Int. J. Oral Maxillofac. Surg. 2012; 41: 1509–1518
http://dx.doi.org/10.1016/j.ijom.2012.06.025, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Clinical Paper
Oral Surgery

Evaluation of trigeminal nerve injuries in relation to third molar surgery in a prospective patient cohort. Recommendations for prevention

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T. Renton, Z. Yilmaz, K. Gaballah: Evaluation of trigeminal nerve injuries in relation to third molar surgery in a prospective patient cohort. Recommendations for prevention. Int. J. Oral Maxillofac. Surg. 2012; 41: 1509–1518.

Abstract. Trigeminal nerve injury is the most problematic consequence of dental surgical procedures with major medico-legal implications. This study reports the signs and symptoms that are the features of trigeminal nerve injuries caused by mandibular third molar (M3M) surgery. 120 patients with nerve injury following M3M surgery were assessed. All data were analysed using the SPSS statistical programme and Microsoft Excel. 53 (44.2%) inferior alveolar nerve (IAN) injury cases and 67 (55.8%) lingual nerve injury (LNI) cases were caused by third molar surgery (TMS). Neuropathy was demonstrable in all patients with varying degrees of paraesthesia, dysaesthesia (in the form of burning pain), allodynia and hyperalgesia. Pain was one of the presenting signs and symptoms in 70% of all cases. Significantly more females had IAN injuries and LNIs ($p < 0.05$). The mean ages of the two groups of patients were similar. Speech and eating were significantly more problematic for patients with LNIs. In conclusion, chronic pain is often a symptom after TMS-related nerve injury, resulting in significant functional problems. Better dissemination of good practice in TMS will significantly minimize these complex nerve injuries and prevent unnecessary suffering.

Key words: third molar surgery; coronectomy; trigeminal nerve injury.

Accepted for publication 22 June 2012
Available online 25 September 2012

Surgical removal of mandibular third molars (M3Ms) is the most common oral surgical procedure worldwide. This procedure is associated with significant morbidity including pain and swelling, together with the possibility of temporary or permanent nerve damage, resulting in altered sensation of lip or tongue. Trigeminal nerve injury is the most problematic consequence of dental surgical procedures with major medico-legal implications.[1] Although the incidence of lingual nerve injury (LNI) has remained static in the UK over the last 30 years, the incidence of inferior alveolar nerve (IAN) injury has increased due to implant surgery and endodontic therapy.[2]

Iatrogenic injuries to the third division of the trigeminal nerve remain a common and complex clinical problem. Altered sensation and pain in the orofacial region may interfere with speaking, eating, kissing, shaving, applying makeup, tooth brushing and drinking, in fact almost every social interaction.[3] After oral rehabilitation, patients usually expect to experience significant improvements, not only regarding jaw function, but also in relation to dental, facial, and overall body image.[4] These injuries therefore have a significant negative effect on the patient's quality of life, with functional implications and pain related to these injuries often leading to significant psychological effects.[5]

With regard to LNIs related to third molar surgery (TMS), most patients recover to normal sensation without treatment, but those with permanent deficits often have severe disability, as indicated by the high proportion of lawsuits in such cases.[3] Mistaken assumptions include that the lingual nerve and IAN injuries are similar. Only LNIs in association with lingual access TMS are reported to be temporary with 88% of LNIs resolving in the first 10 weeks post surgery.[6,7] The IAN is at a greater risk from a variety of dental procedures. The IAN is contained within a bony canal, predisposing it to ischaemic trauma and subsequent injury. This may also result in a higher incidence of permanent damage for IAN injuries.

M3Ms have been postulated to be a cause for incisor crowding for more than 150 years. Despite a great wealth of publications suggesting that teeth crowding is complex and multifactorial, there is no evidence of any available study designed to isolate the effect of third molars from all other factors that may be associated with crowding. Guidelines for M3M surgery vary internationally, but in the UK, the National Institute of Clinical Excellence (NICE) provided guidelines in 2000 recommending very low intervention rates for this surgery with explicit therapeutic indications (caries, pathology and pericoronitis).[8] When the extraction of M3M is indicated, based on the local NICE guidelines, the dentist should consider all these factors critically before deciding to remove M3M. This will significantly avoid the removal of many teeth with high risk potential for IAN injury (IANI).

The aims of this study were to report the signs and symptoms of 120 patients with iatrogenic lesions to the mandibular branches of the trigeminal nerve caused by M3M surgery, and to provide a comprehensive literature review of these iatrogenic injuries.

Methods

The records of 254 patients with trigeminal nerve injuries collected over 3 years, were consulted at the Dental Institute in King's College Hospital, London. Within this cohort, 38 patients presented with trigeminal neuropathy caused by neurological disease, malignancy, multiple sclerosis, sickle cell disease, known alcoholism, injury caused by non-dental trauma, orthognathic surgery, diabetes, HIV, post-herpetic neuralgia, stroke and patients taking chemotherapy. This study evaluated the aetiology, functional status and management of 120 patients with iatrogenic trigeminal nerve injuries; 53 (44.2%) IANI cases and 67 (55.8%) LNI cases, each caused by TMS.

All patients were seen and assessed by a single clinician (TR) who initially obtained a detailed history. This included the date and mode of injury and the patients' self assessment of neurosensory function in terms of reduced function (hypoesthesia, anaesthesia), and neurogenic discomfort (paraesthesia, dysaesthesia, allodynia, dysgeusia, ageusia). The related interference with daily function, explored on a task basis, and psychological effects were specifically identified; the details of which are described elsewhere.[2,9]

A series of standardized tests of neurosensory functions[10] was undertaken on all patients by the same observer (TR) based on recommendations by Robinson et al.[11] and previously used methods.[12,13] Examinations took place in a quiet room with the patients at ease. Patients were urged to concentrate on the neurosensory test. Key factors assessed were size and extent of the neuropathic area, subjective function (SF), mechanosensory function, functional problems and pain profiling.[12]

The percentage neuropathic area (% of extra-oral and intra-oral dermatome) was mapped by running closed forceps gently over the surface from unaffected area to the injured zone, mapping points when the patient acknowledged change in sensation. Their overall level of mechanosensory function of the affected nerve was assessed using a SF scale ranging from 0 to 10 (0, no perception of touch and 10, normal perception).[12] An SF greater than 10 indicated that the patient had hypersensitivity and possibly allodynia to touch and/or thermal stimuli.

Specific mechanosensory tests were carried out to assess neurosensory qualities further, such as light touch (LT), pin prick, sharp-blunt discrimination (SBD), moving-point discrimination (MPD), and two-point discrimination (TPD). All tests/ratings were initially carried out on the uninjured side followed by the injured side to enable comparisons. All tests, apart from the MPD, were tested five times. Pain was assessed at rest and after mechanical and cold stimulation using a visual analogue scale (VAS), where 0 was no pain and 10 was worst pain imaginable. Mechanical and cold stimuli were evoked by gently touching the neuropathic area with a dental probe and a piece of cotton wool sprayed with ethyl chloride, respectively.

Patients with LNI were examined for the presence of elicited neuralgia on palpation of the lingual nerve region. An unpleasant, radiating sensation in the injured side of the tongue induced by digital pressure to the region of suspected injury at the medial aspect of the mandibular ramus was interpreted as being caused by a possible neural entrapment or neuroma. A further test carried out amongst only LNI patients included counting the fungiform papillae within the anterior two-thirds of the tongue on the injured side and comparing this number with those on the contralateral uninjured side.

Following the assessment procedure, the patient was informed of the diagnosis, the degree of injury, the likely cause and permanency of the injury, followed by a discussion of the possible strategies to manage their symptoms. Patients were seen on more than one occasion and were informed at each consultation of how their symptoms were improving or not changing. Patients were also offered an explanation behind their symptoms (such as neuropathic pain, allodynia, paraesthesia) in relation to the current understanding of neuroscience.

Statistics

All data were analysed using the SPSS statistical programme. χ^2 tests were applied for non-parametric testing of frequencies. p values less than 0.05 were statistically significant. Appropriate correlations were also carried out between certain data sets.

Results

This study evaluates 120 patients who presented with trigeminal nerve injury related to TMS, of whom 67 (55.8%) presented with LNI and 53 (44.2%) with IANI. The majority of these injuries were caused by TMS carried out under local anaesthesia (LA, 34 IANI cases and 36 LNI cases), followed by TMS under general anaesthesia (GA, 9 IANI cases