Tiops Cephalometric Analysis, Part 1

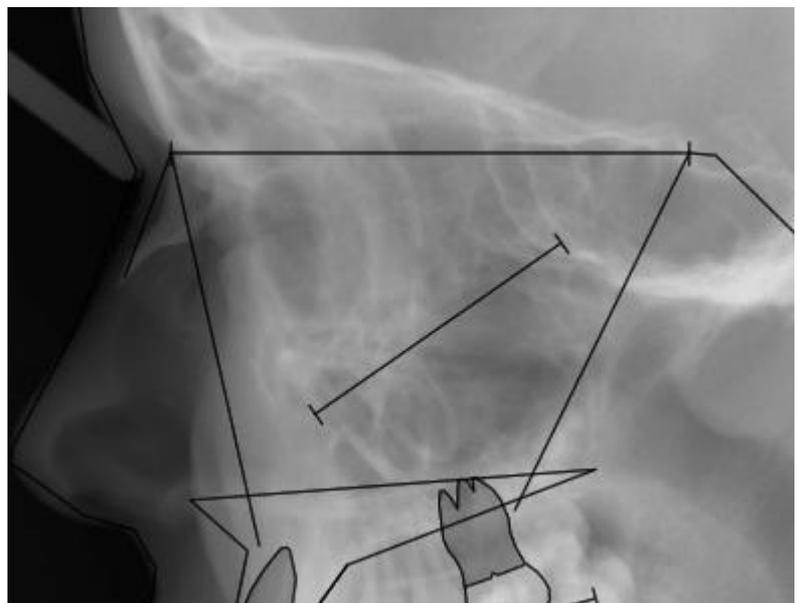## Superimposing Serial Headfilms for Growth- and Treatment Analysis

Analysis of serial headfilms can be done effectively with the Tiops2005 program. The program makes it possible to perform analysis of general facial growth, maxillary and mandibular growth and dentoalveolar change. The TIOPS program is designed to perform structural superimposition according to Björk (1983) using a set of three reference lines, representing stable structures in the cranial base, the maxilla and mandible, respectively. These reference lines are placed on the first film, in a series, and carried forward after superimposition of the second headfilm on the stable structures in the same areas. Additionally, TIOPS can also align sets of occlusograms correctly after the respective headfilms have been entered and saved. The orientation of the individual occlusograms is done in relation to the position of the incisors at the two stages as described by Björk et al (1983)

Procedure

1. To perform the superimpositioning analysis the second digital X-ray has to be saved and stored as either a .jpg or .bmp file in the programs X-ray archive folder normally called D:\Analy2005\Xray. D is your drive letter.

2. Start checking the initial headfilm (digitized and saved) to be superimposed on. Do you still agree with yourself in the way the landmarks are registered? Check the x-ray enlargement factor for the base analysis again. If you have entered the picture resolution yourself check it too. These two factors may be changed without redoing the analysis. Then adjust the brightness and the contrast of the initial headfilm as needed.

   Note: The picture should not be too dark.

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3. In order to correctly orient the actual headfilm to the initial or a succeeding headfilm, that already has been digitized and saved on Tiops2005, a new stage is added by clicking on the green icon with the yellow corner at the top menu bar or by pressing <Ctrl> and <A> simultaneously. This opens a new Stage under the same case number. The Stage Type and the Date is then entered in the menu located on the left side of the screen.

4. Now press <Ctrl> and <Q> simultaneously to create a new lateral Analysis. Under the heading Lateral enter the Date of the film (is defaulted as the Stage Date) and move down, using the down arrow key <↓> to the box labeled Xray. Open Xray with the right arrow key <→>. In the box Filename click on the 🔲 or press <Ctrl> and <→> simultaneously and a listing of .jpg or .bmp files in the Xray folder is seen.
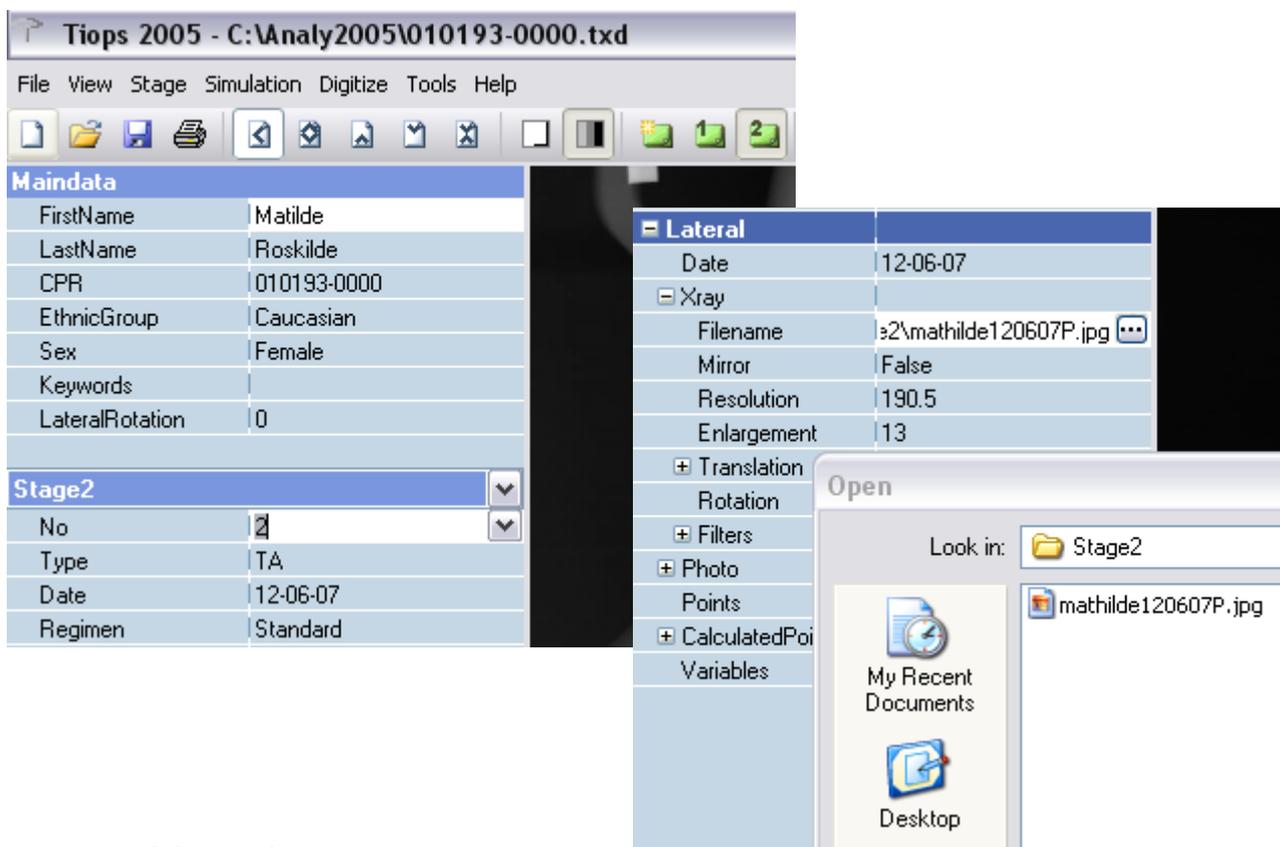
About RESOLUTION

A genuine .jpg file has a built in resolution factor. Most commercial programs will provide you with a correct .jpg file, but some medical Xray systems will unfortunately not create a file with this information. You may see resolution values of 1 or something similar. When you suspect not to have the correct factor indicated, it has to be calculated by means of the file pixel properties and your knowledge about the picture size.

The unit of resolution to be entered in the program is Pixels/Inch.

A .bmp file does not provide you with a resolution value and has to be calculated and entered using this formula:

$$\text{Number of pixels}_{\text{picture height}} \ / \ \text{Picture height}_{\text{inch}} \ .$$

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5. Open the specific headfilm file you wish to superimpose on the initial film. This second headfilm will now be seen together with the Tracing of the initial film. Make sure the two stages to be compared are showing in the top menu bar and that the last stage is selected as active.
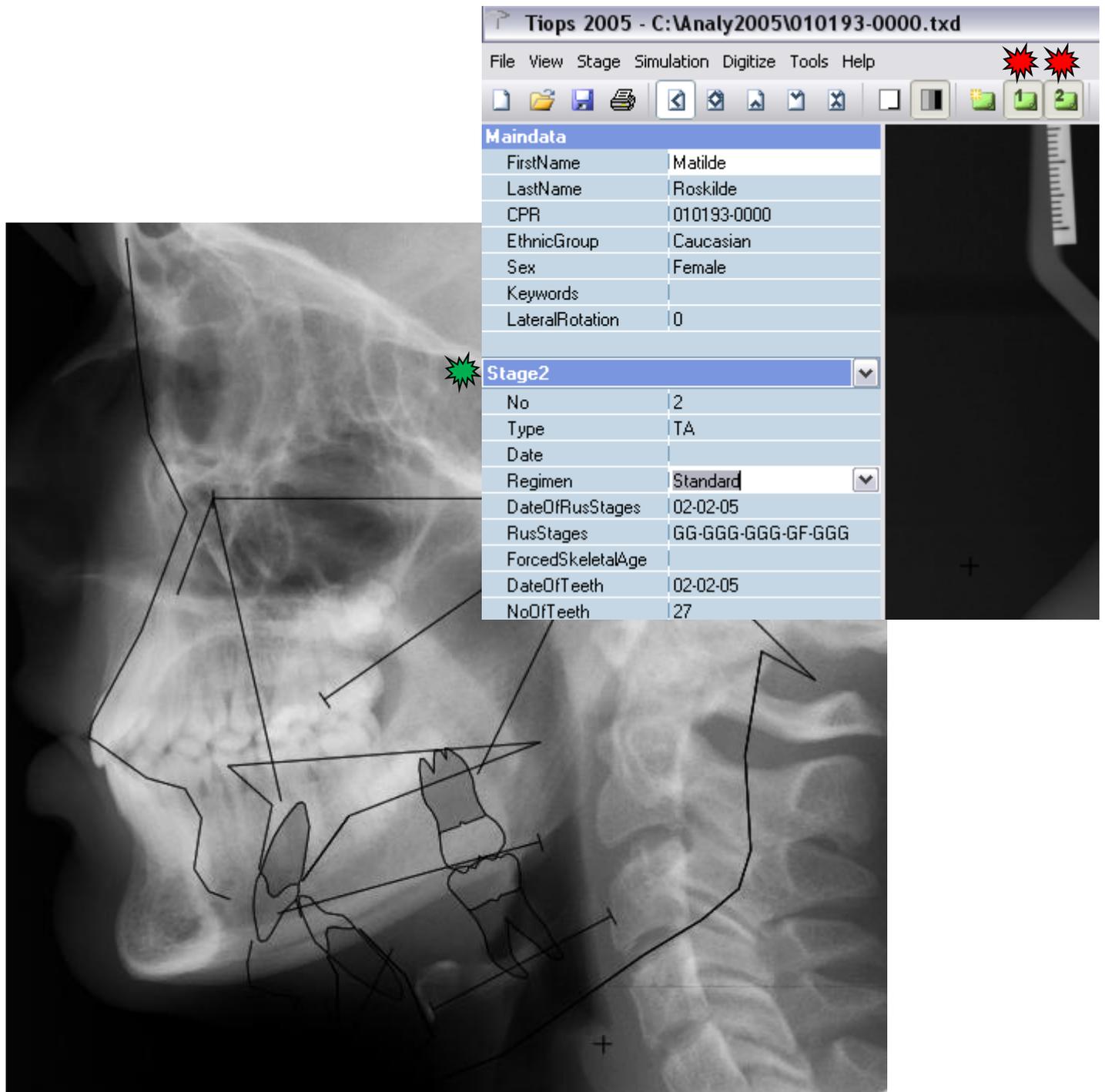
Tiops 2005 - C:\Analy2005\010193-0000.txd

File   View   Stage   Simulation   Digitize   Tools   Help

Maindata

FirstName	Matilde
LastName	Roskilde
CPR	010193-0000
EthnicGroup	Caucasian
Sex	Female
Keywords	
LateralRotation	0

Stage2

|	
No	2
Type	TA
Date	
Regimen	Standard
DateOfRusStages	02-02-05
RusStages	GG-GGG-GGG-GF-GGG
ForcedSkeletalAge	
DateOfTeeth	02-02-05
NoOfTeeth	27

6. The process of aligning headfilms starts by pressing <Ctrl> and <D> or clicking on the white button with a yellow star in the upper tools bar to start the digitizing process.

Screen digitizer start (Ctrl + D)

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You will now see the two films together with the initial tracing aligned with the first film and most of the tool icons are inactivated in order to prevent you from performing incorrect procedures. However, a few additional icons will now appear (see next page).
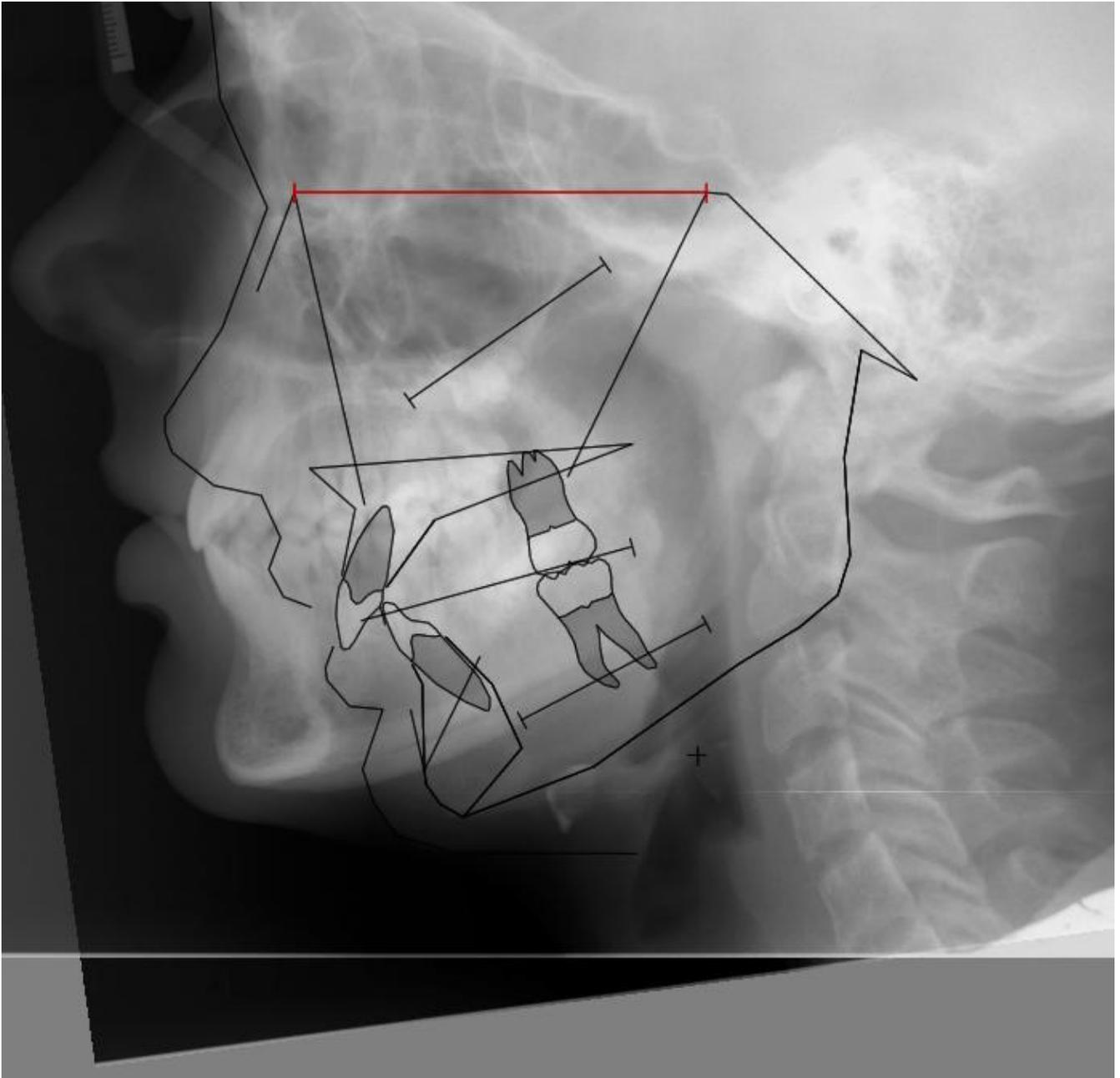
7. The next step is to move the second film to align with the anterior and median cranial base structures on the first film, as described by Björk (1983).

   Note: See also Cephalometric Growth Analysis by Bjork on the www.Tiops.com, Members Page.

   If you now press and hold the left mouse button the second film will rotate when you move the mouse while holding down the button. The center of rotation is located at Sella Anterior (sa) on the first film.
   To translate the second film hold down the <Shift> key and depress and hold down the left mouse button simultaneously. Release the <Shift> key, when you have finished the translation.

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This rather tricky superimpositioning procedure can be eased by using the following tools:
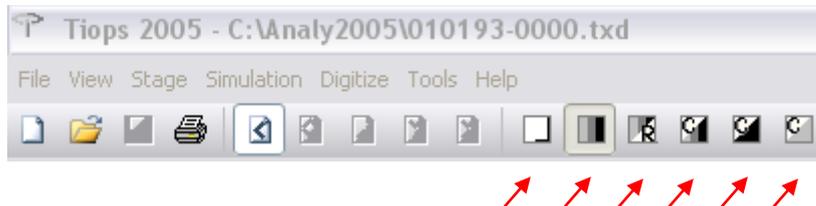
A. ☐   Clicking makes both headfilms disappear.

B. ▮   Clicking makes both headfilms reappear.

C. ▧   Clicking makes the reference headfilm disappear.

D. ▧   Clicking makes the current headfilm disappear. <F5> toggles between C. and D.

E. ▧   Clicking will increase the opacity of the current headfilm in increments of 10%

F. ▧   Clicking will decrease the opacity of the current headfilm in increments of 10%

8. Once you have aligned the structures in the cranial base that are considered stable, click on the white icon with the green check mark:

Accept reference (Ctrl + R)   ⤵

This locks the films together on the cranial base reference line (n(cb1) – sa) which is used for the general superimposition.

About the Snake Regimen
If you wish to mark some bony structures on the headfilms to ease the superimpositioning procedure, then select the Snake regimen for the stage and choose Digitize/Structures. Check the boxes for the number of Snakes you may wish to place.
The corresponding number of w-figures, each defined by 5 landmarks, will now appear near the cervical vertebrae. They can then be repositioned to the desired location using the landmark correction procedure.
You may wish to identify similar bony structures on subsequent headplates,i.e the mandibular canal
If you plan to use this procedure for a patient then select the Snake regimen when you begin digitizing.
The snakes can then be digitized directly and later be removed by unchecking the boxes in the Digitize/Structures procedure.
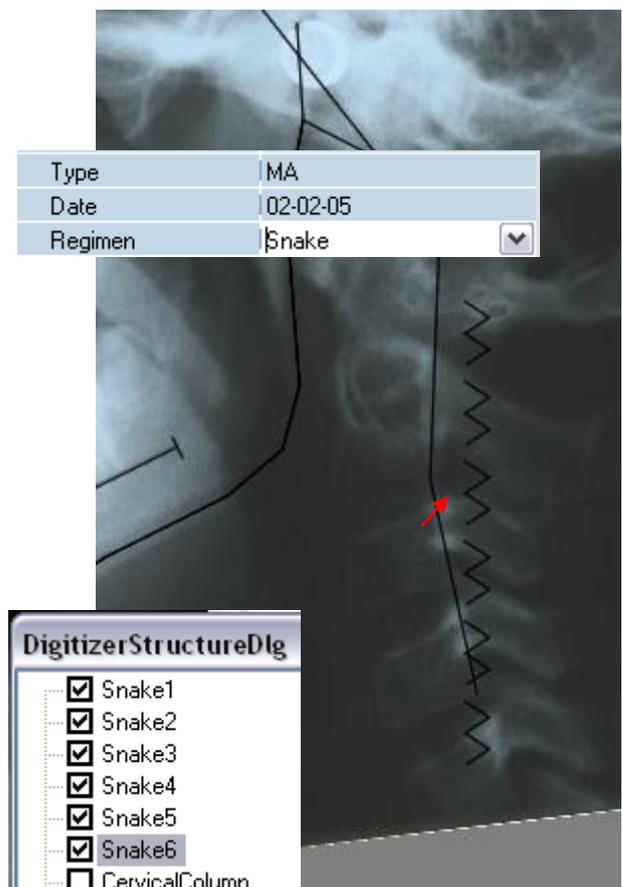
9. The reference film will now disappear and only the second film is visible. A sequence of points is then to be digitized beginning with Nasion (n), the second point is Sella Center (s). After this follows the normal sequence of points located on this second film.
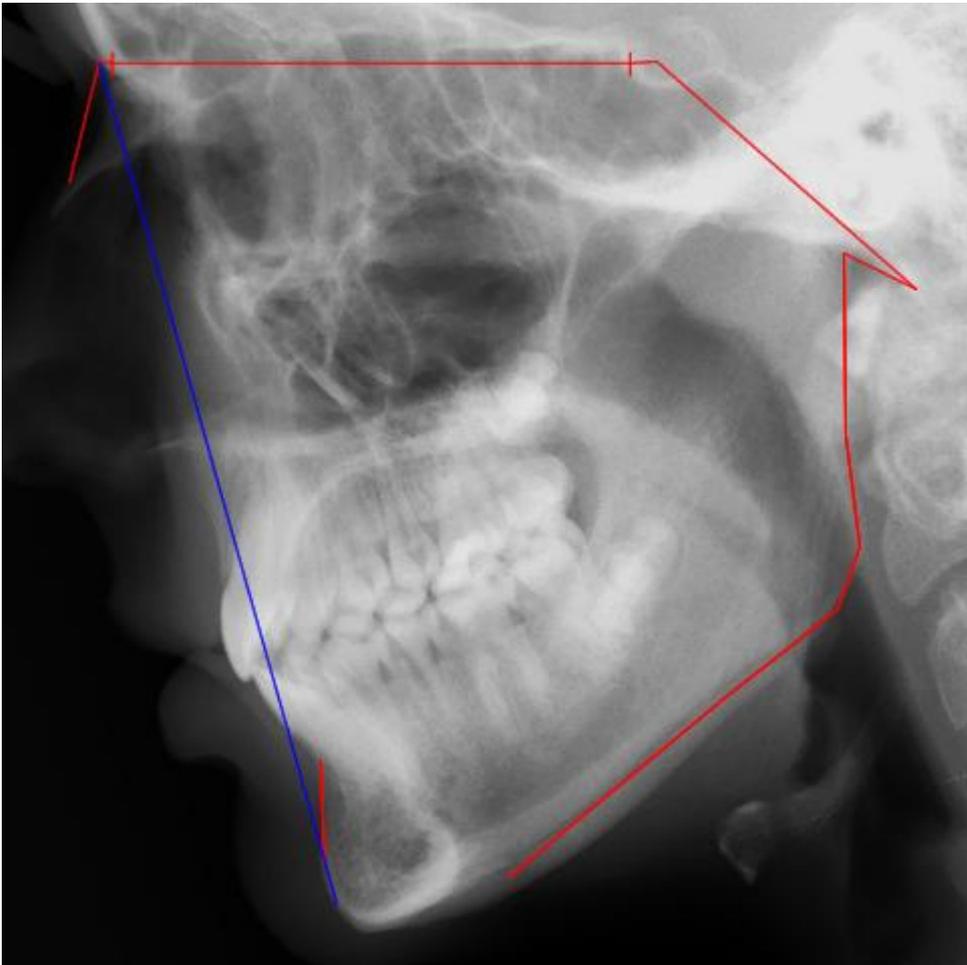
10. When you have digitized the posterior symphysis point (sym), the reference film appears again and the films can be superimposed on the stable mandibular structures. Move the second headfilm in the same manner as before so as to fit the reference film. The rotation center is point supra pognonion (spg) on the initial film. It is usually a good idea to first translate the films until the chins are aligned and then rotate the second film until stable structures (the mandibular canal and other) align. Then once again click on the accept reference icon (the white icon with the green check mark in the upper tools bar), and the films are locked together.

Now move to the next point in sequence; posterior nasal spine (pm), followed by the points (ss), (pal) and (sp). The films can then be superimposed on the maxillary structures using the same technique as described earlier. The center of rotation is located at the anterior nasal spine (sp) on the first film. After alignment the films are locked together by clicking on the accept reference icon.

Note: Translation is achieved by holding down the shift key and then the left mouse button. Rotations are done by holding down the left mouse button alone and moving the mouse.

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Correcting superimpositioning error

1. Make sure that both the reference film and the current superimposed film are visible and the second film is active by checking the stage number in the left data panel. If you have several stages recorded, any stage preceding the third or any subsequent stage (s) can serve as the reference stage.

2. Corrections of the superimposition can now be done by going to the submenu Point under the heading Lateral. Open the Point box by clicking the <+> sign or with the right arrow key <→>.

3. If you wish to correct the anterior cranial base superimposition; scroll down to the first anterior cranial base reference point (cbr1). This activates both films and the current film can be moved to a more correct position. Save the change by scrolling away from point cbr1 in the point list or
Do not use the save function under the file menu before scrolling.

4. You can alter the mandibular superimposition by scrolling down to the first mandibular reference point (ma1) on the point list and then align the films. Save the change by scrolling away from the ma1 point. To alter the maxillary superimposition, scroll down to the first maxillary reference point (mx1).

5. The reference lines on ALL individual stages can be corrected if necessary.

6. To change individual landmarks use the normal procedure for correcting reference points.

7. For additional information see Landmark Correction on the www.tiops.com, Members Page.

8. Make sure you save the changes to the file before you close the program, as the changes otherwise will be lost.

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