

Utility of Multidetector CT Images in Age Assessment from Iliac Crest Ossification: A Preliminary Study

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Abstract

Forensic age estimation is one of the concerns in living individuals especially in pubertal and post-pubertal age group. An evaluation of iliac crest using conventional projection radiography or digital radiography is common practice. However, recently few researchers have used sonography and magnetic resonance imaging for forensic age estimation with comparative results. The aim of present pilot study is to evaluate use of multidetector CT images for iliac crest ossification. In the present study the Risser sign grading system was used. Total 56 tomograms were included consisting of 35 male and 21 female. The age group was from 11 years to 23 years. Considering the present study, fusions of iliac crest with ilium occurs earlier in females than males and are in agreement with other studies. Present study finds multidetector CT very much helpful for assessing the ossification process.

Key words: Forensic; Age Estimation; CT Scan; X ray; Ossification.

Introduction

Forensic age estimation is one of the concerns in living individuals especially in pubertal and post-pubertal age group. In this age group age is estimated based on assessments of secondary sexual characters, eruption and calcification of teeth and survey of different ossification centres. Frequently ossification of shoulder, elbow and wrist with hand are assessed. If all these centres are ossified completely then ossification of medial end of clavicle is evaluated. The ossification of iliac crest can also provide better possibilities for determining age because of relatively late completion of maturation.[1]

An evaluation of iliac crest using conventional projection radiography or digital radiography is common practice. However, recently few researchers have used sonography and magnetic resonance imaging for forensic age estimation with comparative results.[2,3] The aim of present pilot study is to evaluate use of multidetector CT images for iliac crest

ossification and to address whether the investigation by this modern means is useful and superior to conventional radiography or whether such imaging modality is complementary in assessing the age.

Material and Method

This is a retrospective study where multi-slice computed tomograms were evaluated. Those tomograms were originally taken at Government Medical College Hospital Miraj from 2011 to 2014 of the patients who were referred for abdominal and pelvic CT examination for various clinical reasons. Patient having pelvic skeletal deformity or having trauma were excluded from the study. Total 56 tomograms were included consisting of 35 male and 21 female. The age group was from 11 years to 23 years.

A routine abdominal and pelvic CT protocol was followed and Axial plane images were obtained and were transferred to workstation for post processing. At workstation multi-planar reformatting (MPR) of the sagittal and coronal plane images were performed and three dimensional images of the iliac crest were obtained so that an anatomical details and ossification centre could be visualized in better way. The fusion of iliac crest is visualised by utilizing spiral multislice CT machine (Somatom definition AS 128 slice CT by Siemens).

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In the present study the Risser sign grading system was used. It is a six-stage system where the process of iliac crest ossification is divided into quarters. [1]Following is the scheme of Risser sign grading system.

- ☛ Stage 0 – no ossification
- ☛ Stage 1 – apophyseal ossification within the first quarter (<25%) commencing anterolaterally
- ☛ Stage 2 – apophyseal ossification extending into the second quarter (25 – 50%)
- ☛ Stage 3 – apophyseal ossification extending into the third quarter (50 – 75%)
- ☛ Stage 4 – apophyseal ossification extending into the fourth quarter (> 75%) until completion of ossification

- ☛ Stage 5 – fusion of the iliac crest apophyseal from the commencement of the process posteromedially and completion of fusion

The tomograms were evaluated by a single observer. Evaluation was done on right and left side. Statistical analysis was performed on MS Excel Windows 2007.

Results

In all computerized tomographs (n = 56), a reliable multi-slice images in three dimensional view of iliac crest ossification are visualized on both pelvic sides. Table 1 shows number of cases in different age group. Table 2 and 3 shows the age group and fusion status

Table 1: Age and number of cases

Age in years	Male	Female
11	2	--
12	3	1
13	3	1
14	1	1
15	1	1
16	2	2
17	2	2
18	6	1
19	1	1
20	5	4
21	3	4
22	4	2
23	2	1
Total	35	21

Table 2: showing different age group and grades of iliac crest fusion in male