Incidental CT Findings of Patients Who Admitted to ER Following a Traffic Accident

Acil Servise Trafik Kazası Sonucu Gelen Hastaların Çekilen BT’lerindeki İnsidental Bulguların Değerlendirilmesi

Yavuz YIGIT,¹ Harun AYHAN²
¹Derince Training and Research Hospital, Kocaeli;
²Haydarpasa Numune Training and Research Hospital, İstanbul

SUMMARY

Objective
The aim of this study was to investigate and analyze incidental CT find-
ings of traffic injury patients discharged from the ER, and to determine
overall notification rates.

Methods
All traffic injury-related patient records between 01.06.2013-01.03.2013
were obtained from Derince Training and Research Hospital Emergen-
cy Service using patient files and the hospital database. Brain, thorax
and/or abdominal CT images of 340 patients aged between 0 to 84
years were included in the study. ER observation forms were investi-
gated for the patients who had incidental findings on CT scanning and
overall notification rates were recorded.

Results
Mean age of the 363 cases was 31.2 (SD 17.9, min 0, max 84) and 35.5%
of patients were female (n=129) and 64.5% were male (n=234). A total
of 537 CT scans were performed on 363 patients. 147, 319 and 71 CT
scans were performed on the thorax, brain and abdominal, respective-
ly. 27.3% (n=99) of scan results showed the presence of a coinciden-
tal pathology. The most common disease on scans were bone lesions
(8%, n=29), followed by sinus abnormalities (7.7%, n=28). Incidental
findings ratio in patients aged over 60 was 60.8%, while under 60 was
24.8%. It was found that seven patients (7.1%) were informed about
the imaging results.

Conclusion
Most of the incidental findings were found to be benign; however,
16.5% of them were considered to require in-depth investigation. Fur-
ther investigations are needed to understand the clinical relevance of
these findings and their effects on patients.

Key words: Incidental findings, tomography.

ÖZET

Amaç
Bu çalışmada ki amacımız trafik kazası ile acil servise başvuran hastalar-
dan taburcu olanların BT’lerindeki rastlantısal bulguların analizi ve bunla-
rın hastaları bilgi verme oranlarının incelenmesidir.

Gereç ve Yöntem
Çalışma 01.06.2013-01.03.2013 tarihleri arasında Derince Eğitim ve Araş-
trma Hastanesi Acil Servis’inde trafik kazası bağlı olarak takip edilen
hastaların dosyalarından ve hastanemiz veri sisteminden edilen hast-
a bilgilerini kullanarak yapıldı. Çalışmaya be japon ve veya abdominal
BT görüntülemesi yapılan, 0-84 yaş arası 340 olgu alındı. Acil gözlem for-
maları incelenerek rastlantısal bulgular saiflandan hastaların BT yorumları-
ının sonuçları hakkında bilgilendirilerek kaydedildi.

Bulgular
Üç yüz altmış üç olgunun yaş ortalaması 31,2 (SD17,9, min 0, maks 84)
olarak bulunurken hastaların %35.5’i kadın (n=129), %64.5’i erkek (n=234)
idi. 363 hastaya toplamda 537 BT görüntülemesi yapıldığı saptandı. Bun-
lardan 147’ti toraks, 319’u be japon, 71’i abdominal görüntülemeydi. Tomogra-
filerin %27.3’ü (n=99) rastlantısal yakalanan bir patoloji vardı. En sık tespit edilen
rastlantısal hastalık kemik patolojileridir (%8, n=29), sonra sinüs
anomalileridir (%7.7, n=28). Rastlantısal bulguların oranı 60 yaş üzerinde
%60.8 olurken, 60 yaşın altında %24.8 olarak saptandı. Hastalardan yedi-
sine (%7.1) görüntülemeye sonucu hakkında bilgi verildiği saptandı.

Sonuç
Çalışmamızda alınan hastalarda saiflandan rastlantısal bulgular daha çok
benign olmakla beraber, hastaların %16.5’inde ileri araştırma gerektir-
erek görüleceği ciddi rastlantısal bulgular saifandır. Ancak bu bulguların
klinik öneminin ve hastalar üzerindeki etkilerinin araştırıldığı daha çok ça-
lışmaya ihtiyaç olduğu kanaatindeyiz.

Anahtar sözcükler: Acil servis; rastlantısal bulgular; tomografi.

Submitted: 01.10.2013  Accepted: 13.12.2013  Published online: 07.01.2014
Correspondence: Dr. Yavuz Yigit. Derince Eğitim ve Araştırma Hastanesi, Derince, Kocaeli, Turkey.
e-mail: dryavuzyigit@gmail.com

© 2014 Emergency Medicine Association of Turkey. Production and Hosting by Elsevier B.V. Originally published in [2014] by
Kare Publishing. This is an open access article under CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/)
Turk J Emerg Med 2014;14(1):9-14  doi: 10.5505/1304.7361.2014.13284
Introduction

The use of computed tomography (CT) in the Emergency Room (ER) is increasing with its growing availability and diagnostic success. The impact of CT on ER physicians has had undeniable success such as rapid diagnosis and efficiency in the treatment process. There are many publications that emphasize the importance of CT scans which may lead to significant changes in the treatment of patients with multiple traumas.[11-16]

Along with the potential benefits of CT scans, risk factors are associated with the use of this technique such as the potential of high-doses of radiation and contrast-induced nephropathy.[8,10] With this in mind, CT scans constitute 13% of radiological diagnostic methods used the United States and is 70% of radiation source given to the patients.[11,12] The estimated cancer rates due to one-time whole body CT scan is fairly low at 0.08%, while in cases of annual CT scans this rate increases to approximately 2%.[13-16]

Another potential issue related to CT scans is incidental findings. There are advantages and disadvantages of incidental findings and remain a topic of debate. Many publications have come to fruition due to the incidental findings, independent from the patient's main complaint.[17-23] Some of these publications indicated that incidental findings often result in unnecessary tests and spending.[18,23,24] Other publications reported that, in many cancer cases, further analysis of incidental findings lead to early stage cancer diagnosis. [20,25,26] The studies that examined incidental findings in the CT scans of trauma patients reported the rate of incidental findings to be between 34-43%.[17,27,28] The patient notification rates of the detection of incidental findings varied between 21-27%.[19,29]

CT has become one of the more essential tools commonly used in the ER. The breadth of incidental pathologies have not been examined sufficiently in the literature. In addition, the issues on how to manage patients with these incidental findings needs clarity. The aim of this study was to investigate the incidental pathologies observed in CT scans. The frequency and notification rate in discharged patients admitted to the emergency department due to traffic accidents are discussed.

Materials and Methods

This retrospective study was conducted by using files and patient information obtained from our hospital's data processing system regarding patients admitted and followed at the ER of Derince Training and Research Hospital Emergency Service due to traffic accidents from January 2012 to January 2013. The study included 363 patients between the ages of 0-84 whose brain, chest, and/or abdominal CT scans were taken. Patient ER observation forms and files from the hospital data processing system were screened and their age, gender, type of imaging, circumstances of hospital admission (referral or direct), post-treatment status (admission to another department, discharge or mortality during the follow-up), and comments on CT scans (made by hospital's expert radiologists) were recorded. Findings from the CT scans that were considered to be unrelated to traffic accident injuries (bone changes, sinus changes, nephrolithiasis, renal simple cyst, hepatic steatosis, ovarian simple cyst, abdominal hernia, hiatal hernia, cholelithiasis, diverticulum, accesssory spleen, hemangiomas, pulmonary fibrosis, pulmonary nodule, atherosclerosis, arachnoid cysts, aortic dilatation, hepatomegaly, hepatic mass, splenomegaly, hydronephrosis) were recorded under the heading of incidental findings. The incidental findings were divided into two groups according to their severity based on the classification proposed by Barrett et al.[30] Group 1 included incidental findings that did not require urgent intervention, but patients were still required to be notified, whereas Group 2 included findings that should be intervened immediately. The information from the CT review results of patients whose incidental findings were detected by examining the ER observation forms was recorded. The status of patient incidental finding notification was determined by looking at the records from the ER forms and consult notes. The cases in which notification status was not recorded were considered as not informed.

Patients that were (1) hospitalized or transferred to any other department, (2) who lost their lives during the follow-up, (3) whose ER observation forms or hospital information system records were incomplete, or (4) who were referred to our department from another center were excluded from the study.

The SPSS 16.0 software was used for statistical analyses of the data. The normally distributed continuous variables were expressed as mean and standard deviation (±), minimum (min) - maximum (max) values in brackets, while the qualitative variables were expressed as numbers and percentages (%).

The ethics committee approved our study.

Results

When the records of a total of 947 patients who were admitted to our ER due to traffic accident were examined, we determined the following: the CT scan was not done for 278 patients, 182 patients were hospitalized to another department, the records of 83 patients were incomplete, 37 patients were referred to our emergency service from another center, and 4 patients passed away during the follow-up in emergency service (Figure 1).
The mean age of 363 patients whose CT scans were taken in the ER that showed incidental findings was 31.2±17.9 (min 0, max 84). Of those 363 patients, 35.5% were female (n=129), while 64.5% were male (n=234). A total of 537 CT scans (147 thorax, 319 brain, and 71 abdominal) were taken for 363 patients included in the study.

There were incidentally caught pathologies in 27.3% (n=99) of tomography analyses. There was a single pathology in 17.1%, while multiple pathologies were determined in 10.2% (n=37) of the tomography reports. The most commonly detected incidental disease was bone pathology (8.0%, n=29) followed by sinus abnormalities (7.7%, n=28).

Group 1 incidental findings included bone changes, sinus changes, nephrolithiasis, renal simple cyst, hepatic steatosis, ovarian simple cyst, abdominal hernia, hiatal hernia, cholelithiasis, diverticulum, accessory spleen, and hemangioma. They constituted 55.8% (n=76) of all incidental findings and were observed in 20.9% (n=76) of patients (Table 1). All of the bone change cases in Group 1 findings were benign changes (osteophytic changes accompanied by or not accompanied by spinal stenosis) according to Barrett et al’s classification. None of the patients had bone cyst, lytic bone lesions, or bone masses. The other Group 1 findings did not require immediate intervention according to Barrett et al’s classification. None of the Group 1 incidental findings were reported to the patients.

Meanwhile, Group 2 findings accounted for 44.2% of all incidental findings and were observed in 16.5% of the patients (n=60). Only 11.7% of Group 2 incidental findings were reported to patients (Table 2).

When the relationship between the age and incidental findings was examined, the rate of incidental findings in patients over 60 years of age was 60.8% compared with the rate of 24.8% in patients under the age of 60.

According to the ER observation among the patients with incidental findings in the CT scans, only 7 patients (7.1%) were informed about the results of the imaging. The aortic dilatation was determined in 1 of these patients (50.0%), pulmonary nodule in 3 patients (23.0%), hepatic masses in 1 patient (16.6%), hydronephrosis in 1 patient (20.0%) and pulmonary fibrosis in 1 patient (5.50%).
Discussion

The rate of the incidental findings in patients included in our study was found to be 27.3%. In previously conducted similar studies, this rate has been reported to vary between 30.6-35.0%. Therefore, the rate of incidental findings in our study is consistent with previous studies.

In our study, the rate of patient notification regarding the incidental findings was determined as 6.30%. In a similar study by Thompson et al., this rate was 9.80%, in Munk et al.'s study it was 21.0%, while it was 27.0% in Messersmith et al.'s study. When compared to these studies, the notification rates from our study are low. Messersmith and Mink studies both included hospitalized patients. A longer stay in the hospital might have increased the chances of patient notification. Similar to our study, Thompson et al. did not include hospitalized patients for analysis and their notification rates were more similar to our notification rates.

In our study, we determined whether the patients had been notified about the incidental findings from the ER observation forms. The possibility of not recording the verbal notification of patients in the observation forms constitutes a limitation to our study as well as other similar studies.

Another possible cause of the low rate of notification might be that the ER physicians did not think that incidental findings were significant enough to be reported. Both in our study as well as in other similar studies, the notification rates of relatively more significant incidental findings were higher. Mink et al. divided the incidental findings into three groups according to their severity. The group that had the most severe findings (possible fatal symptoms such as bone me-

| Disease                                                                 | Number | Percentage (%) |
|-------------------------------------------------------------------------|--------|----------------|
| Bone changes (osteophytic changes accompanied by or not accompanied by spinal stenosis) | 29     | 8.0            |
| Sinus changes (sinusitis, sinus cysts)                                  | 28     | 7.7            |
| Nephrolithiasis                                                        | 5      | 1.4            |
| Renal simple cyst                                                       | 4      | 1.1            |
| Hepatic steatosis                                                       | 3      | 0.8            |
| Ovarian simple cyst                                                     | 1      | 0.3            |
| Abdominal hernia                                                       | 1      | 0.3            |
| Hiatal hernia                                                          | 1      | 0.3            |
| Cholelithiasis                                                         | 1      | 0.3            |
| Diverticulitis                                                         | 1      | 0.3            |
| Accessory spleen                                                       | 1      | 0.3            |
| Hemangioma                                                             | 1      | 0.3            |

| Disease                                                                 | Number | Percentage (%) |
|-------------------------------------------------------------------------|--------|----------------|
| Pulmonary fibrosis                                                      | 18     | 5.0            |
| Pulmonary nodule                                                        | 13     | 3.6            |
| Atherosclerosis                                                         | 10     | 2.8            |
| Arachnoid cyst                                                          | 6      | 1.7            |
| Aorta dilation                                                          | 2      | 0.5            |
| Hepatomegaly                                                            | 2      | 0.5            |
| Hepatic mass                                                            | 1      | 0.3            |
| Splenomegaly                                                            | 1      | 0.3            |
| Hydronephrosis                                                          | 1      | 0.3            |
tastasis, metastatic lung mass, and abdominal aortic aneu-
rysm) was group 3. Although the notification rate of patients
from group 3 was higher than the general notification rate
(21.0%), it still was only 40.9%. Similarly in our study, the
notification rates for relatively significant findings were higher
than the overall notification rates. However, with the excep-
tion of aortic dilatation, they did not exceed 23.0% (lung
nodules 23.0%, aortic dilatation 50.0%). On the other hand,
Messersmith et al.’s study also classified incidental findings
into three groups based on their severity. They did not find a
significant difference between those three groups in terms
of patient notification. As a result, it does not seem to be
possible to create a definite opinion on this issue.

There are several suggestions for increasing the patient no-
tification rates. Ekeh et al. proposed to notify discharged
patients about incidental findings by mailing a letter. Anoth-
er method is to directly inform the family physician rather
than the patient regarding the detected incidental findings.
With this method, family physicians will follow-up with the
patient for the possibility to reduce unnecessary anxiety.

Messersmith et al. reported that, among all the patients
that were notified about the incidental findings, only 11 pa-
tients (18.0%) later came for follow-up. No major diseases
were detected in the follow-up of these patients. This shows
that the path that emergency physicians choose to follow
when informing patients is essential. Overburdening the pa-
tients may lead to negative consequences such as increasing
the workload and developing complications during further
tests. On the other hand, seriousness of the findings should
be emphasized so that patients do not delay their follow-ups.

Limitations

In our study, we determined whether the patients were noti-
fied about the incidental findings by evaluating the ER ob-
servation forms. The possibility of not recording the verbal
notification of patients into the observation file creates a
limitation of our study and other similar studies. Therefore,
based on our work it is not possible to reach a definitive con-
clusion about the patient notification rates.

In addition, there is a need for a prospective study that
would evaluate the contents of notifications, patient reac-
tions to these notifications, and their efficacy. These consid-
erations could not be assessed in this study.

Conclusion

Most of the incidental findings detected in the patients in-
cluded in our study were benign, however incidental find-
ings detected in 16.5% of the patients were relatively seri-
ous and required further investigation. Nonetheless, more
studies are needed to determine the clinical importance on
these incidental findings and their effect on patients.

Conflict of Interest

The authors declare that there is no potential conflicts of in-
terest.

References

1. Salim A, Sangthong B, Martin M, Brown C, Plurad D, Dem-
etriades D. Whole body imaging in blunt multisystem trauma
patients without obvious signs of injury: results of a prospec-
tive study. Arch Surg 2006;141:468-75.
2. Rizzo AG, Steinberg SM, Flint LM. Prospective assessment
of the value of computed tomography for trauma. J Trauma
1995;38:338-43.
3. Exadaktylos AK, Sclabas G, Schmid SW, Schaller B, Zimmer-
mann H. Do we really need routine computed tomographic
scanning in the primary evaluation of blunt chest trauma in pa-
ients with "normal" chest radiograph? J Trauma 2001;51:1173-6.
4. Brown CV, Antevil JL, Sise MJ, Sack DI. Spiral computed to-
mography for the diagnosis of cervical, thoracic, and lumbar
spine fractures: its time has come. J Trauma 2005;58:890-6.
5. Wisbach GG, Sise MJ, Sack DI, Swanson SM, Sundquist SM,
Paci GM, et al. What is the role of chest X-ray in the initial as-
essment of stable trauma patients? J Trauma 2007;62:74-9.
6. Sampson MA, Colquhoun KB, Hennessy NL. Computed to-
mography whole body imaging in multi-trauma: 7 years ex-
perience. Clin Radiol 2006;61:365-9.
7. Antevil JL, Sise MJ, Sack DI, Kidder B, Hopper A, Brown CV. Spi-
ral computed tomography for the initial evaluation of spine
trauma: A new standard of care? J Trauma 2006;61:382-7.
8. Larson DB, Johnson LW, Schnell BM, Salisbury SR, Forman
HP. National trends in CT use in the emergency department:
1995-2007. Radiology 2011;258:164-73.
9. Merten GJ, Burgess WP, Gray LV, Holleman JH, Rouss TS, Kow-
alchuk GJ, et al. Prevention of contrast-induced nephropa-
thy with sodium bicarbonate: a randomized controlled trial.
JAMA 2004;291:2328-34.
10. Birck R, Krozosok S, Markowitz F, Schnülle P, van der Woude
FJ, Braun C. Acetylcysteine for prevention of contrast ne-
phopathy: meta-analysis. Lancet 2003;362:598-603.
11. Dixon AK, Goldstone KE. Abdominal CT and the Euratom Di-
rective. Eur Radiol 2002;12:1567-70.
12. Mettler FA Jr, Wiest PW, Locken JA, Kelsey CA. CT scanning:
patterns of use and dose. J Radiol Prot 2000;20:353-9.
13. Einstein AJ, Henzlova MJ, Rajagopalan S. Estimating risk of
cancer associated with radiation exposure from 64-slice
computed tomography coronary angiography. JAMA
2007;298:317-23.
14. Rice HE, Frush DP, Farmer D, Waldhausen JH; APSA Educa-
tion Committee. Review of radiation risks from computed tomog-
raphy: essentials for the pediatric surgeon. J Pediatr Surg
2007;42:603-7.
15. Brenner DJ, Elliston CD. Estimated radiation risks poten-
tially associated with full-body CT screening. Radiology
2004;232:735-8.
16. Semelka RC, Armao DM, Elias J Jr, Huda W. Imaging strategies to reduce the risk of radiation in CT studies, including selective substitution with MRI. J Magn Reson Imaging 2007;25:900-9.

17. Paluska TR, Sise MJ, Sack DI, Sise CB, Egan MC, Biondi M. Incidental CT findings in trauma patients: incidence and implications for care of the injured. J Trauma 2007;62:157-61.

18. Maizlin ZV, Barnard SA, Gourlay WA, Brown JA. Economic and ethical impact of extrarenal findings on potential living kidney donor assessment with computed tomography angiography. Transpl Int 2007;20:338-42.

19. Messersmith WA, Brown DF, Barry MJ. The prevalence and implications of incidental findings on ED abdominal CT scans. Am J Emerg Med 2001;19:479-81.

20. Iezzi R, Cotroneo AR. Endovascular repair of abdominal aortic aneurysms: CTA evaluation of contraindications. Abdom Imaging 2006;31:722-31.

21. Chin M, Mendelson R, Edwards J, Foster N, Forbes G. Computed tomographic colonography: prevalence, nature, and clinical significance of extracolonic findings in a community screening program. Am J Gastroenterol 2005;100:2771-6.

22. Khan KY, Xiong T, McCafferty I, Riley P, Ismail T, Lilford RJ, et al. Frequency and impact of extracolonic findings detected at computed tomographic colonography in a symptomatic population. Br J Surg 2007;94:355-61.

23. Xiong T, Richardson M, Woodroffe R, Halligan S, Morton D, Lilford RJ. Incidental lesions found on CT colonography: their nature and frequency. Br J Radiol 2005;78:22-9.

24. Berlin L. Potential legal ramifications of whole-body CT screening: taking a peek into Pandora’s box. AJR Am J Roentgenol 2003;180:317-22.

25. Shetty SK, Maher MM, Hahn PF, Halpern EF, Aquino SL. Significance of incidental thyroid lesions detected on CT: correlation among CT, sonography, and pathology. AJR Am J Roentgenol 2006;187:1349-56.

26. Lumachi F, Borsato S, Tregnaghi A, Marino F, Fassina A, Zucchetta P, et al. High risk of malignancy in patients with incidentally discovered adrenal masses: accuracy of adrenal imaging and image-guided fine-needle aspiration cytology. Tumori 2007;93:269-74.

27. Ekeh AP, Walusimbi M, Brigham E, Woods RJ, McCarthy MC. The prevalence of incidental findings on abdominal computed tomography scans of trauma patients. J Emerg Med 2010;38:484-9.

28. Devine AS, Jackson CS, Lyons L, Mason JD. Frequency of incidental findings on computed tomography of trauma patients. West J Emerg Med 2010;11:24-7.

29. Munk MD, Peitzman AB, Hostler DP, Wolfson AB. Frequency and follow-up of incidental findings on trauma computed tomography scans: experience at a level one trauma center. J Emerg Med 2010;38:346-50.

30. Barrett TW, Schierling M, Zhou C, Colfax JD, Russ S, Conatser P, et al. Prevalence of incidental findings in trauma patients detected by computed tomography imaging. Am J Emerg Med 2009;27:428-35.

31. Thompson RJ, Wojcik SM, Grant WD, Ko PY. Incidental Findings on CT Scans in the Emergency Department. Emerg Med Int 2011;2011:624847.