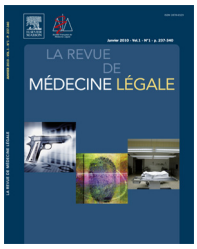
La revue de médecine légale (2016) 7, 144—152

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com



ORIGINAL ARTICLE

# Estimating the skeletal age from two and three-dimensional computed tomography reconstructions of the pubic symphysis and the fourth rib

## *Estimation de l'âge osseux à partir de reconstructions 2D et 3D tomodensitométriques de la symphyse pubienne et de la 4e cote*

**N.I. Trodi [a], N. Jomaah [b], G. Koch [c], Z. Alavi [d], S. Aho [e], D. Ben Salem [f,*,g]**

[a] *Radiologie et imagerie médicale, CHU de Grenoble, 29, avenue du Maquis-du-Gresivaudan, 38701 La Tronche, France*
[b] *Aspetar-orthopaedic and sports medicine hospital, Sports City Street, Al Buwairda St., Doha, Qatar*
[c] *Imagerie interventionnelle oncologique et viscérale, CHU de Strasbourg, 1, place de l'Hôpital, BP 426, 67091 Strasbourg cedex, France*
[d] *Inserm, CIC 1412, hôpital La Cavale Blanche, CHU de Brest, Brest, France*
[e] *Service d'épidémiologie, CHU de Dijon, 2, boulevard Maréchal-de-Lattre-de-Tassigny, BP 77908, 21079 Dijon cedex, France*
[f] *Neuroradiologie et imagerie médico-légale, hôpital La Cavale Blanche, boulevard Prigent, 29609 Brest cedex, France*
[g] *Inserm UMR 1101, Latim, Hôpital Morvan, CHU de Brest, 29609 Brest cedex, France*

Available online 10 October 2016

**KEYWORDS**
Age estimation;
Fourth rib;
Computed tomography;
Pubic symphysis

**Summary**
*Objectives.* — To determine the correct age in legal procedures is paramount in obtaining the age of majority. This study was designed to prioritize a reliable postcranial age estimators capable of accurately assessing ages around 18 years.
*Methods.* — In this retrospective study, we used a two-step procedure (Işcan—Loth and Suchey—Brooks methods) to estimate the age range. CT test sample included 102 pubic symphysis and sternal end of the 4th ribs from male individuals aged from 13.5 to 87 years (median: 20.3). Two-D and 3D-CT reconstructions were performed. Analysis of the correlation between our age range estimation and the chronological age was performed using the Pearson, Lin, and Kappa coefficients and Bland—Altman analysis.

* Corresponding author.
*E-mail address:* douraied.bensalem@chu-brest.fr (D. Ben Salem).

http://dx.doi.org/10.1016/j.medleg.2016.09.001
1878-6529/© 2016 Elsevier Masson SAS. All rights reserved.

*Results.* — In our study, we reported 97% of subjects for whom the estimate of their age compared to legal age of 18 years was feasible through this method. The Kappa coefficient between our age estimation compared to the legal age was 0.905.
*Conclusions.* — Estimation of the legal age through CT scan, of the pubic symphysis and the distal end of the 4th rib, seems reliable and well correlated with whether the individual has more or less 18 years old.
© 2016 Elsevier Masson SAS. All rights reserved.

**MOTS CLÉS**
Estimation de l'âge ;
4e cote ;
Tomodensitométrie ;
Symphyse pubienne

**Résumé**
*Objectifs.* — Déterminer l'âge précis lors des procédures médico-légales est important vis-à-vis du critère de minorité ou de majorité d'un individu. Cette étude vérifie la fiabilité « d'estimateurs osseux » post-crâniens autour de l'âge de 18 ans.
*Méthodes.* — Dans ce travail rétrospectif, nous avons eu recours pour l'estimation de la fourchette d'âge à une procédure en 2 étapes (méthodes d'Işcan—Loth et de Suchey—Brooks). Cent deux scanners de la symphyse pubienne et de l'extrémité sternale de la 4e cote ont été étudiés chez des individus de sexe masculin âgés de 13,5 à 87 ans (médiane : 20,3 ans). Des reconstructions 2D et 3D ont été effectuées. L'analyse de la corrélation entre notre estimation de la fourchette d'âge et l'âge chronologique est réalisée à l'aide des coefficients de Person, Lin et de Kappa, ainsi qu'à l'aide d'une étude de type Bland—Altman.
*Résultats.* — Dans cette étude, l'estimation de la fourchette d'âge par rapport à l'âge de la majorité de 18 ans est faisable dans 97 % des cas. Le coefficient Kappa entre notre estimation de l'âge et l'âge de 18 ans est de 0,905.
*Conclusion.* — L'estimation de l'âge légal à travers le scanner de la symphyse pubienne et de l'extrémité distale de la 4e cote semble fiable et bien corrélée avec le fait que l'individu ait plus ou moins de 18 ans.
© 2016 Elsevier Masson SAS. Tous droits réservés.

## Introduction

The estimation of age, a concept much used in forensic practice, is the milestone in the procedures of identifying corpses. It allows the application of relevant laws when the chronological age of the individual is unknown [1]. Specifically, the determination of adolescence and young adult foreigner age may prove necessary to define the rights and protections that they are entitled to according to their come to age legal status [2]. Currently, when we do not have the calendar age of an individual, its estimation then is based primarily on the recommendation of the international interdisciplinary Study Group on Forensic Age Diagnostics (AGFAD) [2] witch recommend:

- the general clinical examination;
- an X-ray examination of the left hand;
- the dental examination, with an X-ray examination of the dentition.

If the skeletal development of the hand is completed, an additional examination of the clavicles should be carried out: CT scan and/or X-ray examination.

The reliability of the Greulich and Pyle method may vary from an ethnic group to another for some age range [3], this is why the Forensic Anthropology Society of Europe highlight the idea to standardize or not this method according to the specific population [4].

The current state of knowledge and technology in determining the age of a young adult involves a high degree of inaccuracy. The most uncertainty lies between 15 and 20 years [5].

Our study aimed to assess the age in a general male population, especially around 18 years. For this estimation, we used two current and validated methods in anthropology and forensic medicine, to estimate the most accurate young adult age.

These techniques using dry bones are based on two joint sites known to have late maturing:

- the pubic symphysis for the Suchey and Brooks system [6];
- the sternal end of the 4th rib for the Işcan and Loth method [7].

We sought to implement these two validated post mortem methods for estimating age in the living through reconstructions from computed tomography (CT) scan. The ability to perform 3D-CT reconstructions to analyze bones has already been used on dry bones or autopsies samples [8,9], and recently this technique has also been performed in living patients but only on the first rib [10].

Thanks to the different age ranges obtained by these methods, we tried to accurately estimate the age of an individual whose calendar age was unknown, especially around the young adult age.

## Materials and methods

### Population

Our sample of 102 patients, aged from 13.5 to 87 years, were included retrospectively during a 6-month period from the Picture Archiving and Communication System (PACS) of a

Download English Version:

https://daneshyari.com/en/article/7532404

Download Persian Version:

https://daneshyari.com/article/7532404

Daneshyari.com