Technical Note

Rotating the Anterior View of a Skull into the Frankfort Horizontal Plane for Postmortem Drawings

Natalie Murry

Natalie Murry Forensic Art

Abstract: It is commonly accepted that a profile view is needed in order to rotate the skull into the Frankfort horizontal plane, a more natural position in which to view the face. This technical note discusses a method to rotate the skull using only an anterior photograph.

Introduction

One aspect of forensic art is the postmortem drawing. Using photographs (usually obtained from medical examiners or crime scene photographers), the forensic artist renders a drawing of an unidentified person for release to the public for identification purposes. In many cases, the photos have been taken while standing beside or at the feet of the deceased person; this provides a distorted inferior facial view. Some postmortem artist renderings simply recreate the imperfectly angled supplied image without correction, resulting in an awkward image that appears unrealistic.

It is commonly accepted that a profile view is needed in order to rotate the skull into the Frankfort horizontal plane [1], a more natural position in which to view the face. This technical note discusses a method to rotate the skull using only an anterior photograph. Figure 1a shows the skull in an anterior view, approximating a morgue photo; Figure 1b shows the skull rotated into correct aspect. Figure 2a and 2b show the profile view of Figure 1a and 1b, respectively.

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The Frankfort horizontal plane is the most natural position for the head in life. The top of the external auditory meatus lines up evenly on a horizontal line with the inferior edge of the orbital cavity. This allows for the drawing of the face to look less like the tracing of a photo done from death and more like a rendition of a living face.



(a)

(1a) The anterior view of the skull as presented in scene photos; (1b) the anterior view of the skull in the Frankfort horizontal plane, as required for the drawing.

Figure 1



Figure 2

(2a) The profile view of the skull in Figure 1; (2b) rotated into Frankfort horizontal plane.

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Materials and Methods

To begin, the artist opens the anterior photo in a graphics software program. This method is illustrated showing a digital approach using Corel Painter software and drawn on a Wacom Cintiq digital tablet. It can be done when hand sketching by using tracing paper instead of digital layers.

Figure 3 shows the source image of the deceased person as photographed from an inferior position. The artist is aware of gravity issues that pull the right eye horizontally and affect the musculature of the face. The brows drift above the orbital cavities; the mouth is uneven. The left eye appears sunken into the skull. The structure of the sides of the face appears asymmetrical. Note that the left ear is visible in this photo.



Figure 3 Source photograph.

To begin, the artist rotates the image to a vertical orientation and lightly traces the location of the primary facial features: the top of forehead, the eye, the inferior edge of the orbital cavity, nose, mouth, chin, and ear (Figure 4).



Figure 4 Tracing features, photograph layer on and off.

The view of the source photograph is turned off, and the rulers and guides features in the software are turned on. The artist creates guides at key locations on the image. Shown here are guides at the top of the forehead, the eye at the level of the caruncle, the inferior edge of the orbital cavity, the base of the nose, the parting of the lips, and the chin. A guide indicating the ear is not shown because that will move as the skull is rotated (Figure 5).

The anterior layer of the drawing is turned off, and a new layer is added. The artist draws the profile view of where those features fall according to the guides and includes the ear at the same level where it was on the anterior view (Figure 6). Note that it is not possible to gauge the distance between the ear and the facial features in a profile view. This step must include artistic opinion on where the ear lies naturally on the skull. In profile, the ear is placed behind the mandible.



Figure 5 Guides showing placement of features in source photo.



Figure 6 Profile view drawn in red to differentiate from anterior view.

Figure 7 shows how the drawing appears with both the anterior and profile layers turned on. This is included merely to show how the process is intended to work. The artist confirms that both sets of markings for each feature are on the same horizontal level. To proceed, the anterior layer is turned off again to avoid distraction.

The next step requires the artist to use the layer adjuster tool (edit > free transform). One of the transform tool commands is "rotate". Figure 8 shows these tools highlighted. The artist rotates the profile view into the Frankfort horizontal plane. Figure 9 shows how the profile appears when rotation is complete.



Figure 7 Anterior and profile sketch layers both on.



Figure 8 Note circles showing adjuster tool and rotate command.



Figure 9 Features rotated into Frankfort horizontal plane.

A certain amount of artistic judgment is required in this step, because obviously one cannot see the external auditory meatus. The inferior edge of the orbital cavity has been rotated to line up horizontally about mid-ear in this example. Figure 10 shows both drawing layers once the profile has been rotated.

The profile layer is then moved laterally across to the midline of the face. This shows where the central features would be more naturally drawn. Note that the eye has not moved much, but the nose and lipline have dropped. The ear has risen. Figure 11 shows the profile moved to the midline of the face.

The artist turns on the view of the photograph once again to view the comparison between the new placement of features and the photo (Figure 12). The artist considers also the angle of those features, especially the nose tip.

The artist will proceed with the drawing by moving the source photograph to the correct location for each feature as determined by the rotated placements. Because the canvas layer does not move, the artist must copy and paste the source photo layer to get a duplicate. (A canvas layer will not directly duplicate in Painter.) It is also a good idea to discard the layer showing the sketch of the anterior features in their original positions at this time, because it is not used from this point on. The horizontal guides may be discarded, if desired.



Figure 10 View of anterior and newly rotated profile.



Figure 11 Moving the profile into the midline.



Figure 12 Photo visible underneath the newly placed features.

A vertical guide is added down the midline of the face. This allows for measurements to keep both sides of the face similar, regardless of any uneven gravity or bloating issues. The view of the profile features is turned off to lessen confusion when drawing. Additional vertical guides assist even placement of the irises.

The artist proceeds with sketching the eyes (Figure 13). The vertical guides and the canvas rulers are used as measuring tools to make both eyes the same size and same distance from midline. One must consider that the eyes have sunken into the orbital cavities and are not as prominent as they would be in life.

To draw the nose, the profile sketch layer is turned back on and the source photo is moved down to match up with the corrected location for that feature (Figure 14).

The nose is then drawn, taking into account the viewpoint of the camera and the probable angle and shape of the nose when viewed correctly. For this particular case, additional scene photos showed the nose not to have as much asymmetry as in this view (Figure 15).



Figure 13 Placing the eyes.



Figure 14 Source photo moved down to corrected location to draw nose.



Figure 15 Nose placed and sketched at proper location.

The profile layer is turned on again and the source photo is adjusted to the correct height for lips. Knowledge of a standard width of the mouth for specific sex, age, and race [2] and the effects of gravity pulling the lips is taken into account when sketching the location of the mouth. For simplicity purposes, the mouth is drawn closed in this example. Normally in a case where teeth are visible, they will be included in the drawing as another clue for identification (Figure 16).

The source photograph is moved back to the original location where the eyes were correctly placed. Observation of the superior edge of the orbital cavity shows the correct placement of the eyebrows, which have slipped too high in the source photo. A light line is drawn at the superior rim of the orbital cavity to indicate placement of the brows (Figure 17). The source photo is then moved so that the brows in the photo are placed correctly on the line showing the rim of the orbital cavity (Figure 18). Brows can then be drawn at correct location. Note shape, angle, and thickness (Figure 19).



Figure 16

Mouth sketched in at correct location and proportions. Note bottom lip adjusted to closed position.



Figure 17

Source photo returned to original location. Line lightly drawn at superior edge of orbital cavity to allow for correct brow placement.



Figure 18

Source photo moved again to put brows back on the superior edge of orbital cavity.



Figure 19 Brows at correct location.

Guides may now be turned off. With the photo reference layer turned on, the artist observes the sketch and placement of features. Anomalies of this specific face are noted (Figure 20). The information from the forensic anthropologist is taken into account when aging the face, as are subtle indications of age on the skin.

Alternating with the photo reference turned on and off, the artist continues drawing the features of this face.

Because of the angle of the photo, the ears also appear too small. The artist should follow knowledge of artistic canons [3] for the correct length of the ears. This is illustrated in Figure 21.

The source photo is continually checked to note this subject's features. As with most postmortem drawings, a hairstyle was approximated (from length of the parts of the hair seen in the photo) and the age was approximated (per a forensic anthropologist). Figure 22 shows the sketch with original source photo underneath.



Figure 20 Observe anomalies of this individual's face.

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Figure 21

Note short ear on screen right, which was placed following measurements. Length of the ear needs to be adjusted per artistic canons, to more closely resemble ear on screen left.



Figure 22 Sketch showing original photo underneath.

With this method, proportions for the features of the face are maintained. Once a more natural and less awkward position of the head is used for the drawing, the artist may focus on individual attributes of the face to enhance possibilities of identification of the unidentified person.

Figure 23 shows the finished sketch. A life photo is superimposed over the drawing in Figure 24 to show accuracy in feature placement. Figure 25 is a life photo of the subject for comparison purposes.



Figure 23 Finished sketch.



Figure 24 Life photo superimposed over drawing to show accuracy.



Figure 25 Life photo.

Conclusion

When a forensic artist is asked to render a drawing of a deceased person, using only a crime scene or coroner's photograph, the Frankfort horizontal plane method can assist in creating a more lifelike rendering. It is important to note that this method is not appropriate for every case. If the source photograph is at too steep an angle, it would be speculative to attempt to rotate it. There are, however, many cases that would benefit from this method of rotation.

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For further information, please contact:

Natalie Murry Natalie Murry Forensic Art 400 Oak Branch Drive Georgetown, TX 78633 nataliekmurry@gmail.com

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