



Cephalometric Evaluation of Mandibular Relapse Following Bilateral Sagittal Split Osteotomy

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SUMMARY

A retrospective cephalometric investigation was performed to evaluate early, intermediate and long term postsurgical relapse following mandibular advancement by the modified bilateral sagittal split osteotomy.

The investigation involved a detailed assessment of 40 serial cephalometric records. Twenty patient records had longitudinal radiographs which had been taken a minimum of two years after surgery. This subset was investigated for long term relapse.

The forty records were assigned to one of four groups. Group 1 consisted of bilateral sagittal split osteotomy stabilised with screw fixation. Group 2 were cases with bilateral sagittal split and Le Fort I osteotomies stabilised with screw fixation. Group 3 consisted of bilateral sagittal split osteotomy stabilised with wire fixation. Group 4 were cases with bilateral sagittal split and Le Fort I osteotomies stabilised with wire fixation.

Relapse was measured over the short, intermediate and long term and correlated with selected cephalometric variables. The results of the short term study showed that there were no significant differences between sexes for any of the variables studied. In addition, no statistical differences were shown between groups 1 and 2, nor between groups 3 and 4. Therefore, the screw fixation and the wire fixation subgroups were combined. When the groups were examined according to the method of fixation, relatively minor differences between the screw (SF) and wire (WF) fixation groups were evident in the first 6 weeks following surgery. Relapse appeared to be associated with the amount of surgical advancement but this correlation could have arisen through topographical associations independent of a true biological effect.

Early relapse was not correlated with the preoperative mandibular plane, altered posterior facial height or gonial angle. A clear association between condylar displacement and early relapse tendency was not shown in either group. It was found that gonial arc radius increased for both groups in 26 of the 40 (65%) cases but returned by 6 weeks, including those patients in intermaxillary fixation. The high rate of condylar displacement may have been the result of a limitation in surgical technique or a cephalometric misinterpretation.

Both groups had comparable mean mandibular advancement but the relapse tendency was higher in the SF group (-20.3%). This level of relapse conflicts with previous investigations on the stability of screw fixation. Early relapse in the WF group was -13.6% but this difference, compared with the SF group, did not reach statistical significance.

The most significant difference ($P < 0.005$) between the fixation groups was the surgical increase in gonial angulation for the WF group. This was almost double the change recorded for the SF group. The increase in gonial angle for the WF group related more strongly to increased anterior facial height with a lesser contribution from proximal rotation. Despite this difference, no association with relapse was noted. Dental compensation during the first six weeks (T2-T3) was not conspicuous in either group.

In view of the finding that condylar position was not a primary determinant of relapse, it would appear that other factors encourage early relapse. It is possible that the introduction of a new surgical technique, such as screw fixation, inevitably involves a learning phase where intraoperative compromise may occur. Thus the consequences of accepting small compromises in occlusion may not be apparent until cephalometric studies are embarked upon.

The results at 12 months confirmed the findings of previously published research that mandibular relapse continues into the intermediate period. In the long term, stability was observed for all variables implying that 12 month's observation is a minimum requirement for long term studies.

The data from this study showed a mean percentage relapse of -32% after one year. Approximately half of the relapse (-17%) occurred in the first six

weeks and the remainder occurred over the next ten months. Intermediate relapse appeared to be correlated with the amount of surgical advancement in the mandible when all subjects were included. This association was slightly stronger in the wire fixation group compared to the screw fixation group. Notwithstanding specious associations, a biological effect appeared to be involved, supporting the contention that the greater the initial surgical advancement, the greater the likelihood of postsurgical relapse within one year.

No single factor, with the possible exception of magnitude of advancement, was consistently responsible for intermediate relapse. The commonly discussed factors such as preoperative mandibular plane angle, altered posterior facial height and altered gonial arc radius did not appear to influence the amount of relapse when the total sample was assessed.

An interesting trend was observed between chronological age for males and intermediate relapse at B point. It is postulated that the compensatory effect of growth in the small male sample helped to mask postsurgical relapse. This aspect could be confirmed by a cephalometric study of males aged by hand-wrist radiographs, to determine whether this trend represents a true association with decreased relapse tendency.

The validity of these results was confirmed by quantifying the error of the method. Double determinations were carried out on 10 cephalograms from 3 randomly selected cases. Under standardised conditions, twenty hard tissue points and 2 fiducial points (x and x') were digitised on a *Hewlett Packard 9874A* digitiser configured to an *Apple IIe* computer.

The results were expressed as the mean of the differences, the standard error of the mean differences, the standard error of a single determination and the error variance per cent. A rank order based on the standard error of a single determination was assigned to each variable in the x and y plane. Scattergrams were compiled to illustrate the differences between the first and second determinations and each cephalometric point demonstrated a characteristic distribution around origin. The results of this investigation showed that the mean differences and total errors of the method were small. When these were expressed as a percentage of the error variance, errors contributed less than 2 per cent of the observed values.

The total error for 9 angular and 4 linear measurement was established using a modification of the method described by Will et al. (1984). Ten films were traced, superimposed and digitised on 4 occasions giving 20 double determinations. Investigation of the total error for the 13 variables showed that five angles and two linear values differed at the 5% level of probability. However, the mean differences and standard error of the mean differences were small and none of the angles or distances exceeded 1° or 1 mm for the standard deviation of a single determination. The percentages of the observed variance attributable to errors were low for all angular variables. Of the linear variables, overjet and overbite displayed the largest values of 4.52% and 2.55% respectively. It was concluded that the total experimental error was small and was therefore unlikely to contribute significantly to the observed results.

STATEMENT

This thesis is submitted in partial fulfilment of the requirements for the degree of Master of Dental Surgery. I declare that the text of this thesis has not been previously published or written by another person except where due reference is made. The findings are the result of my personal investigations. No part of this work has been previously submitted for a degree in any university.

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