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Computed tomography in the Emergency Department

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Summary

Background:

Emergency Departments (ED) are supposed to serve patients in life-threatening conditions, yet they admit patients not requiring urgent medical attention. Computed tomography is one of the most commonly performed imaging tests in the ED in life-/health-threatening conditions.

The goal of this paper is to analyse CT examinations performed in the ED at St. Jadwiga Provincial Hospital No. 2 in Rzeszow.

Material/Methods:

The study group consisted of 1290 patients of the ED in Provincial Hospital No. 2 in Rzeszow, who were diagnosed in the ED from 01 Jan 2013 to 31 March 2013 and underwent a CT examination.

Results:

Among ED patients, who underwent head CT scans, there were 57% of males and 43% of females. Head CT scans revealed pathology in the head in 52% of males, including life-threatening conditions in 8%. In head CT scan, 44% of females demonstrated a pathology in the head including 7% with life-threatening conditions. CT scans of other body parts revealed a pathology in 45% of males, including 30% with life-threatening conditions, and 56% of females, including 28% with life-threatening conditions.

Conclusions:

CT scans of the head and other body parts due to trauma prevailed in males, whereas in females indications for CT were mainly neurological. Both males and females demonstrated similar – relatively very small – number of test results being directly life-threatening. Among head CT scans normal results prevailed in females. Normal results of CT scans of other body parts were more common in males than in females. CT scans of other body parts performed after trauma revealed a higher number of post-traumatic lesions including life-threatening ones in males. A large number of CT results showing no lesions suggest that a more insightful and precise classification of patients referred to CT scans by ED physicians or consultant physicians is required.

MeSH Keywords:

Emergency Service, Hospital • Infantile Apparent Life-Threatening Event • Tomography Scanners, X-Ray Computed

PDF file:

<http://www.polradiol.com/download/index/idArt/890550>

Background

Emergency departments (ED) are supposed to serve patients with life-threatening conditions [1]. However, they turned into big GP offices.

According to a report prepared by the Supreme Audit Office, the majority of patients admitted to EDs do not require urgent care. In some cases they form a vast majority, as these values can reach up to 80% of services. In most cases patients attend ED by themselves, they are brought by emergency teams in ambulances, or are referred there

by primary care physicians [2]. Computed tomography (CT) is one of the most frequently performed imaging diagnostic procedures carried out in patients with life/health-threatening conditions in ED. Its rapidity and accessibility provide an opportunity for accurate diagnoses that may save the life/health of the patient – it is time that plays an important role in ED.

The aim of the study

The aim of the study was the analysis of diagnoses on referrals for CT examinations to the CT Facility of the Provincial Hospital No. 2 in Rzeszow, the analysis of the results, and the evaluation of the validity and purposefulness of the scans. The scans and their results were divided into several groups according to the type of the scan performed, sex and age of the patients.

Material and Methods

The study comprised a group of 1290 patients of the ED of the Provincial Hospital No. 2 in Rzeszow, who were diagnosed at ED from 01 Jan 2013 to 31 March 2013 and in whom CT scans were performed. The group of the patients included 772 males (59.84%) and 518 females (40.16%). The mean value for age in males was 48 years, and in females – 54 years. Patients after trauma or with health/life-threatening conditions were referred to a CT scan from ED after the examination by the ED physician or the hospital duty doctor.

The scans were acquired using GE Discovery CT750 HD scanner. CT scans of the head were acquired in sequential acquisition at 2.5-mm slice thickness parasagally, and 5.0 mm slice thickness for the remaining part of the cerebrum without intravenous administration of contrast agent. Polytrauma scans: CT of the head as mentioned before, CT of the cervical spine – spiral acquisition at 1.2 mm slice thickness, CT of the thorax and abdomen along with the pelvis – spiral acquisition at 1.2mm slice thickness after intravenous administration of contrast agent + secondary reconstruction. CT scans of individual parts of the spine and other body parts were acquired using spiral acquisition at 1.2 mm slice thickness + secondary reconstruction. Angio CT of the head, thorax and aorta was performed using spiral acquisition with 1.2 mm slice after intravenous administration of contrast agent with the use of automatic syringe + secondary reconstruction.

Results

In the CT Facility of the Provincial Hospital No. 2 in Rzeszow in the first 3 months of 2013 (i.e. the first 3 months of the operation of ED), 1290 CT scans were performed – 14 daily on the average, out of which 79% were CT of the head (1019 scans), and only 21% (271 scans) were CT scans of other body parts (Figure 1).

CT of the head at the ED of the Provincial Hospital No. 2 in Rzeszow

Among ED patients in whom CT of the head was performed, 57% were males – mean value for age 52 years (580 scans), and 43% were females – mean value for age 58 years (439 scans) (Figure 2).

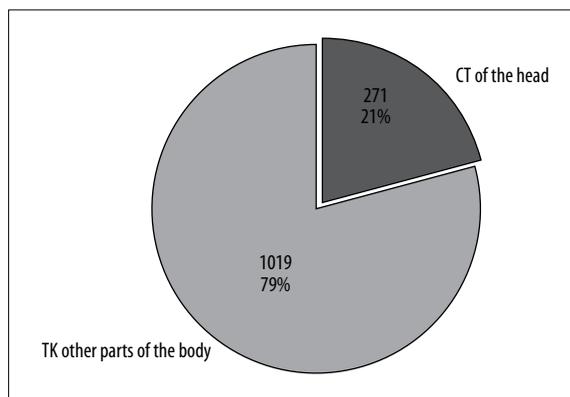


Figure 1. CT scans performed in the ED in Jan-Mar 2013.

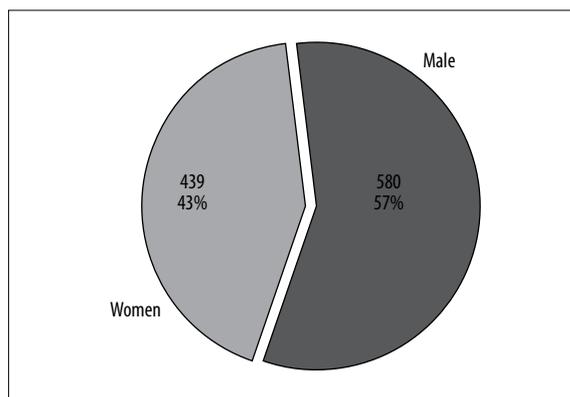


Figure 2. Head CT by sex.

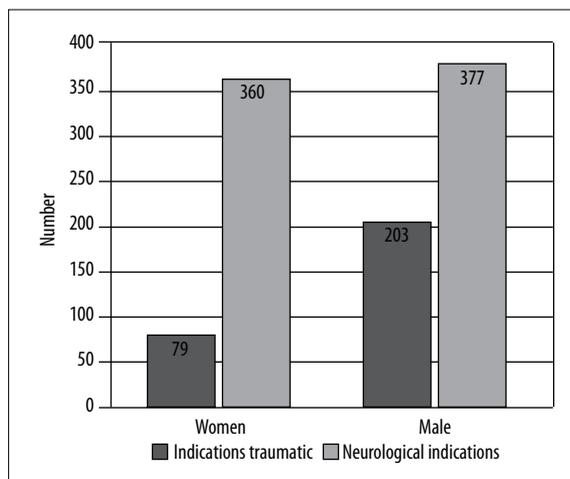


Figure 3. Division of head CT according to causes of referral and sex.

CT of the head in males – 580 scans

CT of the head was performed due to trauma indications in 203 males, which constituted 35% of the referrals for CT of the head issued by the ED physicians.

In order to exclude pathology in the central nervous system, CT of the head was performed because of neurological indications in 377 males, which constituted 65% referrals for the CT of the head issued by ED physicians (Figure 3).

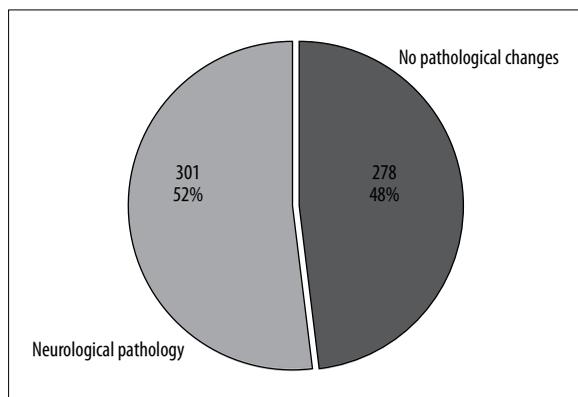


Figure 4. Head CT of males according to the result.

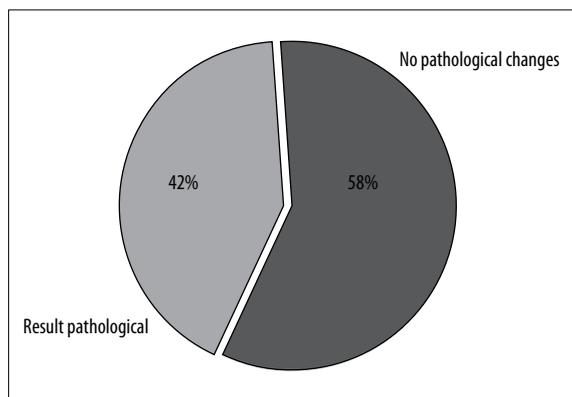


Figure 6. Head CT of females according to the result.

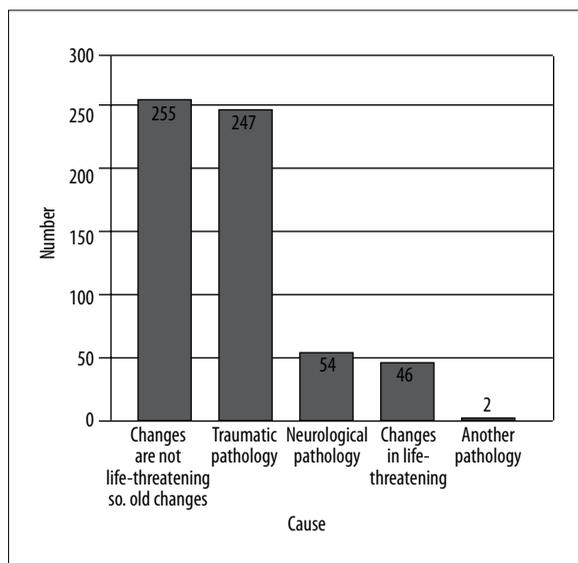


Figure 5. Types of pathological lesions in head CT scans in males.

No pathological lesions were detected on CT scans of the head in 278 males, i.e. 48% (Figure 4)

302 males exhibited pathology in the area of the head: post-traumatic – 54 cases (18%), neurological – 248 scans (82%). Life threatening conditions were detected in 46 patients (8%), not directly life-threatening lesions or „old lesions” were detected in 256 patients (92%) (Figure 5).

CT of the head in females – 439 scans

In female patients, CT scans of the head performed because of neurological indications prevailed – 360 cases – which constituted 82% – but there were less trauma indications – only 79 cases, i.e. 18%. (Figure 3).

No pathological lesions in CT of the head were detected in 255 female patients, i.e. 58% (Figure 6).

184 females (44%) demonstrated pathology in the head: post-traumatic – 8 scans (4%), neurological – 176 scans (96%) (Figure 7). Life-threatening conditions were detected in 30 patients (7%), not directly life-threatening lesions or „old lesions” were detected in 154 patients (35%) (Figure 8).

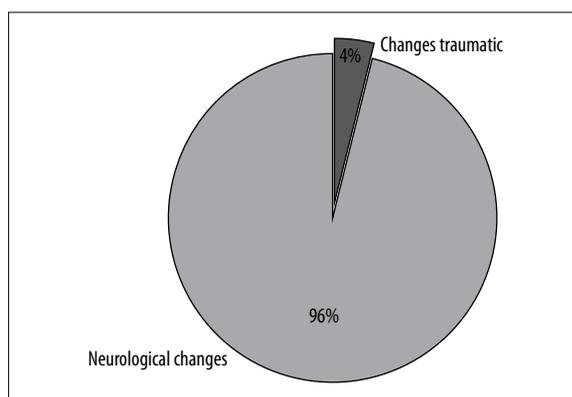


Figure 7. Causes of abnormal head CT scans in females.

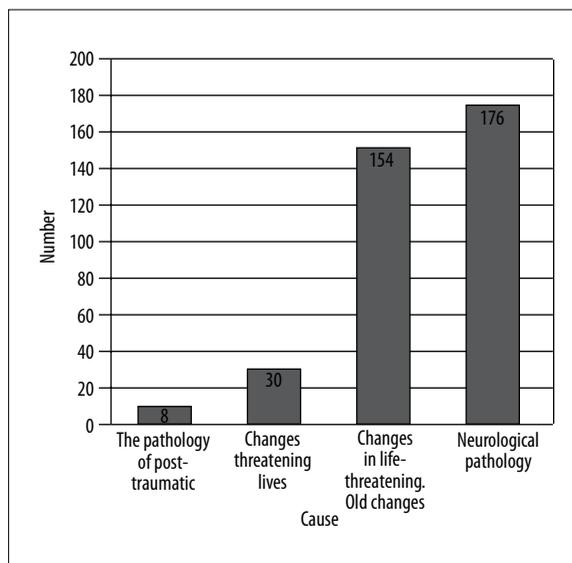


Figure 8. Types of pathological lesions in head CT scans in females.

CT of other body parts – excluding the CT of the head – at the ED in the Provincial Hospital No. 2 in Rzeszow

In this group of patients, 71% (192 scans) constituted males, mean value for age – 44 years. The remaining 29% (79 scans) were performed in females – mean value for age 50 years (Figure 9).

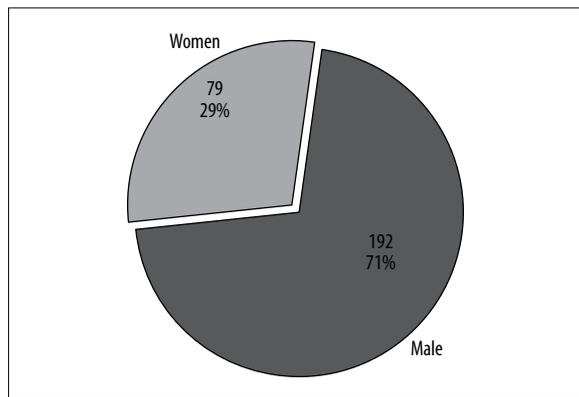


Figure 9. CT scan of other body parts by sex.

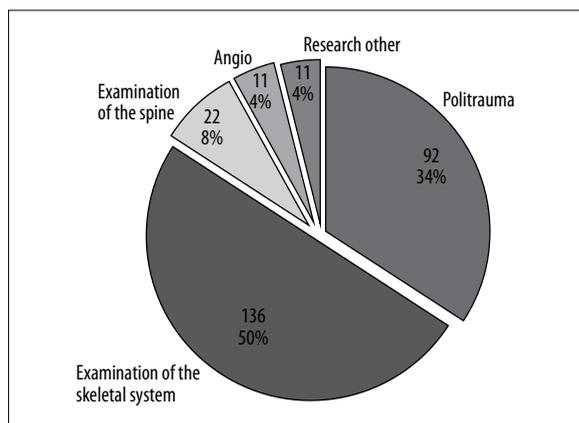


Figure 10. Types and quantity of CT scans excluding head CT.

CT of other body parts (excluding the head) was performed in 271 patients (21%).

Among them one can recognise:

- polytrauma scans – 92 scans (34%), 56 males (29%) and 28 females (35%),
- scans of the skeletal structures – 22 cases (8%), among which 23 were males (12%) and 6 females (8%),
- scans of the spine – 135 scans (50%), among which 91 males (47%) and 39 females (49%),
- angio scans – 11 scans (4%), among which 11 males (6%) and 4 females (5%),
- other scans – 11 scans (4%), among which 11 males (6%), 2 females (3%) (Figure 10).

CT scans of other body parts (excluding the head) in males – 192 scans.

CT of other body parts (excluding the head) because of trauma indications was performed in 169 males, which constituted 88%.

Because of other indications, CT of other body parts (excluding the head) was performed in 23 males, which constitutes 12% (Figure 11).

No pathological lesions were detected in 106 scans (55%) performed in male patients.

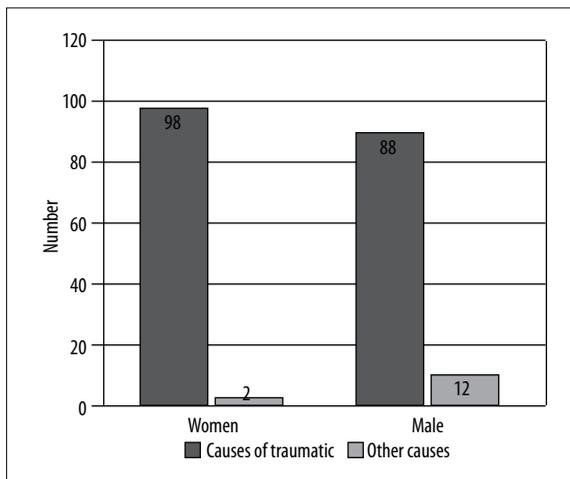


Figure 11. Indications for CT scans excluding head CT according to sex.

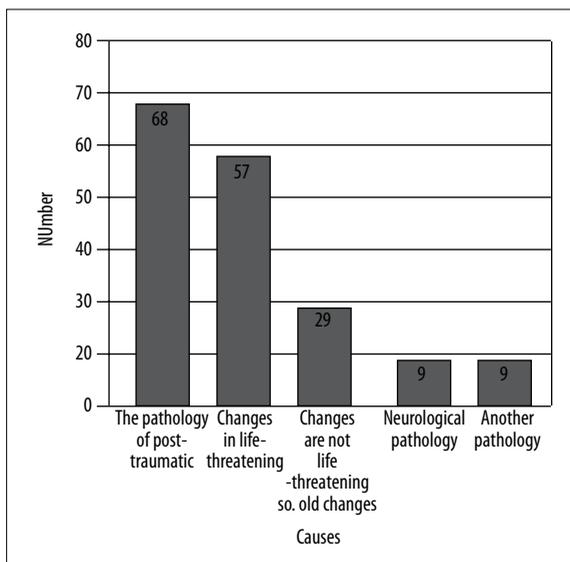


Figure 12. Types of pathological lesions identified in CT scans of other body parts (excluding head) in males.

Pathology was detected in 86 male patients (45%) and included: posttraumatic – 68 scans (80%), neurological – 9 scans (10%), or other pathology – 9 scans (10%). Life-threatening conditions were diagnosed in 57 scans (30%), and 29 scans (15%) disclosed lesions, which are not directly life threatening or „old lesions“ (Figure 12).

CT of other body parts in female patients – 79 scans

CT of other body parts (excluding the head) because of trauma indications was performed in 77 females, which constituted 98%.

Because of other indications, CT of other body parts (excluding the head) was performed in 2 females, which constitutes 2% of the referrals (Figure 13).

No pathological lesions were detected in 35 scans (44%) performed in male patients.

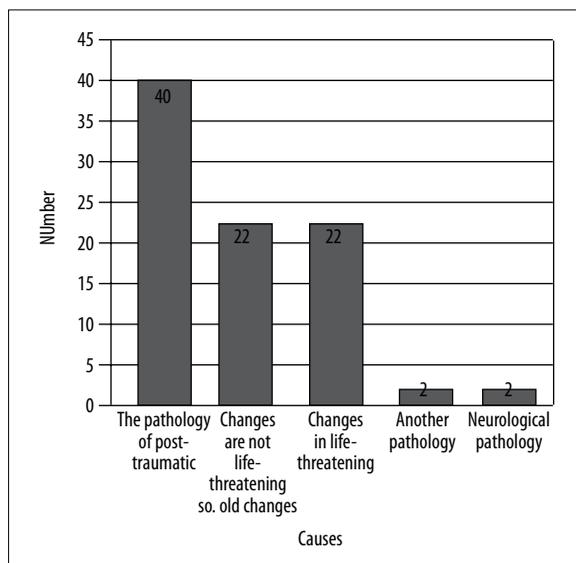


Figure 13. Types of pathological lesions identified in CT scans of other body parts (excluding head) in females.

Pathology was detected in 44 female patients (56%) and included: posttraumatic – 40 scans (90%), neurological – 2 scans (5%), other pathology – 2 scans (5%). Life-threatening conditions were diagnosed in 22 scans (28%), and 22 scans (28%) disclosed lesions which are not directly life threatening or „old lesions“.

Discussion

Computed tomography is considered standard in imaging diagnostics worldwide. Most modern interactive softwares provide rapidity and comfort of the scanning process, which in turn guarantees high diagnostic value and safety of the patient. According to guidelines (despite various opinions in worldwide literature), CT of the head is the basic and primary diagnostic procedure even in minor head injuries, with total exclusion of conventional X-ray examination, and a diagnostic procedure which is especially useful for neurological diagnostics. It should be remembered, however, that CT diagnostics uses X-radiation, which harmfulness is forgotten/not known to the referring physicians.

CT of the head is performed in order to diagnose, inter alia, non-traumatic life-threatening lesions in central nervous system such as e.g. stroke – haemorrhagic or ischaemic, subarachnoid haemorrhage, active hydrocephalus or the suspicion of a neoplastic process. It is also an invaluable diagnostic modality in recent craniocerebral trauma used most frequently on duty in hospitals in urgent cases. The scans performed in urgent cases in the CT Facility in ED include scans in patients after polytrauma – polytrauma CT, patients with subarachnoid haemorrhage – angio CT of the head, with an aneurysm or aortic dissection – angio CT

of aorta, with suspected pulmonary embolism – angio CT of the thorax. These are basic diagnostic scans performed in patients with life-threatening conditions.

The rapidity and accuracy of the scans, as well as their high diagnostic value, enable an immediate introduction of an appropriate life/health-saving therapeutic method.

Many patients are referred to ED unnecessarily – either they come by themselves without a referral, or are referred to ED by general practitioners, or brought in ambulances by emergency teams. The patients are often examined by young, inexperienced doctors, who frequently perform duty in ED. Duty in ED is often considered the hardest and the most difficult, and is often seen as exile. The physician often compensates the inexperience with performing numerous additional examinations and all possible consultations. Patients who do not require help from ED and are admitted there generate additional time, effort and work at the expense of time for other patients who are in real need of help. No clear-cut management scheme for patients admitted to ED has yet been found, which results in multiplication of diagnostic procedures, diagnostic-therapeutic errors and, more and more often – legal consequences concerning physicians [3].

Another problem for the CT facility arises because of the lack of referral, or incomprehensible information or its poor amount. Introducing mandatory replacement of Latin names and closer clinical data with ICD codes has exacerbated diagnostic problems – ICD codes do not provide full clinical data, are entered incorrectly, and are not supplemented by other data.

Conclusions

1. CT scans are performed in the CT Facility of the Provincial Hospital No. 2 in Rzeszow 14 times a day, more frequently in younger males than in females.
2. CT of the head and of other body parts performed due to trauma indications prevails.
3. Scans because of neurological indications prevail in females.
4. Both in males and in females a relatively low amount of results of the scans indicating health/life-threatening conditions was shown.
5. In CT scans of the head in females, unremarkable results prevailed.
6. In CT scans of other body parts unremarkable results were found more frequently in males than in females.
7. In CT scans of other body parts because of trauma indications, more post-traumatic lesions, including life threatening ones, were found in males.
8. A high number of unremarkable CT scans suggests the patients should be qualified in a more insightful and precise manner by ED physicians and consulting physicians.

References:

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