

Journal of Advanced Scientific Research

ISSN

Available online through http://www.sciensage.info/jasr

0976-9595

Research Article

DETERMINING THE ACCURATEINTERPRETATION OF CT SCANIMAGES OF THE BRAIN WITHOUT CHILDREN IN JECTION AMONG RESIDENTS OF CHILDREN AND EMERGENCY MEDICINE

Hojjat Derakhshanfar¹, FarzadBozorgi², Shamila Noori³, AlirezaMajidi¹, Mehdi Frouzanfar¹

¹Department of emergency medicine, ShahidBeheshti University of medical sciences, Tehran, Iran Emergeny Medicine department, Mazandaran University of medical sciences, Sari, Iran. ³Resident of Pathology ShahidBeheshti University of medical sciences, Tehran, Iran. *Corresponding author: farzadbozorgi1356@gmail.com

ABSTRACT

Computed Tomography (CT Scan) has become an essential instrument in medical imaging and diagnosis. Interpretation of radiologic images as well as patient history and physical examination helps the physician to make the most relevant diagnosis. Emergency Medicine (EM) and Pediatric residents are two groups of physicians that are faced with CT Scans of children during their daily practice and need to know how to use it well. In this cross sectional study accuracy of Pediatric and Emergency Medicine residents in interpretation of pediatric brain CT Scans is determined. Two groups of residents consisting of 19 volunteers in each group were participated in this study. Images of pediatric brain CT Scans were presented to each participant and he was asked to find the pathologic findings in the image. Then, overall score for each participant was recorded and statistical analysis was conducted on these scores. Emergency Medicine residents had significantly greater score in comparison with pediatric residents (P value = 0.02). Accordingly, Postgraduate Year 1(PGY1) EM residents had greater scores than pediatric PGY1 residents (P Value=0.007). In Contrast there was no significant difference between PGY 2 residents in two groups. There was no difference between residents participated in CT Scan lectures or pediatric or EM rotations and ones that did not pass these courses. According to this study, EM residents are more accurate in interpretation of pediatric brain CT Scans. In addition, neither CT Scan lectures nor rotations were as much helpful as per case CT Scan experiments in Emergency Room for progression of residents' accuracy.

Keywords: CT Scan, Pediatrics, Emergency Medicine

INTRODUCTION 1.

In parallel with the progress of CT Scan technology, its application in the emergency and especially children emergency has highly increased, in the manner that today, CT unit has been included in several emergency wards for a faster access to that [1-4]. CT scan without brain contrast is one of the most common paraclinic measures o radiology which is requested for the patients in emergency ward. Accidents are the fist reason of death in individuals older than one year. In these accidents, the most common reason of death and disability includes damages to the brain (about 70% of fatal damages caused to the children were of brain damage type). Each year in the United States, the influent damages caused to the children brains result in 3,000 deaths, 50,000 inpatients and 650,000 referrals to emergency ward in half of which CT scans are performed on the children's brains [5, 6]. Considering special conditions and the necessity for making a correct and of course prompt decision for most children, in case of lack of access to a radiologist, most of the times these stereotypes are interpreted by the physicians of emergency

and/or pediatrics. A physician of emergency and/or pediatrics should request for a suitable radiologic image and shall interpret that accurately to take necessary measures for treatment of the patient [7-9]. Incorrect interpretation of CT Scan images has a significant effect on the increase of mortality and morbidity of patients. Studies conducted to compare the interpretation of radiologic images by radiologists and other physicians contain results indicating mismatch of interpretation of the two groups [10]. Moreover, in the training programs for pediatric residents, sports medicine and radiology are not defined accurately and some of the courses are optionally accessible for pediatric residents. As a result, some of the capabilities required by a physician as a pediatrician to diagnose pediatric diseases may not be fulfilled in the training course. Capabilities of pediatric residents in auscultation, resuscitation, study of growth and development of children, diagnosis of otitis media and examinations of knee and ankle have already been reviewed in different studies. In each of those studies, capabilities of pediatric residents have been

evaluated to be less ideal. As a result, it is also required to evaluate the capabilities of pediatric residents so that the possible shortcomings in early diagnosis of pediatric emergencies in training programs can be modified [11]. According to the studies conducted in some countries, interpretation of CT Scan images by emergency medicine physicians was accompanied by some conflicts as compared to radiologists. In some cases, it has even potentially influenced on treatment and prognosis of the respective patients [7]. Of course, It has also been reported in other studies that despite incorrect interpretations, there was no significant disturbance in the treatment process of patients [10, 12]. This study has been designed to find the disadvantages of residents and specialty team of emergency medicine and pediatrics in interpretation of Cranial CT Scan in children so that by comparing this proficiency among this group of physicians, shortcomings are determined and necessary plans for improvement of this proficiency for residents of emergency medicine and pediatrics are designed and included in their formulated training program and in this way the quality of diagnostic and therapeutic services offered to the patients in the emergency ward of hospitals which are administrated by the residents and specialists of emergency medicine and pediatricians is improved.

2. MATERIALS AND METHODS

In this study which has been designed in terms of a cross sectional observational study, residents of pediatrics and emergency medicine are studied in two large pediatrics and emergency medicine hospitals (Mofid Pediatrics Hospital and Imam Honssein Hospital. The population in this study consisted of residents who voluntarily participated in the study. Total number of emergency medicine residents was 54 residents out of whom 20 residents voluntarily participated in this study. Pediatric residents of Mofid and Imam Hossein hospitals were totally 61 residents out of whom 20 residents voluntarily took part in our study.

2.1. Entry and Exit Criteria of the Study

Entry criteria of study included education in the residence course of pediatrics and emergency medicine. Exit criteria included non-completion of questionnaire and finding the answers to the questions before conducting the test. Sampling was made in terms of accessible sampling and asking questions from the volunteers during their attendance in different wards of the hospital. Samples of this study included the residents of pediatrics and emergency medicine in Mofid and Imam Hossein hospitals. Method of group determination based on exposure included field of study (pediatrics, emergency medicine). Residents first input their initial and demographic data through a questionnaire. Then, 10 slides containing CT Scan images of children that had been collected from educational materials and booklets in the ward and on internet were displayed to them. The images consisted of common cases of emergency and non-emergency in children. Emergency cases included head trauma with frontal lobe contusion and skull fracture with pneumocephalus and edema, head trauma with subdural hematoma and midline shift. Diseases of children included communication hydrocephalus, tuberoussclerosis, brain abscess, intraventricularhemorrhagein preterm infants, etc. A normal brain CT Scan case was also included in the questions to evaluate the capability of residents in ruling out the diseases. Each of the slides was displayed for the volunteers for 30 seconds. In the questionnaire before each volunteer, several considerable and positive cases had been provided for each image. For example, if there were both subdural hemorrhage and midline shift in an image, the image had been marked by two numbers and the volunteer should write a finding on the opposite of each number. Finally, the questionnaires were collected, corrected and were statistically reviewed in the manner described below. It should be noted that sampling was made once the residents had passed about 8 months of residence course and had also participated in the training course of CT Scan interpretation which had been held in Mofid Hospital (participation/non-participation in the above session was asked from the volunteer in the questionnaire). Descriptive statistics including mean, standard deviation, frequency and percentage are used. Mann-Whitney test was used to compare the two groups. More comparison of the two groups was made through Kruskal-Wallis test.

3. RESULTS

40 persons were tested in this study out of which 2 persons were not included in the study due to non-completion of the questionnaire. Finally, two 19-member groups of volunteers were studied. The studied residents in emergency medicine group were totally 19 residents out of whom 9 residents were in the first year, 6 residents were in the second year and 4 of them were in the third year. Pediatric residents consisted of 10 residents in the first year, 6 residents in the second year and three of them in third year of pediatric. Table 1 shows supplementary information of each group separately.

Field of study	Emergency medicine	Pediatrics
Age mean and standard	5 1 33 84	2 7 31 21
deviation (respectively)	J.1-JJ.0T	2.7-31.21
No. of female residents	6(31%)	11(57%)
No. of male residents	13(%68)	8(42%)
Average time interval as of		
graduation from general	6 47	4 4 1
course with the beginning of	6.47	4.41
residence		
No. of people who have		
participated in the CT Scan	4(210/)	10(E20/)
session within the recent 6	+(21%)	10(52%)
months		
No. of people who have		
participated in the pediatric	11(57%)	
rotation session		
No. of people who have		
participated in the		10(530/)
emergency medicine rotation		10(52%)
session		

Table 1: General information of samples separatedbased on the group

Table 2: Supplementary information of each groupseparately

P Value	Emergency Medicine Pediatr		atrics	Question	n Type of	
value	sd	mean	sd	mean	number	question
0.000	2.02	6.73	1.90	2.60	А	
0.832	8.15	2.47	2.98	8.15	С	
0.694	3.80	8.15	4.20	7.63	Н	Traumatic
0.070	2.56	4.86	2.64	3.28	Ι	
0.180	7.27	27.92	6.19	21.68	total	
0.297	3.74	1.57	2.29	.52	В	
0.049	3.4	3.15	3.68	5.52	D	
0.596	3.10	4.70	3.82	4.21	Е	Non
0.517	4.18	7.89	4.60	6.97	F	traumatic
0.290	4.95	3.68	4.18	2.10	G	
0.592	8.26	21.05	8.07	19.34	total	
0.020	10.99	48.97	11.30	41.02		All questions

Table 4: Rotation of residents in this Series

 Table 3: The marks obtained from the test for the volunteers of emergency medicine and pediatrics

P Value	Pediatrics		Emer Med	gency icine	
	sd	mean	sd	mean	
0.007	7.93	38.54	4.67	45.66	First year resident
0.366	14.03	46.85	8.35	54.83	second year resident
	6.78	35.43	21.12	47.62	third year resident
0.020	11.30	41.02	10.99	48.97	Total

Based on the information obtained from the questionnaires of volunteers, their answers to the questions and the marks they have obtained are as follows. As it is seen in table 2, the questions are classified into trauma and non-trauma groups and average of each mark in each group of questions has also been calculated for each field. The marks obtained from the test for the volunteers of emergency medicine and pediatrics are separately shown in table 3 both generally and based on the level of education. The results obtained from statistical comparison of the two groups are also seen in this table. It should be noted that since the 3rd year residents were busy with the specialty board test and completion of the course and they were not therefore always accessible, the number of these volunteers is not sufficient in the sample and as a result, the marks of third year residents were not calculated in the statistical tests for comparison of residents in different years. The following results were obtained in the comparison made between the first and second residents of the same field: The first and second residents were significantly different in the emergency medicine. (*P Value= 0.036). No significant difference was observed in the comparison made between the first and second residents of pediatrics (P Value = 0.0246). The results obtained from the study of volunteer's attendance in the training courses of CT Scan and rotations of emergency medicine for pediatric residents and pediatric rotation for residents of emergency medicine on the obtained mark are shown in table 4.

	Pediatrics			Emergency Mee	licine	
P Value	No-pass	Pass	P Value	* No pass	*Pass	
0.46	9.58-38.66	12.78-43.15	0.810	12.26-49.53	3.9246.87	[#] Class CT Scan
0.278	10.63-43.44	12.00-38.85				Rotation of emergency medicine
			0.904	5.06-47.37	14.00-50.09	Rotation of pediatrics

4. DISCUSSION

In this study, capabilities of two main groups of residents working in health centers to interpret the findings of CT Scans made on the children's brains were evaluated. The results of the present study indicate that interpretation accuracy of these graphs in all residents of emergency medicine is higher than that of pediatric residents. Several studies have already been conducted on the capabilities of residents of different hospital groups separated based on their annual rank; however, there are few studies in which two different groups of residents (from two different specialty groups) are compared [13, 14]. For example, in the study made by Aydyn et al. [14], capability of emergency medicine residents to interpret the graphs of trauma patients was evaluated. In this study, a high agreement coefficient is seen in the comparison made between the residents of emergency medicine and radiology. In fact, capability of emergency medicine residents in some of the specific fractures is almost the same as that of radiology residents. Such finding may not be consistent to the result of the present study. This inconsistency is likely due to the difference between the two studied groups of residents and different graphs because in the present study, despite Aydyn's study, CT Scan images are the criterion for different performance marks of residents in the two groups and not simple graphs. In another study made by Ryan et al. [15], capability of pediatric residents to identify and teat the fractures has been reviewed. The results of this study indicate that on the whole, about 60% of the graphs have been accurately diagnosed. In that study, despite the present study, no scoring system has been used and the results have only been recorded in terms of nominal qualitative data (diagnosis, nondiagnosis). The scoring system used in our study is capable to report the results more accurately. In addition, classification of questions into two main groups, namely trauma and nontrauma questions can omit the confounding effect of diagnosis type. Statistical review of educational years of residents is one of the methods to evaluate the effect of training on the performance of residents. In this study, a comparison was made between the first and second year residents due to low number of third year samples (R. K. results section). The results of statistical comparison among the samples of this study indicate that a significant difference is seen only in the group of emergency medicine residents between the marks of the first and second year residents. This difference and also attention to no difference between the first and second year pediatric residents maybe indicate the effect of clinical experience and multiplicity of exercise and repetition in the

group of emergency medicine. It is interesting that these results for different ranks of residents have been also found in other studies. It is also interesting that in the aforementioned study, completion of radiology and orthopedics courses in pediatric residents has caused no significant statistical difference between correct answering percentages. Such results have been identically proved in our study. It has been shown in our study that participation in separate training courses has caused no significant statistical difference not only in the emergency medicine group but also in interpretation of CT Scans. These results can be seen in table 4. The effect of experience in interpretation of CT Scan in medicine group and lack of this effect in pediatric group as well as ineffectiveness of participation in theoretical training courses indicate that the best method to enhance the capability of CT scan interpretation is to couple the training of pathologic points of graphs on the patient's bed; an event which is seen more in the emergency medicine group. In addition to comparison of CT interpretation marks in the two residence groups, the present study has reported a comparison based on the type of question (subgroup analysis) as well. The results indicate that in general, pathology has caused no significant statistical difference in the accurate interpretation of CT due to trauma or non-trauma reasons and there was no significant difference between the marks of both groups in both types of questions. In the study made by Rayan for example, only the fractures have been studied. In the study made by Brunswick [16], only simple graph findings have been reviewed and most pathological cases have been for the organs. Low sample volume is one of the problems for design of this study. In addition, CT interpretation without accessing to the patient is often more difficult because it is impossible to perform clinical examination and to compare that with graph symptoms. Such restriction has existed in similar studies as well (R. K. study of Rayan et al.). In addition, the possibility of awareness of subjects from the contents of questionnaire is one of the common restrictions in the studies made based on questionnaire. This restriction will be clearer especially if a test-based criterion exists and it may potentially change the results. To minimize this effect, efforts have been made in this study to separate the environment for answering the questions and to avoid availability of correct answers to the subjects until before completion of project. In general, the results of this study indicate that accurate interpretation of positive findings in CT scan in the emergency medicine group is higher as compared to pediatric residents. In addition, the effect of mere theoretical trainings in enhancing this capability is

hesitated considering the findings of this study. Therefore, considering the importance of accurate interpretation of graph and the need to some interventions in terms of emergency (even in pediatric group), it seems that more attention should be made to this issue in the lesson programs of this group.

5. REFERENCES

- Haaga JR. CT and MRI of the whole body. 5th ed. Philadelphia, PA: Mosby/Elsevier; 2009.
- Stephanie B. Abbuhl; Principles of emergency department use of computed tomography; Judith E. Tintinalli, Gabon D. Kelen, J. Stephan Stopczynski; Emergency Medicine; sixth edition; 2004: 1881.
- National Center for Health Statistics, Centers for Disease Control and Prevention (2000) National Hospital Ambulatory Medical Care Survey, Emergency Department File (2002); CD-ROM Series 13, No. 33.
- Blackwell CD, Gorelick M, Holmes JF et al. Ann Emerg Med, 2007; 49:320-324.
- 5. Kuppermann N. Pediatr Radiol. 2008; 38(4):S670-674.

- Wong AC, Kowalenko T, Roahen-Harrison S, Smith B, Maio RF, Stanley RM. *PediatrEmerg Care*, 2011; 27(3):182-185.
- Arendts G, Manovel A, Chai A. AustralasRadiol., 2003; 47(4):368-374.
- Nolan TM, Oberklaid F, Boldt D. AustPaediatr J, 1984; 20(2):109-112.
- Perron AD, Huff JS, Ullrich CG, Heafner MD, Kline JA. Ann Emerg Med, 1998; 32(5):554-562.
- Mayhue FE, Rust DD, Aldag JC, Jenkins AM, Ruthman JC. Ann Emerg Med, 1989; 18(8):826-830.
- Ryan LM, DePiero AD, Sadow KB, Warmink CA, Chamberlain JM, Teach SJ, et al. *Pediatrics*, 2004; **114(6)**:1530-1533.
- Al-Reesi A, Stiell IG, Al-Zadjali N, Cwinn AA. Eur J Emerg Med, 2010; 17(5):280-282.
- JMysko WK, Weller GE, Renard R, Gitlin JN, Bluemke DA, et al. AJR Am J Roentgenol, 2000; 175(5):1233-1238.
- Aydyn SA, Bulut M, Topal NB, Akgoz S, Koksal O, Orcan S, et al. *Emerg Med J*, 2008; 25(8):482-485.
- Ryan LM, DePiero AD, Sadow KB, Warmink CA, Chamberlain JM, Teach SJ, et al. *Pediatrics*, 2004; **114(6)**:1530-1533.
- Brunswick JE, Ilkhanipour K, Fuchs S, Seaberg D. AcadEmerg Med, 1996; 3(8):790-793.