

1971

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### Recommended Citation

P. Chandra Sekharan, Revised Superimposition Technique for Identification of the Individual from the Skull and Photograph, A, 62 J. Crim. L. Criminology & Police Sci. 107 (1971)

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## A REVISED SUPERIMPOSITION TECHNIQUE FOR IDENTIFICATION OF THE INDIVIDUAL FROM THE SKULL AND PHOTOGRAPH

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Identification of the dead from the skull is of primary importance in criminal cases. It is often necessary to undertake examinations in the Forensic Science Laboratories to determine whether a skull could have belonged to a particular person whose photograph is available.

It was Professor Brash<sup>1</sup> who in 1935 first suggested that the photographs of the missing person and the skull could be superimposed as an identification technique. Since then various scientists have utilized this technique in many criminal cases. Mr. G. Webster<sup>2</sup> gives a detailed description of the superimposition technique adopted in the Plumbago Pit case. Recently in the Corn field crime case of Peru, Dr. Basauri<sup>3</sup> also used superimposed photographs, besides forensic odontology, for identification purposes. In all these cases the technique generally adopted has been described as follows: From the original photograph a negative retake is made. The original photograph may be a bust, a full length photo of the individual or a group photograph. In any case only the face is reproduced on the negative of definite format. The skull is then placed on a tripod, and its position is adjusted exactly to that of the face in the photograph. It is then focused on the ground glass at the same format. The reproduced negative is placed on the ground glass and the image of the skull is adjusted to super impose on the negative and then photographed. The adjustment is made by drawing an outline of the face or by marking the prominent anatomical points of the face on the ground glass. Finally the two negatives are superimposed to give a positive print. Then the photograph is enlarged and points that are coinciding are noted and opinion given. \*

In this technique there is often criticism that there is nothing scientific in adjusting the size of the negative image of the skull to fit in with the image of the face. In fact, it is possible to fit a skull with photographs of different persons. Also the real size of the face has not been brought about in the above technique. To be more scientific, the two negatives should be enlarged to the life size, independently, and they should then be superimposed.

The revised technique as suggested by the author in this paper adopts this principle eliminating the aforesaid discrepancy and employs a more scientific and convincing method. The revised technique followed in the examination of two of the cases in the Tamil Nadu Forensic Science Laboratory are discussed in this paper.

In this technique the face of the individual in the photograph has to be enlarged to life size. This is possible if any of the articles such as the shirt, spectacles, the chair, saree, etc., found in the photograph can be obtained and brought to the laboratory. If, for example, the shirt worn by the individual is available, the distance between the two button holes (that appear in the photograph) can be measured and from this distance, the required magnification of the negative retake to make a life size photo can be worked out. When these distances are measured it is very essential to select the distances that are involved in linear magnification only. The shirt, the face of the individual, etc., can be considered to be in the same plane taking into account the distances involved between the camera and the individual when the original photograph was made. Thus a life size face is reproduced in a diapositive film. Then the skull is set in a universal skull rest, and its position can be adjusted exactly in the same way the face is seen in the photo, say, straight or oblique, slightly oblique or raised or lowered turned to-

<sup>1</sup> GLAISTER, J. AND BRASH, J. C., MEDICO-LEGAL ASPECTS OF THE RUXTON CASE (1937).

<sup>2</sup> WEBSTER, G., 28 POLICE J. 185 (1955).

<sup>3</sup> BASAURI, C. 204 INT. CRIM. POL. REV. 37 (1967).



FIGURE 1  
Photograph of the individual sent in case I.

wards, left or right and so on. In this position, the skull is photographed with a scale and a life size 1:1 enlargement of the skull is obtained in another diapositive film. These two diapositives are then placed one over the other and viewed in a viewing lobby. An x-ray viewing lobby is well suited for this purpose. When a correct superimposed position is attained both the diapositives can be fixed by adhesive tapes. Then a print can be made on a photographic paper or film using these two superimposed diapositives. From this superimposed negative further enlargements can be made. These enlargements can be studied for points of similarity as usual.

The following cases will further illustrate the technique adopted by the author.

Case I. In this case of murder a man was reported to have been beaten by two persons and the

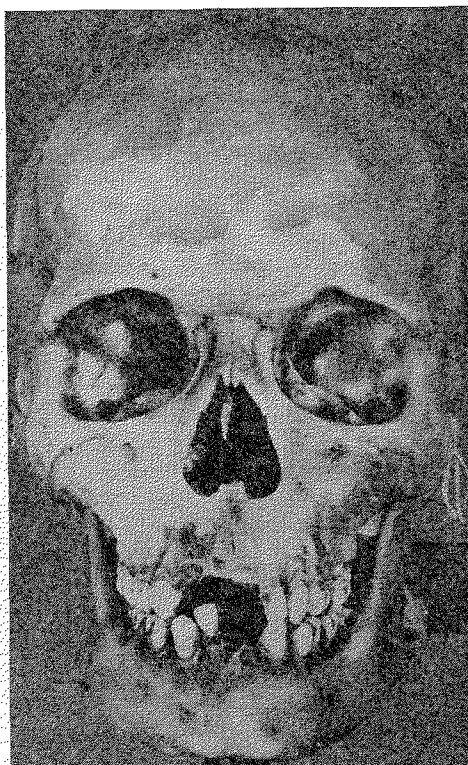


FIGURE 2  
Skull sent in case I.

body was alleged to have been buried in a river bed. On information the police recovered the skull and other bones and forwarded the skull with the mandible along with the photograph of the deceased. Fig. 1 is the photograph of the individual sent to the laboratory along with the skull (Fig. 2). The chair (Fig. 3) in which the individual is seen sitting in the photograph was traced and brought to the laboratory. From the measurements of the chair the magnification factor was worked out and the face was enlarged to life size (Fig. 4). Fig. 5 is the superimposed print prepared from the superimposed diapositives.

Case II. This is again a case of murder in which the deceased was alleged to have been attacked by a group of persons. A towel was put around his neck, and he was strangled to death. The dead body was buried in the bed of the nearby Odai (river). The body was later pulled out by jackals and left on the sands. In this particular case, the photograph which showed the deceased with his wife, (Fig. 6) was sent to the laboratory along with the skull (Fig. 7). The saree worn by the woman in



FIGURE 3

Chair seen in Figure 1 was brought to the laboratory and the magnification factor was worked out from its measurements.



FIGURE 4

Face enlarged to life size.



FIGURE 5

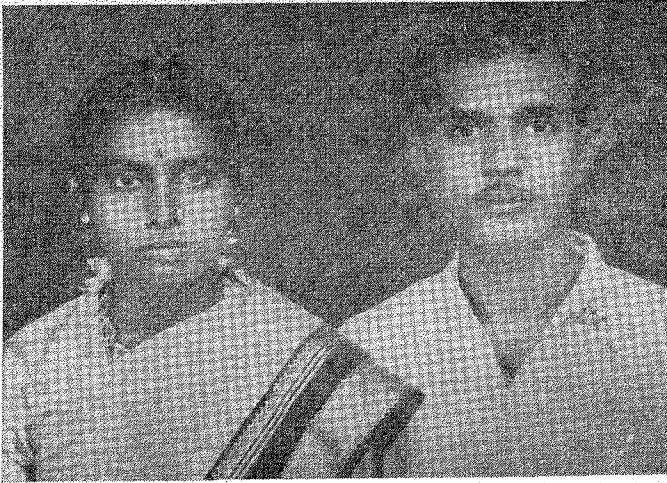


FIGURE 6  
Photograph of the couple in case II.

TABLE I

COMMONLY MEASURED DISTANCES IN THE SKULL  
AND FACE PRINTS

Distance between Anatomical Points	In Skull (in cms)	In Face (in cms)
NM	11.9	11.2
NO <sub>1</sub>	4.8	4.6
NO <sub>2</sub>	5.2	5.0
NK <sub>1</sub>	6.4	6.0
NK <sub>2</sub>	6.5	6.3
NG <sub>1</sub>	10.7	8.8
NG <sub>2</sub>	10.8	9.8
NS	4.9	4.5
NB	7.5	6.8
SO <sub>1</sub>	6.6	6.3
SO <sub>2</sub>	6.7	6.8
SK <sub>1</sub>	5.5	5.4
SK <sub>2</sub>	5.8	5.6
SG <sub>1</sub>	6.4	6.0
SG <sub>2</sub>	6.6	5.8
BK <sub>1</sub>	6.8	6.7
BK <sub>2</sub>	7.1	7.0
O <sub>1</sub> K <sub>1</sub>	2.8	2.6
O <sub>2</sub> K <sub>2</sub>	2.8	2.5
K <sub>1</sub> G <sub>1</sub>	6.4	5.9
K <sub>2</sub> G <sub>2</sub>	6.4	5.6
MG <sub>1</sub>	4.8	4.5
MG <sub>2</sub>	5.2	5.0
G <sub>1</sub> G <sub>2</sub>	8.8	8.4
BM	4.3	4.2
BO <sub>1</sub>	7.9	7.5
O <sub>1</sub> M	11.8	11.2

the photograph was traced and brought to the laboratory. From the measurement of the width of the saree border, "B" in (Fig. 8) the magnifications factor was worked out and a life size face of the individual was reproduced in a diapositive

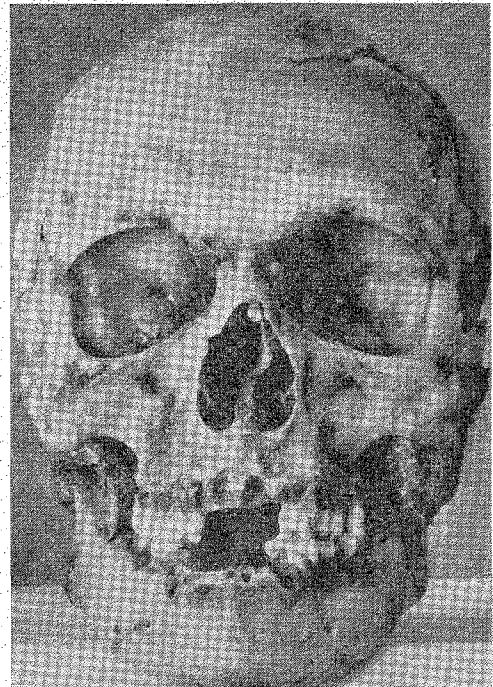


FIGURE 7  
Skull sent in case II.



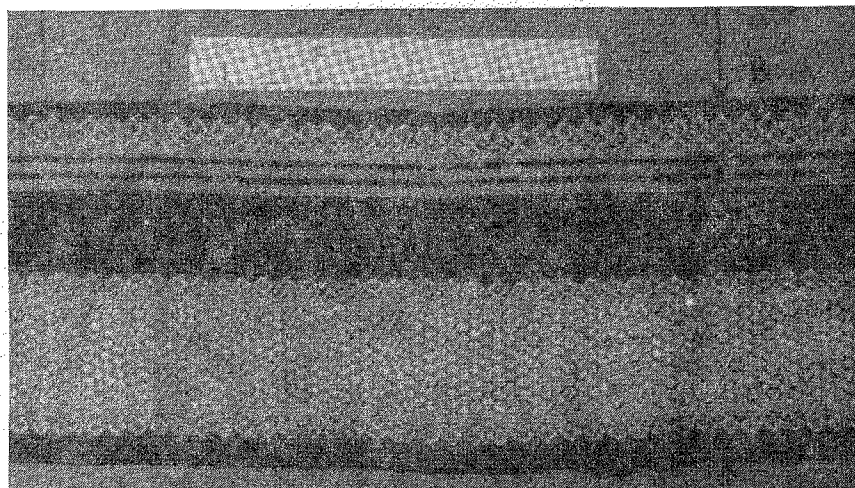


FIGURE 8

Saree worn by the woman seen in figure 6 was brought to the laboratory and the magnification factor was worked out from the breadth of the saree border 'B'.

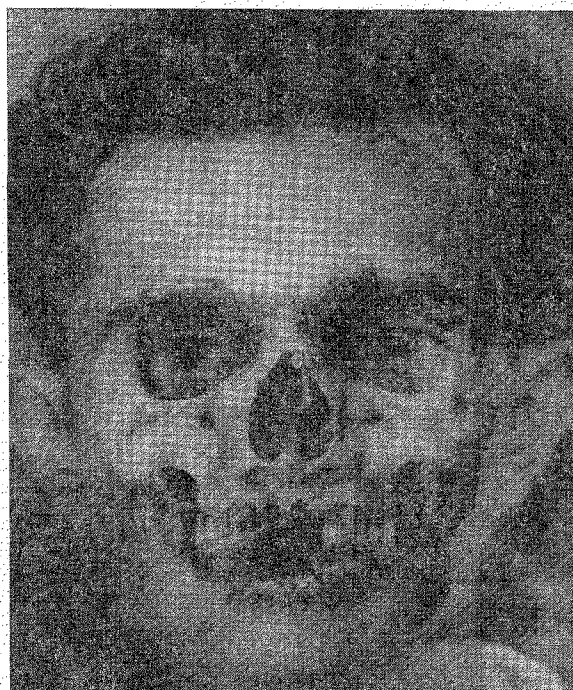


FIGURE 9

Superimposed photograph in case II.

film. Fig. 9 is the superimposed print the face and the skull diapositives. Out of academic interest, the face of the woman in the photograph (Fig. 6) was enlarged to life size and was superimposed

with the skull (Fig. 10). There were no points of agreement.

In the above studies the flesh thickness in various anatomical positions that are available



FIGURE 10

Superimposed photographs of the skull in case II on face of the woman in figure 6. Please note that there are no points of agreement.

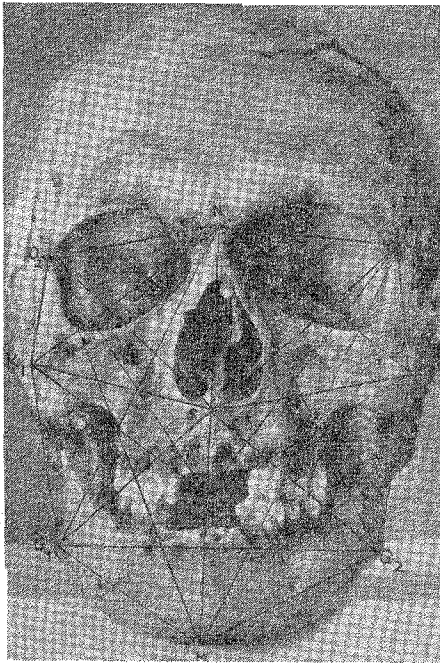


FIGURE 11

Enlargement of the skull. The prominent anatomical points are marked on the skull, norma frontalis and the distances between them are measured.

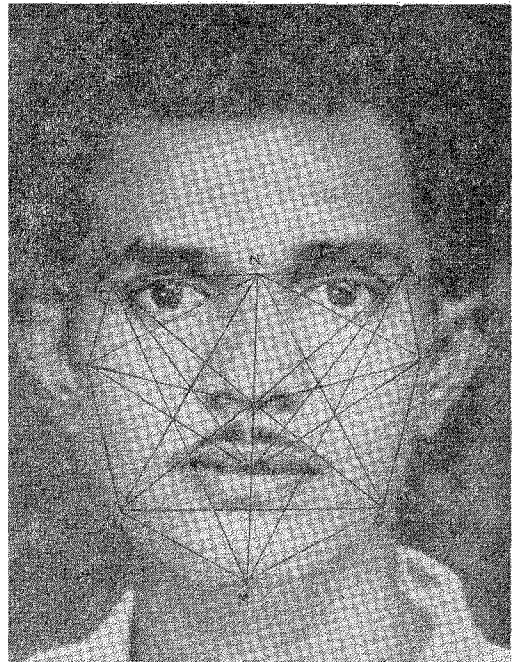


FIGURE 12

Enlargement of the face. The same anatomical points that are marked on the skull print are marked here also and the distances between them are measured.

TABLE II  
RATIOS BETWEEN SETS OF SELECTED DISTANCES IN  
THE SKULL AND FACE PRINTS

Ratio between distances	in skull	in face
NM/G <sub>1</sub> G <sub>2</sub>	1.352	1.333
NM/NO <sub>1</sub>	2.479	2.434
NM/K <sub>1</sub> G <sub>1</sub>	1.859	1.898
NM/SG <sub>1</sub>	1.859	1.866
NM/SO <sub>1</sub>	1.799	1.778
BK <sub>1</sub> /BM	1.581	1.595
SN/O <sub>1</sub> K <sub>1</sub>	1.750	1.731
O <sub>1</sub> M/O <sub>1</sub> B	1.494	1.493
NG <sub>1</sub> /NK <sub>1</sub>	1.672	1.633
NO <sub>1</sub> /NG <sub>1</sub>	0.448	0.469

Note: Ratios for all possible combinations of values in Table I have not been shown here.

elsewhere<sup>4</sup> are taken into consideration. The flesh thicknesses can also be worked out for persons of different categories—well built, moderately built, etc.

The following method is suggested by the author in cases where no such physical objects that are seen in the photograph are available to work out the magnification factor. In such cases, the 1:1 skull enlargement is obtained in a bromide paper. An approximate life size enlargement of the face is obtained in a bromide paper, keeping approximately the interpupillary distance as six centimetres. The distances between various anatomical points (anthropometric land marks) such as Kranion, Gonion, Nasion, Menton, Alveolar Point, etc. are measured independently in the skull and face enlargements (see fig. 11 and 12) and tabulated in Table I. Taking any two distances in the print of the face, say NM and G<sub>1</sub>G<sub>2</sub>, let NM = x cms and G<sub>1</sub>G<sub>2</sub> = y cms. Let the magnification factor be "m". Since the face is not enlarged to actual size, these distances have to be multiplied by the magnification factor "m" to get the actual distances in a life size photograph. The actual

distances will be 'xm' and 'ym' centimetres respectively. The ratio of these distances will be xm/ym or x/y which eliminates the magnification factor. Several values of ratios can be worked out for the various distances that can be commonly measured both in the skull print and face print. There will be no difficulty at all in fixing these landmarks in the skull print. However, it is a bit difficult to fix the same in the face print. But this difficulty can be overcome by taking into account the tissue thickness as suggested earlier. These ratios can be tabulated. (See Table II). If there is an agreement in a number of values as is the case in Table II then a probable opinion that the skull could have belonged to the person in the photograph can be given. The anatomical points which are marked in the skull and face photographs (Figs. 11 and 12) are the common landmarks that can be fixed on the skull and face, norma frontalis.<sup>5</sup> The anatomical point, bregma (b) could not be marked on the face photograph because of the hair style. This point also can be marked approximately in some cases, for instance, in the photograph of the woman in fig. 6.

A comprehensive study to find out the extent of variations in the superimposition techniques is proposed to be undertaken in this laboratory by taking face portraits of living persons whose skull radiographs (A.P. view) are taken for other medical diagnostic purposes and superimposing the photographs and radiographs.

#### ACKNOWLEDGEMENTS

The author wishes to acknowledge the advice of Mr. N. Pitchandi, Director, Tamil Nadu Forensic Science Laboratory, Madras and to thank him for permission to use the case notes in preparing this paper. He would also like to thank his colleague, Mr. G. Seshagiri, for his assistance in examining one of the two reported cases. Further thanks are due Dr. M. M. Cooper, Director, Institute of Anatomy, Madras Medical College, Madras for his advice.

<sup>4</sup> FRANCIS E. CAMPS, GRADWOHL'S LEGAL MEDICINE (Table XII—Analysis of Tissue Depths at 15 points over face as determined in cadavers) 151 (1968).

<sup>5</sup> HRDLICKA, A., ANTHROPOMETRY, 105-106 (1920) and WILDER, H. H. A LABORATORY MANUAL OF ANTHROPOMETRY 40-48 and 151-152.