



INCIDENCE AND CHALLENGES IN TRAUMA RADIOGRAPHY IN A TERTIARY HOSPITAL, SOUTH EAST NIGERIA.

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ABSTRACT Managing critically injured patients are challenging, as most victims of major trauma are often present with a host of complications including inability to precisely locate the site and nature of injury. Hence the need for an urgent diagnosis and resuscitation. This study was carried out to establish the incidence of trauma and the radiographers' challenges in managing trauma patients in Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, Anambra state South East Nigeria. There was retrospective data review of trauma cases from January 2014- June 2015, and a questionnaire was used to generate information from practicing radiographers. Twenty five (25) questionnaires were shared to practicing radiographers of the hospital, and twenty, (20) questionnaires were returned. A simple descriptive data analysis was used to calculate the frequencies and the percentages. Within the study period, the total number of trauma cases was 601 (11.23%) of the total conventional X-ray investigations done in the department. The different anatomical parts are as follows; chest 227 (4.24%), skull 145 (2.71%), spine 101 (1.89%), extremities 86 (1.61%) and abdomen 42 (0.78%). Also, inability to visualize cervical spine C7/T1 junction and unco-operative patients are the greatest challenges facing the radiographers during their investigations. The study established the incidence of trauma cases from January 2014 – June 2015 and the challenges faced by the radiographers during trauma investigations in the hospital.

KEYWORDS : incidence and challenges, trauma radiography, Radiology Department, Nnamdi Azikiwe University Teaching Hospital Nnewi.

INTRODUCTION

Radiography is the art and science of application of various forms of radiant energy on human being in order to promote health, treat diseases and produced various diagnostic images. The practice of radiography therefore involves a sound knowledge in scientific and technical skills based on theoretical framework, utilizing the imaging modalities necessary with its accessories and employing an effective communication system to interact with the patient before and during the investigation, to achieve the desired goal. The imaging modalities used includes; the conventional radiography, computed tomography, magnetic resonance imaging and ultrasonography.

The word trauma is a direct borrowing of the ancient Greek word trauma, which was used to refer to the bodily wounds or injuries suffered by soldiers from the piercing of their armour (Kardiner, 1941). Later in history, particularly in medical and psychiatric literature, trauma was understood as a wound inflicted on the mind, rather than on the body. According to concise medical dictionary, trauma is defined as physical wound or injury such as fracture or blow. Trauma is also defined as an emotionally painful and harmful event concise medical dictionary. The term psychological trauma is used to refer both to negative events that produce distress and to the distress itself (Krystal, 1969).

Therefore, by these definitions, trauma is a common case which occurs in radiology department and it goes beyond the case of just road traffic accident (RTA), as it may be perceived by common man. But to includes the cases like intestinal obstruction, testicular torsion, falls, natural disaster and the injuries sustained in violence or war.

It can occur in different parts of the body with no age limit. Most countries of the world are experiencing an epidemic of trauma, but the most spectacular increase has been in the developing countries. Proliferation of roads and use of vehicles has led to a rapid increase in injuries and deaths and many peripheral medical facilities find themselves faced with multiple casualties from bus crashes or other disasters. Severe burns are also common in both urban and rural areas (David, 2006).

But irrespective of the type and the degrees of the injury involved, one of the expectations of the radiographer is to provide a diagnostic image that is of high quality. This high quality image can be achieved in

conjunction with adequate patient cooperation. However, most of the time, this patient co-operation which would have been put toward achieving better diagnostic image quality, is therefore impaired as it is often witnessed in patients with fractures, accident and emergency cases, unconscious patients and generally in trauma cases. These most at times, poses serious challenges to radiographers during radiological procedures, most especially the young radiographers and student radiographers who are less acquainted with clinical practices.

These injuries which could be sustained on the various body parts can be diagnosed with different imaging modalities as listed above. Therefore, any factor which could compromise the diagnostic image quality or hamper the uses of the imaging modality of choice is known as a challenge. Therefore, the type and the various degrees of trauma can impose some challenges in the use of these imaging modalities (Web, 2006).

Generally, for all health care professionals, mental preparation and communication are the key factors when dealing with trauma situations.

This means, in order to affect a positive result in the management of trauma situation, effective communication by radiographers is essential, so as to effectively achieve imaging process and to produce stress-free as possible. Any problem with communication be it a major or minor one, will affect the outcome of the case. It is expected that the images should be produced without deteriorating the patient's condition further.

Besides this mental preparation and effective communication, there are also necessary modifications that can be adopted when confronted with cases of trauma. This ranges from equipment selection and orientation, factor selection, patient positioning and the use of positioning accessories/aids. Also of utmost importance is the maintenance of a sterile environment as trauma can be exposed and thus, have increased chance of contamination. However, the positioning principles for trauma cases are similar to those applied for routine general radiography. The primary difference can be summarized with the word adaptation. Each trauma case and situation is unique and the radiographer must take time to evaluate the patient properly so as to adapt with the situation.

Therefore, the incidence of trauma cases and the challenges associated with imaging trauma cases by radiographers have not been assessed in the institutions under study and this has prompted this research.

OBJECTIVES

- To establish the incidence of trauma cases in Nnamdi Azikiwe University Teaching Hospital (NAUTH) from January 2014 to June 2015.
- To evaluate the challenges encountered by radiographers during the examination of trauma patients in Nnamdi Azikiwe University Teaching Hospital (NAUTH).
- To determine the most common trauma cases encountered by the radiographers
- To assess the anatomical part that poses a challenge during the examination.

RESEARCH METHODOLOGY

Research design

This is a retrospective study of the incidence and challenges in trauma radiography at the radiology department of Nnamdi Azikiwe university teaching hospital (NAUTH), Nnewi, Anambra state Nigeria.

Study population

This study included patients whose request, query or referral documents are designated trauma by referring physician and the investigation carried out by practicing radiographers at the Radiology department of Nnamdi Azikiwe university teaching hospital, Nnewi.

Sample size

A convenience sampling technique was adopted to obtain a sample size of 601 trauma cases and 20 practicing radiographers for the study.

Equipments / Materials

The instrument for data collection was a retrospective data of trauma cases of patients from January 2014- June 2015. A questionnaire-based survey was used for the radiographers working in the hospital during the period of the study. The questionnaire was 16 questions semi-structured and open-ended questionnaire. The questionnaire was designed in a way that the information obtained from each section was used to obtain each objective of the study.

Procedure for data collection

Data were collected from request, query or referral documents in the archive of the x-ray unit including the radiologist's reports. The following information were collected from the patients' x-ray jackets and request, query or referral documents.

- Date of Examination
- Patient x-ray number
- Patient age
- Sex
- Clinical indication/ nature of investigations
- Radiologist's final report
- Image Modality used

Secondly, questionnaires were given to twenty two (22) practicing radiographers on the first visit. Nineteen (19) completed questionnaires were returned on the same day. A second visit was made after two days, and 3 questionnaires were distributed. Out of the three one was returned properly completed.

Data analysis

Data was analyzed using statistical package for social science, SPSS (version 20) based on findings, prevalence, sex and age. Results were presented on frequency and percentage tables.

Data presentation and analysis

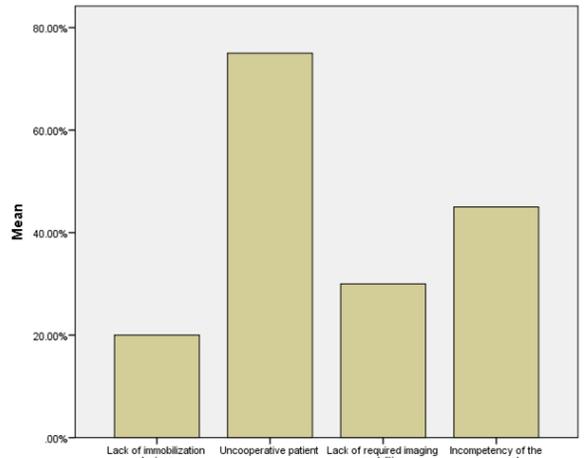
Table 1: Frequency of the investigations in the department

S/No	Anatomical Part	Trauma Cases	Routine	Total (%)
1	Skull	145	264	409 (7.63)
2	Spine	101	297	398 (7.43%)
3	Chest	227	3533	3760 (70.18%)
4	Abdomen	42	80	122 (2.27%)
5	Extremities	86	583	669 (12.49%)
6	Total	601	4757	5,358 (100.00%)

The above table showed that the frequency of the total investigations in

the department from January 2014- June 2015 was 5358 (100.00%), with the total number of routine investigation as 4757 (88.79%), and that of the trauma case as 601 (11.23%). Chest examination had the highest number of both routine and trauma investigations with a total of 3533 (65.94%) and 227 (4.24%) of trauma respectively. Skull had a total of 264 (4.93%) routine and 145 (2.71%) of trauma cases respectively. It was the second of most occurred trauma after chest. Spine also, had a total of 297 (5.54%) of routine examinations and about 101 (1.89%) of trauma respectively. It was the third of the most occurred trauma. The abdomen had a total of 80 (1.49%) of routine examination and 42 (0.78%) of trauma cases. From this study, abdominal trauma showed to be the least occurred trauma within this period of the study. Then, the extremities had the total number of routine as 583 (10.88%), and a total of 86 (1.61%) of trauma cases.

Bar chart 1: The most frequently encountered challenges by radiographers during the examination of trauma cases



The bar chart showed the challenges encountered by the radiographers during trauma cases examination, with unco-operative patient presenting the greatest problem with 75%, incompetency on some of the radiographers with 45%, lack of required imaging modalities 30% and lack of immobilization devices presenting 20%.

Table 2: The age ranges of the participated radiographers

Variables	Age (years)	Frequency	Percentage
	21-30	14	70%
	31-40	6	30%
	41-50	-	0%
	Total	20	100%

Table 2, showed that most of the practicing radiographers are in age range of (21-30) years, while few of the radiographers are in age range of (41-50) years and none within the age of (51-60).

Between these two groups, males were higher in number which was about 16 (80%), and that of the females were 4 (20%).

Bar Chart 2: The participated males and females in the study.

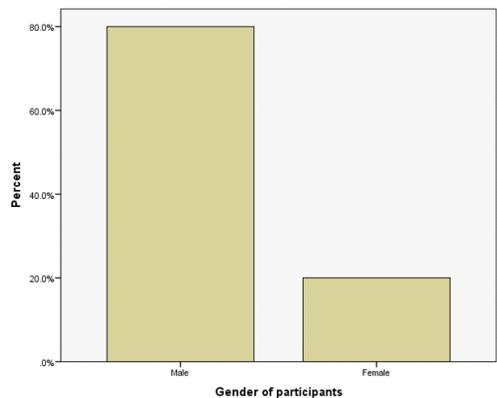


Table 3: The duration of the practicing radiographers

Length of practice	Frequency	Percentage
Less than 5 years	17	85%
5 – 10 years	3	15%
10 years above	-	0%
Total	20	100%

The above table showed that the duration of the majority of the radiographers practicing was within the range of less than five, of about 17 (85%) while duration of just few radiographers was within the range of 5-10. None was within the range of 10 years above.

Table 4: Qualification of the radiographers

Qualification	Frequency	Percentage
B.Sc.	17	85%
M.Sc.	3	15%
Total	20	100%

Table 4, showed that 17 (85%) of practicing radiographers are B.Sc. holders while 3(15%) of radiographers are M.Sc. holders. This implies that most of the practicing radiographers in Nnamdi Azikiwe University Teaching Hospital (NAUTH) are B.Sc. holders. While none of them is PH.D holder.

Table 5: The imaging modalities used in various trauma cases.

Modality Anatomical Part	X-ray	C.T	MRI	Ultrasound	Total
Skull	18(9.09%)	19 (9.60%)	4 (2.02%)	0 (0.0%)	41(20.71%)
Spine	19(9.60%)	11 (5.56%)	9 (4.55%)	0 (0.0%)	39(19.70%)
Chest	20(10.10%)	14 (7.07%)	2 (1.01%)	3(1.52%)	39(19.70%)
Abdomen	18(9.09%)	13 (6.57%)	4 (2.02%)	11(5.56%)	46(23.23%)
Extremities	20(10.10%)	8 (4.04%)	5 (2.53%)	0(0.0%)	33(16.67%)
Total	95(47.98%)	65 (32.84%)	24(12.13%)	14(7.08%)	198(100.0%)

Table 5, showed that 18 radiographers out of 20, use x-ray in their skull trauma examinations, while 19 radiographers out of 20; use C.T in their examination of skull trauma. Also, four (4) radiographers use MRI in their examinations while nobody uses ultrasound in the investigation. In spine, nineteen (19) radiographers also reported using x-ray in their examination of spinal trauma, eleven (11) radiographers use C.T, nine (9) radiographers use MRI and nobody uses Ultrasound.

In chest trauma, all the radiographers who participated in this study, indicated using x-ray in their examinations, fourteen (14) radiographers indicated, using CT., two (2) radiographers use MRI and three (3) radiographers use Ultrasound. Also, eighteen (18) use x-ray in an examination of abdominal trauma, thirteen (13) use C.T, eleven (11) use Ultrasound and four (4) use MRI. While in trauma of the extremities, all the twenty (20) radiographers use X-ray in the examination, eight (8) radiographers use C.T, five (5) radiographers use MRI and nobody uses Ultrasound in the examination.

Table 6: The most challenging anatomical part

Anatomical part	Frequency	Percentage
Skull	3	30%
Spine	5	50%
Chest	1	10%
Abdomen	1	10%
Extremities	0	0%
Total	10	100%

Table 6: Showed that spine is the most challenging anatomical part with 50% and skull occurs with 30%. Chest and Abdominal trauma posed a little challenge with just 10% each while extremities do not posed challenge at all.

Table 7: The specific region of the spine that mostly posed a challenge.

Spine	Frequency	Percentage
Cervical (T7/T1 junction)	6	54.5%
Thoraco-lumbar	3	27.3%
Lumbo-sacral	2	18.2%
Total	11	100%

Table 7 showed that cervical(C7/ T1 junction) is the most challenging part of the spine with 54.5%, followed by thoraco-lumbar spine with

27.3%, and lumbo-sacral, the least challenging part with just 17.6%.

DISCUSSION

The study "incidence and challenges in trauma radiography at tertiary hospital in south east Nigeria was due to the researcher's interest in trauma radiography. In this study, a retrospective data of routine and trauma cases examinations between January 2014, to June 2015; with 16 questions semi-structured questionnaires which were given to the radiographers working in Nnamdi Azikiwe University Teaching Hospital (NAUTH) within the period this study was used.

This study showed that the number of trauma cases within this period was insignificant in relation to general routine examinations of all the body parts. Although, it appeared to be insignificant in relation to the general routine examinations, it is imperative to handle any cases of trauma, as urgently as possible with great care. Based on this study, it showed that chest trauma occurred most with the total of 227 (4.24%), skull with the total of 145 (2.71%) and the spine with a total of 101 (1.89%). While the incidence of the abdominal trauma and that of the extremities were relatively small. According to Nan et al (2009), blunt cardiac rupture was an exceedingly rare injury but patients with cardiac rupture following blunt thoracic trauma rarely survive and most die at the scene of the accident or soon after in the emergency room, before the cardiac lesions were detected.

This study equally showed that, the use of conventional x-ray with C.T, in the examination of skull trauma was in line with (Hessmann et al, 2004 and Huber-wagner, 2009) as the initial imaging modality and an adjunct to primary survey respectively. However, skull C.T scan was the diagnostic procedure of choice in the evaluation of the acutely injured patient or patient with acute neurological deficit. It can be done quickly even for uncooperative patients, and can even allow a firm diagnosis to be made, as well as in excluding alternative diagnoses. In addition, CT has been valuable in identifying and localizing intracranial bony or metallic fragments. Unlike MRI, patient monitoring was simple and safe. Currently, patient's stabilization and monitoring devices pose no difficulty with CT imaging, whereas MRI was of great value in the evaluation of subacute and chronic changes, and in identification of subtle abnormalities such as shearing injuries and cortical contusions.

According to Moran, S.G.et al (1994), recommended that, in moderate and severe head trauma, a CT scan was the investigation of choice. However, skull radiographs were helpful in those patients suspected of non-accidental injury, depressed skull fracture, penetrating head injury by a foreign body, or head trauma in children less than 2 years of age, even without neurological symptoms.

In spinal trauma investigation, this study showed that the greater number of radiographers used conventional x-ray in their investigations, followed by C.T. This study was in line with National Institute for Clinical Excellence (2007) report, that conventional x-ray could be used in the examination of cervical spine (with the exception of unconscious patient) but must be taken in three projections.

That is, the AP, Lateral and the Odontoid peg projections. According to this report, the cervicothoracic junction (C7/T1) can be difficult to see on the lateral x-ray. As a result, additional techniques may be used to supplement the initial series of three radiographs when necessary. This includes; the swimmers projection, supine oblique, and the collimated true lateral projections (CTL). Also, computed tomography (CT) scanning was used as an alternative or supplement to radiographs.

Furthermore, Bagley, L.J. (2006) noted that modern imaging studies such as computed tomography (CT) and magnetic resonance imaging (MRI) have substantially improved the diagnosis of osseous and discoligamentous injuries after spinal trauma. Thus, such changes as improvement in scan availability, image quality, acquisition time, and image reformatting have changed commonly used algorithms. However, plain films were still helpful, because they allow a quick overview of the bony deformity. Also, standard radiographs are important for analyzing long-term results and deformities at follow-up.

In chest trauma, all the radiographers who participated in this study indicated support in the use of conventional x-ray as the imaging modality in assessment of thoracic trauma while C.T is used as an adjunct to the primary survey. This is in contrary with the report of

American College of Radiology (2014) which revealed that , chest CT scan or CT angiography is the gold-standard routine imaging modality for detecting thoracic injuries caused by blunt trauma. However, supported the used of conventional x-ray only in routine examination. But, there was disagreement on whether routine chest CT is necessary in all patients with histories of blunt trauma. Ultimately, the frequency and timing of CT chest imaging should be site specific and should depend on the local resources of the trauma center as well as patient status.

They also indicated that, Ultrasound may be beneficial in the detection of pneumothorax, hemothorax, and pericardial hemorrhage; transesophageal echocardiography is a first-line imaging tool in the setting of suspected cardiac injury. While the use of MRI and nuclear medicine in blunt trauma setting, likely play no role in the acute setting, although these modalities may be helpful as problem-solving tools after initial assessment.

In abdominal trauma, this study showed that the majority of the radiographers used conventional x-ray and ultrasound, with x-ray occurred highest.

In extremities, this study showed that conventional x-ray was the first imaging modality used in detection of fracture.

This study also, showed that trauma of the spine was the most challenging anatomical part, particularly to the cervicothoracic junction (C7/T1). This was in line with the report of NICE (2007) that the visualization of cervicothoracic junction (C7/T1) is difficult to see with lateral projection.

Ireland et al (1998) also noted that patient's radiation dose is markedly higher with the swimmers projection than other plain radiographic projections, and movement of patients with suspected neck injuries may be unsafe.

This then raised doubts over the use of the swimmers projection as the possible means of visualizing the cervicothoracic junction. France et al (2005) have criticized oblique projections as being hard to interpret, although (Ireland et al, 1998 and Offerman et al, 2008) disagreed. However, in another survey undertaken by Jenkins, Curran and Locke into the techniques which would clearly demonstrate C7/T1; they stated that supine oblique give better information about spinal alignment, with less radiation of the patient.

Additionally, this study also showed that among the challenges frequently encountered by radiographers during the trauma patients' examination, patients' non- cooperation to instructions is markedly higher. This may be as a result of traumatic brain injury (TBI) sustained during the trauma.

CONCLUSION

Trauma is one of the cases that come to the radiological unit often. In fact, radiology unit is a second home to trauma cases apart from the trauma centre.

Managing critically injured patients are challenging, as most victims of major trauma are often present with a host of complications including inability to precisely locate the site and nature of injury, therefore, the need for an urgent diagnosis and resuscitation.

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