

FEATURES SECTION

Relevant research from non-orthodontic journals

This section is designed to draw the attention of readers to papers that have been published in non-orthodontic journals, but which may be of interest. The abstracts have been selected and edited by Louise Kneafsey and Professor Nigel Hunt.

Orthognathic surgery

Long-lasting neurosensory disturbance following advancement of the retrognathic mandible: distraction osteogenesis versus bilateral sagittal split osteotomy. *Int J Oral Maxillofac Surg* 2009; 38: 719–25

Wijbenga JG, Verlinden CRA, Jansma J, Becking AG, Stegenga B

Objectives: Neurosensory disturbance (NSD) of the inferior alveolar nerve (IAN) is the most common complication after bilateral sagittal split osteotomy (BSSO) and distraction osteogenesis (DO) of the retrognathic mandible. It is suggested that the risk is lower after DO than after BSSO. This retrospective study compared both techniques with regard to long-lasting (over 1 year) NSD and overall patient satisfaction.

Methodology: This was a retrospective study of 91 patients (representing 182 IANs) from 3 different medical centres. They completed a questionnaire and underwent an objective neurosensory test.

Results: In the BSSO-group (90 nerves), long-lasting NSD was reported in 27 cases (30%) versus 21 cases (23%) in the DO group (92 nerves). In 39 cases (24 BSSO, 15 DO) the long-lasting NSD was reported in the lower lip, the chin or both. Of these cases, 9 (5 BSSO, 4 DO) were objectively tested positive. The overall prevalence was 8% in the BSSO group and 10% in the DO group.

Conclusions: There were no significant differences in subjectively reported and objectively measured NSD between the groups. In this study patients seemed to over-report the NSD compared with the objective findings. For both procedures, overall patient satisfaction was high.

Comment: There is little information in the literature on whether long lasting sensory disturbance after orthognathic surgery influences patient satisfaction with the outcome of the procedure. In this study the satisfaction

rate was very high. Interestingly the patients questioned would be more likely to undergo BSSO again (98%) compared to DO (89%); it is postulated that this may be due to the level of discomfort during the distraction period or the required second surgical intervention. The initial perceived advantage of DO for reduced NSD seems unwarranted.

Orthognathic surgery

Accuracy of computer programs in predicting orthognathic surgery hard tissue response. *J Oral Maxillofac Surg* 2009; 67: 1628–39

Kaipatur N, Al-Thomali Y, Flores-Mir C

The aim of this systematic review was to investigate the accuracy of computer programs in predicting skeletal changes after orthognathic surgery.

Methodology: A systematic computerised database search was conducted with the help of a health sciences librarian. Specific selection criteria were used to select articles, reference lists of the selected articles were also searched for any potential articles that might have been missed in the electronic search, and additional information not available through the articles was obtained directly from the corresponding author.

Results: Of the 79 initially identified articles (abstracts/titles), only 9 fulfilled the final selection criteria. As expected, no dental changes occurred, but the computer programs were unable to precisely predict all the skeletal changes. Most of the prediction inaccuracies were within 2 mm or 2°, which can be partially attributed to measurement errors in cephalometric tracing.

Conclusions: This systematic review showed that computer programs cannot consistently predict the skeletal changes occurring after orthognathic surgery but their results may be considered inside a clinically acceptable range. Last-minute changes by the surgeons could also explain the differences. We also conclude that no

software program was shown to be superior in prediction accuracy compared with its competitor.

Comment: The studies looked at cephalometric points pre-surgically and post-surgically, there was no measure of how accurately the surgeon performed the planned surgical moves. This may introduce another area of error in addition to the tracing error. This systematic review reinforces that current software cannot replace careful case analysis, sound preparation by the orthognathic team and surgeon's experience. It acknowledges that prediction programmes should be used as a guide only.

Temporary anchorage devices

Factors associated with the stability of mini-implants for orthodontic anchorage: a study of 414 samples in Taiwan. *J Oral Maxillofac Surg* 2009; 67: 1595–99

Wu T, Kuang S, Wu C

Objectives: To evaluate failure rates and factors associated with the stability of mini-implants used for orthodontic anchorage.

Methodology: Enrolment of 166 patients (35 male patients and 131 female patients) who had consecutively received mini-implants for orthodontic anchorage at the Section of Orthodontics and Paediatric Dentistry, Taipei Veterans General Hospital (Taipei, Taiwan) from January 2001 to December 2006. A total of 414 mini-implants with diameters ranging from 1.2 to 2.0 mm were evaluated. 4 types of mini-implants were used; MIA Absoanchor, A1, Lomas and Microscrew. Clinical variables for analysis were divided into host-related and implant-related factors. Mini-implants that could be maintained for orthodontic anchorage for more than 6 months were considered to be successful. Statistical analysis was used to evaluate the failure rate in the study cohort and to identify possible associated factors.

Results: The overall failure rate was 10.1% (42 of 414 screws) with orthodontic force loading for more than 6 months. Most failures were due to loosening and occurred within the first 2 weeks. Differences in overall failure rates for the maxilla and mandible (9.3% and 16.3%, respectively) were not statistically significant. A lower failure rate was found for the maxilla with implant diameters equal to or less than 1.4 mm ($P=0.036$). The left side had a lower failure rate than the right (6.7% vs 13.9%, $P=0.019$). Length and type of mini-implants, age and gender were not associated with mini-implant failure.

Conclusions: Use of mini-implants for anchorage is reliable. In the study the overall success rate was 89.9%. Careful diameter selection for different locations is essential. In the maxilla an implant diameter equal to or less than 1.4 mm is recommended. In the mandible an implant diameter larger than 1.4 mm is suggested for better orthodontic anchorage. Hygienic care of implantation sites should also be emphasized for long-term success of mini-implant anchorage.

Comment: With the increased use of temporary anchorage devices it is interesting to note that the authors recommend diameter selection in relation to maxillary or mandibular location as a key to improving success rates. This should aid operators using the many different systems available.

Temporary anchorage devices

Orthodontic mini-implant stability in different healing times before loading: a microscopic computerized tomographic and biomechanical analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009; 108: 196–202

Zhao L, Xu Z, Yang Z, Wei X, Tang T, Zhao Z

Objectives: The aim of this study was to evaluate the influence of different healing times before loading on the stability of implanted titanium mini-implant.

Methodology: Forty mini-implants were implanted into the bilateral maxilla of 10 beagles, loaded with a force of 0.98 N immediately or after delays of 1, 3, 5, and 7 weeks. Microscopic computerized tomography (μ CT) and 'pullout testing' (F_{max}) were used for morphometric and biomechanical analyses, respectively. To facilitate 'pullout testing' the bone specimen was embedded in a polymethylmethacrylate block and placed on a machine that could tightly clamp the block and pull the mini-implant head by a jig along an axis that introduced no bending moment.

Results: All μ CT parameters and the F_{max} of mini-implants were stimulated with the prolongation of healing time before loading. Between the group of 1 week and 3 weeks, a more obvious rising tendency of both μ CT parameters and the F_{max} of implants were observed. After 3 weeks, the tendency of increase tapered off.

Conclusions: The results indicated that immediate loading may damage the osseointegration and stability of the implant-bone fixture and that delayed loading (after 3 weeks) is better than immediate loading.

Comment: With the increased use of temporary anchorage devices in orthodontics new studies to advise on the timely loading of these are welcome. These data may serve as the basis for additional clinical studies in humans to help orthodontists choose optimum implant loading to achieve more successful outcomes.

Restorative dental implants

A randomised prospective multicentre trial evaluating the platform-switching technique for the prevention of post-restorative crestal bone loss. *Int J Oral Maxillofac Implants* 2009; 24: 299–308

Prosper L, Redaelli S, Pasi M, Zarone F, Radealli G, Gherlone EF

Objectives: To evaluate the effectiveness of the platform-switching technique to prevent crestal bone loss following the restoration of dental implants.

Methodology: A randomised, prospective, multicentre trial which analysed 60 partially edentulous adults, recruited at 12 professional dental centres. Subjects were randomly selected to receive either platform enlarged or control cylindrical implants in 3 different surgical procedures; conventional non-submerged, submerged and submerged with a reduced abutment. The primary outcome measure was the crestal bone level assessed radiographically 12 and 24 months following placement. Non-parametric analysis of variance for repeated measures (Friedman test) was used to assess the overall significance of differences over time in the crestal bone levels changes among implants. Comparisons among and between groups of implants were performed by the non-parametric Friedman and Wilcoxon tests, respectively. In all the analyses $\alpha < 0.05$ was considered significant.

Results: A total of 360 implants were placed (60 for each group). Three control implants failed during the second year following placement. All submerged and 92% of non submerged platform-enlarged implants exhibited no bone loss. Control implants with an abutment as large as the platform exhibited more bone loss than their platform-enlarged counterparts ($P < 0.001$) or control implants with a reduced abutment ($P < 0.001$). Submerged implants with an enlarged platform showed better crestal bone preservation than sub-merged control implants with a reduce abutment ($P = 0.6$).

Conclusions: The findings of this trial indicate that the use of implants with an enlarged platform can result in better preservation of the crestal bone as compared with

conventional cylindrical implants when a reduced abutment is mounted.

Comment: This is an interesting article for anyone involved with orthodontic space creation for implant replacement of missing teeth, especially anteriorly. Loss of crestal bone can have detrimental effect on the aesthetics of the final coronal restoration.

Trauma to maxillary incisors

Risk factors for injuries to maxillary permanent incisors and upper lip among school children in Dar es Salam, Tanzania. *Int J Paediatric Dent* 2009; 19: 148–54
Kahabuka FK, Mugonzibwa EA

Objectives: To investigate the risk factors for injury to maxillary permanent incisors and the upper lip among Tanzanian schoolchildren aged 8–14.

Methodology: A cross sectional study involving 1119 children. The risk variables investigated included age, gender, lip competence and overjet. The corresponding proportions of injuries and the relative risk (with 95% confidence interval) were calculated and tested by Fischer's exact test. Logistic regression was applied to ascertain the strength and direction of the association of the risk variable to injuries, and backward selection was used to test significant risk factors.

Results: About 24% of the children had trauma to maxillary incisors, 45% had incompetent lips whereas 31% had increased overjet. Age, gender, overjet and lip competence showed significant association with injuries to the upper lip and maxillary incisors. Boys had sustained more injuries than girls with a higher relative risk for luxation injuries. Enamel fracture was associated with overjet combined with lip incompetence, whereas enamel dentine fracture without pulp involvement was related to gender. Luxation injuries were associated with gender, tooth avulsion with overjet and lip competence. Injury to the upper lip was associated with age.

Conclusion: Male gender, increased overjet and lip incompetence were the main risk factors of getting trauma to the maxillary incisors, whereas age was the risk factor for injury to the upper lip.

Comment: This is a study with a large sample size that suggests that those children with an increased overjet and lip incompetence are at increased risk of trauma to the upper lip and maxillary incisors. The main risk factor is, however, gender for which there is no orthodontic intervention!

Molar-incisor hypomineralisation

Aetiology of molar-incisor hypomineralisation: a critical review. *Int J Paediatric Dent* 2009; 19: 73–83

Crombie F, Manton D, Kilpatrick N

Objectives: To assess the strength of evidence for the aetiology of molar-incisor hypomineralisation (MIH), often referred to as demarcated defects in the enamel.

Method: A systematic search of online medical databases was conducted with assessment of titles, abstracts and finally, full articles for selection purposes. The level and quality of the evidence was then assessed for each article according to Australian national guidelines.

Results: Of 1123 articles identified by the database search, 53 were selected for review. These covered a variety of potential aetiological factors, some of which were grouped together for convenience. The level of evidence provided by the majority of papers was low and most did not specifically investigate MIH. There was moderate evidence that polychlorinated biphenyl/dioxin exposure is involved in the aetiology of MIH;

weak evidence for the roles of nutrition, birth and neonatal factors, and acute or chronic illness/treatment; and very weak evidence to implicate fluoride or breastfeeding.

Conclusion: There is currently insufficient evidence in the literature to establish aetiological factor/s relevant for MIH. Improvements in study design, as well as standardisation of diagnostic and examination protocols would improve the level and strength of evidence.

Comment: Orthodontists are highly likely to encounter children with MIH in clinical practice (see associated feature article by Dr Kilpatrick in this issue of the Journal). Knowledge of the aetiology of MIH will assist in identification of those patients that may be at risk of MIH and aid explanation of the situation. This paper provides an analysis and summary of aetiological information regarding MIH published over the last 18 years in the form of 5 hypotheses. It illuminates the problems with definition and classification of MIH and other enamel defects and suggests strategies to improve future research.