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Reconstruction of Mutilated Victims for Identification

Death by violent means, rendering a victim mutilated beyond recognition, presents the medical examiner and the police department with a problem of legal identification. This paper outlines the reconstruction of victims mutilated beyond recognition, by intent or accident, when the remains are not skeletal. This type of reconstruction and restoration requires an excellent knowledge of skull anatomy and some of the talent of a sculptor.

Mutilated victims present two serious problems: that of positive identification and the grief and misery of the person called upon to identify the victim. An attempt should be made by those in charge to reconstruct and restore the facial features. If restoration is not necessary, multiple lacerations should be sutured and the bruises and sutures covered with a suitable restorative wax and cosmetic. This makes the task of visual identification a far less terrifying memory. Acceptable methods of identification include the following:

- (1) visual identification by family, friends, or associates;
- (2) identification by fingerprints;
- (3) identification by dental records; and
- (4) identification by footprints.

Visual identification made by other than the immediate family requires substantiation. The factual evidence may be a photograph, identification of surgical or traumatic scars, X-rays of healed disease or injury, or birthmarks. If the deceased cannot be identified by fingerprints or dental records and the facial features are mutilated beyond recognition, a reconstruction and restoration of the facial features must be attempted. The method used is dictated by the condition of the deceased. Concerning skeletal remains, Krogman [1] notes:

The identification of human skeletal remains is a critical matter. A fully qualified specialist in this area must be extremely well grounded in comparative osteology, human osteology, craniometry and ostiometry, and racial morphology.

At the 29th Annual Meeting of The American Academy of Forensic Sciences, February 1977, a case report describing the reconstruction and restoration of the facial features of skeletal remains was presented [2]. The victim was a female found in a shallow grave. The knowledge of a physical anthropologist unfolded pertinent data from the skeleton: the approximate age, approximate height, old fractures, type of accident, and the fact that she had given birth. With this information and scientific facts in mind, a sculptor reconstructed the imagined facial features of the skeletal skull. A picture of the finished reconstruction and the information concerning the healed fractures and type of accident was

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distributed. A person viewed the photograph, saw a resemblance to someone he had met, noted the reference to the fracture (supposedly the result of an auto accident), and came forward. He supplied the police with a lead that resulted in a positive identification. The reconstruction in that case was skeletal remains. The knowledge of a physical anthropologist was of paramount importance to the success of the restoration.

The reconstruction of victims whose remains are not skeletal begins with the bone fragments and attached tissue; evidences of the physiognomic details are restored when these fragmented bones are juxtaposed and placed in their proper anatomical planes. It is important that the maxillomandibular dentition be in such a position as to present a proper occlusional mandibular relationship. This can be complicated by the lack of either the mandible or the teeth. Loss of facial features by the destruction of bone and tissue makes it necessary to follow some rule-of-thumb measurements or artistic canons concerning the proportions of the skull and its facial features and characteristics.

Reconstruction is the juxtaposition of bone fragments of the skull by cementing or wiring them together and placing them in their proper anatomical plane to make the skull as nearly normal as possible. Restoration of the facial features is brought about by matching and suturing the lacerated flesh and positioning it over the natural bone and reconstructed bony structure of the skull. After this has been done it will usually be necessary to reconstruct such parts of the face as the nose, mouth, eyes, and ears. It is then that the following basic concepts of facial physiognomy as rule-of-thumb guides or artistic canons are followed [3].

1. The face is considered to extend from the hairline to the base of the chin and is thought of as an oval divided into thirds: forehead, eyebrows to base of nose, and base of nose to chin.
2. The ears are in the same plane as the nose. The eyebrows are adjacent to the top of the ear and the base of the nose is adjacent to the bottom of the ear.
3. The eyes are on a line half the distance from the top of the head to the base of the chin.
4. The lip closure line is one third of the distance from the base of the nose to the base of the chin.
5. The horizontal cleft of the chin is two thirds of the distance from the base of the nose to the base of the chin.
6. The distance between the inner canthus of one eye to the inner canthus of the other eye is equivalent to the length of one eye.
7. The breadth of the nose at the nares is equivalent to the breadth of one eye.
8. A line dropped from the inner canthus of the eye to the chin determines the lateral border of the nose and the lateral end of the curve in the upper lip.
9. A line dropped from the middle of the upper eyelid to the chin determines the lateral boundaries of the lip closure line.
10. The character lines begin at the lateral corner of the nares to the corner of the lips.
11. The face area below the lower eyelids and the nares present varying degrees of slope, rise, and indentation, determinable to some degree by the zygomatic arch, infra-orbital area, fatty tissue, age, and other factors.
12. The ramus of the mandible is represented by a somewhat sloping line from the intertragus notch to a line extended along the lip closure line where the inferior border of the mandible curves to meet it.
13. The forehead is not a straight plane but is made up of a medial and two lateral planes. The medial plane's lateral boundaries are a line from the supraorbital foramen upwards. This frontal plane exhibits the frontal eminences (two asymmetrical bony prominences). The lateral planes slope away from the lateral borders of the frontal plane to the temporal line at the top of the ear.
14. The highlights and character to the face are provided by planes of the forehead,

cleft of the chin, character lines from the lateral nares to the corners of the lips, fatty extensions of the chin, aging lines, the zygomatic arches, and the occlusion of the teeth.

15. The face from the lateral borders of one zygomatic arch to the other is usually equivalent to five eye-lengths and is the widest part of the face.

16. When viewed from above the skull may present an outline either more or less oval or nearly circular.

17. The lower rim of the eye sockets projects less than the upper rim. The line of closure (extended by the inferior margin of the inner canthus) terminates against the medial and lateral walls of the eye socket.

The instruments and materials needed to perform a reconstruction and restoration are these:

- (1) plaster of Paris;
- (2) cheesecloth;
- (3) cotton (balls or roll);
- (4) restorative wax (easily softened in the restorer's hands but firm and not greasy upon drying on subject);
- (5) cosmetic colors for wax;
- (6) alpha cement (Krazy Glue®, Miracle Cement®);
- (7) a hand electric drill with dental bits and medium-gage wire;
- (8) spatulas [one 25 cm (10 in.) and one 15 cm (6 in.)];
- (9) sculptor's smoothing instruments (all wood—one thin blade and one large blade; two with wire loop extensions—one large loop and one small loop);
- (10) suture (surgical #5.0 and #4.0);
- (11) autopsy thread (waxed);
- (12) postmortem needles (one each, half-curved #3 and #5; one each, double-curved #3 and #5);
- (13) regular surgeon's needles and half-curved #10 to #20 needles;
- (14) Mayo dissecting scissors [one 171-mm (6¾-in.) straight Wexteel® and one 171-mm (6¾-in.) curved Wexteel];
- (15) gauze shears (scissors), 25 cm (10 in.);
- (16) thumb dressing forceps, serrated tip, 20 cm (8 in.);
- (17) BP® laboratory handle #6;
- (18) BP blades for above handle, #20, 21, 22, and 25;
- (19) Polaroid®-type camera;
- (20) stippling brush (to produce simulated pores in wax);
- (21) face powders in several colors;
- (22) wigs or hair pieces;
- (23) rouges;
- (24) eye caps; and
- (25) mouth formers.

All of the above, except the camera, can be purchased from a funeral supply house.

To restore the facial features of a mutilated victim, it is best to begin by establishing the profile. The profile accentuates the character lines. The norma lateralis view is not identical for both sides of the face, and when the right and left profiles are completed the norma frontalis view will have the asymmetry that is normally present in facial features. The nose is very seldom perfectly straight, and the lips are not of the same length from the midline of the face. The depth of each eyelid is not the same, and the ears are of a different contour on each side of the head. A break is taken at various times during the procedure to view the restoration from a distance. A Polaroid photograph of the work as it progresses will allow the proper anatomical perspective to be maintained.

Case Reports

Case 1

Report—The body of a white female who had committed suicide by jumping in front of a train was found with the legs twisted and a large laceration of the right thigh posteriorly. Most of the head and all of the face were missing. Portions of skull and brain were scattered beside the track. An arm was found approximately 28 m (92 ft) west of the body. A white shoe and portions of scalp were at intervening distances. The head was submitted in portions. The scalp was completely distorted by extensive lacerations. The right half of the face could be somewhat distinguished, and the nasal passages contained fresh blood. The mouth and distal portions of the face could not be determined; these areas contained extensive lacerations and contusions with comminuted fractures of the bony structure. The left half of the face was attached to the body. The left ear could be seen. The neck disclosed extensive contusions, lacerations, and comminuted fractures of the spine. A lower denture was found (Fig. 1).



FIG. 1—Mutilated body of a suicide victim (Case 1).

Reconstruction—The recovered parts of the skull and facial features were separated from the body and set apart on a stretcher. It was necessary to view the anatomical parts and the extent of the mutilations to determine how to begin (Fig. 2). The occipital portion of bone and the remains of the right side of the face required that a base be provided for securing the right side of the face to the occipital bone; this established the basis for the profile. The greater portion of the occipital bone fragment was filled with plaster to its containing edges and allowed to harden.

The remains of the right side of the face were positioned, the bones were juxtaposed in the area of the asterion, and an approximation of chin protrusion and interior skull area was considered. The right side of the face was laid aside, and cotton dipped in a thin paste of plaster was used to project a base for the chin and an anchor for the temporal and parietal bone; the remains of the right side of the face were pressed against this. The plaster was held in position and allowed to harden (Figs. 3 and 4).

The other parts of the occipital bones were juxtaposed and cemented, as were the parietal bones of the right side. The spaces left in the cranial vault were filled with cotton dipped in a medium plaster-water mix to support the cemented occipital and parietal bones. This was allowed to harden; a Polaroid photograph and a break from the restorative procedure were taken to ascertain the correctness of the bony reconstruction. Because

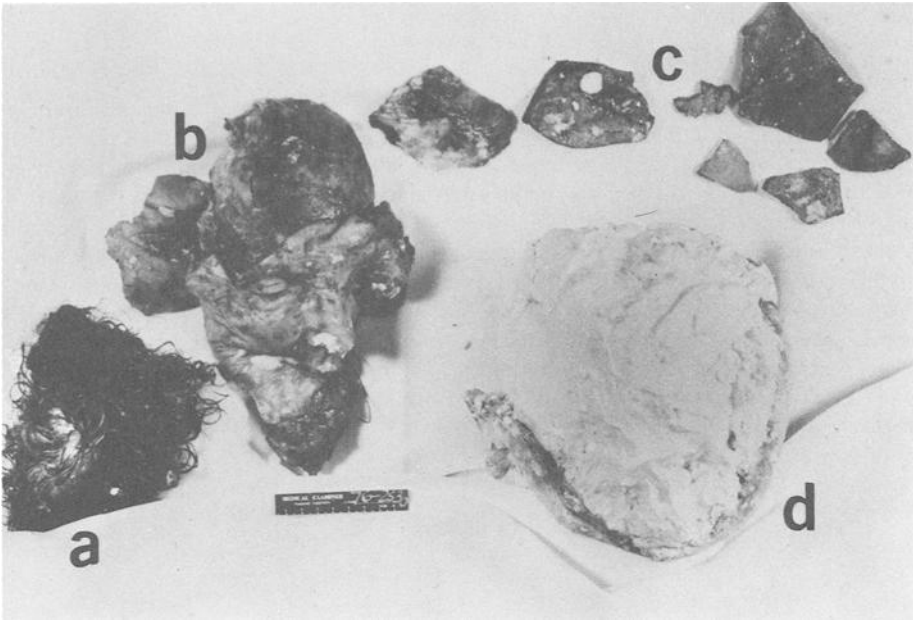


FIG. 2—Recovered parts of the skull and facial features of Case 1; (a) scalp and hair; (b) remains of the right side of the face, frontal bone, parietal bone, right temporal, part of ear, right eye, right zygoma, and part of the nose; (c) fragments of parietal bones, left temporal bone, and fragments of occipital bone; and (d) greater portion of occipital bone.



FIG. 3—The positioning of Section b of Fig. 2 with Section d.

of the absolute destruction of the basilar portion of the skull, no attempt was made at its reconstruction. The remaining parts of the small and large wings of sphenoid, the petrous portion of the temporal bone, and the occipital border of the foramen magnum were used to establish the anatomical plane presented by the anterior, middle, and posterior fossae.

The recovered scalp hair was positioned on the bony structure of the right side and



FIG. 4—Approximation of interior skull area, chin projection, and positioning of Section b of Fig. 2 with Section d.

stretched to its normal range over this surface. An estimation was made of the extent of occipital, parietal, and temporal reconstruction necessary on the left side. Cotton dipped in a medium plaster mix was molded to approximate the contour of the top of the head. The remaining fragments of occipital, parietal, and temporal bones were set in place. The inclination of the forehead was determined, and the nose was set in the midline. The lower denture plate was then set into the reconstruction and held in place with a soft plaster mix. The longer drying time allowed time to correct any errors made in establishing the anatomical planes (Figs. 5-8).

Another Polaroid photograph of the reconstruction was taken and the rule-of-thumb measurements governing facial features were used as a check on the work completed. At this point in the reconstruction it became necessary to chip out some of the hardened plaster to adjust the position of some of the bones, especially to reestablish the superciliary arch, the orbital margin, and the slope at the glabella as it touched the supraorbital margin of the restored left side. The profile of the left side was again appraised for anatomical corrections, and work proceeded to further reconstruct the chin and extend this reconstruction to the right side of the face. The anatomic plane was determined and the mandible reconstructed. The right zygomatic bone was positioned. The orbital cavity was approximated by establishing the right superciliary ridge frontal nasal process and supra-orbital margin. A frontal eminence was restored to the right frontal plane of the forehead. The lips of the left side were cemented together in the lip closure plane, and a base was formed for the reconstruction of the facial features of the right side. Other pieces of facial tissue were found in the remains that were contained in a separate plastic bag. The edge of this tissue was matched with those portions of skin already in place.

The juxtaposed areas of skin and scalp were sutured, as were the lacerations (Fig. 9).

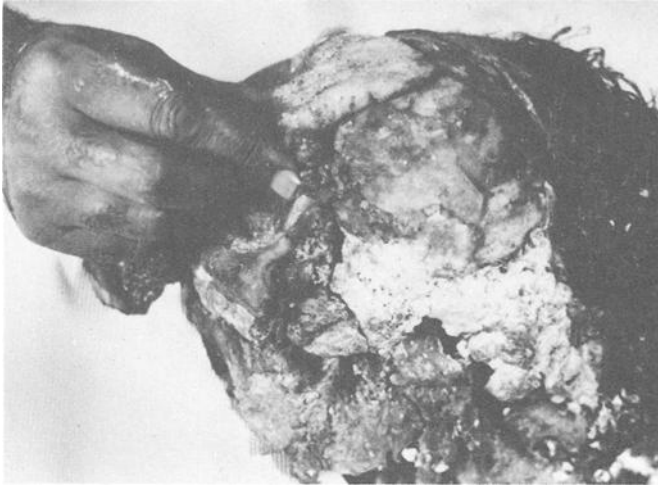


FIG. 5—Placement of Sections a and c of Fig. 2 on the surface of the built-up Section d.



FIG. 6—Superior view of Fig. 5.

The reconstruction was checked for any abnormal stretching of tissue or incorrect matching of skin areas. The sutured areas of the left side were covered with restorative wax colored to approximate the skin color. The missing facial features were reconstructed, and what was thought to be the facial characteristics of the reconstructed skull were restored.

The finishing details of smoothing the wax, adjusting the contours of the features, and comparing the reconstruction with the rule-of-thumb measurements were once again done. The norma frontalis view (Fig. 10, *left*) showed that more work needed to be done, but the norma lateralis view (Fig. 10, *right*) was sufficient for a visual identification. The family was shown the deceased and an identity was established. A picture in the possession of the police showed a remarkable resemblance. A description of the clothes and ring she was wearing made it conclusive, and a legal identification was established.



FIG. 7—Placement of denture in Case 1.



FIG. 8—Adjustment of denture in Case 1.

Case 2

Report—A middle-aged white male, 170 cm (5 ft, 7 in.) tall and weighing approximately 50 kg (110 lb), was run over by an unknown number of cars (Figs. 11 and 12). The head disclosed multiple compound fractures. The hair in the posterior portion was brown-grey. The base of the skull disclosed compound fractures throughout. The features of the face could not be identified. The entire frontal bone was absent, and the eyes were absent. Over the midline there was a laceration of the skin and subcutaneous tissue that disclosed denuded cartilage and bony structures. The upper maxilla disclosed comminuted and compound fractures. No teeth were present in the lower jaw. The tongue was in the midline and protruding. The lower maxilla disclosed comminuted and compound fractures.



FIG. 9—Suturing of lacerations in Case 1.

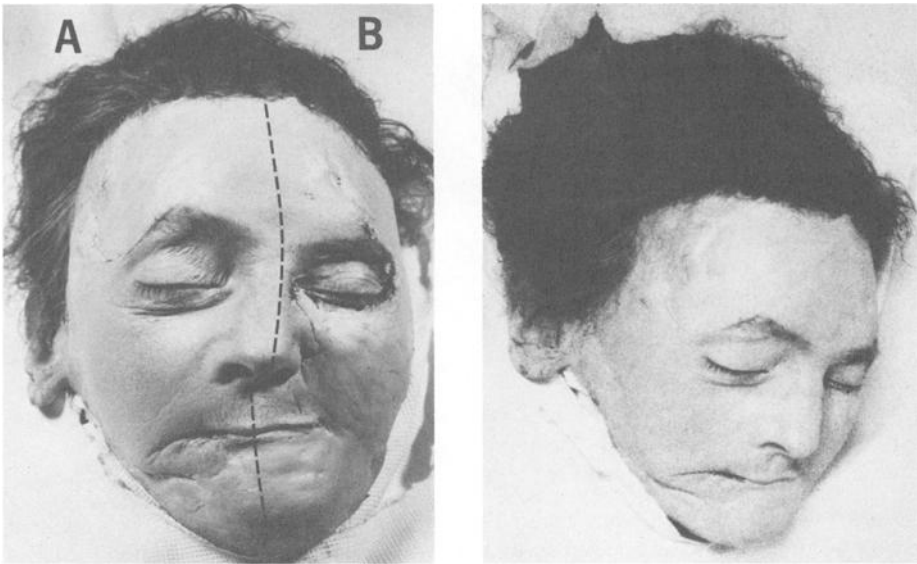


FIG. 10—Norma frontalis view (left) of restoration in Case 1 shows that more work needs to be done, but the norma lateralis view (right) is sufficient for identification.



FIG. 11—*Mutilated remains on a parkway of a pedestrian run over by an unknown number of cars (Case 2).*



FIG. 12—*Mutilated remains of Case 2 in the morgue.*

There was a deep laceration of the skin and subcutaneous tissue over the chin. The mandible showed comminuted and compound fractures. A denture was found for the upper jaw.

Reconstruction—The head was reconstructed along the same lines as in Case 1 (Fig. 13). The case presented a problem because an identification was not established by fingerprints. The reconstruction was photographed, and these photographs were distributed to the Bureau of Missing Persons, which led to a tentative identification that was later substantiated.

Other Cases

Figure 14 depicts the reconstruction of a person who had been beaten to death with a wooden statue. The reconstruction of the victim of an automobile accident is depicted in Fig. 15; the reconstruction is complete except for wax restorations.



FIG. 13—Composite photograph of the restoration of Case 2; (center) reconstruction; and (counterclockwise from upper left) restoration of the scalp, preparation of materials, preparation of the negative mold, and a photograph supplied by the family of the victim (center).



FIG. 14—Mutilated remains (left) and completed normal lateral reconstruction (right) of a person beaten to death with a wooden statue.



FIG. 15—*Mutilated remains (left) and incomplete reconstruction (right) of a victim of an automobile accident.*

Conclusions

Eight attempts to restore the facial features of mutilated victims have been successful. A tentative identity was made and later substantiated in each case. Reconstruction of the norma lateralis view of the deceased proved to be the best way to approach the restoration. The restorations were accomplished without preliminary preparation of the tissues by embalming to lessen the amount of distortion to the bruised, lacerated, and contused tissue that results from the injection of the additional fluids during embalming.

Artistic ability is a needed adjunct to knowledge of skull anatomy in successfully completing a reconstruction and restoration. The procedure outlined in this paper is generally applicable to a mass disaster such as the Big Thompson flood [4], where they could have used the services of a restorative specialist. A worthwhile procedure after a mass disaster would be to embalm, reconstruct, and restore the faces of those severely mutilated. Refrigeration poses a problem that could be overcome by embalming. Embalming and reconstruction could be done after the autopsy. Fire, drowning, freezing, and decomposition will complicate restoration because of the distortion of the tissue by heat, bloating, and presence of maggots. The end results are worth the work and time involved in the reconstruction of mutilated victims. Helping investigators and presenting a less horrible sight to ease the grief of family or friends are rewarding. We strongly advocate the use of such reconstruction and restoration procedures in all medical examiner's or coroner's offices.

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