

# Forensic dental investigations and age assessment of asylum seekers

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Age estimation is useful in forensic investigations to aid in the process of identifying unknown victims as well as living individuals. In many countries age estimation is commonly used to assist immigration authorities in deciding whether refugees or illegal migrants have reached that designated age that separates a juvenile from an adult. This is particularly important for the protection of unaccompanied minors. Italy is a country of great appeal for immigration as people from other Mediterranean countries can easily reach Italian coasts. In Italy, as in other western world countries, unaccompanied asylum seekers deemed to be under 18 face a very different path through the immigration system. They cannot be deported and are sent through a juvenile system where they have access to education programmes and may be granted a residence permit. The Section of Legal Medicine of the University of Bari was approached by Judges and Immigration Police with the question to assess the age of unaccompanied asylum seekers who claim to be below 18 years of age. The contribution of forensic odontologists for age estimation was recognised and since November 2006 age estimation of asylum seekers in Bari (Italy) relies on clinical and dental examination together with skeletal maturation as seen on radiographs of the left hand and wrist, the pelvis for iliac crests and root development and mineralisation of third molars as seen on an orthopantomogram.

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The increasing volume and complexities of migratory flows, in the broader context of globalisation, have led to a range of problems such as protection, human rights and illnesses but also identification of people with the right to apply for refugee status, age assessment for unaccompanied minors during the registration process and identification of immigrants who have died at European frontiers<sup>1</sup>.

Asylum-seekers often arrive without documents or with false documentation as they may have had to face persecution in their country of origin. For this reason they are frequently compelled to travel without documents or with forged documents to reach a potential country of asylum.

Countries receiving the largest number of new asylum claims during 2004 were France (58,500), United Kingdom (40,200), Germany (35,600), United States (27,900), South Africa (32,600), Canada (25,800), Austria (24,600) and Sweden (23,100).

The largest number of new arrival and appeal asylum claims were filed by nationals from Russian Federation (35,200), Serbia and Montenegro (30,900), China (29,000), The Democratic Republic of Congo (28,700), Turkey (27,000), Iraq (23,500), Somalia (22,800), Colombia (20,200), Nigeria (18,300), Iran (15,500), India (15,300) and Pakistan (15,300).

Italy is, however, a Country of great appeal for immigration as the Mediterranean countries around Italy can easily reach Italian coasts, especially during the summer season<sup>2-7</sup>.

There are four hot spots on the Mediterranean Sea: the Sicilian Channel, along the route from Libya and Tunisia towards Malta; Lampedusa; the coast of Sicily; Morocco towards Spain, crossing Gibraltar or in the direction of the Canary Islands in the Atlantic Ocean.

Without entering into a deep legal dissertation on immigration and migrants in Italy, which would require a separate paper, it is important to highlight that migrants

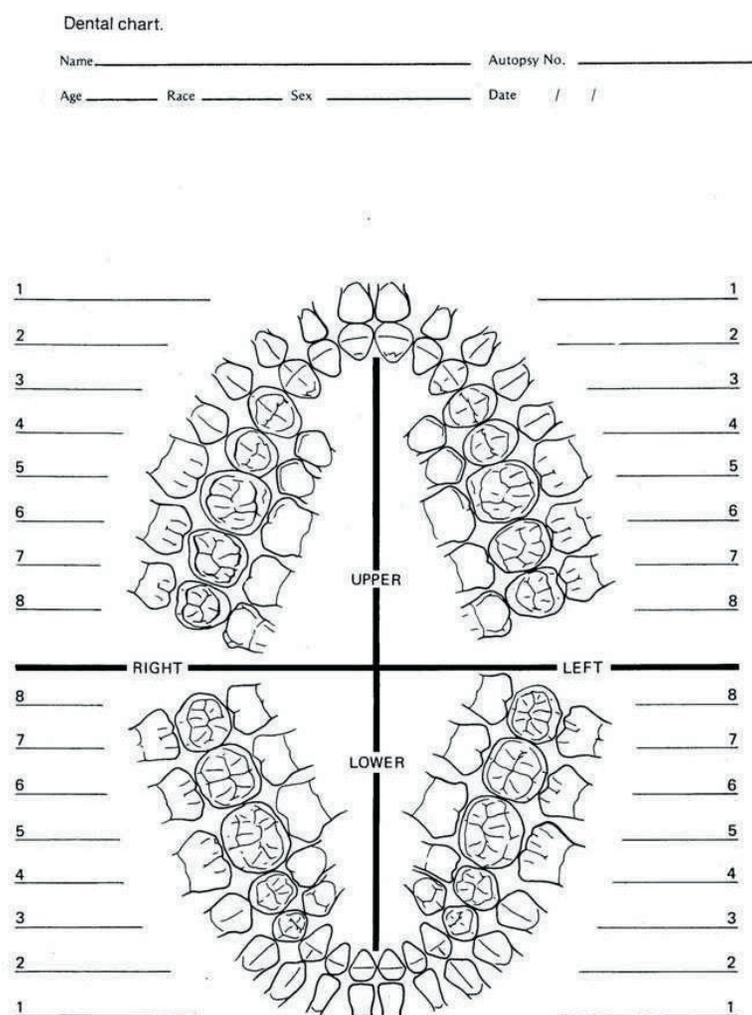
examined by us are defined 'irregular', i.e. foreigners without a legal right to remain in Italy (for example residence permit for study, work or medical treatment).

Depending on the gravity of the unlawfulness the immigrant receives an exclusion order from the Prefect, compelling him to leave the State immediately, either accompanied by the police or autonomously. Only in situations where it is not possible to accompany the illegal immigrant, owing to a police unit not being available, or because it has not been possible to identify him through the referring embassy, is the immigrant retained in a Temporary Reception Centre. Also when a foreigner is found without legal documents crossing the State border or in territorial waters, he receives an exclusion order from the Prefect and is retained in a Temporary Reception Centre. There is a 60 day period in which these exclusion orders can be challenged. Since the provisional administrative detention is comparable to 'arrest', a Judge must determine if this is in accordance with the law within 48 hours.

A different path is faced through the immigration system in Italy, as in other Western countries, by ir-

regular migrants deemed to be under 18. Age, together with other provisions within the law, is one reason why a minor might not be excluded. Minors are processed through the juvenile system, where detection is not mandatory, and often have access to education programmes, and may be granted leave to remain. A Judge in the Juvenile Courts verifies the migrant's age after they undergo a medical legal assessment.

The Section of Legal Medicine of the University of Bari was approached by Judges and Immigration Police with questions about how to assess the age of unaccompanied asylum seekers who claim to be below 18 years of age. A forensic investigation contribution by forensic odontologists was recognised for age estimation which had previously been performed only by forensic pathologists and/or radiologists. Since November 2006 age estimation of asylum seekers in Bari (Italy) have relied on clinical and dental examination together with skeletal maturation as seen on radiographs of the left hand and wrist, the pelvis (for iliac crests) and the root development and mineralisation of the third molars as seen on an orthopantomogram.



**Figure 1.** Dental findings chart (American Society of Clinical Pathologists)

## Forensic investigations

Forensic pathologists and odontologists start the age assessment with an interview for background information, with the help of a translator. A clinical, dental and radiological examination is then performed. Weight, height and other clinical findings like secondary sex characteristics, scars, burns, tattoos and abnormalities in general are registered on a standard form. Oral mucosa and teeth are then examined, with caries, restorations, diastemas, teeth displacements and degree of attrition registered on an odontogram form (*Figure 1*). The dental examination ends with a visual assessment of the age based on the teeth present.

After the clinical and dental examination, radiographs are recorded of the hand and wrist, pelvis (for iliac crests) and third molars using digital X-ray devices (*Figures 4-7*). Before taking the radiograph of the hand the individual is asked to write his or her name to assess if they are left or right-handed. Furthermore on those individuals whose physical and somatic growth suggested an age below 18, it was decided to perform only two instead of three radiographic examinations, i.e. left hand and OPG. The dental age of the individual was calculated from the root development and mineralisation of third molars using tables from South Africa by Harris and Nortjè (*Figure 8*) and from Sweden by Kullmann *et al.* and from Moorrees-Fanning *et al.*<sup>8-11</sup>.



**Figure 2.** Case KW, radiograph of the left hand (age under 18).



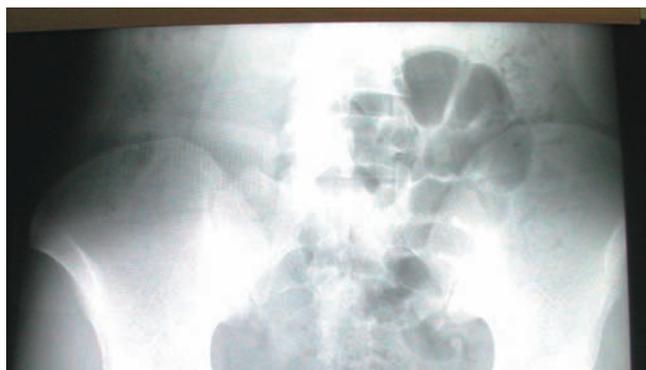
**Figure 3.** Case KW, radiograph of the medial clavicles (age under 18).



**Figure 4.** Case KW, orthopantomogram (age under 18).



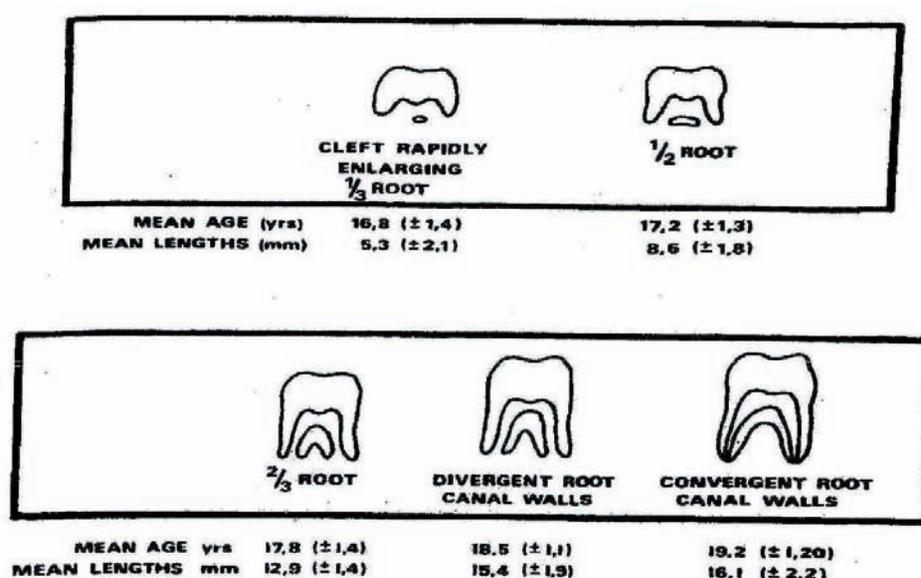
**Figure 5.** Case MM, radiograph of the left hand (age over 18).



**Figure 6.** Case MM, radiograph of the medial clavicles (age over 18).



**Figure 7.** Case MM, orthopantomogram (age over 18).



**Figure 8.** The 5 stages of mandibular third molar root development with corresponding mean ages and mean lengths (Harris and Nortjé<sup>8</sup>).

The final age estimation is obtained through an expert opinion based on evaluation of all examination data, radiologist reports and image evaluation<sup>12</sup>. The use of multiple radiological assessments and clinical findings not only fulfils the urgent request of the Court order (minors have legal rights not to be detained as adults in the Temporary Reception Centre) but also increases the precision and accuracy of the final expert opinion on age estimation.

## Discussion

Dental and bone testing procedures are used by physicians, anthropologists and dentists to assess the age of these young immigrants. The methods used rely on the skeletal maturation as seen on radiographs of the hand or the ilium and on the dental maturation and root development of third molars and other teeth. Unfortu-

nately these tests do not necessary reflect the accurate chronological age. In fact the standard deviation in these tests can be as much as three years, which is a very large margin of error when considering the attempt to distinguish an adult or a minor<sup>13-16</sup>.

The age estimation process applied is the extrapolation of different expert opinions - medical, dental and radiological - combined with three different radiological assessments.

The skeletal maturity is assessed considering the ossification centres and union of epiphysis as they have precise sequences of development. For this reason radiological assessment of the left hand and the pelvis represents one of the best known methods to assess skeletal age in a living individual<sup>13</sup>. Since ossification centres fuse at different times and considering the clinical examination of potential minors, it was decided to consider only those which fuse between 15 and 20 years of

age. For this reason Fels' method and radiological atlas were used to evaluate hand, ilium and both trochanters centres of ossifications<sup>13,17</sup>.

For purposes of dental age estimation it was decided to consider eruption, mineralisation and root development of third molars as shown on the orthopantomogram combined with a dental examination. The techniques employ a visual guide to establishing the level of crown and root development and then an uncomplicated scale for mean age estimation based upon analysis of the development of third molars.

Dental age research suggests that children of different racial and ethnic backgrounds may well develop bones and teeth in a somewhat different manner. Some systemic conditions can cause delay in tooth eruption, while extraction of permanent teeth will cause the earlier eruption of teeth posterior to those extracted. Unfortunately most studies on wisdom teeth calculate only probabilities for an individual to be under or over 18 and do not reach 100% confidence<sup>19,20</sup>.

It is known that there is a margin or error in all age estimation methods, due to human development and there is not complete data for all ethnic groups. For this reason more observational data in the countries where refugees come from is needed, in order to assess the correction parameters to be used in dental and skeletal age estimation formulas.

Nevertheless the methods employed lead to a margin of error in favour of the minor age, and for this reason ethical principles are respected. The ethical codes of the medical and dental professions suggest that one should give a child the benefit of the doubt if the exact age is uncertain.

## Conclusions

The age estimation of unaccompanied minors is a fundamental principle of human rights and human dignity. The method or methods for age estimation can vary for a specific case. It is the authors' opinion that a possible increase in accuracy of age estimation process can be achieved only using multiple age indicators. In order to achieve and maximise effectiveness of the age assessment process more emphasis in the role of the forensic odontologist is needed, promoting co-operation among forensic pathologists and radiologists. In practical case work all available methods should be considered involving forensic dental techniques for the most accurate results.

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