Radiological Assessment of the Carpal Bones Maturation and the Appearance of the Ossification Centres Among Egyptian Children

Joseph Aziz 1, Michael Morgan 2
1 Unitec Institute of Technology, Auckland, New Zealand
2 Cairo University, Cairo, Egypt

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INTRODUCTION AND AIM OF THE WORK

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• Bone age determination is usually performed by comparing the plain radiograph film of the left wrist and hand of a patient with findings in a normal reference population (Rikhasor et al., 1999).

• The Greulich-Pyle atlas is the most commonly used reference for bone age assessments throughout the world (Chiang et al., 2005).

• Bone age assessment is frequently performed in children and adolescents for the evaluation of growth and the diagnosis and management of endocrine disorders and pediatric syndromes (Boecha and Lee, 2007).

• Skeletal maturity assessment plays an important role in confirming the diagnosis of normal variants of growth such as familial short stature and constitutional delay of growth (Spadoni and Cianfarani, 2010).
Greulich-Pyle atlas assumes that in healthy children, skeletal maturation is uniform and all bones have an identical skeletal age and the appearance and subsequent development of ossification centers follow a fixed pattern (*Gilsanz and Ratib, 2005*).

In Egypt, Greulich-Pyle Atlas is also used in a wide scale both in clinical practice as well as in research works concerning determination of skeletal maturity and growth disorders.

The aim of the current work was to monitor the ossification of the carpal bones among Egyptian children of both sexes and to evaluate the need for some modification of the currently used standards to enhance the ability to determine skeletal maturation with accuracy, reliability and consistency in Egypt.
MATERIAL AND METHODS
Material: Plain radiographs of the left wrist and hand were obtained from 337 children (173 males and 164 females) aged from two months to 18 years who came to the emergency and orthopedic outpatient departments because of suspected trauma, Cairo University Hospital and Al-sahal Teaching Hospital during the period from June 2017 to February 2018.

Methods: The children were divided into two groups; group A (males) and group B (females). The obtained radiographs were assessed for estimation of age of appearance of ossification centers of the carpal bones and the subsequent morphological changes of each individual bone during development till full maturity. Any sex difference was evaluated.
RESULTS

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It was noticed that there was no significant sex difference in the age of appearance of the ossification centers of the capitate, hamate, triquetrum and lunate.
All the carpal bones showed a significant sex difference in the age of their full maturity where the females preceded males by one to two years.
With the advance of age, each carpal bone acquired its specific morphological characteristic till reaching its adult configuration. These changes were attained as a result of reciprocal shaping of the carpal bones to each other, to the bases of the metacarpals and to the radial and ulnar epiphysis. The time of occurrence of these morphological changes for each carpal bone was determined.
Comparing the obtained data and values with the corresponding data mainly presented by the Greulich-Pyle American standard in addition to other countries, several differences were found regarding the time of appearance of carpal bones ossification centers, time of occurrence of the morphological changes and time of reaching the adult contour.

The results of the current study suggested that Egyptian children may have a different tempo of skeletal maturation during development from those children of other countries.
CONCLUSION
In the light of the current study it could be concluded that an establishment of a special national standard is needed to evaluate the skeletal maturation in Egypt.

The standards currently available are based mainly on historical series of radiographs from particular populations.

The national standards should be established and updated regularly if bone ages are to be used to assess development.
THANK YOU

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