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The Prevalence of Phantom Tooth Pain / Atypical Odontalgia

Sook Ling Leong

A treatise submitted in partial fulfillment of the requirements for the Degree of Master of Dental Science (Prosthodontics)

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September 2003
Statement of Authorship

I declare that all the work presented in this treatise is my own, unless otherwise stated. The work of colleagues is acknowledged in general terms within the ACKNOWLEDGEMENTS and specifically within the body of the text, wherever it is appropriate.

Sook Ling Leong

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# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glossary of terms and abbreviations</td>
<td>6</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>8</td>
</tr>
<tr>
<td>2. Literature Review: Atypical Odontalgia (AO) or Phantom tooth pain (PTP)</td>
<td>9</td>
</tr>
<tr>
<td>2.1. Terminology and Definitions for AO or PTP</td>
<td></td>
</tr>
<tr>
<td>2.2. Origins and Synonyms for AO or PTP</td>
<td></td>
</tr>
<tr>
<td>2.3. Classification of AO or PTP by International Associations</td>
<td></td>
</tr>
<tr>
<td>2.4. Is AO the same as PTP? Classification of AO or PTP resulting from published research data</td>
<td></td>
</tr>
<tr>
<td>2.5. Rational for Studying AO or PTP</td>
<td></td>
</tr>
<tr>
<td>2.6. Theoretical Framework for the Proposed Study</td>
<td></td>
</tr>
<tr>
<td>2.7. Previous epidemiological research methods and findings on AO or PTP</td>
<td></td>
</tr>
<tr>
<td>2.8. Statement of the problem to be investigated</td>
<td></td>
</tr>
<tr>
<td>2.9. Research questions to be investigated</td>
<td></td>
</tr>
<tr>
<td>2.10. Delimitations and limitations of the study</td>
<td></td>
</tr>
<tr>
<td>2.11. Summary</td>
<td></td>
</tr>
<tr>
<td>3. Materials and Methods</td>
<td>25</td>
</tr>
<tr>
<td>3.1. Pilot Survey using 11-item Screening Questionnaire on General Dentistry Group</td>
<td></td>
</tr>
<tr>
<td>3.2. Pilot Survey using 2-item Screening Questionnaire on Endodontics Group</td>
<td></td>
</tr>
<tr>
<td>4. Results</td>
<td>30</td>
</tr>
<tr>
<td>4.1. Results from Screening Questionnaire (General Dentistry Group) – A Pilot Study</td>
<td></td>
</tr>
<tr>
<td>4.2. Results from Follow-up Clinical Examination and Comprehensive Questionnaire (General Dentistry)</td>
<td></td>
</tr>
<tr>
<td>4.3. Results from Screening Questionnaire and Endodontics Recall Clinical Examination (Endodontics Group) – A Pilot study</td>
<td></td>
</tr>
</tbody>
</table>
4.4. Results from Comprehensive Questionnaire (Endodontics)

4.5. Results from Clinical Examination by Dental Specialists to Confirm Diagnoses (Endodontics Group)

5. Discussions

5.1. Prevalence from General Dentistry Group

5.2. Prevalence from Endodontics Group

5.3. Comparison of Both Methods

5.4. Other Relevant Results

6. Concluding Remarks and Further Research

References

Appendices
Glossary of Terms and Abbreviations

Pain Terms

AAOP American Academy of Orofacial Pain

Atypical Odontalgia (AO) is severe throbbing pain in the tooth without major pathology (Merskey and Bogduk 1994).

Deafferentation is partial or total loss of afferent neural activity to a particular body region through removal of part of the neural pathway (Okeson 1996).

Deafferentation Pain is usually a constant pain perceived in a localised area resulting from the loss or disruption of afferent neural pathways (Okeson 1996).

IASP International Association for the Study of Pain

IHS International Headache Society

Neuropathic Pain (NP) is pain initiated or caused by a primary lesion or dysfunction in the nervous system (Merskey and Bogduk ).

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (Merskey and Bogduk 1994).

Phantom Tooth Pain (PTP) a clinical condition of persistent pain in endodontically treated teeth or edentate areas for which there is no explanation to be found by physical and radiographic examination (Marbach 1993a).
Terms Used in Epidemiology (from Lilienfeld and Stolley 1994)

Cross-sectional studies are also known as “prevalence surveys” and these studies provide information on the frequency of disease in a population.

Incidence rate is the direct estimate of the probability or risk of developing a disease during a specified period of time.

Prevalence rate measures the number of cases that are present at or during a specified period of time. The prevalence rate equals to incidence rate multiplied by the average duration of disease.

Terms Used in Epidemiology (from Weiss 1996)

Reliability is the degree to which repeated measurements give the same result.

Validity is the degree to which it measures what it intends to.
1. Introduction

Atypical odontalgia (AO) or phantom tooth pain (PTP) describes a puzzling chronic pain syndrome that is difficult to diagnose because of: 1) disagreements on the terminology and diagnostic criteria; 2) current laboratory and radiographic diagnostic tests cannot be used as “gold standard”. Epidemiology offers a scientific method based on populations, to classify subjects, who report pain located in a tooth or edentate region without obvious pathology.

AO or PTP has both dentists and sufferers puzzled and frustrated because successful conventional endodontic and oral surgical procedures failed to relieve pain described as constant, dull, deep ache.

Research suggests that it is not a common pain syndrome. It can be a distressing condition for the sufferer, and frustrating for the clinician, because of inconsistencies in diagnosis and theories on etiology, leading to variable responses to current methods of therapy.

The literature review aims to find a consensus in terminology and diagnostic criteria that can be used for an epidemiological study on this chronic orofacial pain syndrome.
2. Literature Review: Atypical Odontalgia (AO) or Phantom tooth pain (PTP)

2.1 Terminology and Definitions for AO or PTP

The International Association for the Study of Pain (IASP) defined atypical odontalgia (AO) as, "Severe throbbing pain in the tooth without major pathology" (Merskey and Bogduk, 1994). The American Academy of Orofacial Pain (AAOP) provided a similar definition of "Tooth pain without obvious pathology and of unknown etiology" (Okeson, 1996).

Phantom tooth pain (PTP) is "a clinical condition of persistent pain in endodontically treated teeth or edentate areas for which there is no explanation to be found by physical and radiographic examination" (Marbach, 1993a).

2.2 Origins and Synonyms for AO or PTP

The use of the term AO is most likely to have been introduced by Rees and Harris (1978) who renamed "idiopathic periodontalgia" (Harris, 1974) because of an apparent relationship with atypical facial pain. Graff-Radford and Solberg used AO in earlier publications (Graff-Radford and Solberg, 1986, 1992, 1993), but more recently changed the term to "sympathetically maintained traumatic trigeminal neuralgia" (Graff-Radford et al., 1995). Other synonyms for AO include neurovascular odontalgia (Mahan and Alling, 1991) and chronic idiopathic orofacial pain (Allerbring and Haegerstam, 1993). Even the AAOP uses a synonym, as AO was defined as "idiopathic odontalgia" in the glossary (Okeson, 1996).
Marbach was the first to introduced PTP in the English literature. PTP seemed to share the same mechanisms that resulted in phantom limb pain (Marbach, 1978). Reisner (1981) claimed to have introduced phantom phenomenon in 1977 with the following statement: “Phantom experiences from extracted teeth, on the other hand, are rarely described. H. Reisner first described this phenomenon in 1977, pointing out that it is more or less unknown in dental medicine”. The publication can be found in the German-language journal - Ostesterr Z Stomatol 1977; 74: 423-427.

Elfenbaum (1954) advocated the use of causalgia in dentistry to describe “a peculiar nagging, persistent post-extraction pain that has either been treated inappropriately or with poor results”. Elfenbaum cited works by Mitchell (1918) and Livingston (1947), two recognised authors on post-amputation pain. More recent users of dental causalgia were Massler (1981) and Biggs and Miranda (1983). The IASP renamed causalgia as “complex regional pain syndrome type II” (Merskey and Bogduk, 1994).

Merrill (1997) placed AO in the category of “complex regional pain syndrome type III” - an additional category when compared to that indicated by the IASP classification. Vickers and Cousins (2000) and Berge (2002) used “neuropathic pain” as an all-embracing term for AO and PTP.

Marbach (2000, personal communication) attempted to standardise the terminology by combining PTP and AO as “Phantom Odontalgia”.

10
The IASP Special Interest Group on Orofacial Pain is working on the taxonomy of AO; consideration of a change to “trigeminal neuropathic pain” or “trigeminal dysesthesia” for those who complain of discomfort rather than pain (see Orofacial Pain: Newsletter of the IASP Special Interest Group on Orofacial Pain 2001”).

2.3 Classification of AO or PTP by International Associations

The IASP arranged the pain syndromes by site (Merskey and Bogduk, 1994) and AO is arranged under:

- General category of “B. Relatively localized syndromes of the head and neck”
- Sub-category of “Group IV: Lesions of the ear, nose & oral cavity”
- “Odontalgia: Toothache 4. Tooth pain not associated with lesions (IV-5)”.

AO is given a classification code of “034.X8b” by the IASP (Merskey and Bogduk, 1994). It represents the following:

0 Head, face and mouth [Axis 1 = Regions]
3 Musculoskeletal system and connective tissue [Axis 2 = Systems]
4 Recurring irregularly (e.g., headache, mixed type) [Axis 3 = Temporal characteristics of pain: Pattern of occurrence]
.X To be completed individually in each case [Axis 4 = Patient’s statement of intensity: Time since onset of pain]
8 Unknown or other [Axis 5 = Etiology]
b Suffix to differentiate from other conditions with the same code (Temporomandibular pain and dysfunction syndrome [034.X8a] and Toothache, cause unknown [034.X8f])

11
Other similar IASP codes: 1) “034.X8a” Temporomandibular pain and dysfunction syndrome; and 2) “034.X8f” Toothache, unknown cause.

The AAOP classified AO as continuous deafferentation pain in the general category of neuropathic pain (Okeson, 1996). AAOP defined deafferentation pain as “usually constant pain perceived in a localised area resulting from the loss or disruption of afferent neural pathways”, and neuropathic pain as “pain initiated or caused by a primary lesion or dysfunction in the nervous system” (Okeson, 1996).

The International Headache Society (IHS) classified AO as “facial pain not fulfilling criteria in groups 11 and 12” (Olesen, 1988). Group 11 is “headache or facial pain associated with disorder of cranium, neck, eyes, nose, sinuses, teeth, mouth or other facial or cranial structures” and Group 12 is “cranial neuralgias, nerve trunk pain and deafferentation pain”. It is interesting that IHS did not classify AO under the deafferentation category compared with AAOP. Delcanho (2003, personal communication) suggested that there is to be a launch of a revised classification by IHS in September 2003.

Both AAOP and IHS classified pain syndromes according to underlying aetiologic mechanisms.

PTP is classified as deafferentation pain, belonging to neuropathic pain syndromes (Marbach, 1993a). This is the same as for AO by AAOP. The question is, “Is AO the same as PTP?”
2.4 Is AO the same as PTP? Classification of AO or PTP resulting from published research data

By definition in Section 2.1, PTP differs from AO in specifying continuation of pain following deafferentation procedures. However, the classification of AO and PTP by the AAOP and Marbach in Section 2.3 placed them in the same category. AAOP mentioned AO is referred to as PTP (Okeson, 1996). Some authors have considered PTP as being similar to (Bates and Stewart, 1991; Schnurr and Brooke, 1992) or a variant (Widmer, 2001) of AO.

Vickers and Cousins (2000) considered AO or PTP as subsets of “neuropathic orofacial pain”. Berge (2002) combined the diagnostic criteria of AO and PTP for an epidemiological study on chronic neuropathic pain. Merrill (1997) believed AO included subgroups of neuropathic pain (nociceptor- sensitised pain, sympathetically maintained and independent pains) and classified AO as “complex regional pain syndrome type III”.

The classification of AO with atypical facial pain (AFP), oral dysaesthesia and temporomandibular disorder (TMD) as “psychogenic facial pain” (Harris, 1974; Feinmann and Harris, 1984) is controversial. This classification group was renamed as “chronic idiopathic orofacial pain” (Aghabeigi et al., 1984; Madland and Feinmann, 2001) and adopted by others (Woda and Pionchon, 1999; De Nucci et al., 2000). Despite using this classification, Woda and Pionchon (2000) attributed neuropathic changes as the aetiologic mechanism for AO.
MEDLINE database (1966 to June 2003) was used to search for publications of AO, PTP, neuropathic orofacial pain (NOP), sympathetically maintained pain (SMP), chronic idiopathic orofacial pain (CIOP), dental causalgia (DC), and deafferentation pain (DP). Figure 1 indicates the distribution of terms used in published articles, with the most publications using AO, followed by PTP and NOP. Neuropathic pain is noted as a recent term in medical and dental literature (Vickers, 1998) and Figure 1 supports this by showing most publications using term of NOP were in the 1990’s onwards.

Terms such as NOP, SMP, DC and DP imply acceptance of an aetiological mechanism. CIOP is less specific and may include heterogenous pain syndromes.
Graff-Radford (2000) discouraged the use of "idiopathic" and "atypical" because these words do not define the problem and suggest that something is unknown. "Phantom" indicates that something is not real. However, phantom pain is widely used in the medical literature.

Different classifications and terminology have made diagnosis at a population level difficult. More recent literature suggests a trend in classifying AO and PTP under the same category of neuropathic pain, and a general acceptance that both pain conditions are not the same, but are similar.

2.5 Rational for Studying AO/PTP

The importance of recognising AO / PTP is for the diagnosis and selection of appropriate treatment, and the prevention of using extensive dental therapies to ameliorate pain albeit unsuccessfully (Marbach, 1978; Rees and Harris, 1978-79; Brooke, 1980; Bates and Stewart, 1991). It is unfortunate that misdiagnosis of AO as odontogenic pain has resulted in multiple irreversible dental therapies, decompression of the trigeminal ganglion and even sectioning of the inferior alveolar nerve (Lilly and Law, 1997). Battrum and Gutmann (1996) illustrated the difficulty of diagnosing PTP as repeated treatment failures eventually led to diagnosis by exclusion.

The irreversible procedures are economically costly for the patient. On average almost eleven doctors were consulted by subjects with PTP (Marbach, 1978), and five healthcare providers including specialists for those with AO (Vickers et al., 1998). It
becomes expensive for the sufferer and healthcare system. At a psychological level, a high score for demoralisation in PTP cases was found (Marbach, 1993b).

Marbach (1993b) emphasised especially in the current climate of litigation, of the importance of informed consent concerning the possibility of PTP following endodontic therapy, and exercising caution when performing endodontic treatment, especially as pain is characteristic of PTP.

2.6 Theoretical Framework for the Proposed Study

Epidemiology systematically indicates to which group a pain syndrome belongs to, and advises about the nature of diseases with the aim of disease prevention on a population basis (Von Korff, 1999).

An indispensable tool for prevalence studies is an internationally accepted diagnostic criteria with clear definition, to ensure a homogenous group (Crombie et al., 1994, Crombie and Davies, 1999). “Determining variables common to those afflicted may also assist in differential diagnosis” (Klausner, 1994). The paradox is an absence of consensus of diagnostic criteria and an objective “gold standard” diagnostic test which hampers epidemiological studies on AO / PTP, and in turn fails to identify the common features that will define the diagnostic test.

Three organisations classifying orofacial pain syndromes (IASP, IHS, and AAOP) have separate diagnostic criteria and only use the term AO. A literature search found prevalence studies on PTP (5) and chronic neuropathic pain (1) that used
different diagnostic criteria or was not specified (Marbach et al., 1982; Campbell et al., 1990; Pöllmann, 1993; Fiscoff et al., 1999; Jacobs et al., 2002; Berge, 2002). When different examiners using the same diagnostic standard reach the same conclusions, the assessment is reliable (Marbach and Raphael, 2000). The accuracy of any diagnostic test depends on reliability and validity, that is the degree to which a person with (sensitivity) or without (specificity) the condition is correctly categorised (Weiss, 1996).

Marbach and Raphael (2000) suggested it is not possible to follow a “gold standard” as diagnostic laboratory and radiographic tests are unavailable, making differential diagnoses difficult. Somatic and sympathetic nerve blocks were used as diagnostic and therapeutic tools with variable results (Marbach, 1978; Bates and Stewart, 1991; Graff-Radford and Solberg, 1992; Vickers et al., 1998). A laboratory test using liquid chromatography coupled to mass spectrometry (LC-MS) could analyse for neuropeptides involved in pain transmission (Vickers, 2001).

Functional imaging techniques such as electronic thermography (ET) (Gratt et al., 1989, 1996; Graff-Radford et al., 1995), positron emission tomography (PET) (Derbyshire et al., 1994), and single photon emission computed tomography bone scanning (SPECT) (DeNucci et al., 2000) were used, with some promise for ET and PET. As for SPECT, validity was considered to be low for detecting painful areas in the jaw (see Table 1). ET is expensive equipment and requires special training and experience for accurate interpretation as shown in the validity scores (Table 2) comparing thermography experts with dentists.
Table 1. The validity scores of SPECT bone scans for detection of painful quadrants and local pathology.

<table>
<thead>
<tr>
<th>SPECT bone scans (DeNucci et al. 2000)</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection of painful quadrants</td>
<td>0.79</td>
<td>0.68</td>
</tr>
<tr>
<td>Detection of previously identified pathoses (control)</td>
<td>0.81</td>
<td>0.93</td>
</tr>
<tr>
<td>Detection of previously identified pathoses (pain)</td>
<td>0.88</td>
<td>0.58</td>
</tr>
</tbody>
</table>

Table 2. The validity scores of blinded interpretation of ET for AO by experts and dentists.

<table>
<thead>
<tr>
<th>Type of Observer (Gratt et al. 1989)</th>
<th>No. of Observers</th>
<th>Sensitivity (mean)</th>
<th>Specificity (mean)</th>
<th>Accuracy (mean)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experts</td>
<td>3</td>
<td>0.87</td>
<td>0.72</td>
<td>0.79</td>
</tr>
<tr>
<td>Dentist (trained)</td>
<td>5</td>
<td>0.60</td>
<td>0.62</td>
<td>0.61</td>
</tr>
<tr>
<td>Dentist (untrained)</td>
<td>5</td>
<td>0.48</td>
<td>0.62</td>
<td>0.55</td>
</tr>
</tbody>
</table>

* Statistically significant difference (p<0.05) with use of Student’s t test, comparing accuracy of experts versus trained and untrained dentists.

Without any objective diagnostic test that is replicable and accurate, diagnostic screening of a population for AO / PTP is reliant on subjective reporting by individuals. Past prevalence surveys used a set of written or verbal questions as a diagnostic tool (Marbach et al., 1982; Campbell et al., 1990; Pöllmann, 1993; Jacobs et al., 2002; Berge, 2002). Marbach and Raphael (2000) indicated: “In the absence of a diagnostic gold standard, accurate differential diagnosis of PTP is dependent upon history, physical examination, and such often overlooked tools as epidemiology”.

18
2.7 Previous epidemiological research methods and findings on AO or PTP

An epidemiological study (Berge, 2002) used the term chronic neuropathic pain and had combined the diagnostic criteria for AO and PTP (Table 3) to determine an incidence of between 0 and 0.38% (95% confidence) amongst patients who had surgical removal of impacted third molars. 1035 patients were contacted via telephone asking one question, "You had one (or more) impacted wisdom tooth/teeth removed by an operation in 1994/5/6. Apart from pain and swelling immediately after the operation, do you now have any symptoms like pain, discomfort, swelling, abnormal skin or mucous membrane sensations or sensitivity, that you attribute to the wisdom tooth surgery" (ibid). Of the study group, 23 reported persistent symptoms, but none met at least three of the diagnostic criteria to have a diagnosis of chronic neuropathic pain.

Table 3. Diagnostic criteria for post-operative chronic neuropathic pain (Berge, 2002)

<table>
<thead>
<tr>
<th>Criterion</th>
<th>References using AO in the text</th>
<th>References using PTP in the text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous dull pain with bursts of sharp pain</td>
<td>Graff-Radford &amp; Solberg 1992</td>
<td>Marbach 1993a</td>
</tr>
<tr>
<td>Mainly limited to area of damaged nerve</td>
<td>Graff-Radford &amp; Solberg 1992</td>
<td>Marbach 1993a</td>
</tr>
<tr>
<td>Onset after nerve damage or surgical procedure</td>
<td></td>
<td>Marbach 1993a</td>
</tr>
<tr>
<td>Delayed onset (days-years)</td>
<td></td>
<td>Marbach 1993a</td>
</tr>
<tr>
<td>Hyperalgesia, allodynia, trigger zones</td>
<td>Graff-Radford &amp; Solberg 1992</td>
<td>Marbach 1993a</td>
</tr>
<tr>
<td></td>
<td>Bates &amp; Stewart (1991)</td>
<td></td>
</tr>
</tbody>
</table>
A prevalence study on PTP features by Marbach et al. (1982) used diagnostic criteria (Table 4) modified from the four major features of phantom limb pain (Melzack, 1971) whereby, 8 of 256 female subjects fulfilled all four criteria, giving a 3% prevalence. A 10-item questionnaire on tooth and facial pain pre- and post-endodontic treatment was mailed to patients of one endodontist and 460 (63%) were returned in a usable form for analysis. Thirty reported persistent pain (longer than one-month post-treatment) but only half returned for examination. Furthermore, the data from four male subjects who attended the examination was not included in calculating prevalence. The authors felt that if the criteria were less rigorous, the prevalence could be as high as 6%.

Fiscoff et al. (1999) used a semi-structured interview and orofacial examination to survey a group of patients who were HIV-seropositive for chronic orofacial pain. This study found 3% of 99 patients had symptoms of PTP but did not specify the diagnostic criteria used.

Campbell et al. (1990) sent a questionnaire containing eight questions to patients who had surgical endodontic treatment, 118 (57%) were returned for analysis. Six reported persistent pain (average duration 21 months) and following examination were judged to have had successful surgical endodontics. The diagnostic criterion was based on the presence of pain before treatment and with this, three who had pre-treatment pain were classified as PTP (2.5% prevalence) and three without pre-treatment pain were classified as having post-traumatic dysesthesia. Those classified as post-traumatic dysesthesia could be classified as PTP utilising the criterion of Marbach et al. (1982): “The greater likelihood of occurrence if the structure had been
painful prior to amputation”. This criterion does not exclude the onset of pain after treatment, which then would result in a 5% prevalence of PTP.

**Table 4. Diagnostic criteria used for prevalence study on PTP (Marbach et al., 1982)**

<table>
<thead>
<tr>
<th>Four major properties of phantom limb pain (Melzack, 1971)</th>
<th>PTP criteria (Marbach et al., 1982)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The pain endures long after healing of injured tissues. It continues for more than a year after onset in about 70% of patients, and may persist for years, even decades, in patients with perfectly healed stumps.</td>
<td>Persistence after the injured tissue appears healed.</td>
</tr>
<tr>
<td>Trigger zones may spread to healthy areas on the same or opposite side of the body. Gentle pressure or pin prick on another limb or on the head may trigger pains in the phantom limb. There is also evidence that pain at a site distant from the stump may evoke pain in the phantom limb. Thus, amputees who develop anginal pain as long as 25 years after amputation may suffer severe pain in the phantom limb during each bout of anginal pain, although phantom limb pain may never before have been experienced.</td>
<td>The presence of discrete hypersensitive trigger points that, when stimulated, elicit pain in the phantom.</td>
</tr>
<tr>
<td>Phantom limb pain is more likely to develop in the patients who suffered pain in the limb for some time prior to amputation. It is relatively rare in war amputees, who tend to lose a limb suddenly, but more common in civilian amputees, in whom presurgical pain is a frequent accompaniment of disease of the limb. Furthermore, the pain may resemble, in both quality and location, the pain that was present before amputation. Thus, a patient who was suffering from a wood sliver jammed under a finger nail, and at that time lost his hand in an accident, subsequently reported a painful sliver under the finger nail of his phantom hand.</td>
<td>The greater likelihood of occurrence if the structure had been painful prior to amputation.</td>
</tr>
<tr>
<td>The pain is sometimes permanently abolished by temporary decreases or increases of somatic input. Injection of procaine locally into the stump tissues or nerves may stop the pain for days, weeks, sometimes permanently, even though the anesthesia wears off within hours. Successive blocks may produce increasingly longer periods of relief. Similarly, procaine injected into the lower-back interspinous tissue in leg amputees produces a progressive numbness of parts of the phantom limb, and prolonged, sometimes permanent relief of pain in all or part of it. Paradoxically, increases in the sensory input may sometimes relieve the pain. Injection of small amounts of hypertonic saline solution into the interspinous tissue of amputees produces a sharp, localized pain that radiates into the phantom limb, lasts only about 10 minutes, yet may produce dramatic partial or total relief of pain for hours, weeks, sometimes indefinitely. Similar effects have been obtained by injections of hypertonic saline solution into the stump tissues.</td>
<td>The lack of elimination of pain by otherwise reliable methods, e.g., nerve blocks, sympathectomy and narcotic analgesics*.</td>
</tr>
</tbody>
</table>

* This criterion is different from Melzack.
Jacobs et al. (2002) found 5.7% prevalence using a questionnaire based on the McGill Pain Questionnaire (MPQ) that was mailed to those who had recent endodontic treatment, dental extraction or who presented with a chronic pain problem. Of those distributed, 176 questionnaires (35%) were returned suitable for analysis and ten provided positive response(s) to either or both questions: “Is the region of the removal of the nerve or tooth extraction still disturbing?” And “Do you have the feeling that the tooth/teeth is/are still in place?” An experienced orofacial pain specialist diagnosed eight with PTP and two with painless phantom tooth.

The study by Pöllmann (1993) asked questions about phantom sensations, finding 1.68% prevalence of PTP amongst 2,620 aspiring employees with edentate areas. There was no specification of the diagnostic criteria. The distinction of Pöllmann’s study was that clinical examination was completed for all patients.

Vickers et al. (1998a) reported twenty-nine AO subjects (using IASP criteria) of 120 consecutive patients seen at a multidisciplinary pain centre. Amongst those with AO, twelve were given a primary diagnosis of AO, and the remaining seventeen were given a concurrent diagnosis of AO-TMD. The prevalence of AO in this selective chronic pain population was estimated to be 24%.

Fricton (1999) indicated the probability of re-classifying 35 patients previously diagnosed with AO or AFP by using AAOP diagnostic criteria. Three were given a diagnosis of neuropathic pain (interestingly, this category included AO).
2.8 Statement of the problem to be investigated

Two methods used in screening for PTP on selected groups (a pilot study).

The work in this treatise involved modifications of an existing questionnaire where the authors had used the term PTP. The population groups chosen for study are subjects who had previous endodontic therapy and extractions, which is more consistent with the definition for PTP rather than AO. Thus, to maintain consistency and to avoid confusion in terminology, from hereafter, PTP is the preferred term.

2.9 Research questions to be investigated

Aim:

The aims were to find the prevalence and test the effectiveness of two methods in screening subjects that may potentially have PTP based on the diagnostic criteria of Marbach et al. (1982) and Berge (2002) respectively.

Hypotheses:

a) There is a prevalence rate of between three and six percent for PTP.

b) There will be no difference between the two methods used to screen the subjects.
2.10 Delimitations and limitations of the study

The project was to test the effectiveness of using a questionnaire alone or combining it with clinical examination to identify by differential diagnosis PTP. The questionnaire does not test the effectiveness of treatment for this condition.

2.11 Summary

PTP is recognised to be an enigmatic chronic orofacial pain syndrome that has been difficult to confidently diagnose due to lack of a universal diagnostic criteria and objective diagnostic tests. Epidemiological studies on PTP can help refine the diagnostic criteria.
3. **Materials and Methods:**

Pilot surveys of two groups of patients from Westmead Centre for Oral Health (WCOH), Westmead, Sydney, used a series of questionnaires and clinical examinations (separate methodologies). The primary aim was to screen for PTP based on the diagnostic criteria used in past epidemiological studies by *Marbach et al. (1982)* and *Berge (2002)* respectively. A secondary aim was to judge which method gave the most consistent answers to the questions asked.

The diagnosis was based on fulfillment of three of four criteria as defined by *Marbach et al. (1982)*, and at least three criteria out of six criteria defined by *Berge (2002)*. Please note that Marbach and co-workers (*op cit*) required all four criteria to be satisfied to qualify for PTP. This study did not test for the last criterion, “Lack of elimination of pain by otherwise reliable methods, e.g., nerve blocks, sympathectomy and narcotic analgesics” for the reasons:

1) It was not possible to test some of these methods at the clinical examination by the clinical investigator (S. L. Leong).

2) The use of local anaesthetic nerve block for relief of pain has shown variable results:
   a) 46% pain was eliminated (*Bates and Stewart, 1991*)
   b) 50% pain was relieved (*Graff-Radford and Solberg, 1991*)
   c) Variable response (*Rees and Harris, 1978-79*)
   d) 76% significant reduction in pain (*Vickers et al., 1998*)

3) The diagnostic criteria published after 1982 did not include this criterion (*Marbach, 1993a; Marbach and Raphael, 2000*).
The questionnaires were self-administering and restricted potential subjects to those who could read and write English, as language assistance was limited. A poor understanding of English language would have been a serious confounding factor on data collection.

The data were analysed using statistical mean, standard deviation, standard error of mean, and tested for sensitivity as well as specificity. The number of positive responses to the screening questionnaire and as a result the comprehensive questionnaire was less than 30, and more extensive statistical analysis was not possible.

3.1 Pilot Survey using 11-item Screening Questionnaire on General Dentistry Group (see Appendices for Questionnaires)

The first survey used a self-administered “Screening Questionnaire for General Dentistry” (Appendix 1) containing eleven questions. This was an abridged version of a 35-item questionnaire designed and used by Professor R. Jacobs and co-workers at the Katholic University, Leuven, Belgium. The number of questions were reduced: 1) to hopefully, attract a higher response rate; and 2) from clinical experience, sections based on the McGill Pain Questionnaire (Melzack, 1975) had been difficult to be self-administered.

Patients treated between April and August 2001 in the General Dentistry Clinics at WCOH, Sydney, were invited by reception staff to complete the questionnaire.
Subjects screened for follow-up examination were identified through positive responses to either or both these questions: Q9. Does the tooth / area still disturb you (gives you pain or sensation) after these types of treatment: removal of tooth nerve / root end or extraction? Q10. Do you have the feeling that the tooth or teeth are still in place? This followed the method described by Jacobs et al. (2002). Positive answers were considered as “Sometimes/Often/All the time”.

At the follow-up examination, subjects were asked to complete a “Comprehensive Questionnaire for General Dentistry and Endodontics” (Appendix 3) on their own after instructions were provided.

This comprehensive questionnaire was different from that used by Jacobs and co-workers by:

1) Replacement of the table in screening “Question 8” with an upper body diagram from MPQ and inclusion of an intra-oral diagram for the patient to indicate the area(s) of pain.

2) Arranging the questionnaire into six sections:
   a) reporting of pain and types of previous dental treatment
   b) location of the pain
   c) quality of the pain
   d) time course of the pain
   e) intensity of the pain including Visual Analogue Scale (Huskisson, 1983)
   f) social impact of the pain

3) Replacement of answers from four-category “No / Sometimes / Often / Constantly” to five categories of “Definitely No / Probably No / Unsure / Probably Yes /
Definitely Yes”. This change allows for five-levels of probability, with answers ranging from “definitely yes” to “definitely no”. The screening questionnaire responses were found to be restricted because the subjects either answered “No” or chose from a frequency category (Sometimes/Often/Constant). It was found in the following screening questionnaire designed for the Endodontics Group, the five categories allowed the subject to answer “Unsure” which was subsequently found to favour a positive answer (“yes”).

Following completion of the questionnaire, each subject gave his or her pain history to clinical investigator (S.L. Leong). Each subject was assessed and periapical radiographs were taken. Subjects with chronic pain without discernible local pathology were assessed at a separate session by two specialists, I. Klineberg (Orofacial Pain and Prosthodontics) and S. Chan (Oral Medicine and Oral Pathology). Clinical examinations were conducted independently with the aim of obtaining a consensus on the diagnosis and differential diagnoses following discussions. The assessment of temporomandibular joint and orofacial musculature used the Research Diagnostic Criteria (Dworkin & LeResche, 1992) and subjects were also asked to complete the SCL-90R psychometric inventory (Derogatis, 1992).

3.2 Pilot Survey using 2-item Screening Questionnaire on Endodontics Group (see Appendices for Questionnaires)

A second survey was completed by mailing a “Screening Questionnaire for Endodontics” (Appendix 2) to patients treated between January and August 2001 by a senior endodontist (I. Martin) from WCOH, Sydney. This questionnaire asked two
questions on persistence of pain post-endodontic treatment and presence of pain before endodontic treatment. The questions were used in past studies (Marbach et al., 1982; Campbell et al., 1990) to screen a group for PTP. However, the present study was different from studies mentioned in that all patients were invited for recall endodontic examination and radiographs in January 2002 with one clinical investigator (S.L. Leong). The screening of subjects for persistent post-treatment pain was based on the clinical examination, not on positive answers to the screening questionnaire.

The answers of “Unsure / Probably Yes / Definitely Yes” were considered a positive response. The subjects diagnosed with chronic pain (without discernible local pathology) in same tooth previously treated by endodontist were asked to complete the same “Comprehensive Questionnaire for General Dentistry and Endodontics” (Appendix 3). The subjects were assessed at a separate clinical session by I. Klineberg (Orofacial Pain and Prosthodontics), S. Chan (Oral Medicine and Pathology) and I. Martin (Endodontics). The clinical examinations were to be conducted independently with the aim to obtain a consensus in diagnosis and differential diagnoses following discussions. The assessment of temporomandibular joint and orofacial musculature used Research Diagnostic Criteria (Dworkin & LeResche, 1992) and participants completed the SCL-90R psychometric inventory (Derogatis, 1992).
4. Results

4.1 Results from Screening Questionnaire (General Dentistry Group) – A Pilot Study

Ninety screening questionnaires were distributed and all were returned in the four-month survey period. Seventy-five (83%) were completed as required. The group comprised fifty-one females (70%) and twenty-two males (30%), ranging in age from 18 to 84 years (mean = 49.8 years, standard deviation SD = 17.2). The demographic details were missing from two questionnaires, but contained data useful for analysis. Figure 1 shows the demographic distribution of the group.

![Figure 1. Demographics from General Dentistry Screening Survey (Ntotal=75)](image)

Two compulsory questions (Questions 1 and 11a-11i) received 100% response for the first question, and at least 97% completed the last section of questions (11a-11i). Sixty-four subjects were expected to answer “Questions 2 to 10” after a positive
response to the first question; and answers are shown in Figure 2. “Question 8” contained a table requesting the location of pain and previous treatment, and had the most incorrect answers or was left incomplete.

Fig 2. The percentage of incorrect or incomplete answers to General Dentistry Screening Questionnaire (Ntotal=75 for Q1 & 11a-i) (Ntotal=64 for Q2-10)

The screening of subjects was based on positive answers (considered as a response other than “No”) to either or both these questions: Q9. Does the tooth / area still disturb you (gives you pain or sensation) after these types of treatment: removal of tooth nerve / root end or extraction? Q10. Do you have the feeling that the tooth or teeth is/are still in place? Twenty subjects gave positive answers comprising of ten to persistent post-treatment pain and fifteen to the presence of sensation in the tooth (Figure 3). Twenty were asked to return for follow-up examination.
4.2 Results from Follow-up Clinical Examination and Comprehensive Questionnaire (General Dentistry)

Ten of those identified through positive answers to screening questions (50%) attended the clinical examination, comprising six females and four males with an age range of 32 to 71 years (mean = 51.3 years, SD = 15.4).

Five subjects were identified by their answers to screening “Question 9”. The same subjects answered screening “Questions 2 to 7” that such procedures relieved their pain. Please note that four subjects reported that these treatments gave no pain relief but only one attended the clinical examination (pain from tooth with temporary root canal dressing since 2001). This person answered “no” to “Question 9” but was included in the follow-up group because of the positive response to persistent sensation.
The comprehensive questionnaire requested that if the present pain was from a tooth that had root canal treatment/apicectomy/extraction procedures. Now, only two indicated the pain was from teeth that had root canal therapy or had been extracted.

Screening "Question 10" identified nine in the follow-up group. The validity (sensitivity and specificity) of the questions asked in both screening and comprehensive questionnaires are shown in Table 1.

Table 1. Validity of Positive answer given to Question against clinical diagnosis of actual persistent pain

<table>
<thead>
<tr>
<th>Positive answer given to Question against clinical diagnosis of actual persistent pain</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening Question 9: Ongoing problems/pain after treatment such as RootCanal/APicectomy/Extraction</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Screening Question 10: Feeling that tooth is still in place</td>
<td>0.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Three separate Comprehensive Questions 3/5/7: This pain is from tooth that had RootCanal/APicectomy/Extraction</td>
<td>1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The follow-up clinical examination indicated six subjects with a diagnosis of acute irreversible pulpitis (AP), one with trigeminal neuralgia (TN), one with temporomandibular disorders (TMD) and in two, the pain had resolved. The visual analogue scale (VAS) scores were 42.8 mm ± 27.7 SD, 13.8 standard error of mean SEM (6 subjects with AP), 86mm (TN) and 97mm (TMD). The McGill Pain Questionnaire (MPQ) scores are shown in Table 2.
Table 2. The McGill Pain Questionnaire (MPQ) scores for eight subjects with acute or chronic pain (General Dentistry Group).

<table>
<thead>
<tr>
<th>MPQ score</th>
<th>AP mean ± SD (SEM)</th>
<th>TN</th>
<th>TMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI (S)</td>
<td>13.0 ± 6.0 (2.7)</td>
<td>6.0</td>
<td>4.0</td>
</tr>
<tr>
<td>PRI (A)</td>
<td>1.2 ± 2.2 (1.0)</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PRI (E)</td>
<td>1.6 ± 1.7 (0.7)</td>
<td>0.0</td>
<td>4.0</td>
</tr>
<tr>
<td>PRI (M)</td>
<td>4.2 ± 2.4 (1.1)</td>
<td>0.0</td>
<td>4.0</td>
</tr>
<tr>
<td>PRI (T)</td>
<td>20.0 ± 10.4 (4.7)</td>
<td>7.0</td>
<td>12.0</td>
</tr>
<tr>
<td>PPI</td>
<td>1.0 ± 0.0 (0.0)</td>
<td>4.0</td>
<td>Missing data</td>
</tr>
<tr>
<td>NWC</td>
<td>9.2 ± 5.4 (2.4)</td>
<td>4.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Note: PRI(S) = Pain rating index (sensory), PRI(A) = Pain rating index (affective), PRI(E) = Pain rating index (evaluative), PRI(M) = Pain rating index (miscellaneous), PRI(T) = Pain rating index (total), PPI = Present pain intensity, NWC = number of words chosen, SD = standard deviation, SEM = standard error of mean.

Table 3 showed the additional scoring procedure for the MPQ introduced by Kremer et al. (1982), who had recommended that a score for each dimension be calculated by:

“Summing the rank order intensity value for each dimension and dividing that summated value by the total possible score on that dimension. This procedure yields values ranging from 0 to 1.0, with 0 indicating that the patient selected no words from a particular dimension to describe their pain and 1.0 indicating that the patient selected all of the highest ranked descriptors in a particular dimension to describe their pain.”

Table 3. Scores from MPQ using the method described by Kremer et al. (1982).

<table>
<thead>
<tr>
<th>Pain type</th>
<th>Sensory</th>
<th>Affective</th>
<th>Evaluative</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP (mean)</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>TN</td>
<td>0.1</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TMD</td>
<td>0.1</td>
<td>0</td>
<td>0.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Note: 0.0 = no words were chosen from a particular dimension to describe the pain.
1.0 = all of the highest ranked descriptors in a particular dimension were chosen.
The diagnostic criteria described by Berge (2002) and Marbach et al. (1982) that investigated the incidence and prevalence of PTP respectively were used to identify those patients requiring follow-up by dental specialists. Table 4 indicates a positive answer (+) for satisfying diagnostic criteria, and negative (-) for a failure to meet the criteria.

Table 4. Subjects and clinical diagnoses and whether satisfied or failed to meet the diagnostic criteria.

<table>
<thead>
<tr>
<th>DIAGNOSTIC CRITERIA</th>
<th>A</th>
<th>A</th>
<th>A</th>
<th>A</th>
<th>A</th>
<th>T</th>
<th>T</th>
<th>T</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P1</td>
<td>P2</td>
<td>P3</td>
<td>P4</td>
<td>P5</td>
<td>P6</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Berge (2002)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Continuous dull pain with bursts of sharp pain</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mainly limited to area of damaged nerve</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Persistence after normal and complete local healing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Onset after nerve damage or surgical procedure</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Delayed onset (days-years)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hyperalgesia, allodynia, trigger zones</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Marbach et al. (1982)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Persistence after the injured tissue appears healed</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The presence of discrete hypersensitive trigger points that, when stimulated, elicit pain in the phantom.</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The greater likelihood of occurrence if the structure had been painful prior to amputation.</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The lack of elimination of pain by otherwise reliable methods, e.g., nerve blocks, sympathectomy and narcotic analgesics*.</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td></td>
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<td>/t</td>
<td>/t</td>
<td>/t</td>
<td>/t</td>
<td>/t</td>
</tr>
</tbody>
</table>

* This criterion is different from Melzack.

Note: N/t = not tested for. AP1-6 = subjects (6) with acute pulpitis. TN = trigeminal neuralgia. TMD = temporomandibular disorder.
One subject satisfied the criteria by Berge (2002) and Marbach et al. (1982) for PTP in this study. This subject (TN) had been diagnosed and treated successfully for trigeminal neuralgia by a neurologist. The diagnosis of trigeminal neuralgia was considered under the discernible pathology category, hence subject (TN) was not called for examination with the dental specialists.

As a result in the pilot survey of the General Dentistry Group, no subjects were found to have pain that could be diagnosed as PTP. A summary of the results is shown in Flow Diagram 1.

**Flow Diagram 1.** Summary of Results from the General Dentistry Survey.

90 Screening questionnaires → 15 Unusable

75 Usable

10 Persistent pain
15 Persistent sensation
5 Answered both questions
Thus 20 required for Follow-up

34 No persistent pain
27 No persistent sensation
10 Failed to attend

10 Presented for exam (SL)
8 Usable comprehensive questionnaires from those with current pain

Discernible pathology
6 Acute pulpitis
1 Trigeminal neuralgia
1 TMD
2 No longer in pain

0 Non-discernible pathology

No PTP
4.3 Results from Screening Questionnaire and Endodontics Recall Clinical Examination (Endodontics Group) – A Pilot study

In the period from January to August 2001, seventy-eight subjects treated by an endodontist at the Westmead Centre for Oral Health were suitable for endodontic recall. Fifty-eight (74% response) subjects completed the screening questionnaires, with thirty-four females (59%) and twenty-four males (41%), ranging in age from 12 to 77 years (mean = 48.1 years, SD = 17.9).

Forty-five subjects (58% of the 78 patients recalled) attended the clinical examination, comprising of twenty-eight females (62%) and seventeen males (38%). The demographics were similar to those completing the screening questionnaires with a similar age range and slight changes in the mean (48.7 years) and standard deviation (18.3). Figure 4 shows the demographic details for respondents to the screening questionnaire and endodontics recall examination.

Fig 4. Demographics from Endodontics Screening Survey
The two questions in this screening questionnaire were answered correctly by all subjects. There were 19 positive answers (12 ‘definitely yes’, 5 ‘probably yes’ and 2 ‘unsure’), and 39 negative answers (32 ‘definitely no’ and 7 ‘probably no’) to persistent pain post-treatment.

The data obtained from subjects’ files indicated that root canal therapy as initial treatment (45 subjects) was the most common procedure, followed by root canal retreatment (12 subjects), and apicectomy (13 subjects). Please note that some subjects had multiple types of treatment for the same tooth or different teeth. Figure 5 shows the number of subjects with the type of treatment and those with persistent pain following these treatments.

Fig 5. Type of endodontic treatment on single or multiple teeth, and subjects with persistent pain after such treatment (Ntotal=58)

Eighteen (95%) of the nineteen subjects who reported persistent post-treatment pain in the screening questionnaire attended the clinical examination. The majority
(95%) also reported pre-treatment pain but only twelve (64%) subjects’ files contained an entry by the endodontist that confirmed the presence of pain before treatment.

Figures 6 and 7 show the relationship between the subject-reported symptom of post-treatment pain and the clinical and radiographic signs respectively, that were evident during the examination. Please note the abbreviations for the tests performed:

1) Freeze-dried carbon dioxide (CO2); 2) tenderness on percussion (TTP); 3) mobility of tooth (Mob); 4) periodontal pocketing >3mm (Perio); 5) pain upon biting on crackfinder instrument (Bite); 6) recurrent caries (Car); 7) local pathology (Path); 8) cracklines evident on transillumination (C-L); and 9) tenderness to palpation around tooth (Palp).

![Fig 6. The clinical signs versus subject’s self-report of pain post-treatment (Ntotal=45)
Fig. 7 The radiographic signs versus subject's self-report of pain post-treatment (N=45)

Those reporting persistent pain were sensitive to tests related to touch and pressure (percussion, biting and palpation) and two had positive responses to the thermal test (cold, freeze-dried carbon dioxide). Despite not reporting pain, there were a number of subjects exhibiting physical signs of local pathology requiring further treatment (3 recurrent periapical lesions, 1 abscess, 8 had periodontal problems including one subject showing bone loss in the furcation area).

The sensitivity and specificity of the screening questionnaire against the clinical tests (palpation, percussion, biting pressure and signs of pathology) and radiographic test are shown in Table 5.
Table 5. Positive answer to screening question and confirmation of persistent pain at clinical examination.

<table>
<thead>
<tr>
<th>Positive answer given to Question: Pain in the same tooth that was treated and “confirmatory” tests</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical tests (palpation, percussion, biting pressure and signs of pathology)</td>
<td>0.78</td>
<td>0.85</td>
</tr>
<tr>
<td>Radiographic signs (periapical lesion, widened periodontal ligament space, root resorption)</td>
<td>0.40</td>
<td>0.60</td>
</tr>
</tbody>
</table>

The clinical diagnoses given for subjects reporting persistent pain following the endodontic recall examination were:

1. Chronic pain related to the same tooth post-treatment (10) - further investigations required
2. Incomplete root canal treatment (1)
3. Recurrent endodontic lesion (2)
4. Pulpitis in another tooth (4)
5. Pain associated with wearing an orthodontic appliance (1).

4.4 Results from Comprehensive Questionnaire (Endodontics)

The comprehensive questionnaire was given to the ten subjects with chronic pain. The mean score ± SD (SEM) for the VAS of pain rating was 26.5 mm ± 20.1(6.5). The McGill Pain questionnaire (MPQ) scores are shown in Table 6.
Table 6. The mean McGill Pain Questionnaire (MPQ) scores for the subjects with chronic pain (Endodontics).

<table>
<thead>
<tr>
<th>MPQ score</th>
<th>Mean ± SD (SEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI (S)</td>
<td>8.2 ± 4.8 (1.6)</td>
</tr>
<tr>
<td>PRI (A)</td>
<td>0.8 ± 1.6 (0.5)</td>
</tr>
<tr>
<td>PRI (E)</td>
<td>1.0 ± 1.2 (0.4)</td>
</tr>
<tr>
<td>PRI (M)</td>
<td>2.0 ± 3.9 (1.3)</td>
</tr>
<tr>
<td>PRI (T)</td>
<td>12.0 ± 9.1 (3.0)</td>
</tr>
<tr>
<td>PPI</td>
<td>1.7 ± 0.5 (0.2)</td>
</tr>
<tr>
<td>NWC</td>
<td>5.2 ± 3.2 (1.1)</td>
</tr>
</tbody>
</table>

Note: PRI(S) = Pain rating index (sensory), PRI(A) = Pain rating index (affective), PRI(E) = Pain rating index (evaluative), PRI(M) = Pain rating index (miscellaneous), PRI(T) = Pain rating index (total), PPI = Present pain intensity, NWC = number of words chosen, SD = standard deviation, SEM = standard error of mean.

Table 7. Scores calculated from MPQ using method described by Kremer et al. (1982).

<table>
<thead>
<tr>
<th>Pain type</th>
<th>Sensory</th>
<th>Affective</th>
<th>Evaluative</th>
<th>Miscellaneous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic pain (mean)</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Note: 0.0 = no words were chosen from a particular dimension to describe the pain. 1.0 = all of the highest ranked descriptors in a particular dimension were chosen.

Table 8 indicates a positive answer (+) for satisfying diagnostic criteria and negative (-) for a failure to meet the diagnostic criteria.
Table 8. The ten subjects and whether subject satisfied or failed to meet the diagnostic criteria.

<table>
<thead>
<tr>
<th>Diagnostic Criteria</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berge (2002)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous dull pain with bursts of sharp pain</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainly limited to area of damaged nerve</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistence after normal and complete local healing</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onset after nerve damage or surgical procedure</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delayed onset (days-years)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperalgesia, allodynia, trigger zones</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbach et al. (1982)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistence after the injured tissue appears healed</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The presence of discrete hypersensitive trigger points that, when stimulated, elicit pain in the phantom.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The greater likelihood of occurrence if the structure had been painful prior to amputation.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The lack of elimination of pain by otherwise reliable methods, e.g., nerve blocks, sympathectomy and narcotic analgesics*.</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
<td>N/t</td>
</tr>
</tbody>
</table>

* This criterion is different from Melzack.

Note: N/t = not tested for.

Nine subjects satisfied the criteria by Berge (2002), and five subjects satisfied the criteria by Marbach et al. (1982) for PTP. All ten subjects were invited to have further investigations by dental specialists because there was no discernible local pathology.
4.5 Results from Clinical Examination by Dental Specialists to
Confirm Diagnoses (Endodontics Group)

Eight of the ten subjects with chronic pain attended the clinical examination. Subject 8 and subject 9 declined to attend. The mean SCL-90-R scores are shown in Table 9.

Table 9. The mean scores for SCL-90-R from eight subjects with chronic orofacial pain.

<table>
<thead>
<tr>
<th>SOM</th>
<th>OC</th>
<th>IS</th>
<th>DEP</th>
<th>ANX</th>
<th>HOS</th>
<th>PHOB</th>
<th>PAR</th>
<th>PSY</th>
<th>Gsi</th>
<th>Ppsd</th>
<th>Pst</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>40</td>
<td>34</td>
<td>45</td>
<td>25</td>
<td>16</td>
<td>0</td>
<td>21</td>
<td>21</td>
<td>44</td>
<td>43</td>
<td>44</td>
</tr>
</tbody>
</table>

Note: Scores <63 are considered to be not of clinical significance.

The analysis of the RDC forms showed that six were “normal” and two showed signs of “moderate depression”. The physical “Axis 1” diagnoses are shown in Figure 5.

Fig 8. The results from RDC examination and questionnaire
(Ntotal=8)
The clinical diagnoses given by dental specialists were:

1) Apical periodontitis secondary to parafunction (Subjects 2, 3 and 7)
2) Paraesthesia secondary to previous trauma (Subjects 4 and 6)
3) Endodontic and periodontal lesion (Subject 5)
4) Trigeminal neuralgia (Subject 10)
5) Post-traumatic neuralgia or possible PTP (Subject 1)

As a result of the pilot survey of the Endodontics Group, one subject (Subject 1) was found to exhibit symptoms that could be classified as PTP, and the case history can be found in Appendix 4. The prevalence rate in this group was calculated to be one of the forty-five subjects examined, giving 2.2% prevalence. A summary of the results is shown in Flow Diagram 2.

The sensitivity and specificity of the final clinical diagnosis against three or more fulfillment of diagnostic criteria by Berge (2002) and Marbach et al. (1982) are shown in Table 10.

**Table 10.**

<table>
<thead>
<tr>
<th>Final clinical diagnosis given by specialists against initial diagnosis by clinical investigator using the diagnostic criteria (at least three) given by:</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berge (2002)</td>
<td>1</td>
<td>0.11</td>
</tr>
<tr>
<td>Marbach et al. (1982)</td>
<td>1</td>
<td>0.56</td>
</tr>
</tbody>
</table>

PTP?
78 Screening questionnaires
58 Returned
45 Presented for Clinical Exam
18 Persistent pain

Chronic pain
10 Non-discernible pathology
10 Comprehensive questionnaires

8 Presented for exam with specialists
8 RDC & SCL-90R forms

1 Possible PTP

20 Not returned
Declined recall exam
12 No persistent pain
1 Persistent pain

27 No persistent pain
Discernible pathology
4 Acute pulpitis (unrelated teeth)
3 Unresolved endodontics
1 Unrelated to endodontics

2 Declined exam with specialists

Differential diagnosis
3 Apical periodontitis (secondary to parafunction)
2 Paraesthesia (secondary to previous trauma)
1 Endodontic/periodontal lesion
1 Trigeminal neuralgia
5. Discussions

5.1 Prevalence from General Dentistry Group

The abridged 11-item screening questionnaire (General Dentistry) received 83% that could be analysed from the ninety questionnaires distributed. The questionnaire used by Jacobs et al. (2002) received 35% analysable from 500 questionnaires mailed out to subjects. The respondents to screening questionnaires in this study (70%) and 83% for Leuven study (ibid) were predominantly females. The different sample sizes do not allow exact comparisons.

Ten subjects (ibid) were identified through positive responses to two questions and eight were diagnosed with PTP (4.5% prevalence), and two had phantom tooth sensation without pain (total prevalence for phantom tooth with or without pain is given as 5.7%). This study identified twenty subjects who answered positively to the same questions, but could verify only half of these. One subject satisfied four of six criteria by Berge (2002), and three of four criteria by Marbach et al. (1982). This subject was already receiving treatment with pain relief (anticonvulsant - Gabapentin) from a neurologist for trigeminal neuralgia*.

* As noted by one of the reviewers, this subject met the criteria for PTP. In hindsight, this subject should have been included for further investigations by the dental specialists, rather than relying on the diagnosis by subject’s neurologist. The medication that was effective for pain relief has been used for certain cases of PTP.
5.2 Prevalence from Endodontics Group

The 2-item screening questionnaire (Endodontics) had a 74% response rate from seventy-eight subjects. Marbach et al. (1982) had 70% response from 732 subjects using a 10-item questionnaire. Campbell et al. (1990) reported a lower response rate (57%) from 206 subjects to an 8-item questionnaire. Our study reports 74% questionnaires useful for data analysis and Marbach et al. (1982) had 63% with more questions.

The respondents to the screening questionnaire (Endodontics) appeared to have a slightly higher proportion of females (59%). However, it can be verified that males were just as willing to answer the questionnaire as females (24 of 33 males = 73% and 34 of 45 females = 76%) but were less likely to attend for clinical examination (17 of 33 males = 52% and 28 of 45 females = 62%). Marbach et al. (1982) found 76% females in their study, but in a study by Campbell et al. (1990), it was almost half (similar to present study).

Nineteen subjects reported persistent pain post-endodontic treatment in the “Screening Questionnaire” (one declined to come for recall examination) and ten were confirmed to have chronic pain without discernible pathology following recall examination.

In the study by Campbell et al. (1990), six subjects reported persistent pain and three were classified as PTP (prevalence 2.5%). Marbach et al. (1982) reported thirty positive responses to post-treatment pain but only half (15) came for clinical
examination. Eight females fulfilled four criteria giving a prevalence rate of 3% (*ibid*). In this study, five fulfilled three criteria by *Marbach et al. (1982)* and the estimated prevalence was 11%, but revised to 2% after only one was thought to possibly have PTP by dental specialists.

### 5.3 Comparison of Both Methods

The “Questions 9 and 10” in the Screening Questionnaire for General Dentistry Group gave low scores for sensitivity (0.5) and specificity (0.5 for Question 9 and 0 for Question 10) for persistent pain post-treatment. The scores were higher for “Questions 3, 5 and 7” in the comprehensive questionnaire that asked for each procedure separately.

The scores for sensitivity was “1.0” for clinical investigator (S. L. Leong) using both diagnostic criteria but very low specificity (0.11 and 0.56 for *Berge, 2002* and *Marbach et al., 1982* respectively). The question on persistent pain in the Screening Questionnaire for Endodontics had high scores for sensitivity (0.78) and specificity (0.85) for persistent pain detectable during clinical examination. The radiographic test when compared answers to persistent pain had lower scores for sensitivity (0.4) and specificity (0.6) compared with clinical examination.

There are problems with both methods. The results indicated the value of a Screening Questionnaire asking about complex dental treatment (such as root canal therapy and apicectomy) from a group known to have experienced such procedures, and appeared to receive more truthful or correct answers. There is no conclusive evidence that either method is better than the other without further study (to exchange
questionnaires for the two groups). It appears that the screening questionnaire for General Dentistry, in the present format, is not suitable for use on a general population.

5.4 Other Relevant Results

The MPQ scores for subjects diagnosed with acute irreversible pulpitis are similar to Grushka and Sessle (1984) and Seymour et al. (1983) shown in Table 11. The average T-scores for SCL-90-R were below 60 and considered as not elevated and not of clinical significance. The RDC revealed less than 30% had an Axis-1 diagnosis.

Table 11. Scores from the McGill Pain Questionnaire (present study compared with other studies).

<table>
<thead>
<tr>
<th>MPQ score</th>
<th>Acute irreversible pulpitis (mean ± SD (SEM))</th>
<th>Grushka and Sessle (1984) Irreversible pulpitis</th>
<th>Seymour et al. (1983) Pulpitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRI (S)</td>
<td>13.0 ± 6.0 (2.7)</td>
<td>13.4 ± 8.6</td>
<td></td>
</tr>
<tr>
<td>PRI (A)</td>
<td>1.2 ± 2.2 (1.0)</td>
<td>2.4 ± 3.2</td>
<td></td>
</tr>
<tr>
<td>PRI (E)</td>
<td>1.6 ± 1.7 (0.7)</td>
<td>2.3 ± 1.8</td>
<td></td>
</tr>
<tr>
<td>PRI (M)</td>
<td>4.2 ± 2.4 (1.1)</td>
<td>4.6 ± 4.2</td>
<td></td>
</tr>
<tr>
<td>PRI (T)</td>
<td>20.0 ± 10.4 (4.7)</td>
<td>22.7 ± 15.5</td>
<td>27.3 (2.6) Females</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>21.3 (2.3) Males</td>
</tr>
<tr>
<td>PPI</td>
<td>1.0 ± 0.0 (0.0)</td>
<td>2.3 ± 1.5</td>
<td>2.1 (2.0) Females</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.8 (0.2) Males</td>
</tr>
<tr>
<td>NWC</td>
<td>9.2 ± 5.4 (2.4)</td>
<td>9.3 ± 5.4</td>
<td>11.2 (0.9) Females</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9.0 (1.0) Males</td>
</tr>
<tr>
<td>VAS mm</td>
<td>42.8 ± 27.7 (13.8)</td>
<td>Not Used</td>
<td>33.0 (5.0) Females</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29.0 (5.0) Males</td>
</tr>
</tbody>
</table>

Note: SD = standard deviation; SEM = standard error of mean
6. Concluding Remarks and Further Research

The research stated aims have been fulfilled. This treatise has discussed the inherent problems associated with a diagnosis of PTP and the need for an epidemiological study. Two methods were used to survey two groups of patients from hospital-based dental clinics.

The literature review discussed the terminology, classification and various diagnostic criteria for PTP used for epidemiological studies. The main difficulties encountered were the absence of international diagnostic criteria and a “gold standard” diagnostic test. The causes of these difficulties are lack of agreement amongst clinicians in classifying this chronic pain syndrome and poor understanding arising from a small proportion of sufferers.

The conclusions are based on a pilot study with small samples of selected groups. Based on the experience gained from this research, the method of asking a question is crucial, particularly if the question is to be used as a diagnostic and screening tool.

The study of Endodontic Group had 33% (19 of 58 respondents) positive answers to pain persisting after treatment, and furthermore, local pathologies requiring additional treatment were found in those who had not reported pain post-treatment. Dentists and endodontists are encouraged to review their patients post-treatment.
Suggested further research is as follows:

1. To use the “Screening Questionnaire for General Dentistry” on an Endodontics Group and the “Screening Questionnaire for Endodontics” for a General Dentistry Group (with minor modifications).

2. To use the Comprehensive Questionnaire in a selected population prior to and after endodontic treatment (immediately, 1-month and 6-month).

3. To use the Comprehensive Questionnaire in a general population with investigator present giving instructions.
References

- Derbyshire SWG, Jones AKP, Devani P, Friston KJ, Feinmann C, Harris M, Pearce S, Watson JDG and Frackowiak RSJ. Cerebral responses to pain in patients with atypical


Appendix 1: Screening Questionnaire for General Dentistry Group

Project Title: Prevalence of Atypical Odontalgia / Phantom Tooth Pain

Names of Investigators: Dr Sook Ling Leong, Dr Sheena Chan, Dr Ian Martin and Professor Iven Klineberg.

Dental Record No: ____________ Date: ____________

Please circle your response.

1. In the past, have you had pain in a tooth?
   No / Sometimes / Often / All the time
   If your answer is No, please go to question 11. Otherwise, please continue.

How was the pain treated?

2. Was the pain treated by having the tooth nerve removed (root canal treatment)?
   Yes / No

3. If your answer is “yes”, did this treatment relieve you of pain?
   Yes / No

4. Was the pain treated by having the end of the root removed (apicectomy)?
   Yes / No

5. If your answer is “yes”, did this treatment relieve you of pain?
   Yes / No

6. Was the painful tooth extracted?
   Yes / No

7. If your answer is “yes”, did this treatment relieve you of pain?
   Yes / No

8. Please indicate the area where the following events occurred (if it applies to your situation) by placing a “X” in the appropriate box.

<table>
<thead>
<tr>
<th>UPER JAW</th>
<th>LOWER JAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>left side</td>
<td>right side</td>
</tr>
<tr>
<td>Question</td>
<td>front teeth</td>
</tr>
<tr>
<td>Where was the pain?</td>
<td></td>
</tr>
<tr>
<td>Which tooth had the tooth nerve removed?</td>
<td></td>
</tr>
<tr>
<td>Which tooth had the root end removed?</td>
<td></td>
</tr>
<tr>
<td>Which tooth was extracted?</td>
<td></td>
</tr>
</tbody>
</table>

9. Does the tooth / area still disturb you (gives you pain or sensation) after these type of treatment: removal of tooth nerve / root end or extraction?
   No / Sometimes / Often / All the time

10. Do you have the feeling that the tooth or teeth are still in place?
    No / Sometimes / Often / All the time
11. These last questions need to be completed by everyone.

a. Do you have headaches?
   No / Sometimes / Often / All the time

b. Do your sinuses disturb you?
   No / Sometimes / Often / All the time

c. Do you have head colds?
   No / Sometimes / Often / All the time

d. Have you injured your teeth?
   No / Sometimes / Often / All the time

e. Does your jaw joint disturb you?
   No / Sometimes / Often / All the time

f. Have you had pain in your face?
   No / Sometimes / Often / All the time

g. Do you have migraines?
   No / Sometimes / Often / All the time

h. Do you have pain in other parts of your body?
   No / Sometimes / Often / All the time

i. If so, which part of your body?
   Neck / Back / Shoulder / Arm / Leg / Stomach / Other

Thank you for your participation.
Appendix 2: Screening Questionnaire for Endodontics Group

Project Title Prevalence of Atypical Odontalgia / Phantom Tooth Pain
Names of Investigators: Dr Sook Ling Leong, Dr Sheena Chan, Dr Ian Martin and Professor Iven Klineberg.

Dental Record No: __________ Date: __________

Last year, you had endodontic (root canal) treatment on:

Tooth/teeth treated:

Date that treatment was completed:

Treatment done: □ root canal treatment □ root surgery

Please answer all questions. Mark with (X) in a box to show your answer.

1. Did you have any pain in this tooth / teeth before your endodontic (root canal) treatment?
   □ definitely yes □ probably yes □ unsure □ probably no □ definitely no

2. Do you now have any pain in the same tooth / teeth that was treated?
   □ definitely yes □ probably yes □ unsure □ probably no □ definitely no

Please bring this form with you to the appointment. Thank you.
Appendix 3: Comprehensive Questionnaire for General Dentistry and Endodontics

Groups

Project Title Prevalence of Atypical Odontalgia / Phantom Tooth Pain

Names of Investigators: Dr Sook Ling Leong, Dr Sheena Chan, Dr Ian Martin and Professor Iven Klineberg.

Dental Record No: ___________ Date: ___________

Please answer all questions. Mark with (X) in a box to show your answer.

1. Are you in pain?
   ☐ yes If yes, please continue with the rest of the questionnaire.
   ☐ no If no, please stop here and Thank You for your help.

2. Do you have pain now?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no

3. Is this pain from a tooth/teeth that had root canal treatment?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no

4. If the tooth/teeth had root canal treatment, was the tooth/teeth painful before treatment?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no
   ☐ question does not apply to me

5. Is this pain from a tooth/teeth that had root surgery (apicectomy)?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no

6. If your tooth/teeth had root surgery, was the tooth/teeth painful before treatment?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no
   ☐ question does not apply to me

7. Is this pain from a tooth/teeth that had been extracted?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no

8. If your tooth/teeth was extracted, was the tooth/teeth painful before extraction?
   ☐ definitely yes ☐ probably yes ☐ unsure ☐ probably no ☐ definitely no
   ☐ question does not apply to me
1. Please mark (X) to show where you feel the pain.
(a) □ upper jaw □ lower jaw
(b) □ right side of face □ left side of face
(c) □ front tooth □ back tooth

2. Please mark (X) on the drawings to show where you feel the pain.

3. Is the pain always in the same place?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

4. Does the pain spread to another place?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

5. Does the pain change from one place to another?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

6. Do you have any of these types of pain?
Headaches?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

Sinus pain?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

Jaw joint pain?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

Pain in the face?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

Migraines?
□ definitely yes □ probably yes □ unsure □ probably no □ definitely no

63
What does your pain feel like now?

1. Please use your own words to tell us about your pain.

2. Please mark (X) ONLY the WORD/WORDS that is the BEST TO DESCRIBE your pain at this moment. Please choose only one word from each group but you DO NOT have to choose a word from each group.

1. Flickering
   - Jumping
   - Pricking
   - Sharp
   - Pinching
   - Pressing
   - Hot
   - Tingling
   - Dull
   - Tender
   - Tiring
   - Sore
   - Taut
   - Exhausting
   - Hurting
   - Raspaging
   - Scalding
   - Aching
   - Splitting
   - Searing
   - Crushing
   - Wrenching
   - Smarting

2. 
   - Frustrating
   - Punishing
   - Wretched
   - Raging
   - Stunning
   - Terrifying
   - Gruelling
   - Blinding
   - Frightful
   - Cruel
   - Intense

3. 
   - Penetrating
   - Drawing
   - Cool
   - Spreading
   - Cool
   - Numb
   - Radiating
   - Nauseating
   - Piercing
   - Drawing
   - Agonizing
   - Tearing
   - Dreadful
   - Squeezing
   - Torturing
   - Killing
   - Freezing
How does your pain change with time?

1. How long have you had this pain?
   - days
   - weeks
   - months
   - years

2. Please mark (X) next to the word/words to describe the pattern of your pain.
   - continuous
   - rhythmic
   - steady
   - periodic
   - constant
   - intermittent
   - brief
   - momentary
   - transient

3. Which one of these statements applies to your pain?
   - pain comes now and then
   - pain changes, but never goes away totally
   - pain is always the same

4. What increases (aggravates) your pain?
   Please describe ________________________________

5. Can you bring on the pain by touching a specific point in your mouth / face?
   - definitely yes
   - probably yes
   - unsure
   - probably no
   - definitely no

6. What decreases (relieves) your pain?
   Please describe ________________________________

7. Do you take any painkillers to relieve the pain?
   - definitely yes
   - probably yes
   - unsure
   - probably no
   - definitely no

8. Do the painkillers relieve your pain?
   - definitely yes
   - probably yes
   - unsure
   - probably no
   - definitely no
   - question does not apply to me

9. Which one of the painkillers relieves your pain?
   Please describe ________________________________

10. Does the pain disturb you any time during the night?
    - definitely yes
    - probably yes
    - unsure
    - probably no
    - definitely no

11. Have you seen a specialist for this pain?
    - definitely yes
    - probably yes
    - unsure
    - probably no
    - definitely no

12. How did this pain come about?
    - suddenly
    - gradually
# How strong is your pain?

1. Your pain right now is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

2. Your pain at its worst is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

3. Your pain at its least is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

4. The worst toothache that you ever had is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

5. The worst headache that you ever had is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

6. The worst stomach ache that you ever had is:
   - [ ] mild
   - [ ] discomforting
   - [ ] distressing
   - [ ] horrible
   - [ ] excruciating

7. How strong do you feel the pain right now?
   Please use one mark (X) anywhere along the line below.

   - no pain
   - (10cm)
   - worst pain
   - imaginable

# How has this pain affected your life?

1. How long were you in pain yesterday? ........ hours

2. Did you rest yesterday because you had the pain?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no
   
   If you had to rest, how long did you rest? ........ Hours

3. Did you wake up last night because you had the pain?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no
   
   If you were awake, how long were you awake? ........ hours

4. Were you in pain when you woke up this morning?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no

5. Did the pain stop you from doing your normal activities yesterday?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no

6. Did the pain affect your posture and the way you move yesterday?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no

7. Did the pain stop you from doing your hobby or play sport yesterday?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no

8. Did the pain affect your appetite yesterday?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no

9. Did you feel generally unwell because of the pain yesterday?
   - [ ] definitely yes
   - [ ] probably yes
   - [ ] unsure
   - [ ] probably no
   - [ ] definitely no
Appendix 4: Case history for Subject 1 (possible PTP) taken in June 2002

A 52-year old female had endodontic therapy for a maxillary right first premolar (tooth #14) three years ago. Pain began as a sharp pain and has not changed in character over the years. The subject had the maxillary right second premolar (tooth #15) extracted about ten years ago without any sequelae. A 3-unit bridge was constructed in 2000, linking the maxillary right first molar (tooth #16) and first premolar. The subject continued to have pain, and tooth #16 was diagnosed with irreversible pulpitis. Endodontic therapy was commenced and completed in 2001. The pain persisted.

The pain is present at anytime, initiated by clenching. Pain improves on releasing but does not resolve completely. Pain can disturb sleep, and is exacerbated by biting or chewing, after eating, and by cold air. Analgesics provided temporary relief (equivocal response). Pain is always located in the same area (subject marked maxillary right posterior teeth in the Comprehensive Questionnaire), and more recently, the surrounding gingivae have been tender. The medical history included allergies to penicillin and aspirin, but the subject is otherwise in good health.

Both teeth #16 and #14 were tender to percussion and to periodontal probing. At the apical region, it was tender to palpation. There were no deep periodontal pockets, mobility or soft tissue pathology (such as swelling, ulceration or erythema), nor radiographic abnormalities in either tooth. The bridge was sectioned about six months ago, leaving the crowns on teeth #16 and #14 intact. Tooth #16 was out of occlusion but the subject reported that it was still painful or tender. Neither of the teeth was painful on biting (crackfinder) nor upon release. The subject claimed that the pain is constant, but prior to percussion of teeth, there was minimal complaint.

The subject chose descriptive words such as, “throbbing, hurting, killing” from McGill Pain Questionnaire, giving a Pain Rating Index (Sensory) of seven, and a Pain Rating Index
(Affective) of five. The Present Pain Index was 2 (discomforting) but the subject marked 62mm (out of 100mm) on the Visual Analogue Scale. The pain did not seem to have affected the subject’s lifestyle, as most (88%) of the answers were “definitely no” in the last section of the Comprehensive Questionnaire (“How has this pain affected your life?”). This is despite the subject reporting that the pain is constant, and of 24-hours duration. There was no Axis 1 diagnosis (muscle disorders, disk displacements, other joint conditions) according to the Research Diagnostic Criteria (RDC), i.e. subject did not exhibit signs or symptoms of temporomandibular disorders. The Axis 2 profile from RDC analysis revealed a normal depression score, and was supported by the SCL-90R scores below 63 for all categories, i.e. none were of clinical significance. The need for further investigation of the psychosocial profile of this subject is indicated.