

Patient reported outcome measures for children and young people having dental bleaching

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Abstract

Purpose

Dental bleaching in paediatric patients can be used to address discolouration of teeth due to trauma, endodontic treatment, or enamel and dentine defects. Despite being a minimally invasive and successful treatment, the use of bleaching products in children and young people remains controversial. This evaluation was designed to provide insight into the child's perspective on dental bleaching and the influence that this treatment has upon their life.

Method

A dental bleaching patient reported outcome measure (PROM) was developed and piloted in 2019. Data was collected from 3 UK units (January - March 2020). Children attending these units for bleaching reviews were invited to complete the PROM.

Results

27 PROM questionnaires were completed including 19 courses of external bleaching and 8 courses of internal-external bleaching. The average age was 14 years old (range 9-17 years). The common indications for bleaching were Amelogenesis Imperfecta, dental trauma and Molar-Incisor Hypomineralisation. Patients reported improvements in their appearance (89%) and self-confidence (81%). Sensitivity was the most common side effect, reported in 63% of cases.

Conclusion

This PROM supports the use of dental bleaching in children and young people when treating dental disease that causes discolouration. Bleaching not only improved the appearance of teeth, but also patients' self-confidence. Sensitivity is a common side effect and clinicians should discuss this common risk and its management with patients and their families.

Keywords

Dental Bleaching
Tooth Discolouration
Paediatric
Amelogenesis Imperfecta
Molar Incisor Hypomineralisation
Dental Trauma

Author contributions statement

K.W., A.L., S.P. and J.M. contributed to conception, design, data acquisition, analysis and interpretation, drafted and revised the manuscript. K.OD. and C.B. contributed to data acquisition. All authors critically revised the drafts and subsequent final paper and approved changes prior to publication.

Statements and Declarations

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Introduction

In paediatric patients, discolouration of teeth is caused by dental trauma and dental anomalies such as Molar Incisor Hypomineralisation (MIH), Amelogenesis Imperfecta (AI), Dentinogenesis Imperfecta (DI) and Fluorosis.

It has been reported that dental conditions with visible aesthetic differences in the incisor teeth are associated with higher levels of dissatisfaction in appearance and have the potential to negatively impact on children's oral health related quality of life (Parekh et al. 2014; Porritt et al. 2011; Rodd et al. 2011). Aesthetic management with minimally invasive interventions has proven to increase children's self-esteem and quality of life, hence are considered preferable to invasive treatment (Hasmun et al. 2018; Lundgren et al. 2015). Dental bleaching is one such minimally invasive treatment that, following adequate protocols, has shown good results in children and adolescents as shown in figure I and II (Donly et al. 2005; Greenwall-Cohen et al. 2018; Haywood and Sword 2017).

However, an ethical and legal dilemma exists following the introduction of the European Communities Directive 2011/84/EU (2011) which prohibits the use of hydrogen peroxide in concentrations above 0.1% in patients under 18 years of age. Following this, the General Dental Council produced a statement that bleaching can be performed in those under 18 years old but only '*wholly for the purpose of treating or preventing disease*' (2016). The provision of dental bleaching has been severely restricted in the UK following concerns regarding indemnity cover (Walshaw et al. 2019). Currently bleaching regulation is covered by the European Union (Withdrawal) Act (2018) and therefore there have been no changes since the United Kingdom has left the European Union.

A recent European survey of paediatric dentists found that 56% of the respondents were unaware of regulations in their country or workplace on bleaching for children and 68% did not provide bleaching for children with dental anomalies (Monteiro et al. 2020). Unfortunately, in cases where dental bleaching was not offered, alternatives were generally more destructive and required greater maintenance. In some instances treatment was not offered until children reached 18 years of age, which may well be at the detriment to the child's psychological wellbeing (Marshman et al. 2009). Deterrents to bleaching often include concerns with sensitivity and gingival irritation, both of which have been shown to be transient, with irritation shown to be preventable with well designed trays (Greenwall-Cohen et al. 2018).

A service evaluation of dental bleaching conducted at the Eastman Dental Hospital in 2018/19 highlighted a lack of comprehensive documentation of bleaching techniques used for patients and therefore drawing conclusions from the data was difficult. Additionally following a literature search, the authors found limited papers on understanding the child's perspective on dental bleaching. For this reason, an alternative prospective evaluation was sought in the form of a Patient Reported Outcome Measures (PROMs) questionnaire. Used in healthcare, PROMs are a series of questions completed by patients in order to ascertain their opinions on their health and care and measure health gain following procedures (NHS Digital 2020). In this evaluation, a self-completed questionnaire measured each patient's health status and indicators of quality of life upon completion of a course of bleaching.

Aims & objectives

To identify paediatric patient's satisfaction following dental bleaching treatment, including:

- ❖ The indications for dental bleaching in children
- ❖ The duration of bleaching courses and whether this is used in combination with other treatments to obtain satisfactory results
- ❖ Whether bleaching improved appearance
- ❖ What side effects patients experienced
- ❖ Whether patients would recommend bleaching

Materials and methods

Information about the survey was sent to the consultants' in paediatric dentistry group (UK), with an invitation to participate in this multicentre PROM. Five UK centres expressed an interest in participating.

The PROMs questionnaire was developed in September 2019 and was piloted with 8 patients (8-16 years) at the Eastman and Newcastle Dental Hospitals. The reading age of the final questionnaire was 11 years, therefore parents were asked to help younger children (Readable[®] 2020). Changes were made to the form following feedback from the pilot evaluation and are described in table I. The final questionnaire was electronically shared with a named clinician at each unit, to be printed in black and white, in one A4 sheet, as shown in figure III. The PROM questionnaire was registered according to local clinical governance procedures at each unit.

Table I: Feedback and changes made following the pilot

Question / area of form	Newcastle pilot 1 child (age unknown)	Eastman Pilot 7 children (8-16)	Outcome / change
General	No suggestions or comments.	All children liked the form and found it easy to complete. Two children suggested the size of the front could be bigger (4 sides printed as booklet).	Increase size of text

Due to the COVID-19 pandemic a reduced data collection period was accepted (01/01/2020 - 16/03/2020). Unfortunately, with the redeployment of staff and lack of patients undergoing routine care, only three units were able to collect and submit results: Eastman Dental Hospital, Newcastle Dental Hospital and Birmingham Dental Hospital. Descriptive statistics were produced using Microsoft Excel 2010.

Results

A total of 33 PROM questionnaires were collected, all patients fully completed the questionnaires, however clinician recorded data from six questionnaires was not fully completed and therefore these questionnaires were excluded from analysis (table II). Completed data sets from 27 patients were analysed (10 male and 17 female, mean age 14 years, range 9-17 years).

One patient had both a diagnosis of trauma and endodontic treatment hence a total of 28 diagnoses for 27 patients were recorded (table III). Amelogenesis Imperfecta was the most common reason for dental bleaching to be undertaken, with trauma being the next most frequently recorded diagnosis. Of the two patients recorded with a diagnosis of 'other' one was stated to have hypomineralisation, and the other a poor dental appearance.

Table II: Questionnaires completed across three units

	Total number of questionnaires completed	Number of questionnaires with complete data
Eastman Dental Hospital	27	22
Newcastle Dental Hospital	4	4
Birmingham Dental Hospital	1	1

Table III: Patient diagnosis

	Male	Female	Total (28)
Trauma	2	5	7
Endodontic treatment	0	3	3
Molar Incisor Hypomineralisation	0	4	4
Amelogenesis Imperfecta	7	3	10
Dentinogenesis Imperfecta	0	1	1
Fluorosis	1	0	1
Other	0	2	2

The majority of cases (n=19, 70%) underwent external bleaching alone, the remainder underwent both internal and external bleaching (walking technique) due to trauma or endodontic treatment.

The average duration for external bleaching was 7.8 weeks (range 2-36 weeks). For the eight courses of internal/external bleaching, the average duration was 9 weeks (range 1-24 weeks). Only in eight cases, (all external bleaching), was another treatment required, with one case needing two additional treatments (figure IX).

Twenty-four patients (89%) reported an improvement in the appearance of their teeth after bleaching with the remaining three patients reporting that their teeth had a similar appearance to before. Twenty-two patients (81%) self-reported improvements in their confidence following bleaching with 16 patients (59%) reporting feeling very confident after bleaching in comparison to just one reporting feeling confident before (4%) as shown in figure X.

Most patients (n=17, 63%) reported some sensitivity, however other side effects including any gingival/periodontal problems were not reported (figure XI). Overall, most patients in the sample (n=23, 85%) stated that they would recommend bleaching to a friend (figure XII), with six making further additional comments in relation to the positive effects of bleaching including 'It is a great thing to do if you are less confident about your teeth' and 'It was very easy and convenient to use'.

Discussion

Tooth discolouration commonly affects anterior teeth and can present an aesthetic concern to patients regardless of age (Marshman et al. 2009). Puberty and secondary education are times when children often become more aware of their own appearance and therefore feelings towards their dental appearance may arise (Rodd et al. 2011). The age range of 9-17 year olds in this sample, with an average age of 14 years reflects this affected population well and demonstrates that bleaching was not a treatment choice for those in the primary dentition.

The results of this study show that internal bleaching is commonly provided for teeth that have had endodontic treatment following dental trauma. Those teeth undergoing a course of combined internal and external bleaching did not require further treatments, suggesting that bleaching alone may be effective in these cases.

Additional treatments were provided in 8/19 (42%) of external bleaching cases, with microabrasion the most common adjunct. This may partly be due to external bleaching being more commonly used in cases of anomalies, where a greater proportion of the dentition is commonly affected, often to different degrees of severity. Regrettably this study did not take into account whether these additional treatments were completed before or after the course of bleaching and so the effectiveness of undergoing dental bleaching in isolation as a first line approach cannot be fully determined.

Almost half (13/27) of patients were 'not confident at all' prior to bleaching correlates with studies reporting that visible incisor differences are associated with higher levels of dissatisfaction with appearance and have the

potential to negatively impact on children's oral health related quality of life (Rodd et al. 2011; Lundgren et al. 2015; Dantas-Neta et al. 2016). It was reassuring to see that the vast majority of patients (n=24, 89%) reported an improvement, with no patients reporting a worsening in appearance of their teeth. Confidence levels of the majority of patients increased (n=22, 81%) with no patients reporting a reduction in confidence and 16 (59%) stating that they are now 'very confident' after dental bleaching. This demonstrates the vast impact that dental aesthetic concerns have on our young people and the need to appropriately address these issues should not be underestimated.

Sensitivity was reported by the majority of patients (n=17, 63%). Only two patients in the sample reported this sensitivity to be 'a lot' and only one of them stopped the course of treatment as a result, but still stated that they would recommend dental bleaching. None of the patients who reported sensitivity went on to say that they would not recommend dental bleaching. Sensitivity is a common side effect of bleaching and it has been found to be transient. Furthermore bleaching-related sensitivity in children and adolescents seems to be reduced when compared to adults (Donly et al. 2005). It is of note that the majority of patients had Amelogenesis Imperfecta, which is a condition often associated with increased sensitivity. The high prevalence of sensitivity in this group of patients supports the need for a clear consent process, and the need for the treating clinician to prepare families to combat sensitivity should it occur. For example, instead of using bleaching product every night, the child alternates with a sensitivity toothpaste or CPP-ACP in the bleaching tray instead.

The other adverse side effect reported was 'a little bit' of 'gum problems' in two patients within the sample but these patients continued with their bleaching course and both reported that they would still recommend it. Gingival irritation is a well-known side effect and it is thought to be related to ill-fitting trays or failure to remove excess gel and can be reversed by eliminating over-extensions (Donly et al. 2005; Greenwall-Cohen et al. 2018).

These results suggest that dental bleaching for paediatric patients, in specialist-led centres, is successful. Sensitivity should always be mentioned as a prevalent side effect, which should be monitored. The use of desensitising agents has been suggested, but if sensitivity is causing significant concern treatment should be modified or ceased (Greenwall-Cohen et al. 2018). The importance of fully informing patients and families of risks prior to dental bleaching in order to gain appropriate consent cannot be underestimated with high quality patient information leaflets forming part of this process.

Conclusion

This study highlighted both the benefits of dental bleaching in improving appearance and confidence in young people suffering from conditions that are related to dental discolouration, and the importance of dental bleaching as a treatment option within paediatric dentistry. Known advantages include ease of application and minimal intervention precluding the need to remove healthy tooth structure. Despite the majority of children in this sample having Amelogenesis Imperfecta, sensitivity was usually not severe and at a level which patients felt able to tolerate. Gingival irritation was uncommon in this evaluation.

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Figure I: Clinical photographs of external dental bleaching in a child with a diagnosis of Hypomature Amelogenesis Imperfecta. **a** Preoperative photograph. **b** Postoperative photograph

(a)



(b)



Figure II: Clinical photographs of dental bleaching a previously traumatised 21 which had undergone endodontic treatment and subsequently discoloured. **a** Preoperative photograph. **b** Postoperative photograph


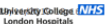
(a)




(b)



Figure III: Final PROMS questionnaire

Dental Bleaching Patient Survey



Thank you for helping us with our survey. We would like to ask you a few questions about bleaching your teeth.

Please answer the questions in section 2 by ticking your answer, for example:

4. Did you have any sensitivity during bleaching?

No A little bit A lot I don't know / I can't remember

Section 1. Your dentist will fill in this information

Date:

Age: Years

Gender: M / F / X

Indication for bleaching (diagnosis):

Bleaching technique: External Internal/external (inside-outside) with bleaching tray Internal

How many weeks did patient use bleach for in total: weeks

Date bleaching completed (MM/YY):

Did the patient receive any other treatment to manage the discolouration (please tick all that apply)?

No other treatment
 ICON
 Microabrasion
 Direct restoration
 Indirect restoration

Section 2. Please answer the following questions:

1. How confident were you about your front teeth **before** you had bleaching?

Very confident
 A little confident
 Not confident at all
 I don't know / I can't remember

2. How confident are you about your front teeth **after** you had bleaching?

Very confident
 A little confident
 Not confident at all
 I don't know / I can't remember

3. Has the appearance of your teeth changed with bleaching?

They look much better
 They look about the same
 They look worse
 I don't know / I can't remember

4. Did you have any sensitivity during bleaching?

No A little bit

A lot I don't know / I can't remember

4. Did you have any gum problems during bleaching?

No A little bit A lot I don't know / I can't remember

5. Did you experience other side effects during bleaching?

No Yes

If you ticked yes, please tell us what you experienced

6. Would you recommend bleaching to a friend, if they had similar teeth to you?

Yes Maybe No I don't know / I can't remember

7. Lastly, do you have any other suggestions or comments about the bleaching service you have received?

Figure IX: Additional treatments undertaken

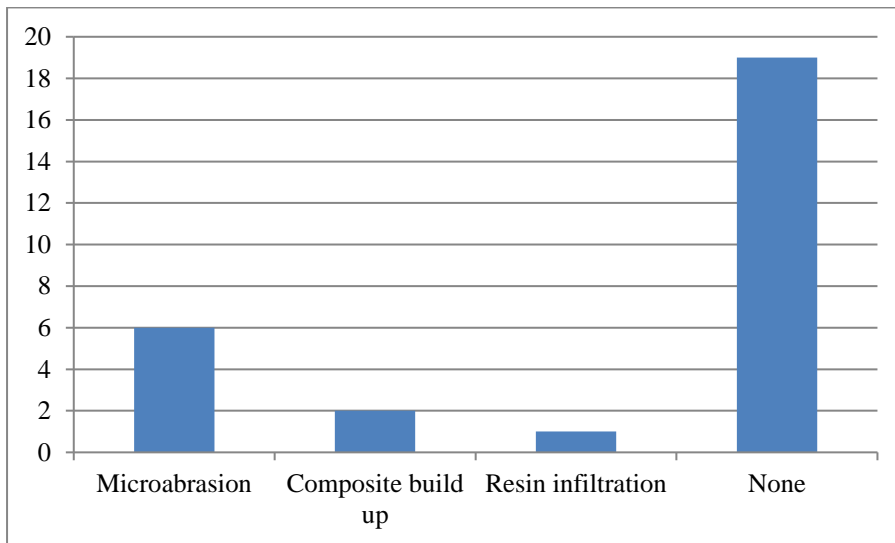


Figure X: Patient confidence prior to and following a bleaching course

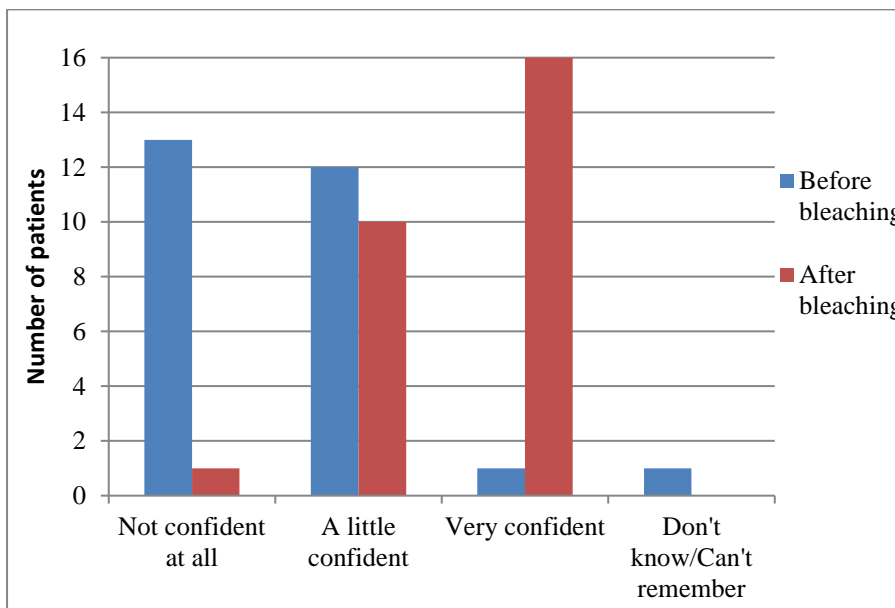


Figure XI: Prevalence of associated problems with dental bleaching

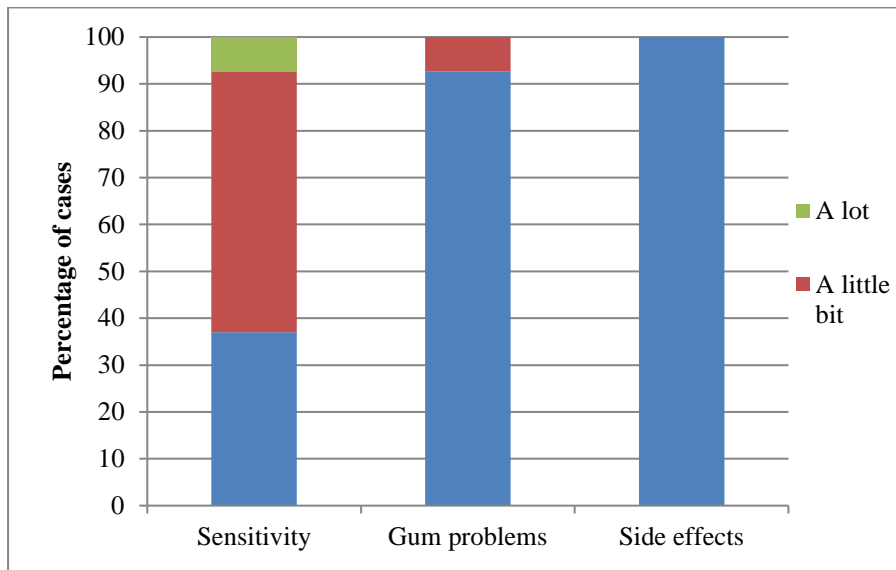


Figure XII: Answers to question 6: “Would you recommend bleaching to a friend, if they had similar teeth to you?”

