventory (HDI)

The questionnaire was developed by Gary Jacobson, Nabih Ramadan, Sandeep Aggerwal and Gary Newman in 1993 at the Henry Ford Hospital, Detroit, MI, USA. It is designed to evaluate the self-perceived disability effects (emotional and functional) of headaches on the Activities of Daily Living (ADL) and consists of a 25 item questionnaire. The HDI can be used to periodically evaluate a patient with headache to determine the effectiveness of a management strategy over time. The domains are emotional (13 items) and functional (12 items). The participant will be asked questions regarding their headache and should answer "yes" sometimes or "no" to each item. For response “yes” 4 points, “no” 0 points and “sometimes” 2 points will be allocated. The minimum score is 0, maximum emotional subscale is 52, and maximal functional subscale is 48. Maximum score obtainable on the index is 100. A higher score on the greater index indicates a higher disability caused by the headache. A decrease in the total HDI of $\geq$ 29 points as a consequence to a management strategy is considered a significant improvement. A person with a low total HDI (< 29 points) would not be able to meet the criteria for significant improvement. The developers have reported that the 25-item Headache Disability Inventory has good internal consistency reliability, robust long-term (2 month) test-retest stability, and good construct validity. In 1995 they conducted further investigations to evaluate the short-term (1 week) test-retest reliability and spouse perceptions of patients' self-perceived headache disability. The short-term test-retest reliability of the HDI was excellent (Jacobson et al 1995).

2.9 Physiotherapy management for cervicogenic headache

Physical therapy treatment for cervicogenic headaches should be provided by an expert as a part of multidisciplinary pain rehabilitation programme (Biondi 2005). Bronfort, et al (2004) reviewed the evidence for non-invasive physical treatments for five types of headache including "migraine," "tension-type," "cervicogenic headache," a mix of "migraine and tension-type," and "post-traumatic" headache. They found evidence that both neck exercise (low-intensity endurance training) and spinal manipulation were effective in the short-term and long-term for cervicogenic headaches. Furthermore, evidence-led approach to clinical management of cervicogenic headaches consisted of spinal manipulative therapy focusing on upper cervical segments, muscle stretching (SCM, upper trapezius, levator, scalenes, suboccipitalis, pectoralis major and minor), soft tissue mobilisation and therapeutic exercises (Page et al 2011). The findings of a recent study by Bodes- Pardo et al (2013) showed that manual therapy targeted to active TrPs in the sternocleidomastoid muscle may be effective for reducing headache and neck pain intensity and increasing motor performance of the deep cervical flexors, pressure pain threshold, and active cervical range of motion in individuals with cervicogenic headache showing active TrPs in this muscle.

Jull et al (2002) studies conducted determined the effectiveness of manipulative therapy and a low-load exercise program for cervicogenic headache when used alone and in combination on a treatment period of 6 weeks with a follow up session up to twelve months. At the 12-month follow-up assessment, both manipulative therapy and specific exercise had significantly reduced headache frequency and intensity. Their studies concluded that manipulative therapy and exercise can reduce the symptoms of cervicogenic headache, and the effects are maintained over a long period of twelve months (Jull et al 2002)

2.10 Summary

This literature review looked at the classification of headaches, cervicogenic headache and its pathophysiology. It also discussed the diagnostic criteria of cervicogenic headache, TrPs and its importance in headache, physiotherapy treatments to release TrPs, the NPRS, HDI and algometer. There is a gap in the literature in comparing the presentation especially the sensitivity of TrPs points of cervicogenic and non-cervicogenic group. The results from this study may lead to understand the difference in presentation of the both groups so appropriate recommendations can be made with regards to the physiotherapy treatment.

CHAPTER 3

3.0 METHODOLOGY

This chapter describes the methodology used in this research study. It follows a sequence from study design, selection of participants, ethical approval, sample size and location of study to a full description of the procedure. The pilot study and main study methods will be described in separate sections.

3.1 Study Design

The study was conducted as a quantitative, cross sectional, descriptive study.

3.2 Pilot Study

3.2.1 Introduction

The pilot study was conducted prior to the main study, aiming for the following:

1. To minimise the potential errors in the main study.
2. To identify challenges faced in doing the procedure.
3. To get familiar with the use of algometer and questionnaire.
4. Training research assistant in identification of TrPs and differentiating patients into cervicogenic and non- cervicogenic group (Appendix i).
5. To determine inter-examiner reliability in using algometer and differentiating participants into cervicogenic and non-cervicogenic groups.

3.2.2 Procedure for the Pilot study

Participants were referred to the researchers practice situated in a private hospital set up in Port Elizabeth by medical practitioners for headache treatment. An information session was scheduled with the participants where the test procedures and the questionnaires were explained. Informed written consent (appendix vi) was obtained from the participants prior to the test procedure. A fellow physiotherapist in the same practice who is practising manual therapy since 1997 with the researcher was chosen as a research assistant. The research assistant had 15 years of experience in manual therapy. The research assistant underwent 16 hours of training related to the procedure and criteria of the project. All participants were assessed by the same research assistant to determine the category to which they belonged. The researcher was blinded to this information. Five participants (four females and one male) who had headaches and fulfilled the inclusion criteria were selected study the pilot group. These five participants were not to be included in the main study. The participants were given a unique identification number. The details of the participants were available only to the researcher. In order to determine intra-examiner reliability of the algometer the sensitivity of TrPs on selected muscles was measured three times each and the average was noted.

3.2.3 Results of the Pilot Study and Recommendations for the Main Study

The intra-examiner reliability of using the algometer was measured using Pearson Correlation(r). Results are between -1 and 1. The closer the value of r gets to zero, the greater the variation. High correlation is 0.5 to 1.0 or -0.5 to 1.0, medium correlation is 0.3 to 0.5 or -0.3 to 0.5 and low correlation is 0.1 to 0.3 or -0.1 to -0.3 (Bruton et al 2000).The intra-examiner reliability of using the algometer was excellent. (r=0.99). This is classified as a strong correlation (Reeves et al 1986 and Kinser et al 2009).

The test procedure went well and no changes were made to the procedure for the main study. Since both therapists were needed at the time of testing it was decided to call the participant to the practice at a time when both therapists were available. It was agreed that the research assistant notes the unique study number of the participants and the group they belong and the results will only be made available to the researcher during data analysis. This is mainly to avoid biased assessment by the researcher towards a particular group while assessment.

3.3 Main Study

3.3.1 Participants

3.3.1.1 Inclusion criteria (for both groups)

The following inclusion criteria were used to recruit voluntary participants and the criteria used was in line with the international classification of headaches:

1. Voluntary individuals aged between 18 to 60 years.

2. Male or Female.

3. Headache is not associated with nausea but photophobia and phonophobia may be present.

4. Headaches usually lasting thirty minutes to 7 days.

3.3.1.2 Exclusion criteria (for both groups)

Participants with the following will be excluded:

1. Patients on psychiatric medications.

2. Patients who are on medication for headaches 24hrs prior to testing.

3. Previous surgery to cervical spine.

4. Patients who are on physiotherapy treatment currently or 4 weeks prior to testing.

5. Patients with rheumatoid arthritis of the cervical spine.

6. Patients with tumours on the neck \head area.

7. Patients suffering from severe acute migraine attacks (diagnosed according to IHS 2004).

8. Patients who complain of medication overuse headache(diagnosed according to IHS 2004).

9. Patients with communications problems that will prevent them from reporting on the level of pain during the trigger point sensitivity threshold testing.

3.3.1.3 Participant recruitment and setting

The participants were patients referred for physiotherapy (who fits the same inclusion and exclusion criteria as referred to in the pilot study) at a practice in Mercantile Private Hospital from Nov 2012 to June 2013. Invitation to refer patients was given to medical practitioners who include general practitioners, physicians, orthopaedic surgeons, neurosurgeons and physiotherapists in Port Elizabeth Metropole. A brief description of the study along with the inclusion and exclusion criteria was given to the other medical practitioners in Port Elizabeth (appendix iv). They were informed that participation is voluntary and the participants may refuse to participate at any stage during the study and there were no financial implications to the practitioner or the patient involved in this research study. It was advised that participants will be asked to refrain from any pain or anti-inflammatory medication 24 hours preceding

the testing procedure and refusal to participate will not bear any penalty or loss of benefits to which the participant is otherwise entitled.

3.3.2 Sample Size

An expected rate of positive trigger points in cervicogenic group was calculated at 70% and 25% for non cervicogenic group (Page 2011). A power calculation of 80% suggested that the sample size of 20 per group. Twenty participants with cervicogenic headaches and twenty participants with non cervicogenic headaches were recruited for this study. This is in accordance with similar studies conducted by Zito et al (2006) on clinical tests of musculoskeletal dysfunction in the diagnosis of cervicogenic headache and Hong et al (2010) on clinical assessment of patients with cervicogenic headaches.

3.3.3 Instrumentation and outcome measure

A hand-held digital algometer was used to measure the sensitivity of TrPs (Appendix viii) and The Henry Ford Hospital Headache Disability Inventory (HDI) questionnaire (Appendix ix) was used to measure the level of disability due to headaches.

3.3.3.1 Details of the Algometer

A hand-held digital algometer with $1cm^2$ round head was used (J Tech Medical; 470, Lawndale Drive, Salt Lake City, UT 84115, USA). The algometer was supplied by Physiotherapy Department of the University of the Witwatersrand. According to the information provided by J Tech Medical, USA, calibration is not required every year, the

accuracy of the device can be gauged by applying a known weight to the device. A known weight was applied to the algometer to check the accuracy of the device and no variation was noted. The device was set to zero reading before taking each measurement.

3.3.3.2 The Henry Ford Headache Disability Inventory

The questionnaire Henry Ford Headache Disability Inventory (appendix ix) developed by Gary Jacobson, Nabih Ramadan, Sandeep Aggerwal and Gary Newman in 1993 at Henry Ford Hospital, Detroit, MI, USA (Jacobson et al 1994) It is designed to evaluate the self-perceived disability effects (emotional and functional) of headaches on the Activities of Daily Living (ADL).

3.3.4 Procedure Protocol

The researcher arranged meetings with the referring doctors at the Port Elizabeth Metropole. A detailed explanation of the project was provided and the information sheet for referring medical practitioners was handed to the doctors. To maximise the sample size the researcher also contacted other physiotherapists and medical practitioners via telephone and the project details were e-mailed to them. An information session was arranged by the researcher to the participants prior to the testing. Each participant was given the information document that explained the study and written informed consent was obtained from each participant. The participants were asked not to take any pain and anti-inflammatory medication during the 24 hours preceding evaluation.

After completing the demographic questionnaire (appendix x) clinical information regarding the duration of headache and level of pain was noted. Assessment of pain was based on a

NPRS (appendix xi). The research assistant then assessed the participant to determine which group they belonged to and the researcher was blinded to this information. The researcher then explained the HDI (appendix ix) questionnaire and the participants were asked to complete it. The researcher had arranged translator for the HDI and NPRS in case any of the participants had difficulty in understanding English. But all the participants who came for the study were able to express their disabilities in English. Neither the research assistant, nor the researcher looked at the questionnaire information before or during patient assessment. The participants were then seated and was examined by the researcher (standing) for presence of one active TrP the upper trapezius, sternocleidomastoid, posterior cervical muscles & temporalis (according to Simons and Travell 1999) mainly by using thumbs and index finger and patients responds by referred pain when pressing on the trigger points. The selected muscle that did not have TrPs was marked "N" next to the muscle on the data collection sheet (appendix x). After locating the trigger points the algometer with a round tip of $1cm^2$ was positioned at the physically located trigger points. Compression pressure was gradually increased perpendicularly on the muscle and a measurement (the reading which is the minimal pressure needed to elicit pain) was taken. The reading on all located trigger points was taken three times by re-setting the machine for each of the three readings at each of the points. The researcher recorded the name of the muscle and algometer reading as well as the level of pain the participant experienced.

3.4 Data Analysis

The variables tested in the study are:

a) Pressure threshold of the trigger points in the following muscles in $kg\backslash cm^2$: Upper trapezius, SCM, posterior cervical muscles and temporalis (continuous data).

b) HDI questionnaire (categorical data).

c) Participants demographic data (Age, Sex, Height, Weight & BMI) (continuous data) and

d) Participants pain response in numeric pain rate scale (0 to 10) (categorical data) and duration of headache (continuous data).

The data of both the groups were entered to an Excel sheet. The cervicogenic group were compared to the non-cervicogenic group in terms of the above mentioned continuous variables using the Student t-test and the categorical data were compared using the Chi-Square test at a 5% level of significance. The data was analysed using STATA version 12 (Data Analysis and Statistical Software). Descriptive analysis was used to establish the distribution of data and all data were normally distributed. Effect sizes were calculated using Cohen's *d* where effect sizes of 0.2, 0.5 and 0.8 were interpreted as small, medium and large, respectively (Cohen 1992). The results will be discussed in the following chapter.

3.5 Ethical considerations

Application for ethical clearance was granted by the Human Research Ethics committee of the University of the Witwatersrand before the collection phase commenced. (Appendix ii). A signed informed consent (Appendix iii) was mandatory and obtained from each participant prior to the testing procedure. Detailed information regarding the purpose of the study and the diagnosing criteria (Appendix iv) was given to the medical practitioners and physiotherapists referring participants for this study. Each participant was given a unique identification number (to maintain strict confidentiality throughout the study) and patient information sheet (appendix v). Participants were re-reimbursed the transport cost from their homes if they had to use public transport to attend the study.

CHAPTER 4

4.0 RESULTS

In this chapter, the results will be presented in the order of objectives of the study.

4.1 Descriptive characteristics of the study population

TABLE 4.1 Demographic representation of the cervicogenic & non-cervicogenic groups

Variable	Cervicogenic (n=20) n(%)	Non-cervicogenic (n=20) n (%)	p-value (<0.05)
Gender			0.15
Male	1.0 (5.0)	4 (20.0)	
Female	19.0 (95.0)	16 (80.0)	

TABLE 4.2 Descriptive characteristics of the cervicogenic & non-cervicogenic groups

Variable	Cervicogenic (n=20)	Non-cervicogenic (n=20)	p-value (<0.05)
Age (yrs)			0.08
Mean (±SD)	36.5 (±8.38)	41.2 (± 8.21)	
BMI(kg/m^2)			0.37
Mean (±SD)	29.8 (±6.0)	28.0(±6.0)	
Duration (months)			0.88
Mean (±SD)	34.5(±42.54)	32.6(±35.9)	

Table 4.1 and 4.2 shows the results for the descriptive characteristics of the two groups of participants (cervicogenic and non-cervicogenic) that participated in the study. Among the cervicogenic group, females constituted 95% (n=19) while 80% (n=16) were females in the non-cervicogenic group. The average age of cervicogenic participants was 36.5 (±8.38) years compared to 41.2 (±8.21) years in the non-cervicogenic participants

4.2 Presence of trigger points and sensitivity comparison between both groups

TABLE 4.3 TrP Sensitivity in cervicogenic and non-cervicogenic groups (kg/cm^2)

Variable	Cervicogenic (n=20)	Non-cervicogenic (n=20)	p-value (<0.05)
Right upper trapezius(SD)	13.4(±8.8)	20.3(±9.8)	0.02
Right sternocleidomastoid(SD)	11.4(±5.6)	13.6(±5.5)	0.22
Right temporalis(SD)	12.8(±7.1)	16.2(±7.7)	0.16
Right posterior cervical muscles(SD)	13.95.(±8.0)	17.35(±9.0)	0.21
Left upper trapezius(SD)	11.7(±7.2)	20.4(±8.2)	0.01
Left sternocleidomastoid(SD)	9.0(±3.0)	9.0(±3.5)	1.00
Left temporalis(SD)	9.6(±5.5)	12.2 (±7.0)	0.12
Left posterior cervical muscles(SD)	14.3(±7.9)	16.5(±9.2)	0.41

Sensitivity of the active TrP on the selected muscles was established and table 4.1 compares sensitivity of trigger points between cervicogenic and non-cervicogenic participants. The lowest algometer reading in cervicogenic group was 0.57kg/cm^2 and the highest was 2.6kg/cm^2. In non-cervicogenic group the lowest reading was 0.55kg/cm^2 and the highest was 6.6kg/cm^2. The table shows the mean reading in kg/cm^2 in each muscle of both the groups. Results found evidence of a statistically significant difference between the two groups with respect to trigger points sensitivity in right upper trapezius (p=0.02; effect size d = 0.74) as well as left upper trapezius (p=0.01; effect size d = 1.13) muscles. Therefore, since cervicogenic participants had a lesser mean sensitivity score, it implies that trigger points sensitivity were significantly higher in cervicogenic participants than non- cervicogenic participants in the right upper trapezius and the left upper trapezius.

4.3 A comparison of the cervicogenic and non-cervicogenic groups in terms of self-perceived disability

TABLE 4.4 Total HDI score and pain rating scale of both groups

Variable	Cervicogenic n=20	Non-cervicogenic n=20	p-value(<0.05)
Functional score			
Mean (±SD)	31.9(±11.8)	34.4(±10.0)	0.47
Emotional score			
Mean (±SD)	30.3(±10.9)	30.8(±12.3)	0.89
Total score			
Mean (±SD)	62.2(±21.5)	65.2(±21.1)	0.66
Pain scale (0 to 10)			
Mean (±SD)	7.0(±1.5)	6.3(±1.1)	0.12

TABLE 4.5 The HDI - Emotional Items in cervicogenic and non-cervicogenic groups

Variable	Cervicogenic n=20	Non-cervicogenic n=20	p-value(<0.05)
Because of my headaches I feel handicap			0.24
more than 1 per week	6(30.0)	2(10.0)	
more than 1 but less than 4 for month	14(70.0)	18(90.0)	
No one understands the effect that my headaches have on my life			0.24
No	4(20.0)	9(45.0)	
Yes	7(35.0)	6(30.0)	
Sometimes	9(45.0)	5(25.0)	
My headaches make me angry			0.74
No	5(25.0)	5(25.0)	
Yes	13(65.0)	11(55.0)	
Sometimes	2(10.0)	4(20.0)	
Sometimes I feel that I am going to lose control because of my headaches			0.36
No	9(45.0)	5(25.0)	
Yes	8(40.0)	9(45.0)	
Sometimes	3(15.0)	6(30.0)	
My spouse(significant other) or family and friends have no idea what I am going through because of my headaches			0.79
No	6(30.0)	4(20.0)	
Yes	7(35.0)	7(35.0)	
Sometimes	7(35.0)	9(45.0)	
My headaches are so bad that I feel I am going insane			0.29
No	3(15.0)	6(30.0)	
Yes	10(50.0)	11(55.0)	
Sometimes	7(35.0)	3(15.0)	
My outlook on the world is affected by my headaches			1.00
No	6(30.0)	6(30.0)	
Yes	10(50.0)	11(55.0)	
Sometimes	4(20.0)	3(15.0)	
I am afraid to go outside when I feel that a headache is starting			0.71
No	11(55.0)	8(40.0)	
Yes	3(15.0)	5(25.0)	
Sometimes	6(30.0)	7(35.0)	
My headaches place stress on my relationship with family or friends			0.34
No	5(25.0)	5(25.0)	
Yes	8(40.0)	12(60.0)	
Sometimes	7(35.0)	3(15.0)	
I feel irritable because of my headaches			0.27
No	3(15.0)	0(0.0)	
Yes	15(75.0)	17(85.0)	
Sometimes	2(10.0)	3(15.0)	
I feel desperate because of my headaches.			0.50
No	0(0.0)	1(5.0)	
Yes	12(60.0)	14(70.0)	
Sometimes	8(40.0)	5(25.0)	
My headaches make me feel confused			0.62
No	7(35.0)	6(30.0)	
Yes	9(45.0)	7(35.0)	
Sometimes	4(20.0)	7(35.0)	
My headaches make me feel frustrated			0.88
No	2(10.0)	2(10.0)	
Yes	13(65.0)	15(75.0)	
Sometimes	5(25.0)	3(15.0)	

TABLE 4.6 The HDI -Functional Items in cervicogenic and non-cervicogenic groups

Variable	Cervicogenic n=20	Non-cervicogenic n=20	p-value(<0.05)
Because of my headaches I feel restricted in performing my daily routines			1.00
Mild	2(10.0)	3(15.0)	
Moderate	7(35.0)	6(30.0)	
Severe	11(55.0)	11(55.0)	
I restrict my recreational activities (e.g. sports hobbies) because of my headaches			0.89
No	2(10.0)	2(10.0)	
Yes	11(55.0)	9(45.0)	
Sometimes	7(35.0)	9(45.0)	
Because of my headaches I am less likely to socialize			0.85
No	5(25.0)	6(30.0)	
Yes	7(35.0)	8(40.0)	
Sometimes	8(40.0)	6(30.0)	
I am concerned that I am paying penalties at work or at home because of my headaches			0.67
No	4(20.0)	6(30.0)	
Yes	9(45.0)	9(45.0)	
Sometimes	7(35.0)	5(25.0)	
I avoid being around people when I have a headache			0.71
No	8(40.0)	5(25.0)	
Yes	8(40.0)	10(50.0)	
Sometimes	4(20.0)	5(25.0)	
I believe my headaches are making it difficult for me to achieve my goals in life			0.05
No	4(20.0)	3(15.0)	
Yes	14(70.0)	8(40.0)	
Sometimes	2(10.0)	9(45.0)	
I am unable to think clearly because of my headaches			0.81
No	5(25.0)	4(20.0)	
Yes	12(60.0)	14(70.0)	
Sometimes	3(15.0)	2(10.0)	
I get tense (e.g. muscle tension) because of my headaches			0.21
No	7(35.0)	2(10.0)	
Yes	8(40.0)	11(55.0)	
Sometimes	5(25.0)	7(35.0)	
I do not enjoy social gatherings because of my headaches			0.59
No	4(20.0)	4(20.0)	
Yes	12(60.0)	9(45.0)	
Sometimes	4(20.0)	7(35.0)	
I avoid travelling because of my headaches			1.00
No	6(30.0)	5(25.0)	
Yes	10(50.0)	11(55.0)	
Sometimes	4(20.0)	4(20.0)	
I find it difficult to read because of my headaches			0.74
No	3(15.0)	1(5.0)	
Yes	15(75.0)	16(80.0)	
Sometimes	2(10.0)	3(15.0)	
I find it difficult to focus my attention away from my headaches and on other things			0.43
No	4(20.0)	2(10.0)	
Yes	13(65.0)	12(60.0)	
Sometimes	3(15.0)	6(30.0)	

The average functional score for cervicogenic participants was 31.9% (n=20) while a mean functional score of 34.4% (n=20) was recorded in non-cervicogenic participants. However, the difference in mean scores did not attain statistical significance. A similar pattern of higher average emotional score and average total score was observed in non-cervicogenic participants. Results also showed that 30% (n=6) of cervicogenic participants felt handicapped by their headaches more than once per week compared to only 10% (n=2) in the non-cervicogenic group. However no statistical evidence of significant difference was found between the two groups. Response patterns were found to be similar between cervicogenic and non-cervicogenic participants across the HDI items with no evidence of statistically significant difference between them (Table 4.4). The mean pain scale score in cervicogenic participants was 7.0 compared to 6.3 in non-cervicogenic participants For all these characteristics, difference between cervicogenic and non-cervicogenic participants did not attain statistical significance ($p<0.05$).

4.4 CONCLUSION

The results from the current study found evidence of a statistically significant difference with respect to trigger points sensitivity in right upper trapezius (p=0.02) and left upper trapezius (p=0.01) muscles, implying that trigger points sensitivity were significantly higher in cervicogenic participants than non-cervicogenic participants in the right upper trapezius and the left upper trapezius. Trigger points sensitivity were found to be higher in the left SCM and left temporalis in cervicogenic participants although this did not reach statistical significance. The results further more revealed a response pattern found to be similar between cervicogenic and non-cervicogenic participants across the HDI items with no evidence of statistically significant difference between them. The cervicogenic and non-cervicogenic groups were similar in terms of descriptive characteristics. The implication of results contained in this chapter will be discussed in the following chapter.

CHAPTER 5

5.0 DISCUSSION

This chapter focuses on the discussion of the results of the study outlined in Chapter 4 and how these findings relate to other research findings.

5.1 Demographic Data

The study examined a total of 40 participants, 20 with cervicogenic headache and 20 non-cervicogenic headache. The physical characteristics of the participants in this study show very close similarities to those of other studies. For demographics (gender & age) and physical (BMI & duration) characteristics, differences between cervicogenic and non-cervicogenic participants did not attain statistical significance ($p<0.05$). These results are in accordance with studies conducted by Hong et al (2010) who examined 22 cervicogenic headache subjects with 14 healthy subjects and found no statistical difference in gender, age and BMI between both groups. A similar study done by Zito et al (2011) on musculoskeletal dysfunction in diagnosing cervicogenic headache examined cervicogenic headache, migraine with aura and control subjects found no difference in mean age and duration of headaches between the groups. Among the cervicogenic group, females constituted 95% (n=19) with a mean age of 36.5 years which is in accordance with Page (2011) & Hall et al (2008)where 85-88 % female predominance in cervicogenic patients was mentioned. The female predominance in majority of the studies can be associated with hormonal shifts (Page 2011) or the fact that females tend to seek medical attention more than men (Hall et al 2008). This may also be the case in the current study as more females suffered from headaches. Similarities in the descriptive characteristics of both groups suggest that both types of

headaches cannot be differentiated in terms of a specific age, sex, body mass index, pain intensity or level of disability.

5.2 Trigger point sensitivity in participants with cervicogenic headaches and participants with non-cervicogenic headaches

The results of this study found evidence of a statistically significant difference with respect to trigger points sensitivity in right upper trapezius (p=0.02) and left upper trapezius (p=0.01) muscles when comparing cervicogenic and non-cervicogenic participants. In addition to statistical significance, an effect size (Cohen's *d*) of 0.74 for the right and 1.13 for the left upper trapezius which can be classified as a medium and large effect size, respectively The algometer reading or TrP sensitivity value is low when the patent can only handle a minimal amount of pressure (threshold) before pain is felt. Therefore, since cervicogenic headache participants had a lesser mean sensitivity score (lower the algometer reading, higher is the sensitivity of TrPs), this implies that trigger points sensitivity were significantly higher in cervicogenic participants than in non-cervicogenic participants in both the right upper trapezius and the left upper trapezius.Couppe´ et al (2007) reported similar results in a group of twenty patients with the diagnosis of chronic tension type headaches (CTTH), and 20 healthy age-matched and sex-matched control participants. The control group was blinded to the examiner and the participants were advised not to take any analgesic drug or muscle relaxants 24hrs before the examination. The TrPs sensitivity was measured using VAS and NPRS. The results of the mentioned study suggest that TrP palpation revealed more TrPs in patients (n=17) versus controls (n=6). Referred pain was also more frequent in patients (n=17) versus controls (n=9). Pain intensity of TrPs in patients was higher than in control group. The study concluded that number and pain intensity of TrPs may be used to distinguish between the two groups. The increased myofascial tenderness by palpation or

movement was shown to be positively correlated to intensity and frequency of headache. The findings of the study by Couppe´ et al (2007) suggests that increased sensitivity of TrPs correlates to the intensity and frequency of headache. Similarly in this study the increased sensitivity of TrPs in upper trapezius may be used as an additional factor to distinguish between both groups.

Page (2011) also reported that cervicogenic headache patients have a high probability of having myofascial trigger point pain particularly from over-activity of the SCM, upper trapezius, and temporalis which can be due to forward head posture and decreased endurance of the deep neck flexors. Myofascial TrPs of the SCM have a similar referred pain pattern to that seen in cervicogenic headaches (posterior to frontal). In addition, he reported that all 12 cervicogenic headache patients had at least three myofascial trigger points on their symptomatic side which reproduced their headaches over 50% of the time. The reason for this in these patients is that pain thresholds are decreased where the local tenderness is increased represented by a segmented central sensitisation or supraspinal modulation of incoming stimuli (Page 2011).

Jull et al (1999) tested the upper cervical muscle tightness of 15 cervicogenic subjects and found significantly higher muscle tightness was found in upper trapezius of the cervicogenic group. Page (2011) suggests that the tightness in upper trapezius can be associated to the forward head posture (upper crossed syndrome) of cervicogenic headache patients. Antonaci and Sjaastad (2011) also mentions increased upper trapezius sensitivity in cervicogenic patients. Postural adaptations may play a role in the development of the TrPs in the upper trapezius muscles associated with especially a forward head posture.

5.3 A comparison of the cervicogenic and non-cervicogenic groups in terms of self-perceived disability

Response patterns were found to be similar between cervicogenic and non-cervicogenic participants across the HDI items with no evidence of statistically significant difference between them. It can however be seen that some time was lost (due to time taken off from work due to headaches) by cervicogenic participants who felt handicapped by their headaches more than once per week compared to only 10% (n=2) in the non- cervicogenic group. This could have severe economic implications for both employer and employee. Hall, et al (2008)mentions that although the prevalence of cervicogenic group is considerably lower than tension type headache and migraine, patients with cervicogenic headache have a substantial quality-of- life burden, comparable to patients with migraine and tension-type headache. Even though this study was not compared to migraine and tension type only, the results from the self-perceived disability (HDI) showed that quality of life burden of cervicogenic group was as equal to the non cervicogenic groups. Van Svijlekom et al (2003) conducted a study with a similar questionnaire on thirty-seven patients with cervicogenic headache, 42 patients with episodic tension-type headache, and 39 patients with migraine without aura. The objective of their study was to establish the health related quality of life of cervicogenic group. Their studies concluded that patients with cervicogenic headache demonstrate that the impairment of quality of life in those with cervicogenic headache is worse compared to healthy persons but is, in general, comparable with patients with migraine and tension type headache (Van Svijlekom et al 2003).

5.4 Conclusion

This chapter discussed the major findings of this study in comparing the presentation of cervicogenic and non-cervicogenic group. The pressure pain threshold (sensitivity) of TrPs in the upper trapezius muscles may be used as an additional factor to differentiate between cervicogenic and non-cervicogenic headaches. Both the cervicogenic and non-cervicogenic groups showed a similar level of disability, which may have economic implications for both employer and employee. Descriptive characteristics of both cervicogenic and non-cervicogenic groups revealed similar results showing female predominance in both groups. Limitations and recommendations from the whole study are highlighted in the next chapter (chapter 6).

CHAPTER 6

6.0 CONCLUSION

Headache is one of the most common disorders of the nervous system and several of its subtypes lead to substantial levels of disability. This study compares the presentation of cervicogenic and non-cervicogenic headache. The level of disability between both groups is compared using HDI. Similarities in the descriptive characteristics, pain intensity and level of disability of both groups suggest that both types of headaches cannot be differentiated in terms of a specific age, sex, body mass index, pain intensity or level of disability. Increased sensitivity of TrPS in upper trapezius may be used as an additional diagnosing factor of cervicogenic headache group.

6.1 Study limitations

The cervicogenic and non-cervicogenic groups participants were not matched by age and gender due to the difficulty in finding patients that fitted the criteria of this study. However, the difference between these two groups was not significant as shown in table 4.5. The study of headache disability assessment was done only using HDI in both groups.

6.2 Clinical recommendation

From the above study it is recommended that cervicogenic headaches cannot be differentiated from non-cervicogenic headaches in terms of a specific age, sex, body mass index, pain intensity or level of disability. Increased sensitivity of trigger points in upper trapezius may

be used as an additional diagnosing factor of cervicogenic headache group. Since physiotherapy treatment regime are indicated in treating TrPs the presence of TrPs in upper trapezius in cervicogenic headache patients indicate the benefits of physiotherapy in treating these patients.

6.3 Recommendations for future research

More research is needed to compare the sensitivity of TrPs in other forms of headaches. The role of upper trapezius fiber trigger points sensitivity on the frequency and duration of cervicogenic headache needs to be investigated. More research is needed Neuro muscular management techniques in effective management of cervicogenic headaches. Other methods of assessment of pain and disability in cervicogenic headaches and the validity of tools used in South African population needs to be investigated.

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Appendix i Diagnosis of cervicogenic headaches

Cervicogenic patients were differentiated from non cervicogenic patients by using the diagnostic criteria used by Zito et al (2006) and the clinical characteristics explained by Biondi,(2005). The clinical characteristics are:

1. Unilateral head or face pain without side shift; the pain may occasionally be bilateral
2. Pain localized to the occipital, frontal, temporal or orbital regions
3. Moderate to severe pain intensity
4. Intermittent attacks of pain lasting hours to days, constant pain or constant pain with superimposed attacks of pain
5. Pain is generally deep and non-throbbing; throbbing may occur when migraine attacks are superimposed
6. Head pain is triggered by neck movement, sustained or awkward neck postures; digital pressure to the sub occipital, C2, C3, or C4 regions or over the greater occipital nerve; valsalva cough or sneeze might also trigger pain
7. Restricted active and passive neck range of motion; neck stiffness
8. Associated signs and symptoms can be similar to typical migraine accompaniments including nausea, vomiting, photophobia, phonophobia and dizziness.

Zito et al (2006) manual examination criterion for identifying cervicogenic headache patients consists of:

1. measurement of cervical flexion and extension (according to Knackstedt et al 2007 decreased at least by 20 degrees in cervicogenic group)

2. manual assessment of O/C1, C1/C2,C2/C3 (painful segmental dysfunction in cervicogenic group)
3. muscle extensibility- Upper trapezius, Scalenes, Levator Scapulae, Short Cervical Extensors, Pectoris major & minor (muscle tightness higher in cervicogenic group)

Appendix ii Ethics Committee Clearance Certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Mr Abraham Pramod

CLEARANCE CERTIFICATE **M120813**

PROJECT The Difference in Pressure Threshold of Trigger Points in Patients with Cervicogenic Headaches and Patients with Noncervicogenic Headaches

INVESTIGATORS Mr Abraham Pramod.

DEPARTMENT Department of Physiotherapy

DATE CONSIDERED 31/08/2012

DECISION OF THE COMMITTEE* Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 31/08/2012 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Ms Benita Oliver

DECLARATION OF INVESTIGATOR(S)
To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix iii Informed consent form

I hereby confirm that I have been informed about the details of the study

"A comparison of the presentation of patients with cervicogenic headaches and patients with non-cervicogenic headaches" done by Mr. Abraham Pramod.

I have had sufficient opportunity to ask questions and declare myself prepared to participate in the study.

I give consent to perform palpation techniques to my neck muscles and to apply pressure by means of a digital hand- held algometer.

I understand that I can withdraw from the study at any time without giving any reasons to the researcher.

PARTICIPANT

……..

Printed Name Signature Date and Time

I, Abraham Pramod, herewith confirm that the above participant has been fully informed about the details of the above study

RESEARCHER

……..

Printed Name Signature Date and Time

Appendix iv Information sheet to referring medical practitioners

"A comparison of the presentation of patients with cervicogenic headaches and patients with non-cervicogenic headaches"

Dear colleague

My name is Abraham Pramod, I am a registered physiotherapist doing my Master's Degree In Physiotherapy at the University of the Witwatersrand. I am conducting research on the presentation of patients with cervicogenic headaches and non-cervicogenic headaches. By determining the presentation of the two groups the researcher wants to determine the effect of physiotherapy treatment in both groups since physiotherapist plays a huge role in treating headache patients.

I would like you to take part in the study by referring your patients that suffer from headaches. The following information will give you the criteria of referral.

Inclusion Criteria (for both groups)

1. Voluntary Individuals aged between 18 to 60 years

2. Male or Female

3. Headache is not associated with nausea but photophobia and photophobia may be present

4. Headaches usually lasting thirty minutes to 7 days

Exclusion Criteria (for both groups)

1. Psychiatric patients on medication

2. Patients who are on medication for headaches24hrs prior to testing

3. Previous surgery to cervical spine

4. Patients who are on physiotherapy treatment currently or 4 weeks prior to testing

5. Patients with rheumatoid arthritis of the cervical spine

6. Patients with tumours on the neck \head area

7. Patients suffering from severe acute migraine attacks

8. Patients who complain of medication overuse headaches

9. Patients with communications problems that will prevent them from reporting on the level of pain during the trigger point sensitivity threshold testing.

- All the participants will be asked to fill in questionnaires relating to their headache, as well as sign written informed consent. Confidentiality will be maintained through-out the study and each participant will be allocated a number to conceal their identity. The procedure will not take more than an hour of their time. Participation is voluntary and you may refuse to participate at any stage during the study .There is no financial implication to you or the patient, in this research study. Please be advised that participants will be asked to refrain from any pain or anti-inflammatory medication 24hours preceding the testing procedure Refusal to participate will not bear any penalty or loss of benefits to which the participant is otherwise entitled. The participant will be offered a treatment session free of charge following the assessment.
- For further information and questions regarding the study please do not hesitate to contact me:

  Abraham Pramod

  Email: apramodpt@gmail.com

Tel: 041 4536385

Cell: 0832345778

- Or information regarding ethical consideration can be obtained from the chairman of the Human research ethics committee (medical), University of the Witwatersrand, Johannesburg, Prof. P.E Cleaton Jones, Tel 011 7171234.

Appendix v Information sheet to participants

A comparison of the presentation of patients with cervicogenic headaches and patients with non-cervicogenic headaches

Introduction

Good day, my name is **Abraham Pramod**, am a registered physiotherapist and currently a postgraduate student at the University of the Witwatersrand, Johannesburg. I am conducting research on the presentation of patients with headaches. I would like to invite you to participate in the research study. Before agreeing to participate I would like you to read and understand the following explanation of the purpose of the study, the study procedures, benefits and risks. If you have any questions please do not hesitate to ask.

Purpose of study

The purpose of the study is to determine if the sensitivity of trigger points (knots) in the various neck muscles are the same in patients with different types of headaches which will determine the efficiency of physiotherapy treatment in different groups of headache patients

Procedures

If you have agreed to participate in the study, you will be required to fill in a questionnaire containing questions about your headaches. You will be evaluated by a registered physiotherapist and the whole procedure should not take more than an hour of your time.

Risks and Discomforts

This study has no risks. After the evaluation process you might experience some discomfort and tenderness on the neck muscles and these symptoms should not present for more than 24hrs.

Benefits and/Compensation

The benefits of this study will give us a better understanding of the trigger points in headaches. You will not be paid to participate in the study. You will be reimbursed the travel expense to participate and catering on the day of testing will be provided as a token of my appreciation for your time. You will be offered a treatment session free of charge following the assessment.

Voluntary Participation

Participation in this study is voluntary. If you decide not to participate in this study, your decision will not involve a penalty and you are free to withdraw at any time. You have the right to decline to answer any questions that you are not comfortable with.

Confidentiality

Efforts will be made to ensure absolute confidentiality of your name and personal information.

Contacts and Questions

For further information and questions regarding the study please do not hesitate to contact me:

Abraham Pramod

Email: apramodpt@gmail.com

Tel: 041 4536385

Cell: 0832345778

Or information regarding ethical consideration can be obtained from the chairman of the Human research ethics committee (medical), University of the Witwatersrand, Johannesburg, Prof. P.E Cleaton Jones, Tel 011 7171234.

Appendix vi Algometer Report

Name:_____Date :__/__/____Examiner:_____

Right Side

Pressure Threshold	REP1	REP2	REP3	AVG
Upper Trapezius				
Sternocleidomastoid				
Temporalis				
Posterior Cervical Muscles				

Left Side

Pressure Threshold	REP1	REP2	REP3	AVG
Upper Trapezius				
Sternocleidomastoid				
Temporalis				
Posterior Cervical Muscles				

Appendix vii Headache Disability Index

HEADACHE DISABILITY INDEX QUESTIONNAIRE

Name:_____ Ref. Dr:_____ Date: _____

ID#: _____ Age: _____ Gender: M / F

INSTRUCTIONS: Please CHECK the correct response:
1. I have headaches: ○ 1 per month ○ more than 1 but less than 4 per month ○ more than 1 per week

2. My headache is: ○ mild ○ moderate ○ severe

INSTRUCTIONS: (Please read carefully): The purpose of the scale is to identify difficulties that you may be experiencing because of your headache. Please check off "YES," "SOMETIMES," or "NO" to each item. Answer each question as it pertains to your headache only.

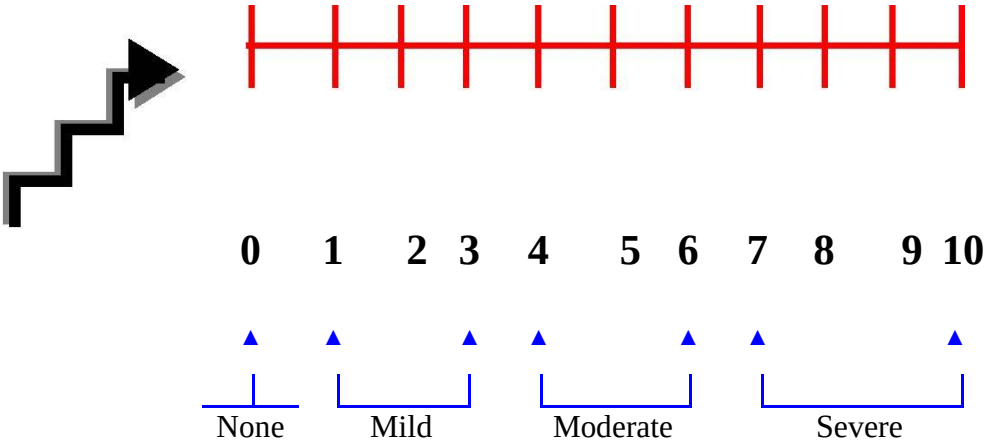
	YES	SOMETIMES	NO
E1. Because of my headaches I feel handicapped.	○	○	○
F2. Because of my headaches I feel restricted in performing my routine daily activities.	○	○	○
E3. No one understands the effect my headaches have on my life.	○	○	○
F4. I restrict my recreational activities (eg, sports, hobbies) because of my headaches.	○	○	○
E5. My headaches make me angry.	○	○	○
E6. Sometimes I feel that I am going to lose control because of my headaches.	○	○	○
F7. Because of my headaches I am less likely to socialize.	○	○	○
E8. My spouse (significant other), or family and friends have no idea what I am going through because of my headaches.	○	○	○
E9. My headaches are so bad that I feel that I am going to go insane.	○	○	○
E10. My outlook on the world is affected by my headaches.	○	○	○
E11. I am afraid to go outside when I feel that a headache is starting.	○	○	○
E12. I feel desperate because of my headaches.	○	○	○
F13. I am concerned that I am paying penalties at work or at home because of my headaches.	○	○	○
E14. My headaches place stress on my relationships with family or friends.	○	○	○
F15. I avoid being around people when I have a headache.	○	○	○
F16. I believe my headaches are making it difficult for me to achieve my goals in life.	○	○	○
F17. I am unable to think clearly because of my headaches.	○	○	○
F18. I get tense (eg, muscle tension) because of my headaches.	○	○	○
F19. I do not enjoy social gatherings because of my headaches.	○	○	○
E20. I feel irritable because of my headaches.	○	○	○
F21. I avoid traveling because of my headaches.	○	○	○
E22. My headaches make me feel confused.	○	○	○
E23. My headaches make me feel frustrated.	○	○	○
F24. I find it difficult to read because of my headaches.	○	○	○
F25. I find it difficult to focus my attention away from my headaches and on other things.	○	○	○

Appendix viii Demographic questionnaire

1. Name:
2. Age:
3. Sex:
4. Race (for statistical purposes only):
5. Area of residence:
6. Occupation:
7. Duration of headache :
8. Height:
9. Weight:

Appendix ix- Numeric Pain Rating Scale (NPRS)

0 – 10 Numeric Rating Scale



Instructions:

1. The patient is asked any one of the following questions:
   - What number would you give your pain right now?
   - What number on a 0 to 10 scale would you give your pain when it is the worst that it gets and when it is the best that it gets?
   - At what number is the pain at an acceptable level for you?
2. When the explanation suggested in #1 above is not sufficient for the patient, it is sometimes helpful to further explain or conceptualize the Numeric Rating Scale in the following manner:
   - 0 = No Pain
   - 1-3 = Mild Pain (nagging, annoying, interfering little with ADLs) 4–6 = Moderate Pain (interferes significantly with ADLs)
   - 7-10 = Severe Pain (disabling; unable to perform ADLs)

Appendix x :Faculty clearance

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011)717-2075/6

Reference: Ms Mpumi Mngapu E-mail: Mpumi.Mngapu@wits.ac.za
13 February 2013 Person No: 579277 PAG

Mr A Pramod

P O Box 70519, The Bridge
Port Elizabeth
6032
Eastern Cape South Africa

Dear Mr Pramod

Master of Science in Physiotherapy: Approval of Title

We have pleasure in advising that your proposal entitled "*A comparison of the presentation of patients with cervicogenic headaches and patients with noncervigenic headaches"* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences