3D FORENSIC FACIAL RECONSTRUCTION

Ms. Riya Ghosh

INTRODUCTION

Have you ever thought about what comes into effect when a skull is accidentally recovered from a nearby forest or a mass disaster? We know definitely what comes into play for the positive identification of the skull which remains unidentified. But what if traditional and conventional techniques of DNA (Deoxyribonucleic acid) analysis and dental record examination fails in that regard. In such scenarios, a methodological technique is being applied which constitutes a part of Forensic Anthropology and a part of Archaeology. Forensic Facial Reconstruction is a tool that is helpful in recognising the skull when problems like lack of information, cost management, and condition of the remains becomes an obstacle. Forensic Facial Reconstruction is a combination of artistic skills and scientific techniques. There is a controversy going on among the reviewers; some say this reconstruction method is just a technique of approximation that says a single skull can give different facial structures while the others say that a single skull can give its only single form of facial construction. But as time passes with the advent of knowledge and technology scientific forms have evolved to make this method more powerful through means of 3D (Three-dimensional) techniques i.e., what we call now as 3D forensic facial reconstruction.

Fig 1.1 Showing the recovery of an unidentified skull

IMPORTANCE OF 3D FORENSIC FACIAL RECONSTRUCTION:

It is an alternative tool that plays a significant role when there is no or very little trace of evidence or its extract is being present for identification of the recovered skull. Now the question arises as to how to identify the victim when the only body part left is the skull which is already being destroyed or decayed by animals, insects, or any other environmental factors. Earlier manual-based reconstruction techniques of the 2D (Two-dimensional)-based mode used to be applied but now with the very fast pace of time, advancement has been done in this field to make the manual-based techniques more efficient and error-free. In the midst of the 21st century where every aspect has its technological dynamics, the Forensic Reconstruction technique is nowhere less. Many techniques and methods have been introduced that keep aside the manual reconstruction, 2D drawings, and clay model techniques and relies upon the computerised 3D techniques for a positive identification of the skull.

Methods of 3D Forensic Facial Reconstruction: The methods include both manual 3D construction as well as some computerised techniques. But both techniques need artistic skills as well as forensic aspects of Anthropology. The conventional techniques were based on clay models, wax, and plastic using depth of tissues. But now many software programmes like CARES (Computer-Assisted Recovery Enhancement System) and FACES (Forensic Anthropology Computer Enhancement System) quickly produce 3D reconstructed images using scanned and stock photographs. The following methods have been used in the facial recognition:

• Anthropometrical American Method:

This method is called the Tissue depth method. The method shares common features like the 2D reconstruction of images. The method was developed by Krogman in 1946. It involves techniques that require highly professional skills and training. So, it is not performed nowadays as man-

The method is based on the principle of measuring tissue depth using X-rays or needles and then recording.

• Anatomical Russian Method:

This method was discovered in 1971 by Gerasimov. In this process, the total replacement of the classical use of tissue depth with facial muscle for measurement takes place. This method gives shape to muscles, glands, and cartilages by placing them in a layer-by-layer style. Reconstructing the fossilised skulls using this method can be done. But the drawback of this method is that it takes more time than the Anthropometrical method.
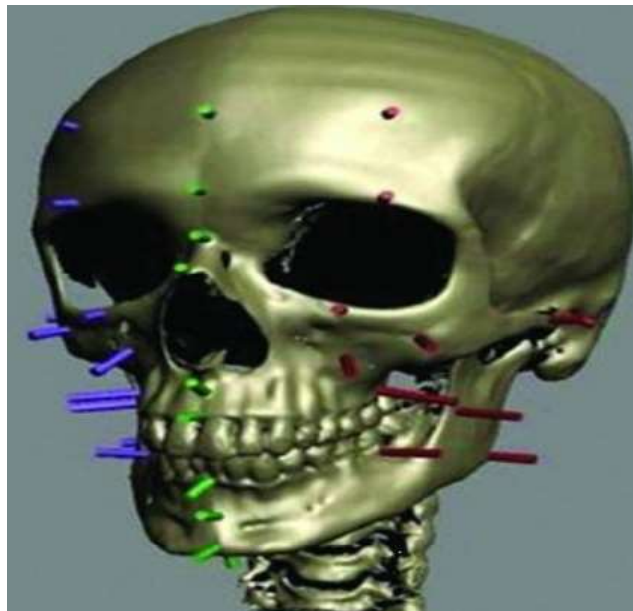

Fig 1.2 Photograph showing tissue-pegs attached to the surface of the skull at the anatomical landmarks

• Combination Manchester Method:

It is also known as the British method developed in 1977 by Neave. It is the most accepted method. Unlike the previous methods, this method takes into account measures of both soft tissue and facial muscles. The cranium and the mandible are articulated into the skull and then adjusted on a stand by placing them at 90 degrees on drilled holes. The depth is determined by age, gender, etc. The muscle is constructed by position based on the origin and insertion of the skull.

- Computerised 3D Forensic Facial Reconstruction:

These are effective and the first computer-based method. They involve the use of 3D animation software that has sensible technology to model the face on the skull. Unlike the manual techniques, when the same input was given, it would always result in producing the same output. Furthermore, it was possible to generate many faces with little variations from the same skull. Capturing of images is done by MRI (Magnetic Resonance Imaging) and CT (Computed Tomography) scanners, but recent pictures are taken by ultrasound that have the facility of giving an upright position.
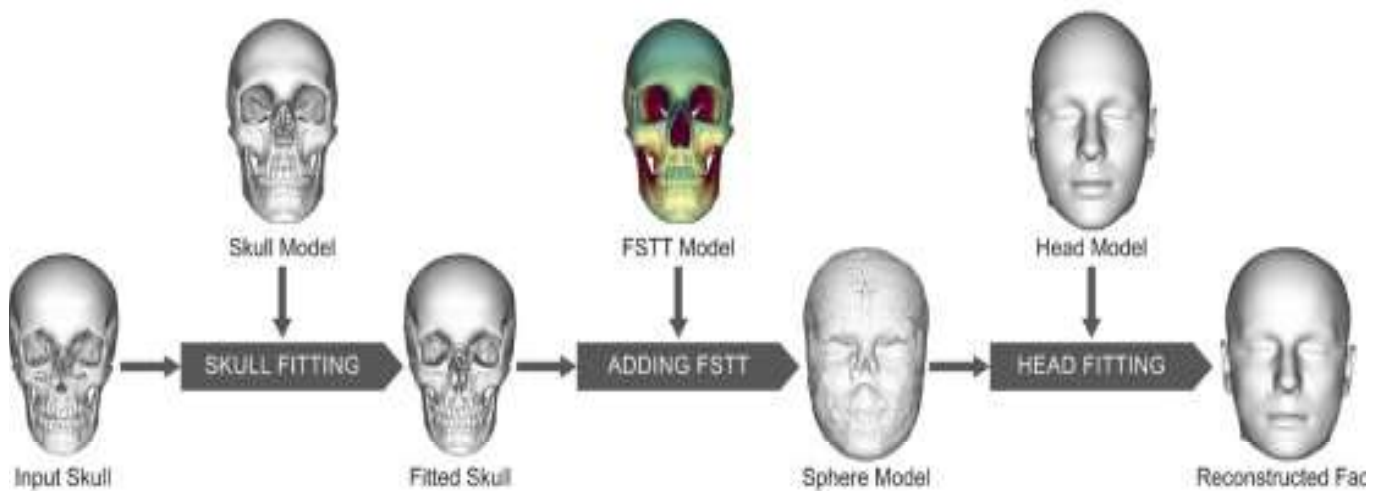

Fig 1.3 Facial reconstruction using computer software

The major disadvantage is that it causes health hazards caused by the radiation.

REFERENCES:
- George, R. M. (1987). The Lateral Craniographic Method of Facial Reconstruction. Journal of Forensic Sciences, 32(5), 11181J. https://doi.org/10.1520/jfs11181j
- Miyasaka, S., Yoshino, M., Imaizumi, K., & Seta, S. (1995). The computer-aided facial reconstruction system. Forensic Science International, 74(1–2), 155–165. https://doi.org/10.1016/0379-0738(95)01744-4

- Vanezis, P., Blowes, R., Linney, A. D., Tan, A. L., Richards, R. G., & Neave, R. (1989). Application of 3-D computer graphics for facial reconstruction and comparison with sculpting techniques. Forensic Science International, 42(1–2), 69–84. https://doi.org/10.1016/0379-0738(89)90200-4
- [Fig 1.1] Putting a Human Face on Unidentified Remains. (2017, May 2). Federal Bureau of Investigation. https://www.fbi.gov/news/stories/forensic-anthropology-puts-a-human-face-on-unidentified-remains
- [Fig 1.2] Fernandes, C. M. S., Pereira, F. D. A. de S., da Silva, J. V. L., & Serra, M. da C. (2013). Is characterizing the digital forensic facial reconstruction with hair necessary? A familiar assessors' analysis. Forensic Science International, 229(1-3), 164.e1-5. https://doi.org/10.1016/j.forsciint.2013.03.036
- [Fig 1.3] Gietzen, T., Brylka, R., Achenbach, J., Hebel, K. Z., Schömer, E., Botsch, M., Schwanecke, U., & Schulze, R. (2019). A method for automatic forensic facial reconstruction based on dense statistics of soft tissue thickness. PLOS ONE, 14(1), e0210257. https://doi.org/10.1371/journal.pone.0210257