Journal of Forensic and Legal Medicine 22 (2014) 115–120

Contents lists available at ScienceDirect

Journal of Forensic and Legal Medicine

journal homepage: www.elsevier.com/locate/jflm

Original communication

Soft tissue thickness in young north eastern Brazilian individuals with different skeletal classes

Matheus Melo Pithon, PhD Professor of Orthodontics [a,*],
Débora Laís Rodrigues Ribeiro MD Student, Academic Staff Member of Dentistry Course [a],
Rogério Lacerda dos Santos, PhD Professor of Orthodontics [b],
Cláudio Leite de Santana, PhD Professor of Radiology [a],
João Pedro Pedrosa Cruz, PhD Professor of Forensic Dentistry, Forensic Odontologist [a,c]

[a] Southwest Bahia State University, Jequié, Bahia, Brazil
[b] Federal University of Campina Grande, Paraíba, Brazil
[c] Coordination of Forensic Dentistry, Department of Technical Police of Bahia, SSPBA, Bahia, Brazil

ARTICLE INFO

Article history:
Received 11 November 2012
Received in revised form
19 September 2013
Accepted 23 September 2013
Available online 3 October 2013

Keywords:
Forensic science
Forensic anthropology
Human identification
Cephalometry
Facial reconstruction
Facial soft tissue thickness

ABSTRACT

The aim of this study was to evaluate the variation in facial soft tissue thickness in young north eastern Brazilian individuals according to gender and skeletal class. Measurements were obtained from digitized teleradiographs of 300 children, aged from 8 to 12 years, using the Sidexis Xg program. Data of mean, standard deviation, maximum and minimum soft tissue thickness values of the faces of Angle's Class I, II and III individuals, were evaluated. The results demonstrated that there was no difference in soft tissue thickness among the skeletal classes for most of anthropological points. For the Class I, statistical differences were found ($P < 0.05$) between the genders in the rhinion point, subnasal and upper lip. It was concluded that there was no difference in soft tissue thickness among the skeletal classes, except between Class II and III for the points: Stomion, Bottom lip and Pogonion, allowing definition of parameters of this population for the purpose of facial reconstruction.

1. Introduction

According to the Interpol guidelines for the identification of victims of mass disasters, in addition to being reliable and capable of being applied under conditions in the field, the methods of identification must be of a scientific nature.[1,2] The primary methods are papiloscopic analysis, comparative dental analysis and DNA exams. These are considered positive techniques, as they allow the individualization of a person, differentiating him/her from any other person.[3]

Secondary methods of identification include the description of personal characteristics, medical findings, clothing, anthropological studies, and facial reconstruction. They serve to support the process of establishing identify, and are considered presumptive techniques, as they allow a suspect to be excluded or not, but do not positively establish identity.[3]

When the remains of a cadaver are discovered after some time, facial characteristics may be presented in such a distorted form (or be absent), which makes it impossible to determine identity. Various attempts are made to identify a body, based on characteristics such as age, sex, race, stature and marks of lesions on bones.[4,5]

In some cases, distinctive characteristics of the deceased, such as polydactyl, old fracture calluses, the presence of an extra rib (cervical or lumbar) may also help in identification. These resources are useful, but do not specifically indicate that the cranium in question discovered definitely belongs to a particular person.[4,5]

In situations in which the identity of a cadaver is unknown, and especially in cases in which there are no suspects, methods such as facial approximation may help to resolve many impasses during the investigation of identity.[6] Facial reconstruction is applicable in cases in which the process of soft tissue decomposition is complete or nearing completion.

The end purpose of reconstruction is to recreate a face sufficiently similar to the one the individual had while alive, to the point of allowing a relative to recognize it.[6]

* Corresponding author. Tel.: +55 77 30842020.
E-mail address: matheuspiton@gmail.com (M.M. Pithon).

1752-928X/$ – see front matter © 2014 Elsevier Ltd and Faculty of Forensic and Legal Medicine. All rights reserved.
http://dx.doi.org/10.1016/j.jflm.2013.09.014

Contemporary facial reconstruction techniques include bidimensional or tridimensional manual, and tridimensional computerized techniques. Basically, the techniques consist of defining the depth of soft tissues in specific points of the cranium, design of the facial musculature, and determining the facial morphology.[6,7]

For definition of the depth of soft tissues in specific points of the cranium tables drawn up on the basis of population studies are used. The literature points out that these methods vary according to the ethnic group, gender and age. Nevertheless, their reliability may be prejudiced by the lack of records about the thickness of soft tissues in a specific population.[8] From this aspect, the aim of the present study was to evaluate the variation in facial soft tissue thickness in young north eastern Brazilian individuals according to gender and skeletal class.

2. Material and methods

With the purpose of obtaining the thickness of patients' soft tissues, an exploratory study with a descriptive experimental approach was developed after it was approved by the Ethics Committee for experiments involving humans – UESB, protocol CEP/0101102, in accordance with The Code of Ethics of the World Medical Association. A selection was made of 340 digital lateral teleradiographs obtained from the same radiologic center, of healthy children aged from 8 to 12 years, who consulted the Southwest Bahia State University Dental Clinic – UESB. Of these, 40 were excluded from the research, as they fell into the category covered by the exclusion criteria (use of fixed appliances and absence of permanent first molar). Therefore, the measurements were taken in 300 images, 48% ($n = 144$) of the male, and 52% ($n = 156$) of the female gender.

After obtaining informed consent from the parents, the digital teleradiographic images were used to evaluate the soft tissue thickness of faces and to classify the patient with regard to occlusal relationship.

Initially the images were classified into three skeletal classes. The types of skeletons were divided on the basis of angle ANB, which indicates the relationship between the position of the maxilla and mandible, measured as follows: (A) the deepest point on the premaxilla outline, (B) deepest point on the anterior wall of the mandibular symphysis and (N), nasion, lateral view of the most anterior point of the frontonasal suture. The three skeletal classes were classified as follows: Class I, angle ANB 2 ± 2°, Class II > 4°, and Class III, angle ANB <0°, with 100 images evaluated for each malocclusion, being: Class I (MALE = 48 and FEMALE = 52) Table 2, Class II (MALE = 50 and FEMALE = 50) Table 3 and Class III (MALE = 46 and FEMALE = 54) Table 4.

After classification, the images were opened in the Sidexis Xg program (Sirona Dental Systems, Bensheim, Germany), which served as a fundamental instrument for exact determination of the soft tissue thickness of each individual from the digital teleradiographs. The images were positioned in the program with the head facing forward and Frankfort horizontal plane parallel to the ground.

The image was handled carefully to prevent distortion of the soft tissues and had a standardized 2.150 × 2.378 pixel resolution and 24-bit depth.

The distance between the bony structures and the soft tissue was measured for each for the following anthropological points: (1) glabella; (2) nasion; (3) rhinion; (4) subnasal; (5) upper lip; (6) stomion; (7) bottom lip; (8) labiomental; (9) pogonion and (10) gnathion, respectively (Fig. 1 and Table 1).

The points were marked by the operator; the computer then constructed a line between the two points and measured the distance between the skin surface point and the point on the bone surface. These measurements were determined with the aid of the "analysis" sector, using "measure length" as the drawing tool available in the Sidexis Xg program. It should be pointed out that all the measurements were taken by the same, previously calibrated operator, for demarcation of the anthropological points and analysis of measures (Kappa = 0.79). The technical error of measurement (TEM), the relative error of measure technique (rTEM), and the coefficient of reliability (R) were performed to assess the accuracy[9–12] of this study. TEM is interpreted as the typical magnitude of error associated with a certain measurement and can be used to estimate inter and intra-observer precision. rTEM represents an estimate of error magnitude as a percentage of object size. According to Pedersen and Gore[13] the relative error of measure technique (rTEM) must be less than or equal to 5% to be considered

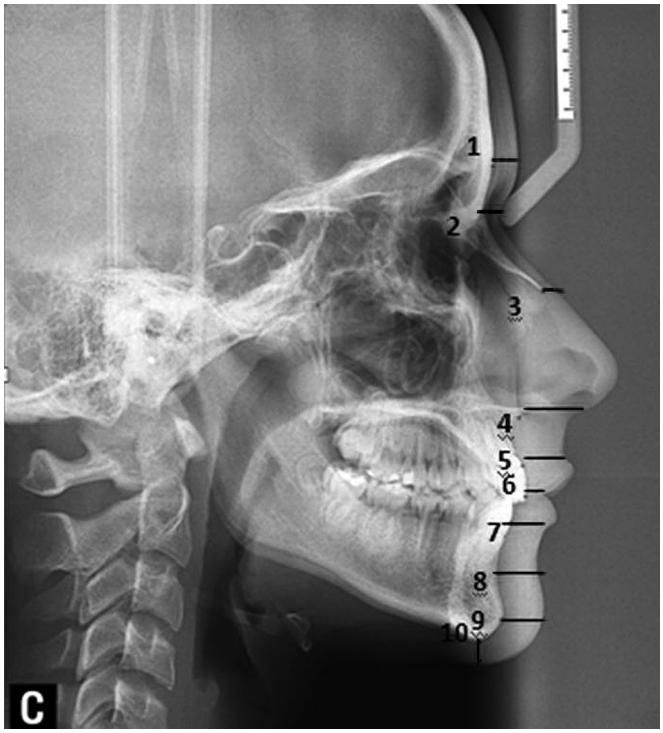

Fig. 1. Location of points used for measuring facial soft tissue thickness: (1) glabella; (2) nasion; (3) rhinion; (4) subnasal; (5) upper lip; (6) stomion; (7) bottom lip; (8) labiomental; (9) pogonion and (10) gnathion.

Table 1
Concepts with reference to structures traced and used.

Concepts	
1. Glabella	Area from the most prominent point between the supraorbital crests to the corresponding soft tissue.
2. Nasion	Area from the midpoint between the frontal bone and orbital nasal bones to the corresponding soft tissue.
3. Rhinion	Anterior point of the nasal bones
4. Subnasal	Area from the most prominent point of the anterior nasal spine to the corresponding soft tissue.
5. Upper lip	Area from the most internal region to the most external region of the upper lip.
6. Stomiom	Area from the midpoint of the oral cavity to the corresponding soft tissue.
7. Bottom lip	Area from the most internal region to the most external region of the bottom lip.
8. Labiomental region	Area from the point below the bottom lip to the corresponding soft tissue.
9. Pogonion	Area from the most prominent point of the mandibular symphysis to the corresponding soft tissue.
10. Gnathion	Area from the most inferior point of the mandibular symphysis to the corresponding soft tissue.