

Incidental Findings on Computed Tomographic Scans in Patients with Head Trauma in Ilorin, Nigeria

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ABSTRACT

Background/aims: The focus of computed tomography (CT) examination in patients with suspected traumatic brain injury (TBI) is to assess the damage to cranial structures as a result of trauma; however, sometimes findings unrelated to the chief complaint and not pertinent to the immediate patient care are discovered. These findings are classified as "incidental findings." The aim of the study is to determine the prevalence of incidental findings discovered during CT examinations in patients with suspected TBI in our environment. **Materials and Methods:** A retrospective study of 551 patients with TBI, referred for CT examination at the Radiology Department of the University of Ilorin Teaching Hospital (UIITH), Ilorin from January 2009-2013. Any non-traumatic findings on CT scan or findings that were not related to the chief complaint were considered "incidental findings." **Results:** Incidental findings were seen in 19 (3.4%) patients, 12 (2.2%) males and 7 (1.2%) females. Enlarged cisterna magna was the commonest finding occurring in 5 (0.9%) patients. Meningiomas were the commonest incidental brain tumor found in 3 (0.54%) patients. Other incidental lesions include lacunar infarcts, arachnoid cyst, neuroglial cyst, and osseous lesions. **Conclusion:** Clinically serious incidental findings were mainly brain tumors. Visual abnormalities resulting from an incidental suprasellar meningioma may actually predispose to TBI as the patient was found to be responsible for the road traffic accident in which the head injury was sustained. However, larger studies involving many centers may be needed to correlate the role of serious incidental findings vis a vis predisposition to road traffic accidents.

Key words: Computed tomography; head trauma; incidental findings

Introduction

Modern day medical practice is empowered with diagnostic imaging tools that can provide information beyond the actual clinical indication. Computed tomography (CT) remains the commonest imaging modality requested for suspected brain trauma.

Within the past decade in Nigeria, CT as a diagnostic tool is now available in many Federal Tertiary Hospitals and state-owned hospitals, including private diagnostic centers.

The focus of the CT examination is to assess damage to the cranial structures as a result of trauma; however, sometimes

findings unrelated to the chief complaint and not pertinent to the immediate patient care are discovered. These findings are classified as "incidental findings." They can be previously unknown to the patient and the family. This finding can range from life saving to insignificant.^[1]

They are unknown to the subject and unrelated to the purpose of the imaging. They may cause anxiety and potentially have medical, lifestyle, or financial consequences.^[2]

The description of such unexpected finding can trigger additional medical care including unnecessary tests, other diagnostic procedures, and treatments that in some cases may pose an additional risk to the patient. This process has been called the "cascade effect".^[3]

Therefore, clinicians need to know how to deal with unexpected findings to avoid any undesirable consequences.^[4]

This study aims to evaluate incidental findings discovered on brain CT in patients with traumatic brain injury (TBI) in our environment.

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Materials and Methods

A retrospective study of 551 patients with TBI injury, referred for CT examination at the radiology department of University of Ilorin Teaching Hospital (UIH), Ilorin from January 2009-2013.

Ethical consent was obtained from the ethical review committee of our teaching hospital for this study.

All CT examinations were performed on a spiral CT scanner (General Electric machine); the slice thickness of films was 5 mm in posterior fossa and 10 mm in supratentorial from the base of skull through the vertex.

All images were reviewed by consultant radiologists. Any non-traumatic findings on CT scan or findings that were not related to the chief complaint were considered “incidental findings.”

Diagnosis of incidental findings were made on CT findings characteristic of each lesion. Incidental brain infarcts were defined as characteristic CT lesions in a patient with no previous symptoms or clinical diagnosis of stroke.

Findings like sinus lesions were excluded because traumatic injury to the sinus bones can cause bleeding/fluid in the sinus, simulating sinusitis. Asymmetry of the ventricles and other normal variants were also not considered as incidental finding.

Other patients’ biodata were obtained from the case note.

Descriptive analysis was done using Statistical Package for Social Sciences (SSPS) Version 17.

Results

A total of 308 (55.9%) males and 243 (44.1%) females were included in the study.

Mean age was 32.3 ± 18 years (range 7-75 years).

Incidental findings were seen in 19 (3.4%) patients, 12 (2.2%) males and 7 (1.2%) females.

The prevalence is summarized in Table 1.

Enlarged cisterna magna was the commonest finding occurring in 5 (0.9%) patients.

The commonest benign brain tumors were meningiomas in 3 (0.54%) patients. They ranged from 4 to 7cm in size, including a suprasellar meningioma, histologically confirmed [Figure 1].

Pituitary macroadenoma was seen in 2 (0.36%) measuring 15 and 24 mm in height, respectively.

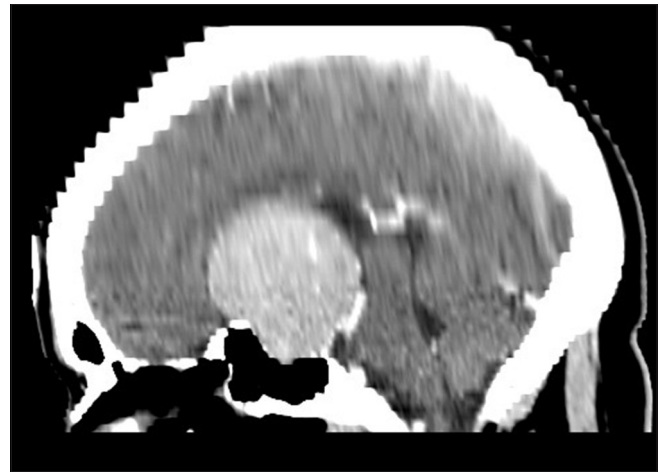


Figure 1: Sagittal reformatting contrast-enhanced CT image in a 53-year-old multicystic with head trauma showing a suprasellar meningioma. CT = Computed tomography

Table 1: Incidental findings on brain CT

Lesion	Frequency	%
Enlarged cisterna magna	5	0.90
Arachnoid cyst	2	0.36
Glioma	1	0.18
Neuroglial cyst	1	0.18
Infarct	2	0.36
Meningioma	3	0.54
Osteoma	3	0.54
Pituitary adenoma	2	0.36
No incidental finding	532	96.6
Total	551	100

CT – Computed tomography

One possibly malignant primary brain tumor (a low-grade glioma that was not histologically confirmed) was seen.

Three (0.54%) osteomas were seen, two in the frontal sinus and one in the right anterior ethmoidal sinus.

Asymptomatic lacunar infarcts (<10 mm) occurred in 2 (0.36%) patients.

Arachnoid cyst was seen in 2 (0.36%) patients [Figure 2], both occurred in the middle cranial fossa.

Neuroglial cyst was seen in one patient (0.18%).

Table 2 shows age distribution of the incidental findings.

Enlarged cistern magna was seen in individuals aged less than 40 years.

All the brain tumors occurred in patients 40 years and above for both meningiomas and pituitary adenomas.



Figure 2: Axial CT in a 3-year-old infant with mild TBI showing a left-sided middle cranial fossa arachnoid cyst. CT = Computed tomography, TBI = Traumatic brain injury

Table 2: Distribution of incidental finding according to age

Number (%)	Years				Total
	0-20	20-40	40-60	60-80	
Enlarged cisterna magna	3 (0.54)	2 (0.36)	-	-	5 (0.90)
Meningioma	-	-	2 (0.36)	1 (0.18)	3 (0.54)
Glioma	-	1 (0.18)	-	-	1 (0.18)
Infarct	-	-	-	2 (0.36)	2 (0.36)
Pituitary adenoma	-	-	2 (0.36)	-	2 (0.36)
Arachnoid cyst	1 (0.18)	1 (0.18)	-	-	2 (0.36)
Neuroglial cyst	-	-	1 (0.18)	-	1 (0.18)
Osteoma	-	3 (0.54)	-	-	3 (0.54)
					19 (3.42)

The asymptomatic infarcts occurred in individuals more than 60 years.

The two cases of arachnoid cyst were seen in patients less than 40 years.

Discussion

CT is commonly indicated in patients with suspected TBI, which may sometimes reveal non-traumatic lesions. These incidental findings vary in their importance, from trivial lesions to findings that may have a greater impact on the health of the trauma patient than the injuries that led to the CT examination.^[5]

Our study indicated that 3.4% of patients imaged with cranial CT after suspected trauma had incidental findings. Previous studies have indicated a prevalence range of incidental findings varying from 1 to 6%.^[6-8]

Meta-analysis of 16 neuroimaging studies including 19,559 volunteers with mean ages from 11 to 63 years examined

with magnetic resonance imaging (MRI), the overall prevalence of incidental findings was 3%, giving a “number needed to scan” of 37 to detect any incidental finding.^[9] Reported prevalence rates of incidental findings in studies limited to pediatric age groups have reported prevalence as high as 26.2%, however, sinus disease were included, and these constituted as high as 83.9% of the total subject population.^[10]

Sinus disease were not included in this study because often fractures of the wall of the sinuses can cause bleeding into such sinuses simulating a sinus disease.

Enlarged cisterna magna defined as cisterna magna greater than 10 mm,^[11,12] it occurs in 0.3 to 0.7% of the population. It was seen in five patients.

The significance of an isolated enlarged cisterna magna is debatable; they may be associated with inflammation, infection, and infarction.^[6,11,12]

Adults with isolated mega cisterna may have an overall normal cognitive functioning but may score inferior to controls on some parameters of memory and verbal fluency.^[11]

Eskandary *et al.*, in a large series of 3,000 patients with head trauma found 11 incidental cases of enlarged cisterna magna were found in a series of 3000 computerized tomography scans. However, their conclusion was that mega cisterna magna by itself is not related to any specific symptoms and may not require further study or treatment.^[6,11,12]

Intracranial tumors were discovered incidentally in a total of 6 (1.1%) patients, with meningioma seen in 3 (0.54%), pituitary adenoma in 2 (0.36%), and glioma in 1 (0.18%).

Majority of incidentally detected brain tumors are meningiomas and pituitary adenomas in previous studies.^[13]

Diagnosed meningiomas have been discovered during surgery, autopsy, neuroimaging, or a combination. However, Radhakrishnan *et al.*, had attributed an increase in incidentally discovered meningiomas to advances in neuroimaging technique. A study in Rochester from 1950 to 1989 showed that rates of incidence of intracranial meningioma were higher from 1970 to 1989 than from 1950 to 1969, most likely as a consequence of the introduction of sophisticated neuroimaging technique.^[14]

Meningiomas are most commonly diagnosed between the sixth and eighth decades of life; however, patients with symptomatic meningiomas commonly are seen in the fifth decade of life.^[15]

The average age of patients with meningiomas in this study is 56.1 years, which is close to the sixth decade.

The rate of growth of meningiomas is naturally slow, with many remaining asymptomatic throughout life, and up to 50% detected at autopsy. It is generally accepted that incidentally discovered meningiomas, which are asymptomatic should be followed up clinically and radiologically, some have advocated an interval of 2 to 3 years.^[16]

The sizes of meningiomas incidentally discovered in this study varied from 3 to 7 cm and were asymptomatic before trauma on account of patients' history. However, one of the patients had a suprasellar meningioma (largest of the meningiomas) and had a visual field defect on examination; furthermore, he was conveying a passenger on his motorcycle popularly called "Okada" in this environment when the accident occurred. It then seems plausible to believe that the visual defect as a result of the meningioma can actually have predisposed to the accident. This patient was referred for immediate neurosurgical evaluation.

Pituitary "incidentalomas" are, by definition, masses that are discovered by CT or MRI performed to evaluate unrelated disorders (such as head trauma), for cancer staging, or because of non-specific symptoms such as dizziness and headache.

Two cases of pituitary adenomas were discovered incidentally (incidentalomas) in this study. Autopsy studies have revealed pituitary microadenomas (i.e. <10 mm in greatest dimension) in 3 to 27% of patients with no history of pituitary disorders.^[17] Macroadenomas (10 mm or larger), on the other hand, are found in fewer than 0.5% of people.^[17] Both cases in this study were macroadenomas.

Key questions that must be answered when a pituitary incidentaloma is discovered are whether it is hormonally active and whether it is causing a mass effect (e.g. a visual field defect due to pressure on the optic chiasm). Incidentalomas that are not hormonally active and that are not causing a mass effect can generally be managed by watchful waiting.^[18] Both cases in our study neither had a visual field defect nor were hormonally active.

Asymptomatic infarcts were seen in two elderly patients above 60 years, both were lacunar infarcts. Asymptomatic infarct has been reported frequently in the elderly population. Such changes have been shown to be associated with increased risks of stroke and cognitive decline.^[16,19]

The incidence of incidental brain infarcts is much higher on MRI-based population studies and reported to be the commonest incidental finding by Vernooij *et al.*,^[16] This can naturally be explained by the higher sensitivity of MRI in detecting lacunar infarcts than CT. The two patients in this study apart from being elderly were known hypertensive's, which could account for the lacunar infarcts.^[20]

Arachnoid cyst was discovered in two patients (0.36%). Arachnoid cysts tend to be discovered as incidental findings

on imaging of the brain. Previous studies have shown varying frequency of arachnoid cyst discovered incidentally ranging from 0.3 to 1.4%.^[21,22] This varying range has been attributed to patient selection criteria, with studies involving neurological patients reporting a higher incidence of arachnoid cysts discovered.^[8]

Neuroglial cyst was seen in one patient (0.18%) also. They are defined as seen as a well-defined, non-enhancing, hypodense (cerebrospinal fluid (CSF) density), and unilocular cystic lesion with no surrounding edema.^[23] They are usually discovered as an incidental finding, usually asymptomatic as in this case.

Incidental findings remain important diagnostic discovery. Some are benign but others especially the brain tumors will require serial follow-up by the clinicians.

Incidental finding is also a dilemma for clinicians and the cooperation between radiologists and clinicians is essential to deal with these abnormalities, these incidental findings must be disclosed to patients balancing the ethical and medicolegal implications of this unsought information.^[24-26]

The impact of incidental findings on quality of life, employment, life insurance, and medical cost is currently unknown; however, in some developed countries for example United Kingdom (UK), following widespread consultation amongst imaging research centers, professional organizations, research funding agencies, ethicists, and lay people (including debate at the UK Biobank Ethics and Governance Council). The UK now has published guidance on minimum standards for the "Management of incidental findings detection during research imaging."^[27,28]

In conclusion, incidentally discovered lesion in this study was seen in 3.4%, clinically serious abnormality seen were mainly brain tumors, including case of suprasellar meningioma required urgent referrals. Based on visual abnormalities seen in the patient with suprasellar meningioma, who was responsible for the the road traffic accident, it seems plausible to assume that some incidental findings may actually predispose to TBI. However, larger studies, involving many centers may be needed to correlate role of serious incidental findings vis a vis predisposition to accidents.

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