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## The mesially impacted mandibular third molar: The incidence and consequences of distal cervical caries in the mandibular second molar

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### ABSTRACT

**Aims:** Distal Cervical Caries (DCC) of the mandibular second molar (Md2M) is primarily related to retained mesially impacted third molars (Md3M). Treatment of this condition indicates the removal of the Md3M and the restoration of the Md2M and, on occasions, the loss of the Md2M. The aim of this study was to determine the incidence, treatment outcomes for patients, and calculate costs related to Md2M DCC.

**Methods:** A review of 121 patients who had Md3M removed due to Md2M DCC was undertaken to determine the treatment outcomes for patients. The number of patients affected by DCC of Md2M was calculated from the incidence of DCC (15%) in a cohort of patients requiring Md3M removal (1100) and the annual number of patients undergoing third molar surgery in England. Direct costs were calculated using NHS and independent treatment tariffs and indirect costs from Office of National Statistics (ONS).

**Results:** It is estimated that 152,000 patients in England undergo third molar removal on an annual basis. Approximately 27,000 Md3M are removed annually due to DCC of the Md2M; costing £27 m to treat with additional costs of £28 m if dental implant replacement of the Md2M is included. Total cost for treating Md2M DCC: £55 m/annum.

**Conclusions:** Treating Md2M DCC and its consequences is expensive for healthcare funders such as the NHS and for patients. Md2M DCC is avoidable if patients who are at risk have prophylactic Md3M removal. This would offer potential and substantial savings in the financial cost of treating an otherwise avoidable disease.

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## Introduction

The presence of partially erupted, mesio-angular, mandibular third molar teeth (Md3M) are a causal factor in the development of Distal Cervical Caries (DCC) on adjacent mandibular second molar teeth (Md2M).<sup>1–7</sup> DCC is defined as a carious lesion, which occurs at the exposed disto-cervical amelocemental junction of a tooth and is seen most frequently related the Md2M.<sup>1,7</sup> As a consequence of DCC formation, treatment of the second molar, either in the form of restoration of the second molar or removal of the second molar is indicated. Moreover, the diagnosis of second molar DCC will require the removal of the Md3M, not only to facilitate the restoration of the second molar but also to eliminate the risk of recurrence of DCC in the second molar.

Although the specific treatment of the second molar will be determined by various clinical and patient factors, the definitive treatment outcomes for patients with third molar related DCC of the second molar has not been quantified. This paper evaluates the treatment outcomes for second molar teeth affected by DCC in a cohort of patients who had their Md3M removed as a consequence of DCC and estimates the relative costs of managing this disease.

## Method

Data from two previous published studies of patients with DCC in 2006 and 2014 were combined.<sup>1,7</sup> This data identified a total of 339 patients who had their Md3M removed due to DCC of the Md2M. Of these 339 patients, 121 patients had contemporary contact details. Advice was sought regarding the need for ethical approval but was deemed not be required. These patients were contacted and asked to confirm what the treatment outcome was for their Md2M tooth, subsequent to the removal of their third molar tooth: 84 patients responded.

## Results

Of the 84 patients, 44 were female and 40 were male. 26 patients (30%) confirmed that their Md2M had either been extracted at the time of third molar removal or subsequent to third molar removal; 26 patients (30%) confirmed that they had had the second molar tooth restored and that it was still present. A further 10 patients (12%) confirmed that they had endodontic treatment of the second molar prior to restoration of the tooth. 22 patients (27%) could not recall what treatment they had for their second molar and could not confirm if the second molar tooth was present or not (Fig. 1).

Of the 84 patients, 38 were from the 2006 cohort and 46 from the 2014 cohort. Of the 2006 cohort; 24% of second molar teeth had been extracted, 45% were restored and 31% could not recall what treatment they had. Of the 2014 cohort: 35% had been extracted, 41% were restored and 24% could not recall what treatment they had.

Of the 62 patients who could recall the treatment outcomes for their second molar tooth, 26 patients (42%) had their second molar removed, 26 patients (42%) had their second molar

restored and 10 patients (16%) had their second molar endodontically treated in addition to restoration (Fig. 2).

## Discussion

DCC in the second molar is most commonly associated with Md3M teeth but it is also seen with maxillary third molars.<sup>1–7</sup> The majority of third molars associated with DCC on the second molar are mesio-angularly impacted, with a smaller incidence observed with horizontal impactions: DCC has not been observed in association with vertical, disto-angular, or ectopic impactions.<sup>1,7</sup>

The presence of the partially erupted mesio-angular third molar impacting against the second molar creates a deficient gingival collar around the second molar tooth which results in exposure of the distal cervical root surface of the second molar to the oral environment.<sup>1,7</sup> The inaccessibility of this area for adequate oral hygiene results in cariogenic plaque formation and consequent dental caries in this area. The partially erupted third molar is causal to the formation of DCC in the second molar as it is not observed in the absence of an adjacent third molar.<sup>1–7</sup>

As already stated, treatment outcomes for patients with DCC include removal of the third molar to facilitate restoration of the second molar tooth. Conservative treatment of the second molar tooth may involve uncomplicated restoration of the tooth but in some cases the tooth will also require endodontic treatment and more complex and expensive restoration. In other cases it may not be possible to restore the second molar and removal may be indicated either concurrent with the removal of the third molar, later if restoration of the second molar becomes unfeasible or; ultimately it may, in its own right, fail at a later stage. In patients in which it is not feasible to restore the second molar tooth and this tooth is indicated for removal, the third molar may, in some cases, be retained if it is disease free, as removal of the third molar may be clinically meaningless. In the majority of cases of patients with DCC in the Md2M the immediate and long-term prognosis for this tooth is poor and the likelihood of the tooth lasting indefinitely would be guarded.

Restoration of the second molar tooth whilst overlooking the need for removal of the third molar tooth is not clinically pragmatic. This makes restoration of the second molar difficult and ultimately the third molar persists in compromising the second molar either from the risk of secondary DCC or periodontal problems (Figs. 3–5). In cases where potential third molar removal will have a significant risk of IDN injury consideration may be given to undertaking a coronectomy procedure on the third molar to eliminate the casual influence and the potential effect of the third molar.<sup>7</sup>

In estimating the cost of DCC, a number of factors need to be taken into account. The number of patients with DCC and the proportion of different treatment outcomes related to these patients have to be calculated. In addition, the direct monetary cost of each of treatment modality and the indirect costs of treatment need to be quantified. The cost of second molar DCC may be difficult to calculate as, although the loss or restoration of a tooth has a financial cost, the ongoing long-term costs of maintenance and possible loss will change with individual

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