

# Tooth bleaching guided by elab protocol

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## Abstract:

The aim of this report is to demonstrate simple digitally controlled tooth bleaching elab protocol. To do this we used a cross polarizing filter (polar\_eyes) attached to Cannon Macro Ring Lite MR-14EX flash to get the cross polarized picture. A grey card was included in the photo (elab\_card) to calibrate the photos in colour and lightness. Walking internal bleaching (Ena white regular, Micerium S.p.A., Avegno, Italy) was proceeded. At day 10 Opalescence pf 16%/ (Ultradent Products, Inc, South Jordan, UT, USA) was added to the protocol. At one-year-follow-up appointment we can calculate the rebound of  $\Delta E = 3,03$  but the difference between the two central incisors is  $\Delta E = 1,1$ .

**Keywords:** bleaching, operative dentistry, elab.

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## INTRODUCTION

A discolouration, either externally or internally, presents a major aesthetic problem, especially if it involves the anterior teeth [1]. The aesthetic appearance of a treated tooth still concerns the clinician and significantly affects patients [2]. To overcome the discolouration internal bleaching procedures can be carried out. Internal bleaching procedures such as the walking bleach technique can be used for whitening of discoloured root filled teeth.

Optimum results of bleaching are difficult to decide and are often influenced by patient expectation and anticipation [3]. Several recent studies have demonstrated that tooth bleaching colour can be efficiently and reproducibly assigned by using dental spectrophotometers or colorimeters [4,5].

The aim of this report is to demonstrate simple digitally controlled tooth bleaching elab protocol.

## Case report

Patient came at the office with discoloration of central right incisor (11) due to endodontic treatment. It was decided to proceed with the non-invasive treatment of tooth bleaching.

We applied elab protocol for color measurement of initial situation [8]. To do this we used a cross polarizing filter (polar\_eyes) attached to Cannon Macro Ring Lite MR-14EX flash to get the cross polarized picture (Fig. 1). As well, we include a grey card in the photo (elab\_card) to help us to calibrate the photos in colour and lightness. Then we introduced the raw photo to the Adobe Lightroom and proceed with the elab protocol to get the numerical LAB coordinates of the tooth colour. To be more precise in the color calculation we divided the tooth in three box areas by applying a grid over the photo (Fig. 2, 3).

Then walking internal bleaching (Ena white regular, Micerium S.p.A., Avegno, Italy) was proceeded. The protocol was applied with the following steps (Fig. 4):

- 1) Removing the gutta-percha 2 mm under CEJ;
- 2) Filling the space with 2mm of Glass Ionomer. At this case EQUIA/GC is used.

- 3) Filling the rest of the space with bleaching gel Closing the cavity with temporary filling (GI or Cavit)

- 4) Repeating third and fourth steps every 3-4 days.

After 3 days we did a new photo utilizing again the elab protocol and we could calculate numerically the difference

$\Delta E$  of the colour on selected areas by applying the Euclidean algorithm. What we can see is that there is a big



Fig. 1. Initial appointment. The photo was made with polarizing filter and grey card.

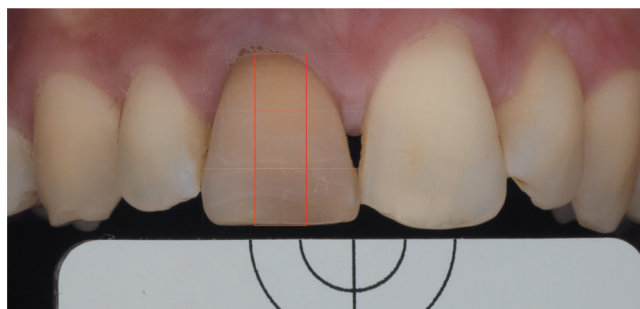


Fig. 2. Three evaluated box areas.



Fig. 3. Three evaluated box areas. Calculated initial LAB colour coordinates of the 3 crown areas. Cervical, middle and incisal.

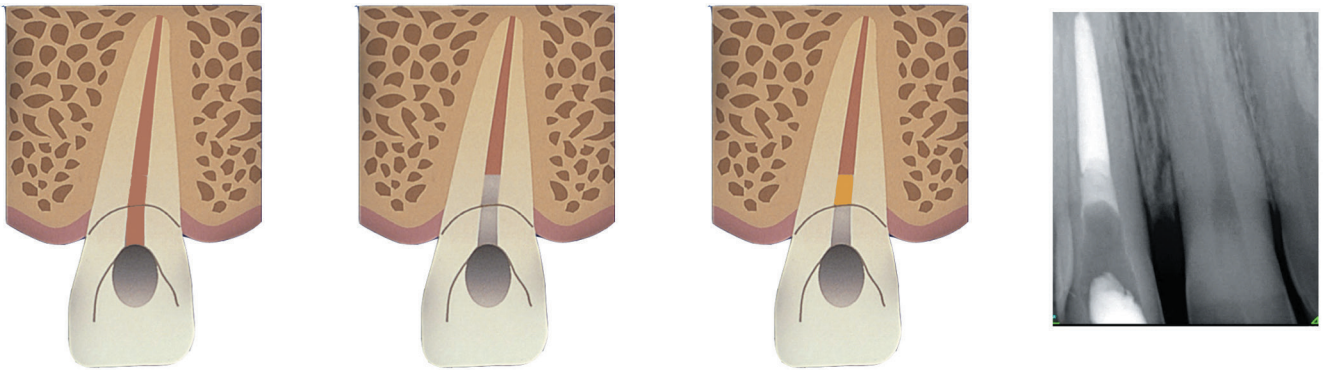


Fig. 4. Walking internal bleaching protocol.

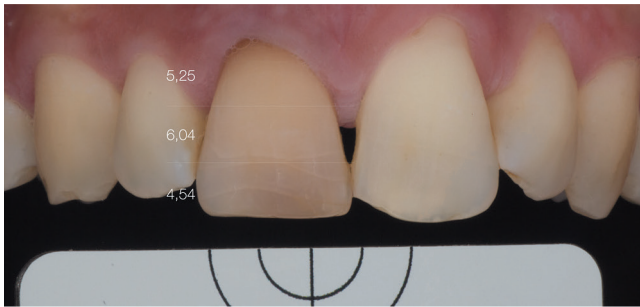


Fig. 5. Big change at the cervical and the middle areas of the tooth and mild change at the incisal area are observed at the day 3.



Fig. 6. A mild change at the cervical area and no visible change at the middle and incisal areas at the day 7.



Fig. 7. Internal-external bleaching, day 10.



Fig. 8. Internal-external bleaching, day 14.



Fig. 9. Internal-external bleaching, day 17.



Fig. 10. Internal-external bleaching, day 21.



Fig. 11. Internal-external bleaching, day 28.



Fig. 12. Internal-external bleaching, day 31.



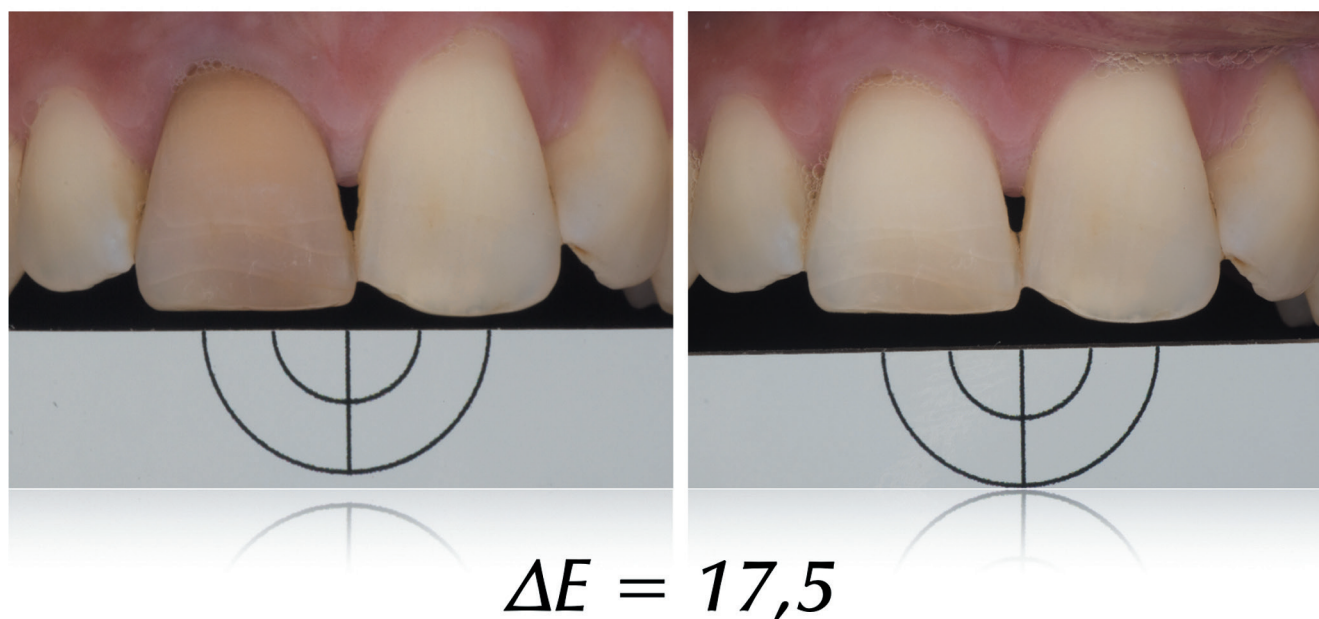


Fig. 13. Initial (left) and final (right) clinical views.

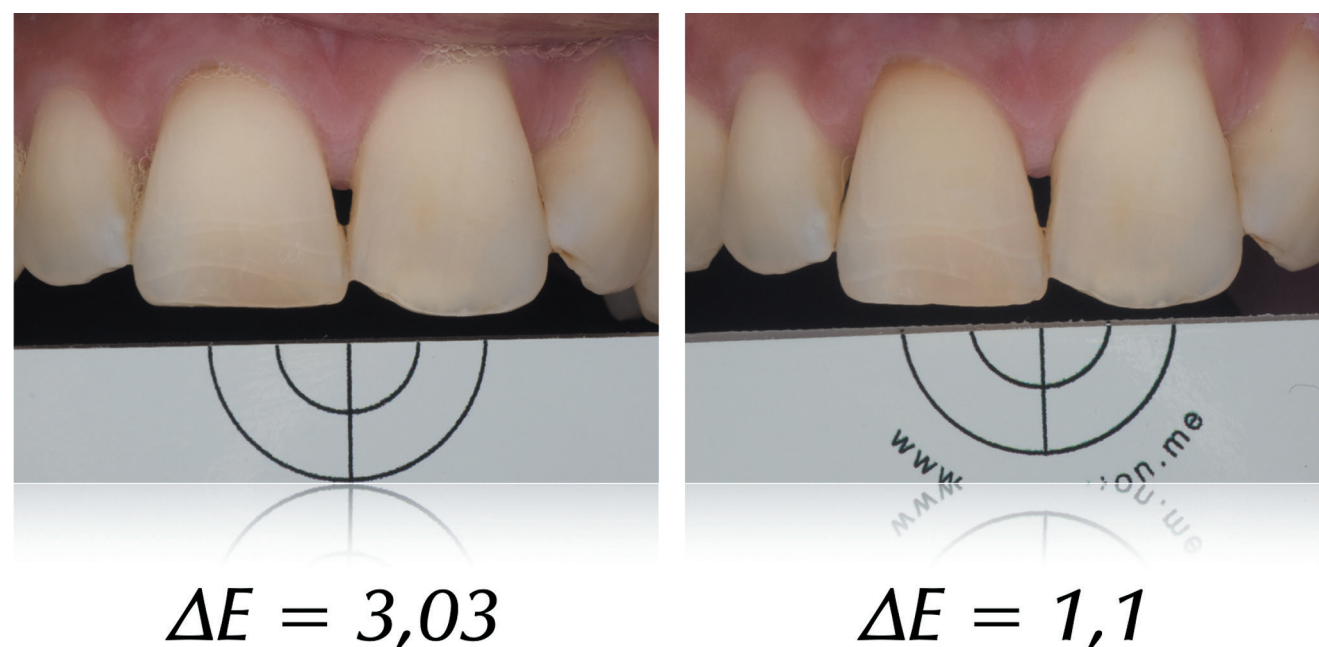


Fig. 14. One-year-follow-up. Reached  $\Delta E = 3,03$  for 11 right central incisors. The difference between the two central incisors is  $\Delta E = 1,1$ .

change at the cervical and the middle of the tooth but there is mild change at the incisal (Fig. 5).

At day 7 of internal bleaching, we can see we have a mild change on a cervical part and no visible change at the middle and incisal part (Fig. 6).

If we continued with the same bleaching protocol there would be no further change and we would describe the tooth as non-bleachable and we would restore it prosthetically. Elab can show us that our bleaching protocol is not working in this patient so we have changed the protocol to internal-external bleaching adding also opalescence pf 16% (Ultradent Products, Inc, South Jordan, UT, USA) at a custom tray and continuing using Ena white regular / Micerium internally.

We decided to use the combination of the materials until the  $\Delta E$  drops down of number 2 on all three areas (cervical – middle – incisal) from day 10 to day 31 (Fig. 7-12).

The final result came with a  $\Delta E 17,5$  providing the patient the most minimal invasive technique for resolving the problem with the colour of this tooth (Fig. 13).

At one-year-follow-up appointment we can calculate the rebound of  $\Delta E = 3,03$  but the difference between the two central incisors is  $\Delta E = 1,1$  which cannot be observed even by experienced observer (Fig. 14 and 15).

#### DISCUSSION

The biggest advantage of the elab protocol applied to bleaching cases is the fact that we can easily compare colour differences. In this way we can understand if the bleaching protocol that we use is working or not. According to Mokrzycki et al [6], when the  $\Delta E$  is lower than 2 only a well experienced observer can recognize the difference. The ideal result for a single tooth is usually achieved by matching the color of the tooth that will be bleached with the adjacent teeth.



**Fig. 15. One-year-follow-up. Photo without polarizing filter.**

A recent study from Bersezio et al [7] correlated internal bleaching with the presence of inflammatory markers (RANK-L and IL-1 $\beta$ ) leading to root resorption regulation and bone destruction in the peri-odontal tissues. They found an increase level of this markers when walking bleach technique with hydrogen peroxide (35%) or carbamide

peroxide (37%) was done with persistence of 3 months post bleaching. Although, this study does not respond to the clinical fact that root resorption could be produced by internal bleaching, it warns of possible harmful effects of this technique. As attempt to avoid cervical resorption preventive measures were performed, such as the cervical cap that prevents diffusion of the bleaching agent into the dentinal tubules close to the enamel-cement junction and consequently, inhibited the inflammatory action of the agents on the gingival tissues and a possible bone resorption.

### CONCLUSIONS

Elab is a very powerful tool for understanding the bleaching procedure and understanding numerically which protocol is working and which is not resulting in predictable results. Also the ability to calculate the rebound and the colour changes between appointments can create answers to the patients about when the bleaching technique is over and in how many years there is a need for re-bleaching.

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