ORIGINAL ARTICLE DOI: https://doi.org/10.18502/fem.v8i2.15464

Incidental findings in brain CT scans of patients with head trauma

Marzieh Alinezhad[1], Fariba Alikhani[1], Fatemeh Bamarinejad[2], Aatefeh Bamarinejad[2], Fatemezahra Hosseinzadeh[2]*

1. Department of Radiology, Isfahan University of Medical Sciences, Isfahan, Iran.
2. School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.

***Corresponding author:** Fatemezahra Hosseinzadeh; **Email:** hosseinzadeh.app@gmail.com

Published online: 2024-04-16

Abstract: **Objective:** Incidental findings (IFs) are newly discovered abnormal findings unrelated to the primary purpose of imaging. Brain computed tomography (CT) scan is one of the most essential and initial imaging evaluations for head trauma patients, which may also have nontraumatic IFs. We aim to investigate the prevalence and nature of IFs in brain CT scans of head trauma patients.

Methods: We conducted a cross-sectional study to evaluate brain CT scans of 1006 head trauma patients over one year (April 2021 to March 2022), to identify incidental findings by consensus agreement of two radiologists. We categorized the incidental findings into four categories based on appropriate follow-up recommendations.

Results: We included 1006 head trauma patients who underwent brain CT scan, of which 126 incidental findings were discovered in brain CT scan of 107 patients. The prevalence of incidental findings was 10.6% (107/1006). The most common incidental finding was brain atrophy (n=15, 11.9%). The mean age of patients with IFs was significantly higher than those without IFs, but there was no difference between the two groups regarding gender.

Conclusion: The discovery rate of incidental findings of brain CT scans in head trauma patients was considerable. Serious medical findings that need immediate evaluation were found in 5.6% of patients, mostly over the age of 40. Therefore, patients who have clinically significant incidental findings need improved documentation and follow-up to evaluate the long-term outcomes and reliability of imaging results.

Keywords: Computed Tomography; Head Trauma; Incidental Finding

Cite this article as: Alinezhad M, Alikhani F, Bamarinejad F, et al. Incidental findings in brain CT scans of patients with head trauma. Front Emerg Med. 2024;8(2):e16.

1. Introduction

Incidental findings (IFs) are unexpected abnormalities discovered during diagnostic imaging studies that are not related to the primary purpose of the examination (1). The prevalence of IFs is increasing due to the growing number of imaging techniques performed per patient (2). IFs can occur in various imaging techniques of different body regions, and their management depends on the type and severity of the finding (1,3,4).

In emergency departments (ED), head trauma is a frequent reason for computed tomography (CT) scans, and non-traumatic IFs can also be detected. Head trauma leads to approximately 69 million ED visits annually around the world (5), affecting a broad age spectrum from infants to the elderly. Brain CT scan is the most commonly used imaging technique for evaluating head trauma patients in ED (6). As well as revealing intracranial bleeding or skull fractures, brain CT scans are also sensitive to a wide range of non-traumatic IFs. These IFs ranged from insignificant normal variations to clinically significant findings which may need urgent medical action. Even if some of these findings are not clinically important, IFs can increase patient stress, further diagnostic testing, and increase costs (7). The clinician must therefore be able to handle unexpected findings to prevent unfavorable outcomes. Despite their potential impact on patient outcomes, there is a knowledge gap about the frequency and management of these IFs in ED that should be addressed. In the present study, we aimed to assess the prevalence of IFs on brain CT scans performed during the evaluation of head trauma in the ED.

2. Methods

This cross-sectional study was performed in Amin Hospital, an Isfahan University of Medical Sciences affiliated, level 1 trauma center with an annual volume of approximately1500-2000 trauma patients in Isfahan, Iran. From April 2021 until March 2022, among 1525 head trauma patients admitted to the ED who underwent an emergency brain CT scan, 1006 patients were included in this study through convenience nonprobability sampling method. Patients with previous surgery or trauma, and patients with poor image quality or non-standard CT scans were excluded from the study.

Table 1 Frequency, gender distribution, age, and follow-up categories for each incidental finding

Incidental finding		Number	Age (mean±SD)	Male Number (Percent)	Follow up category
Tumor	Meningioma	11	71.36±13.79	2 (18%)	Routine follow-up
	Lipoma	3	44.67±13.31	3 (100%)	No further evaluation
	Choroid plexus xanthogranuloma	2	50±28.28	2 (100%)	No further evaluation
	Other tumors	4	47.25±20	3 (75%)	Immediate evaluation
Cyst	Arachnoid cyst	5	29.41± 31.55	4 (80%)	No further evaluation
	Colloid cyst	1	46	1 (100%)	Routine follow-up
	Other cysts	2	37.5±7.77	1 (50%)	No further evaluation
Vascular-related abnormality	Calcified vascular malformation	3	40±8.54	2 (66%)	Routine follow-up
	Small vessel disease	11	74.64±11.64	7 (63%)	Routine follow-up
	Single Virchow-Robin	1	3	1 (100%)	No further evaluation
Skull abnormality	Hyperostosis frontalis	12	66.25±13.28	0 (0%)	Routine follow-up
	Metopic suture	1	25	1 (100%)	No further evaluation
	Scaphocephaly	1	4	1 (100%)	Routine follow-up
	Encephalocele	1	36	1 (100%)	Routine follow-up
Ventricularabnormality	Asymmetric ventricle	6	13.5±8.31	4 (66%)	Routine follow-up
	Hydrocephaly	1	5	1 (100%)	Immediate evaluation
	Cavum septi pellucidi	13	20.33±17.75	10 (77%)	No further evaluation
	Cavum vergea	6	15.50±10.38	5 (83%)	No further evaluation
Subarachnoid space abnormality	Benign enlargement of the subarachnoid space in infancy (BESSI)	2	0.54±0.29	2 (100%)	Routine follow-up
	Giant cisterna magna	9	24.44±18.88	8 (89%)	No further evaluation
Calcification	Parenchyma	1	19	1 (100%)	Routine follow-up
	Basal ganglia	7	51.14±23	4 (57%)	Routine follow-up
Infarct	Temporal lube	1	70	1 (100%)	No further evaluation
Brain atrophy	Generalized atrophy	15	65.93±21.04	9 (60%)	Non-emergency follow-up
	Cerebellar atrophy	1	57	0 (0%)	Routine follow-up
Orbital abnormality	Vitreous hemorrhage	1	42	1 (100%)	Immediate evaluation
Ears, nose, throat	Adenoid hypertrophy	1	5	1 (100%)	Non-emergency follow-up
	Dermoid cyst	1	42	1 (100%)	Non-emergency follow-up
	Ethmoid osteoma	1	87	0 (0%)	Routine follow-up
	Sinusitis	1	40	1 (100%)	Non-emergency follow-up

Table 2 Age and gender distribution for follow-up categories

	Category I Immediate evaluation (n=6)	Category II [a] Routine follow-up (n=46)	Category III [b] Non-emergency follow-up (n=17)	Category IV No further evaluation (n=38)	P-value*
Age, mean±SD	39.3±22.9	50.7±27.3	57.8±24.2	26.6±21.5	<0.001
Gender, male (%)	5 (83.3%)	17 (36.9%)	12 (70.5%)	32 (84.2%)	<0.001

*: Results from one-way ANOVA and chi-squared test, as appropriate; a: P values <0.001 resulted from a comparison of category IV vs. category II; b: P values <0.001 resulted from a comparison of category IV vs. category III; SD: Standard deviation

The sample size estimation was performed using the formula $n=(Z1- a/2)^2 \times \{P (1-P)\}/d^2$, with an estimated prevalence of incidental findings in brain CT scans of approximately 10.9% based on the previous study (8). Taking into account a 95% confidence interval and an absolute precision error of 2%, and using the value of Z corresponding to a confidence level of 1.96, the minimum sample size was estimated to be 932. However, in this study, the sample size reached 1006. Isfahan University of Medical Sciences Ethics Committee approved the study protocol.

The researchers obtained patient demographic data from electronic medical records and utilized the picture archiving and communication (PACS) system to access CT scans. Two board-certified faculty radiologists at the IUMS independently reviewed all brain CT scans (MAN and FA). In case of disagreement between two radiologists regarding the accidental finding or its details, it was resolved through discussion and consensus. In patients with more than one brain CT was performed, we only analyzed the first CT scan. All patients underwent a 64-slice CT scan (Hitachi, Japan) including 15-25 sections (each section being 5mm thick at the skull base to the vertex) at approximately 20 degrees' tilt from the orbitomeatal line.

In this study, all non-trauma-related abnormalities that had not been previously reported in the patient's imaging studies and were not documented in their medical records were reported as incidental findings, which included age-related changes. IFs discovered in brain CT scans of head trauma

patients were classified based on their nature and anatomical location. Also, after abstracting the IFs and reviewing the literature (3,9-15), a categorization scheme of incidental findings was developed by consensus between MAN and FA as follows: 1. An immediate evaluation is required for these findings. 2. Routine follow-up is recommended for these findings, as they do not require immediate or urgent medical evaluation. However, it is important to report them to the referring physician. 3. Non-emergent evaluation is required within weeks of the study for any abnormality that will need further, yet non-emergent evaluation. 4. No further evaluation is necessary for these findings, as they are considered normal or commonly found in asymptomatic subjects. For cases with more than one incidental finding, the worst category was considered as the evaluation category. Currently available guidelines and articles were reviewed to determine appropriate treatment recommendations and evaluate the clinical significance of every incidental finding.

Categorical data is represented using frequencies and percentages, and continuous data are expressed as the mean (±standard deviation (SD)) or median (interquartile range (IQR)). The Kolmogorov-Smirnov test was employed to assess the normality of all continuous variables. We used the chi-squared test for categorical variables and the Mann–Whitney U test for continuous variables. Between-group differences in IF categories regarding the mean age and gender distribution were assessed by ANOVA and chi-squared tests, respectively. The statistical analysis was performed using SPSS (ver. 26.0 IBM Corp., Armonk, NY, USA). A significance level of 0.05 was used in the analysis.

3. Results

Among 1006 head trauma patients who underwent brain CT scan (age (mean±SD): 42.6± 27.3, male: 630 (62.6%)), a total of 126 incidental findings were discovered in brain CT scan of 107 patients (age (mean±SD): 43.8±26.8, male: 66 (61.6%)). Of these, 18 patients (16.8%) had more than one incidental finding. These patients with multiple incidental findings had a mean (±SD) age of 55.6±28.7 years, and 18 (66.6%) of them were male.

The overall prevalence of IFs in brain CT scans was 10.6% (107/1006), and this prevalence was equal to 8.6%, 9.3%, and 15.2% in terms of three age categories, younger than 18 years, 18-60 years, and older than 60 years, respectively. Patients who had IFs in their brain CT scans were significantly older than patients without IFs (age (mean±SD): 43.8± 26.8 vs. 36.5± 24.2; P=0.004). There was no statistically significant difference between head trauma patients with or without IF regarding gender (61.6% (male) vs. 62.7% (female); P= 0.91).

The most common incidental finding in our head trauma patients was brain atrophy (n=15, age (mean±SD): 65.93±21.04), followed by cavum septi pellucidi (CSP) (n=13, 10.3%) and hyperostosis frontalis (n=12, 9.5%). Evidence of tumor was seen in the brain CT scan of 21 patients, among which in the brain CT scan of 16 patients, the evidence was in favor of a radiological diagnosis of benign tumors, and in 5 patients, the radiological diagnosis was not considered. The rate of neoplastic IFs was 2.08% in our patients. Significant age differences were observed between patients who have neoplastic IFs and non-neoplastic IFs (age (mean±SD): 63±19.4 vs. 38±26.8, P=0.00). A total of 8 intracranial cysts were identified (0.79%), including 5 arachnoid cysts (0.49 %), one colloid cyst 0.09 %), and two other cysts (0. 19%). Extracranial findings related to otolaryngology were identified in 0.39% (4 patients) of the subjects and one patient had vitreous hemorrhage. Table 1 shows a list of incidental findings as well as frequency, mean age, and gender distribution in each of the findings.

Regarding the clinical significance and timing of follow-up and assessment of findings, an immediate evaluation was required for 6 (5.6%) patients, routine follow-up was recommended for 46 (42.9%) patients, non-emergent evaluation was recommended for 17 (15.8%) patients, and no further evaluation was necessary for 38 (35.5%) patients. Table 2 demonstrated the mean age and gender distribution for each IF category. Notably, the mean age in category IV is considerably lower compared to categories II and III (age (mean±SD) : 26.6±21.5 vs. 50.7±27.3 and 26.6±21.5 vs.57.8± 24.2 respectively, P<0.001).

4. Discussion

In our study, we reviewed brain CT scans obtained from 1006 head trauma patients. Within this group, a total of 126 incidental findings were identified in brain CT scans of 107 patients. The prevalence of incidental findings in brain CT scans of head trauma patients referred to our ED was found to be 10.6%, which is consistent with the findings reported in previous studies (9-11). Regarding the prevalence of incidental findings in CT scans of various body regions, the rates of incidental findings in abdominal/pelvic and then thoracic CT scans are higher than in brain CT scans (9,12,13). Nevertheless, the frequency of incidental findings in brain CT scans conducted in ED is considerably high as a consequence of the more extensive use of brain CT scans compared to CT scans that evaluate additional anatomical regions for trauma patients.

The frequency of incidental findings in brain CT imaging exhibits considerable variation across studies (3), with some studies reporting a prevalence of incidental findings in brain CT scans of trauma patients that is half to two times higher than our reported findings (12-15). Evans et al. in a recent meta-analysis reported the overall prevalence of IFs in CT scans of trauma patients to be 35% (95% CI: 24%,47%) and the rate of IFs in brain CT scans to be 5% (95% CI: 3%,9%) (1). The observed variations can be attributed to differences in age cohorts, patient study demographics, and the reported classifications of findings. In this regard, our analysis includes extracranial findings as well as intracranial findings, which may contribute to the difference from a previous study that exclusively considered intracranial findings on brain CT

scans and showed a 1% incidental finding rate (16).

The highest prevalence of IFs in the current study was found in the age group over 60 years, accounting for 15.2%. In another study conducted on brain MRI of 503 volunteers over 65 years of age with a mean age of 73 years, the prevalence of incidental findings was reported as 77.9% (17). Furthermore, in another study aimed at determining predictive factors for the presence of incidental findings in emergency CT scans, age was reported as one of the predictive factors for the presence of incidental findings, as well as the presence of incidental findings of high clinical significance (10). Also in our study, the rate of neoplastic IFs in brain CT exhibited a greater prevalence in older patients. These findings highlight the importance of considering age as a factor in interpreting imaging studies and emphasize the need for further research in this area.

The prevalence of IF in brain CT of patients younger than 18 years in the present study was 8.6%. However, in a comprehensive investigation performed by Rogers et.al., they reported a 4% prevalence of IFs in the study population by examining brain CT scans of 15831 children with head trauma (18).

the most prevalent incidental finding in our study was generalized brain atrophy followed by CSP, hyperostosis frontalis, small vessel disease (SVD), and meningioma. Some of them, such as meningioma, are so prevalent that the term "incidental meningioma" is used for it. In fact, it is essential to note that approximately 38.9% of newly diagnosed meningiomas are discovered during the evaluation of asymptomatic patients using brain MRI and CT imaging modalities (19). Although these tumors are benign and do not require emergency action, other brain tumors that are more invasive may also be incidentally detected in brain CT scan of trauma patients. In a study conducted by Russeler et al. 0.4% of IFs in brain CT scan of trauma patients were brain masses suspected to be astrocytoma (20). A recent systematic review of IFs detected on CTs performed in the ED revealed that up to 2% of these findings were indicative of early-stage malignancies in studies reporting follow-up data after incidental findings (1). The identification of incidental findings in these cases presents a notable obstacle for trauma centers, requiring a systematic approach to ensure effective management and subsequent monitoring. However, the majority of IFs do not possess significant clinical relevance. On the other hand, the declaration of these insignificant findings can lead to increased clinical responsibilities and costs, as well as potentially presenting patients with psychological or financial distress, while also subjecting them to interventions that may carry potential harm (21,22). The complex series of medical interventions carry a significant probability of adverse effects. In this context, Ganguli et al. demonstrated that a majority of physicians, specifically 62.8%, expressed the belief that the provision of accessible guidelines about the management of incidental findings would serve to mitigate the adverse consequences associated with cascade effects (23).

The incidental findings committee of the American College of Radiology has released white papers that provide official recommendations for reporting incidental findings (24). These recommendations cover a wide range of findings and often include specific methodologies for determining the timing and modalities of additional testing based on the radiographic features of a particular finding. Unfortunately, there are no established protocols for diagnosing and approaching IFs in brain CTs at this time. Although there are guidelines for how to deal with incidental findings in brain MRI (25,26), these incidental findings in brain MRI are usually seen in people who voluntarily participate in research, and their follow-up will be different from what happens in the emergency department (27,28).

Our investigation revealed that 5.6% of IFs required emergent attention in the follow-up categories. These included brain masses, hydrocephalus, and vitreous hemorrhage. and the vast majority of our IFs were classified as mild, requiring non-emergent investigation or no further evaluation.

5. Limitations

The main limitation of our study is that we did not investigate follow-up patients to identify whether the documented IFs in this study corresponded to eventual neurologic diagnosis. Generally, despite certain histopathological findings being similar to those found on typical tomography, in some cases, the histopathological diagnosis may be different. As a result, certain findings may be over-reported, e.g. malignancy or cyst.

6. Conclusion

In conclusion, the prevalence of incidental findings on brain CT scans performed during the evaluation of head trauma in the ED is considerable. Brain atrophy was the most common finding. Immediate evaluation or routine follow-up was recommended for more than half of IFs. Further studies are recommended to determine the level of agreement with more precise modalities based on IFs and the agreement with pathological and histological results.

7. Declarations

7.1. Acknowledgement

We are sincerely thankful to the study participants.

7.2. Authors' contribution

Contribution to the conception and design: MA, FA, and FH; Data collection: MA and FA; Data analysis and Interpretation: FB and AB; Statistical analysis conduction: AB; Drafting: FB, AB, and FH; Critical revision and Approval: all authors.

7.3. Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have

appeared to influence the work reported in this paper.

7.4. Funding

This research received no external funding.

References

1. Evans CS, Arthur R, Kane M, Omofoye F, Chung AE, Moreton E, et al. Incidental radiology findings on computed tomography studies in emergency department patients: a systematic review and meta-analysis. Ann Emerg Med. 2022;80(3):243-56.
2. Treskes K, Bos SA, Beenen LFM, Sierink JC, Edwards MJR, Beuker BJA, et al. High rates of clinically relevant incidental findings by total-body CT scanning in trauma patients; results of the REACT-2 trial. Eur Radiol. 2017;27:2451-62.
3. Lumbreras B, Donat L, Hernández-Aguado I. Incidental findings in imaging diagnostic tests: a systematic review. Br J Radiol. 2010;83(988):276-89.
4. Liu P-Y, Kuo L-W, Liao C-H, Hsieh C-H, Bajani F, Fu C-Y. Incidental findings on whole-body computed tomography in major trauma patients: who and what? Am Surg. 2022;88(7):1694-702.
5. Dewan MC, Rattani A, Gupta S, Baticulon RE, Hung Y-C, Punchak M, et al. Estimating the global incidence of traumatic brain injury. J Neurosurg. 2018;130(4):1080-97.
6. Mutch CA, Talbott JF, Gean A. Imaging evaluation of acute traumatic brain injury. Neurosurg Clin. 2016;27(4):409-39.
7. Illes J. Brain screening and incidental findings: flocking to folly? Lancet Neurol. 2008;7(1):23-4.
8. Razavi-Ratki SK, Arefmanesh Z, Namiranian N, Gholami S, Sobhanardekani M, Moghadam AN, et al. CT scan incidental findings in head trauma patients-Yazd Shahid Rahnemoun Hospital, 2005–2015. Arch Iran Med. 2019;22(5):252-4.
9. Shoemaker JM, Holdsworth MT, Aine C, Calhoun VD, de La Garza R, Feldstein Ewing SW, et al. A practical approach to incidental findings in neuroimaging research. Neurology. 2011;77(24):2123-7.
10. Gibson LM, Nolan J, Littlejohns TJ, Mathieu E, Garratt S, Doherty N, et al. Factors associated with potentially serious incidental findings and with serious final diagnoses on multi-modal imaging in the UK biobank imaging study: a prospective cohort study. PLoS One. 2019;14(6):e0218267.
11. Sierink JC, Saltzherr TP, Russchen MJAM, de Castro SMM, Beenen LFM, Schep NWL, et al. Incidental findings on total-body CT scans in trauma patients. Injury. 2014;45(5):840-4.
12. Rogers AJ, Maher CO, Schunk JE, Quayle K, Jacobs E, Lichenstein R, et al. Incidental findings in children with blunt head trauma evaluated with cranial CT scans. Pediatrics. 2013;132(2):e356-63.
13. Li Y, Thompson WK, Reuter C, Nillo R, Jernigan T, Dale A, et al. Rates of incidental findings in brain magnetic resonance imaging in children. JAMA Neurol. 2021;78(5):578-87.
14. Munk M-D, 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(3):346-50.
15. 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 Acute Care Surg. 2007;62(1):157-61.
16. Fakler JKM, Özkurtul O, Josten C. Retrospective analysis of incidental non-trauma associated findings in severely injured patients identified by whole-body spiral CT scans. Patient Saf Surg. 2014;8(1):1-8.
17. Berge P, Darsonval A, Nedelcu C, Paisant A, Aubé C. Incidental findings on emergency CT scans: predictive factors and medico-economic impact. Eur J Radiol. 2020;129:109072.
18. Kroczek EK, Wieners G, Steffen I, Lindner T, Streitparth F, Hamm B, et al. Non-traumatic incidental findings in patients undergoing whole-body computed tomography at initial emergency admission. Emerg Med J. 2017;34(10):643-6.
19. James MK, Francois MP, Yoeli G, Doughlin GK, Lee S-W. Incidental findings in blunt trauma patients: prevalence, follow-up documentation, and risk factors. Emerg Radiol. 2017;24:34753.
20. Andrawes P, Picon AI, Shariff MA, Azab B, von Waagner W, Demissie S, et al. CT scan incidental findings in trauma patients: does it impact hospital length of stay? Trauma Surg acute care open. 2017;2(1):e000101.
21. Eskandary H, Sabba M, Khajehpour F, Eskandari M. Incidental findings in brain computed tomography scans of 3000 head trauma patients. Surg Neurol. 2005;63(6):550-3.
22. Boutet C, Vassal F, Celle S, Schneider FC, Barthelemy J-C, Laurent B, et al. Incidental findings on brain magnetic resonance imaging in the elderly: the PROOF study. Brain Imaging Behav. 2017;11(1):293-9.
23. Bos D, Poels MMF, Adams HHH, Akoudad S, Cremers LGM, Zonneveld HI, et al. Prevalence, clinical management, and natural course of incidental findings on brain MR images: the population-based Rotterdam scan study. Radiology. 2016;281(2):507-15.
24. Ruesseler M, Schill A, Lehnert T, Wyen H, Wutzler S, Marzi I, et al. Incidental findings in patients with multiple injuries: how to proceed? J Trauma Acute Care Surg. 2013;75(5):848-53.
25. Zener R, Johnson P, Wiseman D, Pandey S, Mujoomdar A. Informed consent for radiation in interventional radiology procedures. Can Assoc Radiol J. 2018;69(1):30-7.
26. O'Sullivan JW, Muntinga T, Grigg S, Ioannidis JPA. Prevalence and outcomes of incidental imaging findings: um-

brella review. bmj. 2018;361.
27. Ganguli I, Simpkin AL, Lupo C, Weissman A, Mainor AJ, Orav EJ, et al. Cascades of care after incidental findings in a US national survey of physicians. JAMA Netw Open. 2019;2(10):e1913325.
28. Berland LL, Silverman SG, Gore RM, Mayo-Smith WW, Megibow AJ, Yee J, et al. Managing incidental findings on abdominal CT: white paper of the ACR incidental findings committee. J Am Coll Radiol. 2010;7(10):754-73.
29. Gibson LM, Sellors J, Sudlow CLM. Management of incidental findings on multimodal imaging in UK biobank. Incidental Radiol Find. 2017;71-8.
30. Borra RJH, Sorensen AG. Incidental findings in brain MRI research: what do we owe our subjects? J Am Coll Radiol. 2011;8(12):848-52.
31. Nelson CA. Incidental findings in magnetic resonance imaging (MRI) brain research. J Law, Med Ethics. 2008;36(2):315-9.