

Summary of: An *in vitro* comparison of tooth whitening techniques on natural tooth colour

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Objective Tooth whitening has become a popular treatment regime but there is little quantitative evidence to compare techniques and so confusion may exist for the clinician as to which regime to prescribe for greatest efficacy. The aim of this study was to compare immediate and longer-term colour change on natural tooth colour *in vitro*, using five current tooth whitening techniques with blind matched control groups. **Methods** A total of 100 human teeth of matched size were cleaned, stored in sterile deionised water at 4°C then randomly allocated to one of the five active treatment groups or five matched control groups. The active treatments were: 10% carbamide peroxide (CP) x 60 min, 35% CP x 30 min or 35% hydrogen peroxide (HP) treatment x 30 min activated by one of three sources of energy (diode laser, halogen light, and plasma arc curing light). Tooth colour was analysed with a colorimeter before and after treatment: immediate, one week and nine months post-bleaching designed to generate tooth colour value (L*) according to the L*a*b system. The change in colour was determined as ΔL (the difference in the value of the colour) for each tooth, then the mean differences were obtained for each group and compared. Tooth surface temperature was monitored. **Results** Comparing active treatments with controls it was found that 10% CP, 35% CP, 35% HP with halogen provided significantly greater tooth whitening. Comparing the different treatments showed that 10% CP was significantly more effective ($P < 0.05$) than all other treatments except 35% HP with halogen activation. The effect of each treatment regime over time showed that the 10% CP gave a significant gain immediately and one week later ($P < 0.05$), however, all the whitening effects were lost over time following these single treatments. The temperature rise on the tooth surface was greatest when using laser activation during power whitening. **Conclusion** This study suggests that 10% CP is an effective technique for tooth whitening and can offer significant benefits over alternative regimes.

EDITOR'S SUMMARY

The expression the 'Hollywood smile' is succinctly revealing. It could have been the 'American smile' or the 'actor/actress' smile' but the use of the word Hollywood is key. It implies an image, literally and metaphorically, that has elements of being aspirational, perhaps dream-like, maybe unobtainable, probably glamorous and most of all unlikely for an average non-Hollywood person.

The widespread availability of tooth whitening agents, techniques and materials has changed the aspiration into a reality for many more people and patients than ever before with the result that demand has risen sharply. But if the choice seems bewildering for the patient it is even more difficult for the

practitioner who is expected to know which method is best and what the results are likely to be in the short, medium and long term.

This paper begins to clarify the answers and provides a conclusion that readers should welcome in term of being able to give definitive advice to patients. But the very fact that this piece of research has been undertaken is indicative of the way in which dentistry is developing. Taking the definition of cosmetic dentistry as a procedure which enhances the look of the teeth rather than their health, research which investigates the application of this, rather than the ability to treat a disease-mediated condition is also a significant shift, necessary as it might be in terms

of knowledge-base and patient safety.

Proponents would doubtless argue that there is an important element of psychological health to be considered in the debate. While there may be very good grounds for such an assertion the underlying trend remains: with improved oral health in general and greater tooth retention into older age, as the need to treat disease reduces, the desire to have the Hollywood smile increases. Does dentistry follow?

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 204 issue 9.

Stephen Hancocks,
Editor-in-Chief

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IN BRIEF

- Supports the use of 10% carbamide peroxide for tooth whitening.
- This regime offers benefits over certain other whitening treatments and provides a similar benefit to power whitening with a halogen light.
- The whitening effect reduces over time after treatment is complete.
- There is a temperature rise within the tooth when using laser whitening.

COMMENT

Tooth whitening procedures have received much attention over recent years. This study is timely and topical and should provide very useful information to *BDJ* readers. Given the precarious position with the legality of tooth whitening in this country it is essential that the lowest possible dosages of carbamide peroxide (hydrogen peroxide) are used for the shortest possible time and that this is evidence-based.

This *in vitro* study investigated the immediate and longer-term effect of tooth whitening on natural tooth colour using five current whitening techniques with blind matched control groups. Extracted human teeth were treated with either: 10% carbamide peroxide for 60 minutes, 35% carbamide peroxide for 30 minutes or 35% hydrogen peroxide for 30 minutes activated by three sources of energy (diode laser, halogen light, and plasma arc curing light). Tooth colour was analysed using a colorimeter before and after treatment and one week and nine months post-bleaching.

The paper clearly showed that night-guard based vital bleaching with 10% carbamide peroxide is an effective tooth whitening technique and gives support to the growing body of evidence that laser whitening is not

justified as an alternative to this procedure, particularly given the temperature rises to the surface of the teeth, the higher risk of post-operative sensitivity and higher cost.

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AUTHOR QUESTIONS AND ANSWERS**1. Why did you undertake this research?**

We were aware of the multitude of tooth whitening techniques currently available and the lack of evidence base to guide dentists when choosing a particular technique for their patients. This has resulted in confusion with current techniques and some uncertainty amongst dentists, particularly revolving around the relative benefits and use of power whitening *versus* at-home techniques.

We were also aware that patients may not have received the best evidence-based treatment to meet their needs. Much of the dentist's decision making has been influenced by marketing companies who have promoted their whitening systems. Dentists have lacked the evidence base with which to challenge claims by manufacturers when presenting 'in-house' and uncorroborated data.

2. What would you like to do next in this area to follow on from this work?

The present study shows regression of tooth colour improvement over time and this would benefit from further study. A laboratory study over a longer period could monitor this.

A clinical trial based on the same research model as the present study would also be welcome.

Further *in vitro* study could investigate the use of ozone for tooth whitening in comparison with the agents used in the present study.

Further work could also look at the long term perception of patients undergoing tooth whitening, including the extent and duration of the whitening effect, and how all these factors affect the patient.