ISSN: 2754-4990

Journal of Ophthalmology Research Reviews & Reports

SCIENTIFIC Research and Community

Research Article

Open Access

CT Head Lens Exclusion Audit

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ABSTRACT

Objective: An audit was conducted to assess the number of CT head scans in which one or both lenses of the eye were excluded, from scans conducted in the A&E and inpatient setting, as well as in the outpatient setting in a UK district general hospital. For the purposes of this paper, we will focus on the inclusion of both lenses in the A&E and inpatient setting, as well as the outpatient setting in both audit loops.

Study Design: The data was collected via an audit cycle. The first audit loop reviewed lens exclusion in 50 consecutive CT head scans performed in the A&E and inpatient setting, as well as 50 consecutive CT head scans performed in the outpatient setting taken between January- February 2021.

The results were shared with the radiology department at the district general hospital the audit was conducted in. Staff education about the need for CT head lens exclusion was the key intervention.

A re-audit was conducted using the same criteria as the first audit loop for scans performed at the end of May-June 2021. The results for the re-audit were also shared with the team.

Results:

1. A&E and inpatient scans: In the re-audit, 46 CT head scans included the lenses of both eyes. In the original audit, 42 CT head scans included the lenses of both eyes.
2. Outpatient scans: In the re-audit 42 CT head scans included the lenses of both eyes. In the original audit, 45 CT head scans included the lenses of both eyes.

Conclusion: This audit demonstrates that equipment and patient-related factors may pose an ongoing challenge to avoiding the lens in performing a CT head scan. Educational support and awareness is needed to further reduce the radiation to the lens.

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Received: February 01, 2024; **Accepted:** February 05, 2024; **Published:** February 15, 2024

Keywords: CT Head, Lens, Imaging

Abbreviations

CT: Computerised Tomography
CT C-Spine: Computerised Tomography Cervical Spine
MRI: Magnetic Resonance Imaging
A&E: Accident and Emergency
GCS: Glasgow Coma Scale
UK: United Kingdom

Introduction

According to the Royal College of Radiologists the lens of the eye should be excluded in performing a CT head scan [1]. Reasons for this include to help reduce radiation to the lenses and the formation of cataracts [1]. It has been noted that radiation to the lens of the eye following a CT head scan can vary between 2-130mGy [2].

An audit was conducted to assess the number of CT head scans in which one or both lenses of the eye were excluded, from scans conducted in the A&E and inpatient setting, as well as the outpatient setting in a district general hospital. For the purposes of this paper, we will focus on the inclusion of both lenses in the audit cycle from the inpatient and outpatient setting.

Methods

First Audit Cycle

- The first cycle of the audit loop considered whether one or both lenses were included in the CT head scans performed in January – February 2021
- 50 consecutive CT head scans performed in the A&E and inpatient setting were reviewed
- 50 consecutive CT head scans performed in the outpatient setting were reviewed
- Other factors were also reviewed including the age and sex of the patient, indication of the scan, and whether a CT C-Spine had also been performed

Intervention

- The results were presented at the CT/MRI Governance meeting of the radiology department at the district general hospital in May 2021
- The results were also shared with the radiography and radiology team to highlight the issue
- Staff education and raising awareness of the inclusion of lenses in CT head scans was the strategy of intervention

Second Audit Cycle (Re-audit)

- 50 consecutive A&E and inpatient CT head scans performed at the end of May- June 2021 were reviewed
- 50 consecutive outpatient CT head scans performed at the end of May-June 2021 were also reviewed
- The results were collated and shared with the team

Results

First Audit Cycle

A&E and Inpatient Scans

The CT head scans reviewed were taken from 1/1/2021-3/1/2021. 39 CT head brain scans were performed in A&E whilst 11 CT head scans were performed as an inpatient scan. 22 scans were performed on male patients and 28 scans were performed on female patients. 2 scans were paediatric CT head scans (one patient was 4 months old and one patient was 7 years old). For adult patients, ages ranged from 20-92 years old. The average age was 63.3 years old (excluding the paediatric patients).

Indications for performing a CT head scan varied. The majority of patients (twenty patients) had a CT head scan requested to investigate for a query bleed (subarachnoid haemorrhage, subdural haemorrhage, extradural haemorrhage, intracranial haemorrhage or previous intracranial haemorrhage with worsening symptoms). Of these, 10 patients had a witnessed or unwitnessed fall, with one patient noted to be on warfarin. 10 patients were noted to have had a CT head scan requested for query stroke and 3 for query space-occupying lesion. 5 patients were noted to have been referred for a CT head scan for query head injury. Other indications included loss of consciousness/unresponsive episodes, seizures as well as depressed left parietal side. 3 patients also had a CT C-Spine performed.

Of the 50 CT head scans performed, 42 had both lenses included. These included two paediatric patients and three patients who also had a CT C-Spine performed.

Outpatient Scans

50 CT head scans were reviewed which were taken between 04/01/2021- 05/02/2021. 18 female patients and 32 male patients were included. The age range of the patients was between 30-93 years old, with the average age being 70.2 years.

The indications for the scan varied. 9 patients had a scan for querying space-occupying lesions, 8 patients due to cognitive decline/impairment, 6 patients due to progressive weakness (which may have been localised to a limb/more than one limb), 5 patients due to possible stroke and 4 patients were scanned due to a form of paraesthesia often with another symptom (numbness or headache). 3 patients were scanned for querying an intracranial bleed (one querying a subarachnoid haemorrhage and one querying a subdural bleed). Other indications included blepharospasm and worsening migraine. One patient had a CT C-Spine.

Of the 50 CT head scans performed, 45 patients had a CT head scan performed with both lenses included.

Second Audit after Intervention

A&E and Inpatient Scans

50 consecutive CT head scans were reviewed from the 16/6/2021-21/6/21. 26 scans were performed on male patients and 24 scans on female patients. The average age of the adult patients for which the scan was performed was 71.6 years old, with the adult age range being from 43-94 years old. 4 children had CT head scans performed, aged 1 month and 16 days, 3 months, 8 months and 5 years old.

Indications for inpatient scans varied. 8 patients had a CT head scan for possible intracranial bleed, 7 patients had a scan for possible stroke, 6 patients had a scan for confusion including one patient having a scan for confusion post-operation, 5 patients had a scan post-thrombolysis, 5 patients had a scan following a fall or head injury whilst on anticoagulants, 2 patients had a scan following a fall whilst not on anticoagulants, 3 patients had a scan for investigating for metastasis, and 2 scans were performed for patients with seizures. 12 CT head scans were performed for other reasons, including leg weakness, cerebellar signs, query meningitis, reduced GCS and hydrocephalus with series shunts. One patient had a CT C-spine performed.

Of the CT head scans performed, 46 scans included the lenses of both eyes.

Outpatient Scans

50 consecutive CT head scans were reviewed from 27/5/2021-24/6/2021. 29 scans were performed for male patients and 21 scans for female patients. For the adult patients, the youngest age was 22 years old and the oldest age was 90 years old. One paediatric patient was included at 16 years old.

Indications for outpatient scans varied. 9 patients had a scan to check for brain metastases, 8 patients for investigating memory or cognitive decline, 7 patients for investigating space-occupying lesions or intracranial pathology, 3 patients for a query infarct and 3 patients to assess for a residual or new bleed. 20 patients had scans performed for other reasons including to assess for progression of a subdural haematoma, chronic headache, mild disc swelling and left optic nerve swelling with headache.

Of the 50 CT head scans reviewed, 42 patients had the lens of both eyes included. No CT C-Spines were performed.

Discussion

Unfortunately, the results of the second audit cycle demonstrated that the number of CT head scans in which the lenses of the eyes were included had not significantly decreased in the A&E and inpatient settings as well as in outpatient settings compared to the first audit cycle (Table 1).

Table 1: Outcome of audit in which both lenses were included

	Both lenses included
First Audit: A&E and Inpatient	42
First Audit: Outpatient	45
Second Audit: A&E and Inpatient	46
Second Audit: Outpatient	42

In discussing the initial audit results with the radiographers and the radiologists at the CT/MRI governance meeting, it was noted that several external factors had a large influence on the scanning of the lens in the CT head scan. Reasons for inclusion of the lens in performing the CT head scan included difficulty in positioning the patient due to reduced GCS, suspected C-Spine injury, being a paediatric patient less able to tolerate the scan, and confusion or non-compliance.

Additionally, the type of CT scanners used in the department were not able to be angled adequately to avoid scanning the lens. These factors pose an ongoing issue to excluding the lens in CT head imaging.

Even so, the results of the re-audit have been shared with the radiography and radiology team at the district general hospital the audit was conducted in, to further support awareness of this continuing issue. Another re-audit of the exclusion of the lens in CT head scans may be required at a later date, to see if allowing more time following teaching around this subject can help to support changing practice.

Acknowledgements
Thank you to Dr Weehaan Pang (Consultant Radiologist) and Dr Arivalagan Bapusamy (Consultant Radiologist) for supervising and supporting this project.

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