



SMART DENTAL UPDATES

Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you “**SMART DENTAL UPDATES**” which contains latest and interesting news in the field of Dentistry.

This issue contains

- Relationship between the Dental Aesthetic Index and Discrepancy Index
- Novel low-shrinkage-stress nanocomposite with remineralization and antibacterial abilities
- Evaluation of Tongue Force on Mandibular Incisor in Various Malocclusions

Should you require any specific article or medical information, please feel free to contact us at medicalservices@microlabs.in

Looking forward to your valuable feedback

Best Regards,
Medical Team, Micro Labs Limited

Relationship between the Dental Aesthetic Index and Discrepancy Index

Although the terms 'complexity' and 'severity' have been associated with malocclusions, there are differences between them. While the severity of malocclusion is a measure of how much a malocclusion of the ideal deviates and is related with the need for orthodontic treatment, the complexity of malocclusion has been associated with a measure of effort and skill to treat. Orthodontic indices play an important role in the classification of malocclusions, orthodontic treatment needs, level of complexity and prediction of treatment duration.

A linear generalised model could be used to predict the complexity of the case from the malocclusion severity (DAI score).

The study was conducted to establish the association between malocclusion severity and orthodontic case complexity as assessed by the Dental Aesthetic Index (DAI) and the American Board of Orthodontics Discrepancy Index (ABO-DI), respectively.

Pre-treatment dental casts and radiographs from 500 individuals (294 women and 206 men; mean age = 26.06 ± 11.58 years) were randomly selected from the orthodontics department of a private university. Malocclusion severity was assessed using DAI and case complexity was evaluated with ABO-DI. Three previously calibrated operators performed the measurements. Spearman's correlation analysis, Mann-Whitney U test, Kruskal-Wallis test and a linear generalized model were used for statistical evaluation ($P < 0.05$ was considered significant).

Generalised linear models for case complexity (ABO-DI score) as response variable

Variable	Model 1			Model 2		
	Estim	SE	P value	Estim	SE	P value
Intercept	4.47	1.29945	< 0.0001	8.614×10^{-3}	4.961×10^{-4}	< 0.0001
DAI score	0.3621	0.04447	< 0.0001	-1.319×10^{-4}	1.175×10^{-5}	< 0.0001
AIC	3387.8			3523.3		
BIC	3400.489			3535.913		

ABO-DI, American Board of Orthodontics Discrepancy Index; AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; Estim, estimate of regression model coefficient; Model 1, normal distribution, linked identity, no constant variance; Model 2, inverse Gaussian distribution, linked inverse squared

Although the correlation ($r = 0.45$; $P < 0.0001$) between malocclusion severity and case complexity was moderate, strong evidence of an association ($P < 0.001$) between dichotomised DAI and ABO-DI total scores was observed. The linear generalised model showed that for each point of increase in DAI score, the ABO-DI score increased an average of 0.3624 points ($P < 0.0001$).

Association between ABO-DI index disorders and orthodontic treatment need (DAI dichotomised).

	No orthodontic treatment need (DAI < 30)	Orthodontic treatment need (DAI > 30)	P value
	Mean $\pm$ SD	Mean $\pm$ SD	
<i>ABO-DI disorder (points)</i>			
Overjet	0.79 $\pm$ 0.96	1.75 $\pm$ 1.32	< 0.0001
Overbite	1.57 $\pm$ 1.45	1.84 $\pm$ 1.66	0.130
Anterior open bite	0.44 $\pm$ 1.22	0.63 $\pm$ 1.67	0.542
Lateral open bite	0.08 $\pm$ 0.49	0.23 $\pm$ 1.17	0.179
Crowding	2.77 $\pm$ 2.35	3.65 $\pm$ 2.71	0.001
Occlusal relation	1.85 $\pm$ 2.86	3.22 $\pm$ 2.44	< 0.0001
Posterior lingual crossbite	0.29 $\pm$ 0.85	0.44 $\pm$ 1.07	0.180
Posterior buccal crossbite	0.07 $\pm$ 0.39	0.13 $\pm$ 0.54	0.147
ANB	1.04 $\pm$ 2.06	1.34 $\pm$ 2.24	0.151
SN-MP	1.95 $\pm$ 4.07	1.664 $\pm$ 3.78	0.311
IMPA	0.99 $\pm$ 2.52	0.98 $\pm$ 2.41	0.836
Other	1.22 $\pm$ 1.91	2.47 $\pm$ 2.81	< 0.0001

There was a moderate and significant ($P < 0.0001$) correlation between DAI and ABO-DI scores ($r = 0.4502$; 95% CI = 0.3770–0.5235). Strong evidence of an association ($P < 0.001$) between the scores of the dichotomized DAI and DI was found. A generalised linear prediction model showed that for each point of increase in DAI score, the ABO-DI score increased an average of 0.36 points ($P < 0.0001$).

Source: Plaza SP et al. J Orthodontics. 2020 June. 1-10. doi.org/10.1177/1465312520930729

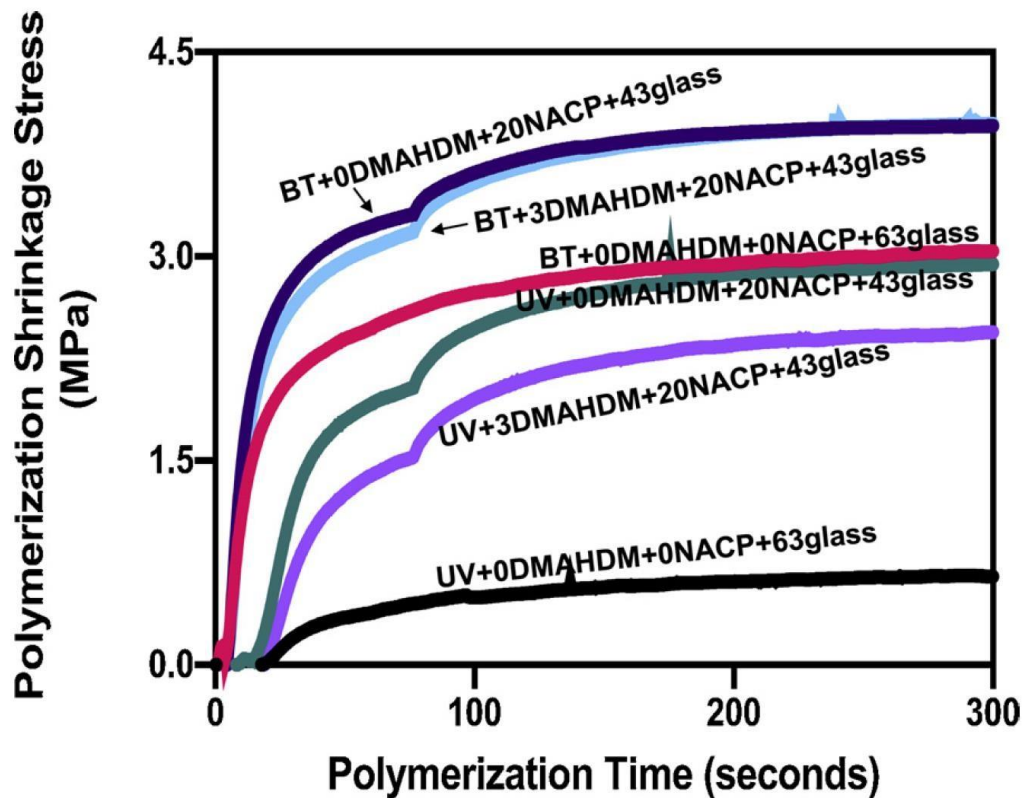
Novel low-shrinkage-stress nanocomposite with remineralization and antibacterial abilities

Polymerization shrinkage stress may lead to marginal damage, microleakage and failure of composite restorations. The objectives of this study were to : (1) develop a novel nanocomposite with low-shrinkage-stress, antibacterial and remineralization properties to reduce marginal enamel demineralization under biofilms; (2) evaluate the mechanical properties of the composite and calcium (Ca) and phosphate (P) ion release; and (3) investigate the cytotoxicity of the new low-shrinkage-stress monomer in vitro.

This new composite is promising to inhibit recurrent caries at the restoration margins by reducing polymerization stress and protecting enamel hardness.

The low-shrinkage-stress resin consisted of urethane dimethacrylate (UDMA) and triethylene glycol divinylbenzyl ether (TEG-DVBE), and 3 % dimethylaminohexadecyl methacrylate (DMAHDM) and 20 % calcium phosphate nanoparticles (NACP) were added. Mechanical properties, polymerization shrinkage stress, and degree of conversion were evaluated. The growth of *Streptococcus mutans* (S. mutans) on enamel slabs with different composites was assessed. Ca and P ion releases and monomer cytotoxicity were measured.

Composite with DMAHDM and NACP had flexural strength of 84.9 ± 10.3 MPa ($n = 6$), matching that of a commercial control composite. Adding 3 % DMAHDM did not negatively affect the composite ion release. Under S. mutans biofilm, the marginal enamel hardness was 1.2 ± 0.1 GPa for the remineralizing and antibacterial group, more than 2-fold the 0.5 ± 0.07 GPa for control ($p < 0.05$). The polymerization shrinkage stress of the new composite was 40 % lower than that of traditional composite control ($p < 0.05$). The new monomers had fibroblast viability similar to that of traditional monomer control ($p > 0.1$).



Polymerization shrinkage stress vs. polymerization time. UV groups displayed a delayed development of polymerization stress and lower shrinkage stresses ($p < 0.05$).

A novel low-shrinkage-stress nanocomposite with remineralizing and antibacterial capabilities were developed. This composite substantially reduced the polymerization shrinkage stress as compared to traditional composite, with no negative effect on mechanical strength and degree of conversion. The cytotoxicity of the new low-shrinkage stress monomer was similar to that of BisGMA. The new low-shrinkage stress nanocomposite restoration protected tooth enamel from demineralization under biofilm acid attack, yielding an enamel hardness that was more than 2-fold that of control composite restoration. The low shrinkage- stress, remineralizing and antibacterial composite is promising to inhibit recurrent caries at the margins and increase the restoration longevity.

Source: J Dentistry. 2020 August; 99: 103406. doi.org/10.1016/j.jdent.2020.103406

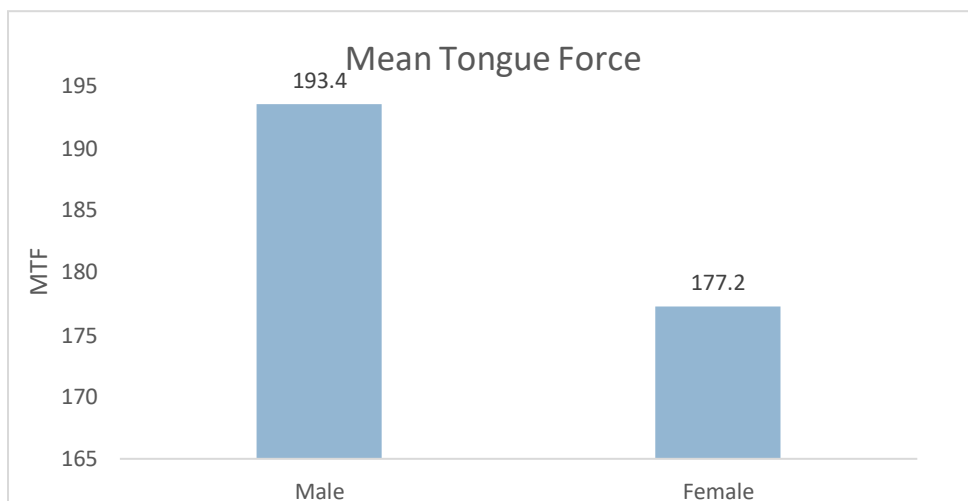
Evaluation of Tongue Force on Mandibular Incisor in Various Malocclusions

The study was conducted to evaluate the tongue forces exerted on the mandibular incisors in various malocclusions and also compare it among genders. The study was conducted on 512 subjects (340 females and 172 males). The subjects were divided into three groups according to the molar relation of the subjects. Molar relation and the tongue forces exerted on the mandibular incisor of the subjects were recorded using a diagnostic kit and a Flexi force resistive sensor respectively. Tongue Force at Rest (TFR), Tongue Force during Swallowing (TFS) and Maximum Tongue Force (MTF), were measured and statistically analyzed.

TFR and TFS were found to be influential in the malocclusion of an individual and also a stronger tongue musculature among males was concluded while comparing MTF.

MTF was a significantly more among males than females. A significant relationship while comparing TFR and TFS among the three groups was also found.

Among the total 512 subjects included in the study, 340 were females and 172 males. On comparing the average MTF among males and females, the mean value was found to be 193.4 and 177.2 respectively. A highly significant relation was found among the gender ($p\text{-value}=0.00$) with an increased value among males than females.



The statistical analysis revealed a mean value of average TFR as 2.0, 5.1 and 12.5 in Class I, II and III respectively. The values put forward a highly significant relation among the groups in a very visible pattern with Class III having the maximum tongue force at rest followed by Class II and least force produced by Class I .

Mean values of the average TFS was found to be 6.6, 16.5 and 31.9 in all the three groups consequently. A significant relation ($p\text{-value}=0.00$) was found while comparing TFS among the groups. The mean value of average MTF for all the three groups was found to be 185.1, 177.9 and 182.3 respectively. While comparing the MTF, the relation was non-significant ($p\text{-value}=0.063$) among the malocclusion.

Source: Chakraborty P et al. Dentistry, 2020 June; 10(4):556



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