

## **Age Determination of Illegal Immigrant**

### **Accertamento dell'Età Biologica in Immigrato Clandestino**

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Lavoro presentato al I Congresso Nazionale della Società Scientifica COMLAS. Siena 9-10-11 Ottobre 2014.

Paper presented at the I National Meeting of the Scientific Society COMLAS. Siena, Italy, Oct. 9-10-11, 2014.

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#### **Riassunto**

A causa dell'aumento globale dei movimenti migratori negli ultimi anni, vi è una crescente domanda per le stime di età anagrafica di persone viventi. Solitamente la determinazione dell'età anagrafica deve valutare la probabilità che la persona esaminata abbia raggiunto una specifica soglia di età giuridicamente rilevante. Le persone sottoposte a siffatte indagini sono per lo più stranieri, non in possesso di validi documenti identificativi, che non conoscono la loro data di nascita o non indicano la loro vera età, ma la cui età deve essere determinata nel corso di procedimenti penali e civili, per asilo politico o ai fini dell'imputabilità e dell'applicazione di pene e misure di sicurezza.

Gli Autori riportano il caso di un giovane detenuto presso l'Istituto Penale per Minorenni di un capoluogo siciliano che aveva commesso un grave crimine, asseriva di avere 15 anni e sembrava un minorenne. Egli non aveva alcun valido documento di identità e quindi fu necessario determinare la sua età biologica.

In questo studio, per la determinazione dell'età biologica, si è proceduto al rilievo di misure antropometriche, esame radiologico e analisi della documentazione clinica.

Parole chiave: Accertamento dell' Età, Minorenne

#### **Abstract**

In recent years there has been a worldwide increase in cross-border migration mainly due to a globalized economy and to ongoing war conflicts. This has brought to a growing demand for forensic medicine to assess the age of living persons. People under examination are mostly foreigners, without valid identification documents, who do not know their age or else are

suspected of not giving their correct age and whose genuine age needs to be clarified in the course of criminal, civil or asylum proceedings.

We report a case of a young inmate at the Institute for Juvenile Criminal who had committed a serious crime. He asserted to be 15 years old and looked like a young boy. He did not have any valid document and it was necessary to ascertain his age. In this study, anthropometric measurements, radiological examination and the analysis of clinical documentation were carried out for the age determination.

**Keywords:** Age determination, Juvenile

## INTRODUCTION

In the field of law, for the purpose of traceability and the application of penalties and security measures, often the need arises to determine the chronological age in immigrants which have made criminal offense<sup>1</sup>. To this purpose, in addition to the assessment of general morphological anthropometry features, such as height, weight and overall body development, with regard to the thoracic-abdominal perimetry, the opening of the arms, the degree of sexual maturation and other indexes (variables during growth), it is of particular importance the skeletal age assessment. To this end the data taken from radiological examination of the skeleton are essential. These data together with the odonto-stomatologic examination, constitute the basis for the estimation of age within the first 20-25 years of life; particular attention has to be given to the appearance of the nuclei of ossification and to the ossification of the cartilages of conjugation (which occurs at the end of skeletal development) and to the degree of mineralization and the time of tooth eruption.

## CASE REPORT

The authors report a case of a young inmate at the Institute for Juvenile Criminal who had committed a serious crime. He asserted to be 15 years old and looked like a young boy and that had committed a serious crime. For the purpose of the application of penalties and security measures, it was necessary to determine the chronological age of the boy.

The clinical documentation of the prisoner highlighted previous episodes of self-harm, an immature personality and a considerable emotional instability, deflection of mood, thought characterized by rigidity and repeatability.

The prisoner was visited, and the general morphological anthropometry features were carried out together with the instrumental tests, such as comparative RX examination of the wrists and hands and orthopantomographic examination.

He was helpful during the interview, despite the language difficulties, and cooperative during the execution of anthropometric measurements. He seemed childish, with notes of deflection of mood.

The prisoner presented symmetrical facial features, in good nutrition. He had normo-elastic, normo-trophic olive-brown skin, black hair, dark eyes, rosy and well moistened mucous membranes; normal adipose tissue, normo-tonotrophic muscle mass. The reproductive system was normal-developed; pubic and armpit hair was poorly represented.

The results of the anthropometric examination of the prisoner are shown in Tab. 1. The weight was 65 Kg.

Radiographic examination of the hands and forearms (Figure 1) did not reveal nor the epiphyseal nuclei of the base of the phalanges, nor those of the metacarpal bones; in correspondence of the radio, a thin radiopaque part indicated the presence of a residue of the bottom epiphyseal center; the ulnar lower epiphyseal nucleus of ossification was not present.

The orthopantomographic examination revealed all the teeth, including the third molars, the roots and the pulp chambers of all the elements.

## DISCUSSION

In forensic science, age determination of bodies and unknown skeletal remains for the purpose of personal identification has a long tradition, however, the determination of the age of subjects in life is relatively recent, but with growing interest<sup>1</sup>. The determination of age is based on the genetic control of the ontogenesis process, which delimits the variation over time of the developmental stages. The general morphological anthropometry features, such as height, weight and overall body development, with regard to the thoracic and abdominal perimeter, the opening of the arms, the degree of sexual maturation and other indexes, vary during growth.

In males the characteristics of the testes, scrotum and penis, prostate, pubis and armpits hair, the timbre of his voice are taken into account.

The data of radiological examination of the skeleton have a great importance and, in combination with the odontostomatologic examination, is the basis for age estimation within the first 20-25 years of life.

The most reliable valuation parameters are represented by the appearance of

ossification centers in the first decade, the time of the welding of the ossification centers and the joint of the epiphysis to the shaft of long bones in the second decade.

In the forensic field, the radiographic examination is carried out on some bone segments: distal epiphysis and medial epicondyle of the humerus, distal epiphysis of the radius and ulna, metacarpal bones, the first three phalanges of the hand, calcaneal apophysis of the tibia, the first three metatarsal bones and phalanges of the foot. The assessment of the degree of ossification of wrist and hand is one of the main pillars of the radiological diagnosis of age in children and adolescents. The results are, in fact, accurate and reliable and the exposure to radiation is limited<sup>2</sup>.

If the X-ray examination of the district hand-wrist detects a full skeletal development, it is also suggested to perform further a chest X-ray for the analysis of the medial epiphysis of the clavicle<sup>3</sup>. Other relevant information for the determination of age is a sequential study of dental development, feasible since the beginning of mineralization of dental buds until the end of the eruption of the last permanent teeth. During the whole of life, the dental structures undergo continuous modifications and alterations, in relation to the action of both endogenous and exogenous factors. In this context, the radiological approach is the method of choice. The examination of the dental status concerns in particular the evaluation of the size of the pulp chamber, as well as the presence and morphology of the third molars.

Until a few years ago, the valuation standards were represented by individuals of the white race, mostly Americans of the United States and Europeans of the North and Center of the Continent, but in recent literature it is found that skeletal maturation is achieved through identical stages for all races: only the conditions of nutrition and socio-economic status<sup>4</sup> may affect the ossification and rate of skeletal maturity<sup>5</sup>. By the way, this condition has been largely superseded by the removal of geographical and cultural boundaries and integration between the various breeds.

This approach can be considered for the subject in question, who has a constitution that comes close to European type, a good nutritional state and normotrophic muscle mass.

As reported by Schmeling<sup>6</sup>, if the methods of interpretation of X-ray examinations are applied to individuals of lower socioeconomic status compared to the reference population, they can only lead to an inadequate assessment of the age with a margin of error (if that can be considered) that does not exceed 12 months.

As reported by Mezzogiorno<sup>7</sup>, from the relation:

$$\frac{\text{Sitting height x 100}}{\text{total height}}$$

the cormic index of Giuffrida-Ruggeri-Vallois can be obtained, which is useful to establish the trunk-arms relationship and to determine the potential physical aptitude of individuals: in this case the value of this index (equal to 52.6) states that the examined subject belongs to the category of individuals with medium bust, between 51 and 53.

As reported by Di Giovanni<sup>8</sup>, the value of the grand opening equals that of the height; however, an excess of the grand opening on the height of 5-10 cm can be considered normal in humans. In the present case, the surplus between the two values is 1.0 cm, and then, below the lower extreme of the range reported above. The perimeter of the chest is essential to determine the constitution of a subject. According to the aforementioned fee of Di Giovanni, it must be equal to half of the stature; in this case, the value reported (88 cm) is 1.5 cm higher than to half the height.

The transverse diameter of the chest corresponds to the bone width of the shoulders and it is important for the determination of the constitutional types, it oscillates between 37 and 41 cm, in the men. In this case, it is 33 cm, 4.0 cm lower than the lower value of the range given for the male.

The shoulder width index is obtained from the relationship:

$$\frac{\text{biacromial width X 100}}{\text{total height}}$$

In this case, it is 19, which correspond to an individual with narrow shoulders (lower than 22).

The index of the perimeter of the head is obtained by the following equation:

$$\frac{\text{Perimeter of the head x 100}}{\text{height}}$$

and the mean value is 34 but in this case it is 31.7 (difference = 2.3) and, hence the difference with the reference value is big, especially if compared with the height.

Basing on the above considerations, on the visit of the prisoner and on the data obtained from the examination of the radiographic examination, the authors affirm that the subject is integrated with the Somali type whose mean stature (adult male) is 175.0 cm.

The literature data indicate that Somalian genetic type (which determines the phenotype) is more similar to Arabian or Caucasian than the African one. It was

found that the subject had presumably reached skeletal maturity. It was possible to interpret the radiographic examinations assessing the reabsorption of ossification centers (index of the reached skeletal maturity) as reported in the texts of Radiology and Human Anatomy, comforted by the absence of major differences between the four major racial groupings and the theory outlined above, for which the subject of this study has anthropometric characteristics that assimilate him to European individuals of similar age.

### **CONCLUSION**

As recommended by the Forensic Age Diagnostics Study Group (AGFAD)<sup>9</sup>, the assessment of the age of living people for forensic purpose should be carried out by physical examination, by anthropometric data survey, X-ray examination of the left hand, odonto-stomatologic and orthopantomographic examination. The results of these examination should be analyzed together to increase the accuracy of the age estimation. The genetic and geographic origin and the socio-economic state should also be taken in consideration. If necessary, other important information can be obtained by neuropsychiatric examination.

In conclusion, despite the direct examination of the prisoner and the issues raised in the interview showed that the subject had not yet reached the age of majority, the anthropometric data and the skeletal maturity allowed to attribute to the subject the age of 20 years.

Table 1. Anthropometric data

			Cm	
Height			173.0	
Sitting height			91.0	
Leg length			92.0	
Transverse diameter of the chest			33.0	
Thoracic perimeter			88.0	
Functional extension		Closed palm	72.0	
		open palm	84.0	
Neurocranium	glabella-opistocranium length		19.3	
	Transverse diameter of the head		15.4	
	Maximum diagonal from the head to the chin		24.8	
	Head circumference		55.0	
Splanchnocranium	Total height of the face		16.4	
	Root nose-chin length		12.2	
	Eyes distance	from the left outer canthus to the right outer canthus		9.8
		from the right inner canthus to the left inner canthus		3.3
	lips width		5.6	
	lips thick		2.6	
	Subnasal-gnation distance		6.7	
	Nose height		4.0	
	Nose thickness		2.0	
	lips-glabella distance		7.9	
	Upper limbs	Grand opening		172.0
plug-elbow length		Right and left	49.0	
plug-wrist length		Right and left	55.0	
acromion humeroradial spacing		Right		60.0
		Left		59.5
Arm length up to the radial styloid process		right and left		28.0
Hand		right hand length		19.0
		right hand circumference		23.2
		3rd finger width of the right hand		19.0
		left hand length		19.0



Figure 1. Radiographic examination of the hands and forearms

## REFERENCES

- 1 Schmeling A., Geserick G., Reisinger W., Olze A.: *Age estimation*. Forensic Science International 2007; 165: 178-181.
- 2 Cameriere R., Ferrante L., Mirtella D., Cingolani M.: *Carpals and epiphyses of radius and ulna as age indicators*. Int. J. Legal Med. 2006; 102: 143.
- 3 Schemling A., Grundmann C., Fuhrmann, Kaatsch H.J. et al.: *Criteria for age estimation in living individuals*. Int. J. Legal Med. 2008; 122: 457-460.
- 4 Schmeling A., Schulz R., Danner B., Rösing F.: *The impact of economic progress and modernization in medicine on the ossification of hand and wrist*. Int. J. Leg. Med. 2006; 120: 121-126.
- 5 Schmeling A., Olze A., Reisinger W., Geserick G.: *Forensic age diagnostics of living people undergoing criminal proceedings*. Forensic Science International 2004; 144: 243-245.
- 6 Schmeling A., Reisinger W., Loreck D., Vendura K., Markus W., Geserick G.: *Effects of ethnicity on skeletal maturation: consequences for forensic age estimations*. Int. J. Legal Med. 2000; 113: 253-258.
- 7 Mezzogiorno V.: *Morfotipologia Umana*. Piccin Editore, 1981.
- 8 Brian L., Anaclerio M., Rossi P.: *Tipi fisici e temperamenti umani*. Piccin, Padova, 1987.
- 9 Schmeling A., Kaatsch H-J., Marré B., Reisinger W., Riepert T., Ritz-Timme S., Rösing FW., Röttscher K., Geserick G.: *“Guidelines for Age Estimation in Living Individuals in Criminal Proceedings”*, 2000.