Case Report

Skull-to-Photo Comparison for Identification Purposes

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Abstract: This case report discusses finding individual anomalies on a face that could be matched to those on a skull to make an identification possible in a case where the medical examiner had been unable to make an identification by standard methods.

Introduction

The deceased victim of a house fire in Clark County, Washington, was unidentified. The homeowner was the probable victim, but there were no living family members with which to compare DNA, no dental records to compare, and no medical records. The medical examiner asked that I do a skull-to-photo comparison to assist in adding to the evidence that this was the homeowner or to rule out the homeowner as the victim.

On past skull-to-photo comparisons, I had done only general comparisons when overlaying a photo of a skull onto the photo of a person so that I could advise whether the skull and its features could possibly fit the person in question. For example, Figure 1 shows two previous skull-to-photo comparisons. Figure 1a shows a fairly close line-up of features to the skull through the midface, but the eyeballs themselves are wider than the orbital cavities. The mouth is also slightly too low; the lipline should be higher than the bottom of the maxillary central incisors. The tissue depth markers on the sides of the face do not line up

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because the face in the photo is turned slightly. Figure 1b shows that the subject has a much longer chin. The eyes are also too high in the orbits. These comparisons were relatively simple compared to the case that follows.

Materials and Methods

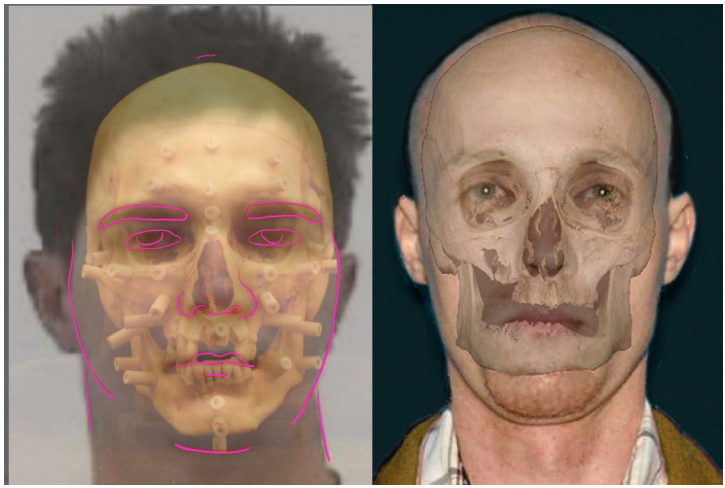
I was given the driver's license photo of the possible victim before I viewed the skull. I examined the photo to see whether the subject had any identifiable features that I would want to look for on the skull when I examined it at the medical examiner's office.

The driver's license photo presented some challenges in that the subject's face was not level and was not completely symmetrical. There were no points on both the right and left side of the face[1] that were on an even horizontal plane. Without bony landmarks, it was a somewhat subjective exercise to level the face. Additionally, the subject had an asymmetrical smile that pulled up all of the features on the right side of his face. I used the eyes as a landmark to level the face. This was done in my Corel Painter computer software program.

I observed asymmetry in the right side of his face, most notably in the lower fleshy portion. His mandible was fuller on the right side but I could not say how much of that buccal fullness was due to his crooked smile. I saw that his maxillary central incisors were crooked (each of them tipping out laterally) and were off center of the midline of his face. He had a missing maxillary lateral incisor. His right ear was also higher than his left by about 5 mm. His chin appeared wider on the right than on the left (Figure 2).

When I went to the medical examiner's office, I found that the skull had not been damaged by the fire, but none of the maxillary incisors were remaining. The maxillary canines were still in the skull but were damaged. I photographed the skull from both profiles and the anterior, and I also photographed an inferior view of the maxillary teeth and palate. (I photograph all cases with a Sony A100 DSLR camera using a Sony DT 18–70 mm 3.5–5.6/18 – 70 lens, mounted on a tripod and placed about 10 feet away from the skull to avoid distortion.) I later downloaded the photos to my computer and opened them in Corel Painter. I arranged the profile and anterior photos and

[1] When referring to the right side of the subject's face, it is seen on the screen left. The left side of the subject's face is seen on the screen right.



(a) *(b)*

Figure 1

Examples of previous skull-to-photo comparisons.

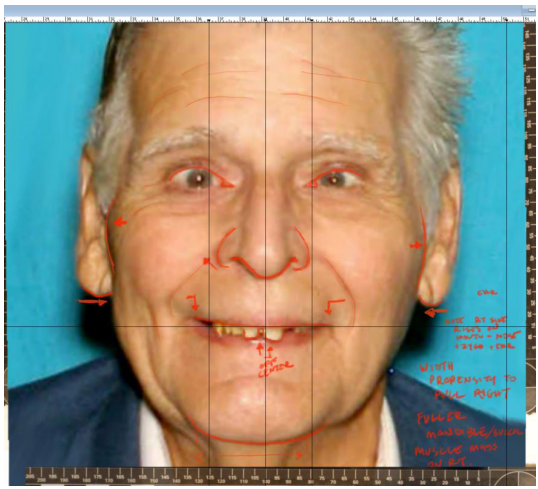


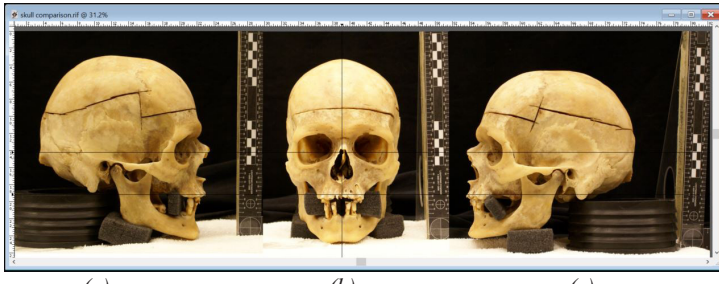
Figure 2

Driver's license photo notes with guide lines.

sized them in a layout to view all three views in a panorama (Figure 3). I drew guide lines horizontally to line up the features and one vertically down the midface centerline.

When I had all three photos arranged in Corel Painter, I placed a clear layer over the anterior photo and drew an outline of the skull. Figure 4 shows this outline in green as my "visual notes", showing the off-center placement for the maxillary central incisors and the crooked chin. I also noted the malar tubercles for eyelid placement. I noted the brow ridge, the zygomatic bones, where the width of the nostrils should fall, and the asymmetrical mandible.

Once I had the basic measurements on the skull, I brought in the inferior view of the maxillary palate to confirm that I had correct placement of the maxillary teeth (Figure 5). I was able to line up the palate with the remainder of the canines using vertical guides. Note in this view that there is breakage to the maxillary bone where the teeth insert, but the palate gives a clear indication where the teeth are placed. The guides on my image are lined up to the outer edges of the canines. A portion of the first premolar #12 is visible behind the canine on his left side, not to be confused with the canine. This view shows clearly that the central incisors midline (indicated with the green measurement marking) is to the right of the facial midline (indicated with the blue guideline).



(a) *(b)* *(c)*

Figure 3

Panorama of skull photos: (a) right profile; (b) anterior; (c) left profile.

Figure 4

Skull measurements. Guideline for midline still in place.

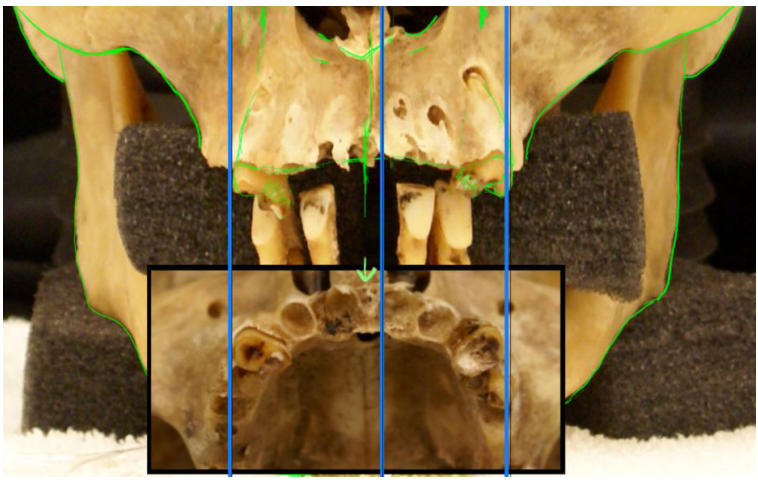


Figure 5

Lining up maxillary palate. Lateral sides of canines of skull lined up with lateral sides of canines on the palate. The midline of the central incisors is then visible as indicated by green arrow.

After determining the layout of the skull, I brought in the driver's license photo of the possible victim and sized it over the anterior skull photo (Figure 6). I did not put tissue depth markers on the skull at the medical examiner's office because I was not doing a reconstruction, but I sized the driver's license photo to the proper size on this skull, allowing for tissue depth on all sides.

Upon placement of the driver's license photo, my initial assessment showed the general fit to be a good one. Eyes were fairly centered in the orbital cavities, allowing for slight changes that were due to the photo angle. The eyebrows followed the superior edge of the orbital cavity. The nose fit into the nasal cavity properly. The zygomatic bones and mandible fit into the head properly. Because of the tooth loss, I was unable to match up the dentals easily at first. I turned on the view of the palate and the skull measurements over the driver's license photo. Figure 7 shows the skull measurements overlaid on the driver's license photo and the inferior view of the palate over the driver's license photo. This confirmed that the subject's maxillary central incisors matched up with the skull palate and also showed the bone structure over the driver's license photo. Notice also the asymmetry to the inferior edge of the zygomatic bones. I do not know whether the thickness of the righthand bone contributed to the thickness of the muscles on that side of his face or whether that was due to his lopsided smile. If, as all of his other provided life photos suggest, he always smiled on the right side of his face, he could have built up the buccal muscles on that side of his face more and they may have built up the muscle attachment on the zygomatic bone slightly.

Regarding the strabismus or crossed eye this subject has on his left eye in this driver's license photo: He did not have this in his other life photos that were provided to me. It appears to have been a recent development, so there would not have been an indication of this on the bones around his eye.

With the palate view turned on, the teeth lined up with the driver's license photo teeth, confirming again that the off-centered incisors for the subject and the skull matched. Because the possible victim did not have dental records, the state of his teeth prior to his death was unknown. There is another driver's license photo taken after this one (but at a slight sideways and downward angle and with a closed mouth) that appears to show him more edentulous.

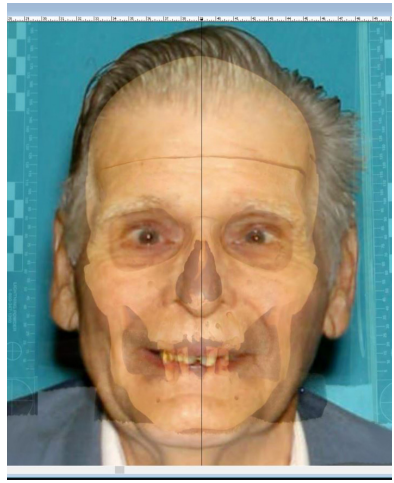


Figure 6

Driver's license overlay on skull, opacity of driver's license photo turned down to view skull.

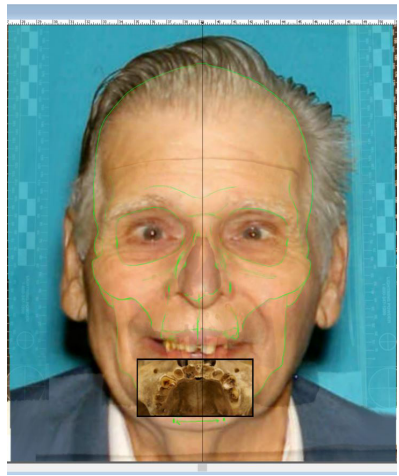


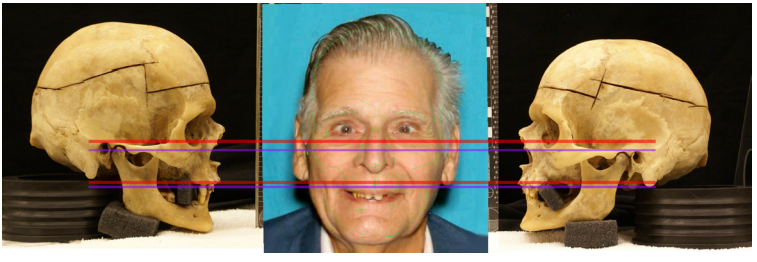
Figure 7

This view shows the skull measurements overlaid on the driver's license photo, and the inferior view of the palate over the driver's license photo.

I moved on to the uneven earlobe issue. Zooming out to the view of all three skulls, I drew horizontal lines at the superior edge of the external auditory meatus (ear canal) on each profile and at the inferior edge of each earlobe. Lines for the right ear are in red and for the left ear are in purple. The right ear was clearly higher than the left, both on the driver's license photo and on the external auditory meatus of the skull (Figure 8).

Next, I moved on to the asymmetrical chin shown in Figure 9. With the skull layer turned on, I moved the ruler below the mentalis (center of the chin) and centered the 100 mm mark of the ruler on the midline. I observed the most prominent point on the right side of the mandible to be about 17 mm lateral of the midline and about 13 mm lateral on the left.

I turned on the driver's license photo layer (Figure 10), and I repeated the same measurements. On this layer, the right side of the chin's most prominent point was about 30 mm and the left side was about 18 mm.



(a) *(b)* *(c)*

Figure 8

Measurements to compare the ears. Right ear measurements in red; left ear measurements in purple. Top line is the superior edge of external auditory meatus; bottom line is inferior edge of ear lobe. These measurements show the right ear is clearly higher in both the life photo of this subject and on this skull.

Figure 9

Mentalis midline on the skull, measuring most prominent points on either side of the chin. The right side of the chin extends further than the left.

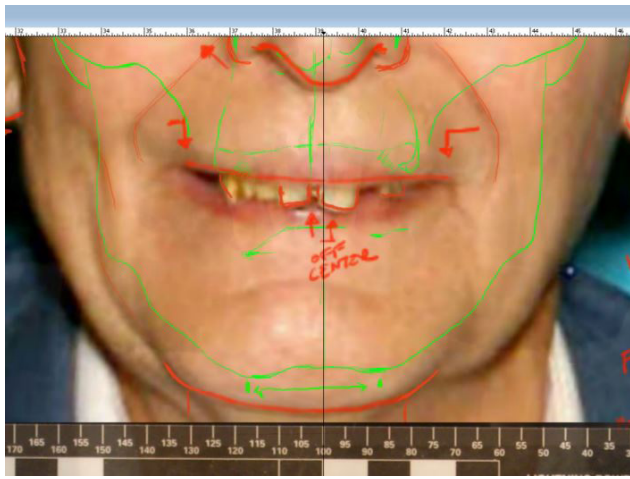


Figure 10

Mentalis midline on the driver's license photo, measuring most prominent points on either side of the chin. The right side of the chin extends further than the left.

Discussion and Conclusions

The entire head shape fit onto the skull with no glaring issues that would cause concern. If I were to be presented with the photo of the skull and the driver's license photo, I would not be able to rule this person out as a possible match. But when examining both the skull and the photo in greater detail, I found anomalies of this individual that were present in both the driver's license photo and the skull: the asymmetry of the ears, the off-center maxillary central incisors, and the asymmetry of the chin.

Considering an elderly Caucasian male was found deceased in this man's home after a house fire, I would determine the chances of this individual being anyone other than the homeowner to be extremely slim.

Acknowledgments

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