

## CLINICAL SECTION

# Photographic ‘Kesling set-up’

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The following report details a technique for producing a digital ‘Kesling-type setup’, which can give the patients an indication of how their dentition will look at the end of orthodontic treatment. High quality digital photographs of the patients’ teeth are probably easier for the patients to relate to than a set of doctored plaster models.

*Key words:* Digital manipulation, Adobe Photoshop, Paintshop Pro, Digital Kesling set-up.

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## Introduction

Consent is the continuing permission of the patient to receive treatment from a clinician, which may be implied, verbal or written. Without it, a clinician is vulnerable to allegations of assault or battery, and clinical negligence, which could lead to criminal or civil charges.<sup>1</sup> Written consent is a way of providing documentary evidence that a full explanation of the orthodontic treatment proposed was given, and consent was sought and obtained. A recent survey, however, showed that, of the 222 consultant orthodontists held on the database of the British Orthodontic Society, only 41% of clinicians obtained written consent prior to commencing treatment.<sup>2</sup>

## Consent process

Obtaining a signed form is not the end to consent; it is a dynamic process where the most important element is to ensure that patients understand the treatment proposed.<sup>3</sup> As most orthodontic patients are children, parents and guardians must play an active part in treatment planning and should be present at the initial consultation. The initial consultation is an example of implied consent by the patient allowing an examination by the clinician. Permission to take diagnostic images for treatment planning is an example of verbal consent. Where more complex treatment is planned, such as combined orthognathic management or any surgical procedure where the conscious level maybe affected, written consent is mandatory.<sup>2,3</sup> This paper describes the

manipulation of digital images as a helpful part of the consent process.

## Communication

The essential factor to informed consent is effective communication between the clinician providing the treatment and the patient. A recent study in America showed that patients often do not adequately understand the information given to them during consent procedures. It showed that patients and parents could only recall a few of the issues discussed with the orthodontist just 15–30 minutes earlier.<sup>4</sup> This highlights the problem in obtaining consent. Effective communication is a difficult process by itself and, hence, the use of visual aids is becoming increasingly important to illustrate the proposed treatment and possible outcome. Digital images allow patients to visualize the need for treatment and, with the use of manipulation programs, complex treatment can be explained in a format that both the patient and parent can understand.<sup>5</sup>

## ‘Kesling set-up’

The ‘Kesling set-up’ is a visual aid to communication between the clinician and the patient at the treatment planning stage. It helps the clinician to plan the stages and type of orthodontic treatment required, and gives the patient an idea of what is achievable and what is involved. It can also highlight the limitation of tooth movement alone, indicating the need for surgical intervention. Kesling described the concept of planning individual orthodontic tooth movement in 1945.<sup>6</sup> He

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**Figure 1** Congenital absence of both upper lateral incisors (By permission of J Clin Orthod and Taylor & Francis)



**Figure 3** Both upper central incisors corrected

used a 'set-up' of casts to plan the sequential stages of treatment, then designed appliances to achieve each of the individual movements. The 'set-up' involved separating the teeth on a model of the patient's dentition and repositioning them with wax according to the desired movement. The photographic 'Kesling set-up' can provide a way of addressing the patient's main concern, i.e. the aesthetic appearance of their face and teeth, and provide a relatively realistic representation of the potential outcome in a way they can visualize and understand.<sup>5</sup>

## Digital imaging

To manipulate digital images, a good quality digital camera is required. The image is captured on a Compact

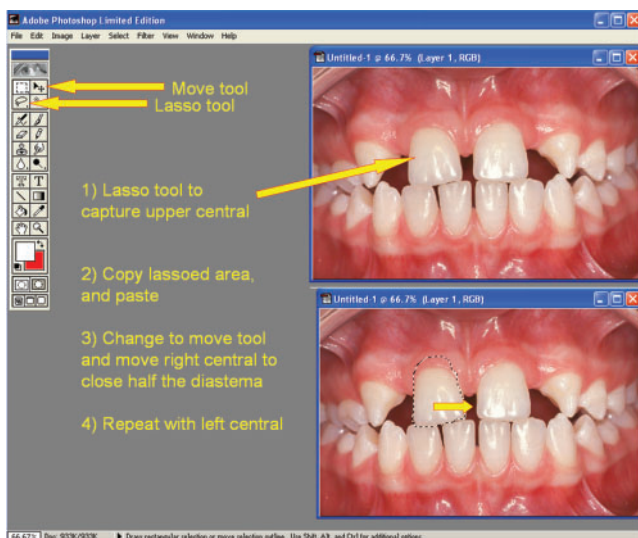
Flash card or Smart Media card, which is downloaded onto a suitable computer via a PCMCIA port. Images can be viewed immediately through Windows XP® or Windows 2000® software, but a program such as Adobe Photoshop 5.0 LE® (Adobe, UK Ltd, Maidenhead, UK) or Jasc Paint Shop™ Pro® (Jasc, Minneapolis, USA) is required if manipulation of the images is necessary.<sup>7</sup> An example of digital manipulation with the use of Adobe Photoshop® is presented to illustrate its potential to help explain different treatment options and outcome.

A patient presented with a Class III incisor relationship on a Class I skeletal base with a well aligned, but spaced upper labial segment largely due to the congenital absence of the upper lateral incisors (Figure 1). Various approaches to treatment were discussed with the patient including no treatment whatsoever and localizing the space in the upper labial segment and replacement of the absent lateral incisors with either implants or bridges.

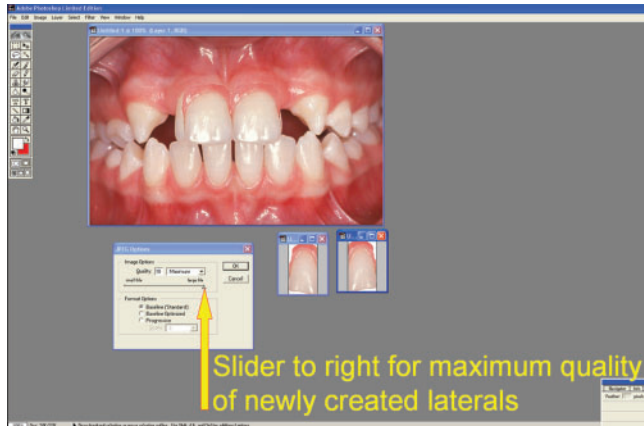
At this stage, the patient asked if there was anyway he could be shown what the result would look like and we were happy to oblige. Using the program Adobe Photoshop, which is almost the 'industry standard' program used by graphic designers and artists worldwide, it is a relatively easy process to digitally manipulate the images, much in the way the plaster teeth are moved around in the traditional Kesling set-up. The technique will be described in a number of stages:

### Stage 1: closing the diastemas

First one of the two central incisors is 'captured' using the lasso tool. A number of attempts to select the exact area will be required and it is important to exactly outline the coronal enamel, but to include 2–3 mm of gingival margin. Then using 'copy' and 'paste' a second



**Figure 2** Steps and tools to correct upper central incisors

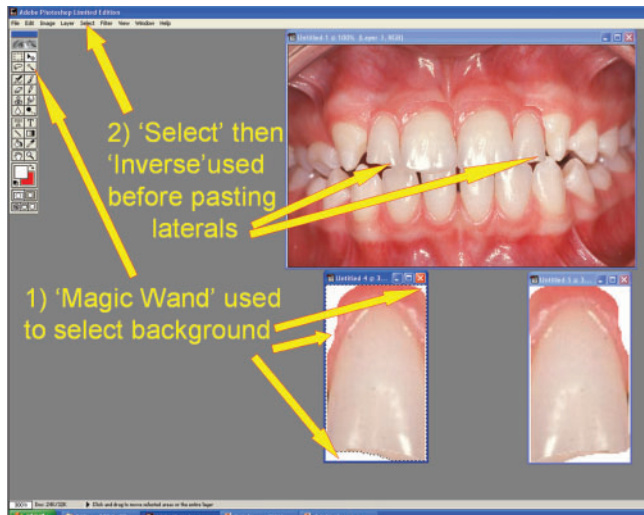


**Figure 4** New lateral incisors pasted and saved as JPGs

layer is produced, which only contains the image of the central incisor which is moved medially by 1 mm to half close the diastema. Once this tooth is in the correct position the image can be 'flattened', which means the two layers are merged. This process is repeated for the opposite central incisor the result being that the two central incisors are approximated, the steps and tools being shown (Figure 2), closing the 2 mm midline diastema (Figure 3).

*Stage 2: creation of two upper lateral incisors*

Now a 'lateral incisor' has to be created and in the absence of a contralateral incisor the lower right lateral incisor is lassoed, copied and pasted twice to form two new layers. One pasted lower right lateral incisor is then flipped vertically and saved as UR2 then the second



**Figure 5** Tools and steps to paste laterals onto the image



**Figure 6** Finishing touches with 'smudge' and 'clone' tools

image flipped horizontally, as well as vertically and saved as UL2. Each new image should be saved using 'Save a Copy', which ensures the image is in a useable JPEG option, rather than as a PSD photoshop document format, which is less useful. Always save JPEGs as maximum quality by sliding the indicator to the right extreme position (Figure 4).

*Stage 3: addition of upper lateral incisors:*

The newly created lateral incisors can be enlarged using 'View' and 'Zoom in' on two or three of occasions, then the background surrounding one of the teeth is selected using the magic wand tool. Then move to 'Select' and 'Inverse' to enable the tooth without its background, to become the selected item. This item is now copied and pasted into the main image of the teeth and, using the 'Move' tool, can be manipulated into the correct position (Figure 5). If the entire background of the tooth is not selected with the 'Magic Wand' tool at first attempt, simply depress the shift key and left click on subsequent areas to capture the entire background before using 'Select', 'Inverse', 'Copy' then left click the main image of the teeth and use 'Paste'.

*Stage 4: final touches*

This pasted layer can now be moved to an 'ideal' position to finally allow a simulation of what the patient's appearance may be, following a course of orthodontics and replacement of the two congenitally absent lateral incisors (Figure 5). To allow the most realistic effect, the 2–3 mm of gingivae lassoed with the crowns of the teeth to ensure the best possible appearance of the teeth 'growing' from the gums can now be touched up. The delineation between the real photograph and the 'transplanted' soft tissue can be minimized using the 'smudge' or the 'clone' tool (Figure 6) leaving almost imperceptible margins in the digital image.



**Figure 7** A more useful informed consent can now be obtained

It is now a very easy task to display the start photograph and the Photographic 'Kesling set-up' side-by-side for the patient to have a reasonably representative picture of the changes that could be achieved with treatment (Figure 7).

The patients and the parents probably have a much better idea of the aesthetic benefits of treatment after looking at digitally manipulated photographs than looking at sectioned and repositioned teeth on plaster models. As we enter the twenty-first century, we owe it to our patients to give them as much information as we can for them to be able to make informed decisions. As with all prediction methods, it must be explained that the result may not appear exactly as in the prediction.

## Conclusion

For valid consent prior to treatment, the patient must understand the following:

1. the need for treatment;
2. the nature of treatment;
3. the effects, risks and benefits;
4. the likelihood of success;
5. length of treatment;
6. any alternative treatment;
7. the consequence of no treatment.<sup>8</sup>

Obtaining informed consent is now a legal and moral obligation for orthodontists.<sup>9</sup> Verbal information is frequently insufficient, especially where compliance is an important factor in determining the treatment outcome. The use of digital photographic manipulation can be a very useful part of providing effective communication and obtaining informed consent.

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