Second Molar Extraction

Greatrex PA, Sampson WJ, Richards LC, Twelftree CC. The extraction of permanent second molars and its effect on the dentofacial complex of patients treated with the Tip-Edge appliance. Eur J Orthod. 2002 Oct;24(5):501-18.

The aim of this investigation was to assess the dentofacial changes in a group of patients consecutively treated with Tip-Edge appliances and the extraction of four permanent second molars by one specialist orthodontic practitioner. Before and after treatment lateral cephalograms and study cast measurements of 45 individuals, 26 females (mean age 13.8 years) and 19 males (mean age 13.9 years), were collated and statistically analysed. Cephalometric variables that exhibited, before treatment, significant sex differences, included SNA, SNB (both smaller in males, $P < 0.05$) and U1-NA degrees ($P < 0.05$), nasolabial angle ($P < 0.05$), and upper lip length $P < 0.01$ (all larger in males). After treatment, sex differences were demonstrated for SNA (smaller in males, $P < 0.05$), mandibular length ($P < 0.01$), upper face height ($P < 0.05$), lower face height ($P < 0.01$), anterior face height ($P < 0.001$), posterior face height ($P < 0.01$), nasolabial angle ($P < 0.05$), and upper lip length and thickness ($P < 0.001$; all larger in males). For the cast analysis, before treatment differences indicated larger values for males than females for lower arch inter-canine, premolar, and molar widths, arch depth (all $P < 0.05$), tooth size, and arch length ($P < 0.01$). Similar findings were noted in the upper arch except for inter-canine and premolar arch width. Despite most arch variables displaying sex differences, no gender effect was found for irregularity or crowding parameters. The same variables exhibited significant sex differences and changes after treatment (except tooth size, lower arch depth, and upper arch inter-canine width). Overall, the pattern of correction exhibited by the subjects included dental, skeletal, and soft tissue changes. Males tended to have greater mean increases in mandibular skeletal and soft tissue variables compared with females. Both males and females had increases in most dental arch variables measured from the study casts. Both sexes demonstrated a small uprighting, but statistically non-significant distalizing of the buccal segments. The lower incisors in the sagittal plane revealed a mean tendency to remain in their pre-treatment positions, with some individual variation. Overall, the treatment results were considered favourable, but case selection appeared to bias towards Angle Class I skeletal patterns of average to slightly reduced facial height, overbite and overjet < or = 4 mm, lip competence, no incisor protrusion, and moderate tooth size to arch length discrepancy (3-3.5 mm lower arch, 1 mm upper arch). Further evaluation of third molar eruption responses may provide insight into appropriate timing of second molar extractions.

[Extraction of second molars as orthodontic therapy] Ned Tijdschr Tandheelkd. 1992 May;99(5):169-71. [Article in Dutch] **Ruiken HM, Kuijpers-Jagtman AM.**

Extraction of second molars as an orthodontic measure is a simple procedure which can lead to good clinical results. Indications as well as timing and long term effects on buccal occlusion are discussed. It is concluded that acceptable results may only be expected when the extraction is strictly indicated and carried out in cases when the third molars have reached their full crown stage but before radiographic evidence of root formation. Upper third molars with an angulation of less than 30 degrees and lower third molars with an angulation of 30-60 degrees to the occlusal plane are likely to give a satisfactory position after eruption.

Waters D, Harris EF. Cephalometric comparison of maxillary second molar extraction and nonextraction treatments in patients with Class II malocclusions. Am J Orthod Dentofacial Orthop. 2001 Dec;120(6):608-13;

This retrospective cephalometric study compared the nature of the skeletodental correction of maxillary second-molar extraction and nonextraction treatments in correcting Class II malocclusions. The sample comprised 50 Class II, deep-bite, low-angle adolescents; half were treated with maxillary second-molar extraction and half were treated without extraction. Pretreatment and posttreatment lateral cephalograms were analyzed. Analysis relied primarily on the method of Lysle Johnston that evaluates sagittal changes in the teeth and supporting bones relative to the functional occlusal plane. All 18 cephalometric variables examined were statistically equivalent between the 2 groups at the start of treatment. In contrast, several skeletodental treatment changes differed significantly. The maxillary second-molar extraction group exhibited distal movement of the maxillary first molar (1.2 mm vs 0.0 mm), and there was greater flaring of the mandibular incisors in the nonextraction group (9.1 degrees vs 3.5 degrees). The upper incisor root was torqued lingually in both groups, but there was more anterior crown movement in the nonextraction group (2.0 mm vs 0.0 mm). Also, the extraction group finished active treatment 7 months sooner on average. Sagittal molar correction in the maxillary second-molar group was a result of distalizing in the maxillary arch, whereas anchorage was expended in the mandibular arch to correct the malocclusion in the nonextraction group. In properly selected Class II malocclusions, maxillary second-molar extraction is a viable alternative treatment choice.

Richardson ME. Second permanent molar extraction and late lower arch crowding: a ten-year longitudinal study. Aust Orthod J. 1996 Oct;14(3):163-7.

The purpose of this investigation was to examine lower arch alignment in the long term following treatment by second molar extraction. Thirty subjects, treated by extraction of four second permanent molars at an average age of 13.9 years, were examined five and ten years after extractions. None had any mechanical treatment in the lower arch. Twenty

had some simple upper arch treatment, including, in five cases, extraction of first premolars. The changes in lower arch alignment were measured on study models. There was a small average decrease in lower arch crowding in the first five years following extraction, and little or no change in alignment in the next five years.

Battagel JM, Ryan A. Spontaneous lower arch changes with and without second molar extractions. Am J Orthod Dentofacial Orthop. 1998 Feb;113(2):133-43.

This study describes the spontaneous changes that occurred in the lower arches of 41 children in whom orthodontic treatment was restricted to the upper arch only. In one group, lower second molars were extracted (n = 18), whereas in the other, these teeth remained in situ (n = 23). A two-phase treatment involved distal movement of the buccal segments with an "en masse" appliance and extraoral traction, followed by edgewise mechanics to retract or align the anterior teeth. Only study casts were examined. The occlusal aspects of the lower casts were recorded with the reflex microscope. Models were examined at the start of treatment, at the completion of buccal segment retraction, and when active appliance therapy was complete. The following arch measurements were recorded: intercanine and intermolar width, arch length and perimeter, and the degree of crowding in both the labial segment and the arch as a whole. In the extraction sample, upper buccal segment retraction was associated with increases in all lower arch dimensions and a reduction of crowding. In the nonextraction group, the response was inconsistent. Although arch length and perimeter reduced, intercanine and intermolar dimensions enlarged with minimal alteration in the labial segment crowding. During the second stage of therapy, dimensions generally decreased: arch length, perimeter, and the intercanine width returned to their pretreatment values in the extraction group and were further reduced in the nonextraction sample. However, both arch length and perimeter remained significantly longer in the extraction group. Intermolar width remained stable in both groups, whereas crowding increased. Over the 2-year observation period, arch length, arch perimeter, and crowding exhibited statistically significant differences in behavior between the two groups.

Jager A, el-Kabarity A, Singelmann C. Evaluation of orthodontic treatment with early extraction of four second molars. J Orofac Orthop. 1997 Feb;58(1):30-43. [Article in English, German]

The outcome of orthodontic treatment involving early extraction of 4 second molars was evaluated in 52 patients (29 girls, 23 boys). Computer-assisted analysis of cephalograms, casts and panoramic X-rays was performed at the start (T1, mean age 11.5 years) and at the end (T2, mean age 14.4 years) of treatment. Following treatment, mesial migration of upper and lower first molars was counteracted; however, treatment only moderately influenced normal development of the position of the incisors and the profile. At the end of treatment, the third molars had erupted in only 3 patients. Nevertheless, on average a significant mesial movement of these teeth was observed. In addition, there was a

significant improvement in the axial inclination of the third molars, especially in the upper arch. This improvement was correlated with the original position of the teeth. All patients needed a longer follow-up period and it seems reasonable that some of them might require a second treatment phase to adjust the position of the third molars.

Smith R. The effects of extracting upper second permanent molars on lower second permanent molar position. Br J Orthod. 1996 May;23(2):109-14.

There is some controversy over whether the extraction of upper second permanent molars as part of orthodontic treatment leads to the over eruption of unopposed lower second permenent molars. A study was established to investigate the presence of any over-eruption in a group of subjects who had upper second permanent molars extracted as part of a previous course of orthodontic treatment. These subjects (the experimental group) were compared with a control group of subjects, matched for age and sex. Upper and lower impressions were taken, and the vertical positions of the posterior teeth were objectively assessed from the study models using the travelling microscope. Measurements from the study models showed that the distal aspect of the lower second permanent molar had over erupted in the experimental group when compared to the control ($P < 0.001$ right, $P < 0.05$ left). The degree of over-eruption was influenced on the mesial aspect by the distal position of the upper first permanent molar ($P < 0.01$), but the distal aspect was not. Eruption of the upper third molar did not affect the over-eruption of the lower second permanent molar in the experimental group. The majority of upper third molars had erupted at least 3 years since the upper second molars had been extracted, but the majority had erupted into an unfavourable contact position with the first permanent molar.

Stellzig A, Basdra EK, Komposch G. Skeletal and dentoalveolar changes after extraction of the second molars in the upper jaw. J Orofac Orthop. 1996 Oct;57(5):288-97

The aim of this study was to evaluate treatment results after extraction of maxillary second molars. Since this therapy was chosen in patients with class II malocclusion, deep overbite and counterclockwise growth pattern, its effects on overbite and correction of the malocclusion were examined. For this purpose pre- and post-treatment models of 25 patients with 48 extracted upper second molars were measured and lateral cephalograms were appropriately superimposed in order to determine maxillary and mandibular skeletal and dentoalveolar changes. Our results indicate an average overbite reduction from 4.7 mm to 2.7 mm. None of the patients showed a posttreatment overbite increase. Despite the considerable initial Class II relation in many cases, a Class I occlusion was achieved in 92% of the patients. Primarily, the correction was achieved by distalization of the upper first molars. Furthermore, the mesial migration of the lower first molars, skeletal changes in the lower jaw, and the growth inhibition in the upper jaw contributed to the correction of the class II malocclusion.

Ryu YK. [The study on third molar changes following second molar extraction (1)] Taehan Chikkwa Uisa Hyophoe Chi. 1990 Dec;28(12):1069-79. [Article in Korean]

The purpose of this study was to observe the changes of the third molars following the extraction of second molars by orthopantomograms. The subjects were consisted of 96 cases in upper second molar extraction, 74 cases in lower second molar extraction. The obtained results were as follows: 1. The favourable eruption condition of upper third molar appeared in both groups with pre-extraction angle under 25 and pre-extraction angle above 25. 2. More favourable eruption condition of lower third molar appeared in group with pre-extraction angle under 25 than the other group with pre-extraction angle above 25. 3. The favourable eruption condition of upper third molar appeared in both group extracted in Nolla's Stage 4, 5 and Nolla's Stage 6,7,8. 4. More favourable eruption condition of lower third molar appeared in group extracted in Nolla's Stage 4, 5 than the other group extracted in Nolla's Stage 6,7,8.

Cavanaugh JJ. Third molar changes following second molar extractions. Angle Orthod. 1985 Jan;55(1):70-6.

Third molars, both upper and lower, do usually erupt into the place of electively removed second molars. None of the third molars in this study group became impacted during the observation period. Second molars in this study were removed before the roots had formed on the third molars. The bifurcation line appears to be a stable reference on the panoramic radiograph. It is the Author's conclusion that the extraction of permanent second molars is best for many patients, and when judiciously applied it is a reasonably safe and conservative modality in orthodontic care.