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Trigeminal Neuralgia: A Review of the Clinical Features, Diagnosis and Management

Emma Carr*, Peter Walker, Joanna Morrison

Public Dental Service Ayrshire & Arran, Kilmarnock, Scotland

Email address:
Ekc96@hotmail.co.uk (E. Carr), Emma.carr2@ggc.scot.nhs.uk (E. Carr)
*Corresponding author

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Abstract: Trigeminal Neuralgia has been described by the American Association of Neurological Surgeons as *'one of the most excruciating pains known to humanity*'. It can have a severe and detrimental effect on the patient's quality of life, and many feel that they cannot perform simple daily tasks or worse still consider a future, whilst suffering this intolerable pain. As Trigeminal Neuralgia has a tendency to mimic pain of dental origin, patients may therefore first seek dental advice and treatment with the hope of gaining some immediate relief of their symptoms. This article discusses a recent case of Trigeminal Neuralgia, which had a delayed diagnosis. It discusses both the immediate management of an acute episode, and subsequent pharmacological treatment using Carbamazepine. Within this paper we also consider the psychological impact this condition has on a patient's wellbeing and quality of life. We also outline how patients can receive additional support and guidance. This article aims to give dental practitioners and health care professionals an overview of the commonly presenting clinical features, diagnosis, and management of Trigeminal Neuralgia whilst discussing a recent case the authors managed within the dental setting. It also considers the crucial role dentists, in particular, general dental practitioners, can have in the initial management and subsequent onward referral.

Keywords: Cranial Nerve, Local Anaesthetic, Oral Medicine, Pain, Trigeminal Neuralgia, Trigeminal Nerve

1. Introduction

Although Trigeminal Neuralgia (TN) is a relatively uncommon condition; it can cause significant debilitation to those affected. With knowledge and understanding of this condition, dentists are ideally positioned to allow early diagnosis and subsequent effective management.

As a background to this article, within the community dental setting, the authors diagnosed and subsequently managed a delayed presentation of Trigeminal Neuralgia. Due to the low prevalence of this condition, and the tendency of TN to mimic pain of dental origin, patients may initially seek dental care when suffering from an acute episode. This paper intends to give the reader an understanding and overview of this condition.

A literature search was completed using Pubmed and Medline. Key words such as 'Trigeminal Neuralgia', 'Trigeminal Nerve', 'Local Anaesthetic, 'Carbamazepine', 'Neuralgia' and 'Oral Pain' were used in a variety of combinations to filter review articles, case reports and retrospective studies published within the last 40 years. These articles were screened along with guidelines and included within our review where applicable.

2. Learning Objectives

The reader should understand and be able to recognise commonly occurring signs and symptoms associated with Trigeminal Neuralgia. They should also have an awareness on the psychological impact and burden this condition can have on patients' quality of life.

3. Main Text

3.1. Definition of Pain

The American Association of Neurological Surgeons has

stated that Trigeminal Neuralgia is one of the most unpleasant types of pain that someone can experience [1].

According to the International Association for the Study of Pain, pain is "*An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage"* [2]. Usually acute pain serves a useful purpose in acting like a warning signal for the body, where it informs the patient or health professional that something is wrong.

On rare occasions, some people are born with a genetic disorder which results in an insensitivity to pain. This is known as congenital analgesia, which initially may be considered an attractive alternative to the discomfort associated with painful conditions. However, an article published in the BBC discussed a case where a patient born with this condition reported that he *'had chewed off about a quarter of my tongue through teething,'* [3] without feeling any discomfort.

However, pain which perseveres without an apparent pathophysiological cause, is no longer serving a function and can have a serious and detrimental impact quality of life.

Chronic Pain is a growing problem and has been reported to affect between one third to half of the UK population at any point in time. This equates to approximately 28 million people, [4] and it is one of the most common reasons for seeking medical assistance [5]. The relationship between pain, depression and anxiety although complex, is well established in the literature [5].

3.2. Pain Scales

Due to the subjective and emotional nature of pain, it can be difficult to quantitatively and reproducibly measure [6]. Evaluating the severity of pain is, for health professionals, a perceived barrier in the provision of effective treatments, and indeed for the patient to attempt to quantify the extent of their discomfort [7]. Common, straightforward, and well-established tools for measuring pain in a healthcare setting include:

1) Visual Analogue Scale (VAS)

The VAS was first used by Hayes and Patterson in 1921 [8] and the result is based on the patient recording where they feel their pain lies on a 10cm horizontal line which represents a continuum ranging from no pain at the left side of the line to severe pain at the opposite end [9]. The measurements are recorded in centimetres and are interpreted as a score out of 10.

2) Numeric Pain Rating System (NPRS)

A method by which the patient reports the level of pain from zero which indicates no pain to 10 which is the worst pain. It can sometimes be subcategorised into 1-3 – mild pain, 4-6 moderate pain, 7-10- severe pain [10].

3) Verbal Rating Scale (VRS)

This involves asking the patient to select the most appropriate adjectives, which describes their discomfort. VRSs are scored as 0=no pain, 1=mild pain, 2=moderate pain, 3=severe pain, 4=very severe pain [10].

These scales work best for a patient who has current acute pain, as the recall of past pain experience is not always an accurate reflection, given that it is influenced by many environmental factors [6]. However, these tools often serve limited purpose in the assessment of prolonged pain, as chronic pain is multifactorial and affects many aspects of a patient's life (both physically and psychologically). In this situation, a full patient history review, clinical exam and diagnostic tests are required.

3.3. Trigeminal Neuralgia

The trigeminal nerve is the fifth cranial nerve, supplying sensory innervation to the face through three branches – ophthalmic, maxillary and mandibular. Trigeminal Neuralgia is characterised by severe, electric shock like, transient pain, which affects one or more divisions of the trigeminal nerve. According to the American Association of Neurological Surgeons, Trigeminal Neuralgia (TN) (also known as Tic Douloureux- meaning painful twitch) is *'one of the most excruciating pains known to humanity* [1]. In 97% of cases it occurs unilaterally, however occasionally can appear bilaterally [11, 12]. Triggers of pain are often associated with daily activities, such as application of make-up, eating or being outside in a cold wind [13]. This is often followed by periods where stimuli do not elicit pain – known as 'refractory periods' - which can be of variable duration ranging from days to months. Females are affected twice as commonly as males and the usual onset is in those older than 50. The estimated prevalence is 4.3 per 100,000 [14].

The aetiology of Trigeminal Neuralgia is not fully understood however, a widely recognised cause of this condition is compression of the nerve by a blood vessel resulting in dysmyelination [11]. Dysmyelination usually involves the proximal part of the nerve root and occurs due to compression from an artery or vein, typically the superior cerebellar artery, which overlies the nerve. Secondary Trigeminal Neuralgia is a term given where an identifiable cause has been diagnosed, e.g., multiple sclerosis or a tumour [15].

There is currently no single objective investigation or test that can confirm a diagnosis of this condition. It is therefore widely accepted that diagnosis is based on clinical findings and detailed pain history. Specialist input may also be sought, and indeed is important in establishing key investigations such as Magnetic Resonance Imaging (MRI) [16].

3.4. Impact on Quality of Life

Trigeminal Neuralgia can have a detrimental and debilitating impact on the health, wellbeing and quality of life for those affected. A prospective longitudinal cohort study, conducted by Zakrzewska *et al* illustrated the relationship between this condition and depression [17, 18]. The effect of this condition on the mental welfare of patients cannot be underestimated as the Trigeminal Neuralgia Facial Pain Association (TNA) have reported isolated incidents of sufferers committing suicide and overdosing on medications [19].

In addition to this, due to the spontaneous and unpredictable nature of the attacks, many patients report

living in fear of an episode occurring [20]. The interference this disorder can have on daily life is summarised by the following statements of those living with the condition:

1) 'I spent my waking hours trying to overdose, screaming and crying for relief. Emotions? Suicidal at worst, depressed at best'
2) 'TN does change your identity. Suddenly you see how precious life can be and it makes you reflect on what you are doing.' [13].

4. Case Report

An unregistered 76-year-old female patient attended her local Urgent Dental Care Centre (UDCC). Her main complaint was severe unilateral pain, which initially affected only the right mandibular ridge. She reported that the pain was indistinct and difficult to describe with no exacerbating or relieving factors. She was edentulous with complete upper and lower dentures, which were severely worn; she reported that due to the pain she had stopped wearing her lower denture. Medically, the patient suffered from hypertension, high cholesterol, stable angina and took the following medications: Amlodipine, Bisoprolol, Doxazosin, Atorvastatin, Isosorbide Mononitrate, Glycerol Trinitrate spray. She was dentally phobic and had avoided attending a dentist for many years. She smoked hand-rolled cigarettes daily and didn't consume alcohol. Clinical examination showed no abnormalities extra orally other than a reduced lower face height due to the reduced vertical dimension of worn dentures. Intraoral examination revealed the mucosa was of normal appearance, other than erythema of the palate, which was provisionally diagnosed as erythematous candidiasis, attributed to poor denture hygiene.

An orthopantogram (OPT) radiograph confirmed no significant hard tissue abnormality. She was given denture hygiene advice, prescribed an antifungal agent and advised to contact if the symptoms did not resolve.

She then returned a week later in severe distress and explained the pain had worsened and migrated to the maxillary ridge and cheek area. She described the pain as 'electric- shock' like, and stabbing. Cold worsened the pain and application of heat/pressure slightly helped. Analgesics provided no relief, and the pain persisted throughout the night keeping the patient awake. She was unable to eat or drink as these appeared to be triggers for eliciting an episode of pain. Since the previous appointment she reported minimal pain-free periods.

After discussion with senior colleagues, a provisional diagnosis of Trigeminal Neuralgia was made, and it was decided local anaesthetic would be administered into the trigger point to provide immediate pain relief and also aid diagnosis as it helped eliminate other potential causes such as referred pain. As the patient was able to localise the pain (which was in the maxillary alveolus high in the buccal sulcus at the location of second permanent molar), this aided in administering the anaesthetic. A cartridge of 2.2ml of lidocaine 2% and adrenaline 1:80,000 using a 30G 10mm needle was administered in the region of posterior superior alveolar nerve on the right maxillary ridge. This provided almost immediate relief of the patient's symptoms which then allowed consultation with her General Medical Practitioner (GMP). Subsequently, an emergency prescription of Carbamazepine and Paracetamol and Dihydrocodeine was prescribed, with a follow-up appointment arranged the following week.

During a telephone review seven days after starting Carbamazepine medication, the patient reported a significant improvement in her symptoms.

5. Management

Many treatments are available for this condition which include pharmacological, surgical and behavioural interventions. However, this paper will focus on the immediate management with local anaesthetic and subsequent prescription of Carbamazepine.

5.1. Immediate Management

Local anaesthetic injected into trigger points have been shown to be an effective short-term, and immediate, way to relieve symptoms for acute attacks; however, there is low quality evidence to support this treatment method. To improve the duration of the anaesthesia, it has been suggested that a lidocaine injection can be supplemented with bupivacaine. Compared with lidocaine, bupivacaine has a significantly longer duration of action and slower time to onset. Bupivacaine has an onset of 5 minutes and a duration of 2-4 hours compared with lidocaine which has an onset of less than two minutes and a duration of 1-2 hours [21]. It has been suggested that patients who present to accident and emergency with an acute episode can have local anaesthetic injections administered at regular intervals until the medication has become effective [11].

In a study conducted by *Baykal and Kaplan* [22], where the effectiveness of treatments in in acute episodes of primary Trigeminal Neuralgia were investigated, local anaesthetic was injected around the mandibular and maxillary branches of the trigeminal nerve. This study involved 13 patients who were experiencing symptoms of varying severity. Lidocaine 2% was administered weekly for 5 weeks (total: 6 administrations) and the patients reported complete relief of symptoms within minutes of injection; however, the initial or post treatment pain scores were not recorded. The purpose of this 5-week treatment was to permit time for titration of medication to allow it to take effect. After this, one patient remained pain-free for 1 month, another two remained pain-free for 6 months, and the remaining 10 patients were pain-free for at least 12 months [23].

Other studies have looked at various techniques using local anaesthetic such as:

1) Continuous infusion of bupivacaine around peripheral nerve branches;
2) Injection of Ropivacaine (either alone or with

gabapentin) into trigger points;
3) Tetracaine (either alone or with bupivacaine) peripheral nerve injection;
4) Lidocaine compared with lidocaine and streptomycin into peripheral nerves;

However, none of these produced marked improvement within the first 24 hours [23].

5.2. Carbamazepine

Carbamazepine has shown to be an effective treatment option for TN, reducing both the frequency and severity of attacks. An initial trial of this drug can aid or confirm diagnosis, as in the preliminary stages it can cause symptoms to completely subside. In a retrospective study conducted by Stefano *et al*, 98% of participants reported an improvement of symptoms upon starting this treatment [24]. However, as it requires a period of titration to become effective, it is not particularly useful as an acute analgesic.

Although many patients report positive effect within 24 hours, Carbamazepine requires careful consideration of the dosing which should be increased gradually to reduce associated side effects such as dizziness, drowsiness and fatigue. Regular blood monitoring is required when taking this drug, including hepatic and renal function tests [25]. It is reported that 27% of patients are unable to tolerate the side effects and subsequently are forced to either stop the medication or reduce the dose [24]. An alternative to this is oxcarbazepine, which has fewer side effects and drug interactions.

5.3. Other Treatment Methods

Other treatments which may be of benefit to some patients include Cognitive Behavioural Therapy (CBT) and Acceptance and Commitment Therapy (ACT), which are designed to provide tools for patients to better understand and manage their condition [26].

It is widely accepted that TN negatively affects the psychological wellbeing of those affected and a multidisciplinary approach, with input from specialists including psychologists and psychiatrists, may be appropriate in addition to pharmacological management.

Due to the low prevalence of this condition, many feel that they are suffering alone. As such, access to good quality, easy-to-understand information, patient support groups and online forums may be useful in providing support.

6. Surgical Management

A brief outline of some of the surgical managements is given below [27].

Table 1. *An outline and description of surgical management.*

Surgical Procedure	Description
Microvascular Decompression	1) The most common surgical procedure for TN. 2) Open surgical approach involving an incision just behind the ear to expose the nerve and relieve compression, usually caused by artery or vein.
Stereotactic Radiosurgery	1) Less invasive than Decompression. 2) Radiation is aimed at the trigeminal nerve where it enters the brainstem which aims to prevent the transmission of pain signals.
Radiofrequency Rhizotomy	1) An electrode is passed through the cheek, which applies heat to the nerve causing controlled damage to the nerve with the aim to stop pain signals being transmitted.
Gasserian Ganglion and retrogasserian ablative procedure	1) A Gasserian Ganglion block is used with the aid of a fluoroscope to aid location of the Foramen Ovale where the ganglion is located. 2) If balloon gangliolysis is used, it aims is to reduce the facial pain permanently by using a balloon to compress the ganglion.

7. Conclusion

As Trigeminal Neuralgia may mimic pain of dental origin, patients may initially seek dental care. In a study which followed up on patients who required intervention for this condition, it was reported that 82% initially consulted their dentist due to their pain [28]. It is therefore important for dentists to understand this condition to avoid unnecessary, irreversible treatment such as extractions and pulp extirpations and delay in diagnosis and appropriate treatment. Patients may seek emergency dental care during an acute episode, and the administration of local anaesthetic into trigger points has been shown to be an effective treatment to give immediate, albeit transient, relief of symptoms. As more than 50 million cartridges of local anaesthetic are administered in the dental setting in the UK each year [29], dentists are ideally positioned to provide local anaesthetic as a short-term intervention. This treatment modality may also be of use within other health care settings to aid management of pain during the titration of drug therapy to therapeutic levels or prior to definitive surgical treatment.

Compliance with Ethical Standards

Ethical approval was not required.

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

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E. Carr: Writing original draft. P. Walker: Clinical management, Reviewing and editing. J. Morrison: Reviewing and editing.

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