

Endodontic treatment completion following emergency pulpectomy

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Aim Emergency pulpectomy is frequently performed to relieve pain experienced by patients following acute episodes of endodontic pain, or to limit the risks of infection or possible root resorption following traumatic pulpal exposures. The aim of this study was to examine subsequent patient attendance for completion of root canal treatment following pulpectomy procedures in a dental emergency unit. **Methods** The treatment records of 574 patients who had each received an emergency pulpectomy at the Casualty Clinic of the University Dental School and Hospital, Cork, Ireland were reviewed. The influence of age, gender, etiology, tooth type, and month in which the pulpectomy was performed on subsequent completion of endodontic treatment was examined. **Results** Of 574 patients, 39% (n=224) returned to have endodontic treatment completed, 11% (n=63) returned to have the tooth extracted, and 50% (n=287) did not return for completion of the endodontic treatment. Cases were monitored up to five years following pulpectomy. Using a multinomial regression model, tooth type, etiology, and month in which the treatment was performed were found to be statistically significant predictors ($p < 0.05$) of endodontic treatment completion in the Cork University Dental School and Hospital. **Conclusions** Proper patient selection and pre-treatment counseling are important considerations when planning emergency pulpectomies to avoid inappropriate use of resources and manpower.

Key words: Completion rates, emergency treatment, endodontic treatment, trauma.

Introduction

For many patients, the avoidance or the elimination of pain is an important reason for seeking dental treatment, and their subsequent determination of its success (Gibson *et al.*, 1993; McCartan *et al.*, 1996; Widström *et al.*, 1990). Emergency pulpectomy treatment seeks to eliminate pain being experienced by a patient and is normally brought about by pulpal extirpation and debridement. It is, of itself, the first part of orthograde endodontic treatment, which, when completed, is a highly successful method of conserving teeth with compromised dental pulps, maintaining the dental image and integrity of the patient, without recourse to prosthetic replacements (Harty *et al.*, 1970; Lynch *et al.*, 2004). It has long been recognized that pulpectomy alone is not acceptable as a satisfactory end-point of endodontic treatment (Rickert & Dixon, 1931).

At the Cork University Dental School & Hospital, Ireland (CUDSH), patients seeking emergency dental care are initially assessed in the Screening Clinic of the Department of Dental Surgery, and acute care is planned. In situations where endodontic treatment is the preferred treatment option, the patient is referred to the Casualty Clinic, where emergency operative procedures, including pulpectomies, are performed to alleviate acute symptoms being experienced by the patient. Patients are subsequently referred to the Department of Restorative Dentistry for completion of treatment. Undergraduates examine and perform necessary treatments in the screening and casualty clinics under guidance from clinical

supervisors. Emergency patients may be patients receiving continuing care in the hospital, but may also be casual attendees, be referred from general dental practice, or are self-referred patients, who reside in the neighboring areas. Patients who cannot afford treatment from general dental practitioners also travel to the hospital for treatment, as this is regarded as a less expensive option of securing oral care.

Examination of the completion rates of endodontic treatment may be an indicator of the effectiveness of the hospital in providing necessary continuum of care for patients. It can identify groups of patients who are most likely not to return following emergency pulpectomy. Particular note must be paid to counseling these patients to the need of completing treatment. The aim of this study was to investigate various factors associated with patients attending for completion of care after emergency pulpectomy at the Cork University Dental School & Hospital, Ireland.

Material and methods

The treatment diaries of the casualty clinic at the CUDSH were reviewed, and the notes of patients who attended for emergency pulpectomy treatments during a four-year period were examined. To reduce confounding variables, patients who had emergency pulpectomy procedures performed on more than one tooth were excluded.

Specific information retrieved included, age and gender of the patient, etiology of the lesion, tooth type, month in which the pulpectomy was performed and subsequent patient activity following the pulpectomy.

These were recorded on a Microsoft Excel spreadsheet. Subsequent patient activity following the pulpectomy was monitored for up to a period of five years, and was classified as: the patient returned for completion of endodontic treatment, subsequent extraction, or did not return. The category of 'did not return' was considered if the patient had not returned after a maximum follow-up time of five years.

The various etiologies recorded in the case notes were reviewed and based on the clinical and radiographic details recorded were grouped into the following super-ordinate categories, symptomatic irreversible pulpitis, symptomatic periapical periodontitis, traumatic exposure of pulpal tissues.

Analysis of the data was carried out in SPSS for Windows (Version 12). A multinomial logistic regression model was fitted to the data with subsequent patient activity as the response variable and age, gender, etiology of the lesion, tooth type, and month in which the pulpectomy was performed as predictor variables. The model was checked for accuracy, and to ensure there was no interaction between factors considered. A chi-square test was carried out to investigate the association between tooth type and etiology. A 5% level of significance was used for all statistical tests.

Results

Following application of the selection criteria, 574 patients were included in the sample. The age of the patients ranged from 9 to 82 years with a median age of 22 years (1st quartile = 18 years, 3rd quartile = 34 years). Forty-six percent of the patients were female (n=264). The majority of the pulpectomies (69%) were performed on maxillary anterior, maxillary premolar or mandibular molar teeth (Table 1). Irreversible pulpitis was the most frequent etiology recorded (Table 2). Pulpectomies performed during the months of January, February and March accounted for 49% with the remaining 51% being approximately equally distributed over the other nine months (Table 3).

Of 574 patients, 39% (n=224) returned to have endodontic treatment completed within the CUDSH, 11% (n=63) returned to have the tooth extracted, and 50% (n=287) did not return for completion of the endodontic treatment of CUDSH.

Month of treatment was a statistically significant predictor ($p < 0.05$) of the outcome with patients seen from April to August inclusive and the month of December being less likely to return for completion of endodontic treatment.

Etiology was also a statistically significant predictor ($p < 0.05$) of the outcome with patients presenting with a symptomatic irreversible pulpitis being more likely to have an extraction or not return for completion of endodontic treatment. Patients presenting in the other two categories, symptomatic periapical periodontitis or traumatic exposure of pulpal tissues, were more likely to return to complete endodontic treatment.

Tooth type was also a statistically significant predictor of the outcome ($p < 0.05$). Patients presenting with maxillary and mandibular anterior teeth were more likely to return for completion of endodontic treatment. The other tooth types were more likely to be extracted or for the patient not return for completion of treatment. A statistically significant association ($p < 0.001$) was also found between tooth type and etiology. Symptomatic irreversible pulpitis was more likely to be associated with premolar and molar teeth rather than anterior teeth, while traumatic exposure of pulpal tissues were more likely to be associated with anterior teeth than premolar or molar teeth.

Neither age nor gender were statistically significant predictors of the subsequent activity by the patient.

Discussion

Pulpectomy is a suitable treatment option for the relief of dental pain. A range of published studies have demonstrated that between 4% and 45% of emergencies presenting at dental casualty units were treated by removal of the neurovascular bundle within the tooth (pulpectomy) (Gibson *et al.*, 1993; Kells & Hussey, 1994; McCartan *et al.*, 1996; Thomas *et al.*, 1995). This study presents interesting information on the subsequent behaviour of patients following pulpectomy, and questions the selection of it as an appropriate treatment in many cases. When monitored over a period of five years, one half of the patients who received pulpectomy treatment during the period 1993-1996 did not return for further treatment, and one-tenth of patients returned for extraction. An audit of primary care in the School of Clinical Dentistry in Queen's University Belfast, Northern Ireland, showed that 35% of patients did not return to the Dental School following primary dental care (pulpectomies and other emergency operative treatments) (Kells & Hussey, 1994). This was considered a significant proportion, however this study of one emergency form of operative treatment shows a higher amount of non-returnees for completion of treatment.

The profile of the patients attending for pulpectomy treatments is also revealing as to treatment selection by patients, and treatment prescription by dental practitioners. Three quarters of patients in this sample were less than 35 years of age. This may represent a desire by more younger patients to retain teeth integrity of their dental arch. Tooth loss may be more readily accepted from older partially dentate patients who may be comfortable with the removal of the involved tooth and its incorporation into a prosthesis. Other reasons for fewer older patients choosing endodontic treatment include the presence of fewer teeth than younger patients - there is an increased prevalence of tooth loss with increased age (Whelton *et al.*, 2007); a lack of awareness of endodontic treatment; and accessibility to treatment. The CUDSH is part of the university system at Cork, students of other disciplines regard it as a less expensive method of obtaining dental treatment. This may contribute to the greater population of younger patients in this sample which has been noted in other international studies (Gibson *et al.*, 1993). Furthermore, the Department of Paediatric Dentistry in the CUDSH is contracted by the Irish Department of Health & Children to provide comprehensive dental care

Table 1. Distribution of emergency pulpectomies performed by tooth type

<i>Tooth type</i>	<i>n</i>	<i>%</i>
Maxillary anteriors	154	27
Maxillary premolars	125	22
Mandibular molars	114	20
Maxillary molars	79	14
Mandibular premolars	64	11
Mandibular anteriors	38	6
Total	574	100

Table 2. Distribution of emergency pulpectomies performed by etiology

<i>Etiology</i>	<i>n</i>	<i>%</i>
Irreversible pulpitis	421	73
Symptomatic periapical periodontitis	95	17
Traumatic exposure of pulpal tissues	58	10
Total	574	100

Table 3. Distribution of emergency pulpectomies by month in which treatment was performed.

<i>Month</i>	<i>n</i>	<i>%</i>
January	95	17
February	80	14
March	82	14
April	52	9
May	32	5
June	23	4
July	29	5
August	30	5
September	38	7
October	36	6
November	38	7
December	39	7
Total	574	100

to pupils of a number of neighbouring schools. Many of these patients will return for treatment in their teenage years, as the CUDSH may be the only provider of oral care with which they are familiar. However, age was not found to have a significant effect on the subsequent re-attendance for completion of endodontic treatment. This is similar to a finding by Brennan *et al.*, (2001) who found that patients with pulpal/ periapical disease had the same chance of receiving extractions regardless of age.

Irreversible pulpitis was the most common etiologic factor for patients presenting for emergency pulpectomy. Almost three-quarters of patients were diagnosed with this, and it was more likely to present in premolar and molar teeth. It is of concern that despite the introduction of water fluoridation in Ireland in 1963 that caries still poses a threat to dental health. Patients with a diagnosis of irreversible pulpitis were least likely to return for completion of endodontic treatment and most likely to return for an extraction. As caries/ irreversible pulpitis is usually associated with inadequate oral hygiene practices and diet, this finding suggests that these patients may be similarly poorly motivated regarding completion of endodontic treatment. However, caries/ irreversible pulpitis also mainly affected posterior teeth, which with more complex root canal morphology may be more time-consuming and expensive to treat than anterior teeth. Loss of affected posterior teeth may not have posed as much cosmetic concern to patients as the loss of affected anterior teeth. As has been noted in the past, anterior teeth are most likely to suffer from trauma (Whelton *et al.*, 2007), and patients who presented with these teeth were most likely to return for completion of endodontic treatment. The reasons for this are most likely associated with cosmetic issues.

The month in which treatment commenced was also found to have a significant effect on subsequent clinical activity. Patients who commenced treatment between April and August and in December were less likely to return for completion of endodontic treatment. During the time of this investigation, the teaching school was closed during the summer months. Continuing care, provided by undergraduates, was not available during this period. Allocation of these cases to students would not have occurred until their return in September. Similarly the teaching school was closed for over two weeks during the Christmas vacation in December. Recently the undergraduate academic calendar has been restructured to allow for ongoing patient care for the entire calendar year. It is also worthy of note that the clinical decision to embark on endodontic treatment should not be made lightly. A recent matched cohort study (Caplan *et al.*, 2005) has demonstrated that endodontically treated teeth have significantly reduced survival times in comparison to their matched non-endodontically treated controls. Endodontically treated teeth can be lost for a variety of reasons including unrestorable carious lesions, periodontal disease, subsequent fracture, prosthetic reasons, or iatrogenic damage during, or after, endodontic treatment (Vire, 1991, Caplan & Weintraub, 1997). However, in our study, each tooth required root canal treatment due to dental caries extending into the pulp chamber, the presence of periapical disease, or due to complicated crown fractures following trauma.

The findings of this study question the appropriateness of performing pulpectomies on teeth of guarded prognosis. Institutional resources are utilized in the provision of emergency pulpectomies, there are costs in terms of materials and staff salaries. In this study over 10% of teeth were subsequently extracted, suggesting that the resources involved in performing emergency pulpectomy treatment were needlessly expended. Subsequent extraction may also have occurred for reasons such as periodontal disease, tooth fracture, or prosthodontic treatment planning, some of which should have been recognized prior to embarking on treatment. Fifty percent of patients who had emergency pulpectomies performed did not return for completion of endodontic treatment. Possible reasons for non-completion of endodontic treatment include inadequate pre-treatment counseling; failure of the recall protocol; or poor case selection resulting in extraction of the tooth. For those patients who did not return to the CUDSH for completion of endodontic treatment, they may have attended another practitioner for completion of treatment or extraction. It should be remembered, however, that a large proportion of endodontic lesions arose in patients who could be considered to be poorly motivated patients and attendees. The subsequent behaviour of these patients is ultimately speculative. However, the impact of this behaviour on institutional resources and manpower are significant and must be considered in future consideration of service provision.

Conclusions

Following emergency pulpectomy, over sixty percent of patients did not return for completion of endodontic treatment, or returned for an extraction. This questions the appropriateness of offering patients a pulpectomy as a treatment option in the first instance. Tooth type, etiology, and the month in which the emergency pulpectomy was performed were found to be statistically significant predictors of whether the patient would return for completion of endodontic treatment. The specific findings of this study performed in one institution provide a more global reminder to all oral healthcare providers that patients must be informed of the consequences of failing to return for completion of treatment.

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