

## ATTENTIVE ANAMNESIS IS FUNDAMENTAL IN EMERGENCY SERVICES: ELUSIVE UNUSUAL RADIOLOGIC APPEARANCES

### ACİL SERVİSDE DİKKATLİ ANAMNEZİN ÖNEMİ: ALDATICI NADİR RADYOLOJİK GÖRÜNTÜLER

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#### ABSTRACT

##### OBJECTIVES

Diagnostic errors have become an important patient safety concern especially in the emergency department (ED). This article is aimed at examining the real importance and the role of clinical history in missed diagnoses with diagnostic radiologic process in the ED.

##### METHODS

In this multicenter study, a total of 2921 patients were investigated for missed diagnosis who were admitted to the ED from December 2007 to November 2008. Medical records were reviewed; complete medical history of the patients, initial diagnosis and final diagnosis were evaluated, CT and/or MRI findings were assessed as radiologic reinvestigation retrospectively.

##### RESULTS

We found that 119 patients (4,07 %) had different initial pre-diagnosis from end-diagnosis in medical records. Our study includes 25 patients (0,85 %) (10 female, 14 male, mean age: 46,7 years) among them with CT and/or MRI investigations regarding the methodology. The basic crucial cause of breakdown was obtained as lack of clinical history for establishing end-diagnosis in all patients even with the assistance of high technology imaging methods.

##### CONCLUSION

Although it seems time-consuming at first sight, greater focus is needed on clinical history. Awareness of the validity of the patient history before today's impressing technical methods can be life saving and fasten the evaluation algorithm in the emergency conditions.

**Key words:** Emergency department, Diagnostic errors, Clinical history.

## AMAÇ

Tanısal yanlışlar, özellikle acil servislerde (AS) hasta güvenliği ile ilişkili önemli hususlardandır. Bu makale, AS'lerdeki radyolojik süreçte meydana gelen tanısal yanlışları da anamnezin gerçek yerini ve önemini araştırmayı amaçlamıştır.

## METHOD

Bu çok merkezli çalışmada, tanısal yanlışların tespiti açısından, Aralık 2007 ve Kasım 2008 tarihleri arasında başvurmuş toplam 2921 taranmıştır. Medikal kayıtlar incelenmiş, klinik öykü elde edilmiş, öntanı ve son tanılarına ulaşılmış ve değerlendirilmiş olguların BT-MRG görüntüleri de retrospektif olarak değerlendirilmiştir.

## BULGULAR

Toplam 119 olguda (%4.07) medikal kayıtlardaki son tanıdan çok farklı ön tanımlar olduğunu tespit ettik. Metodolojide belirtildiği gibi, sadece BT ve MRG'sine ulaşılanlar dahil edildiğinden, bizim çalışmamız bu olguların sadece 25'ini (%0,85) içermekte idi. Son derece teknolojik görüntüleme metodları kullanılsa da yanlışlardaki en temel nokta anamnezin eksik alınması idi.

## SONUÇ

İlk bakışta zaman alıcı gözükse de, anamnez için daha fazla zaman ayırmak gereklidir. Günümüzün etkileyici teknolojik yöntemlerine rağmen, anamnezin hala geçerli etkinliğe sahip olduğunun bilinmesi, hayat kurtarıcı olabilir ve acil servisteki algoritmayı güçlendirebilir.

## INTRODUCTION

There is universal consensus that clinical history is a fundamental and irreplaceable step for establishing the correct diagnosis. The published literature data also express

belief in the essential role of communication. In particular, obtaining a patient's history and performing a physical examination has been a cornerstone of medical practice throughout the ages, but unfortunately effective communication with the patient has been found to be sadly lacking (1). Although we met amazing high technological tools everyday, it is still accepted that clinical history is the inevitable step before using technical possibilities. Having reviewed the medical literature on this topic, however, we have observed that a systematic discussion on the value of the clinical history as a cornerstone in medical examination has failed to appear for a very long time (2).

Research has shown the emergency department (ED) to be a particularly problematic environment where patient safety is a concern due to various factors, such as the range, nature and urgency of presenting conditions and the high turnover of patients (3). As a result we came across various hurdles in ED and especially the main problems were declared as the attitude of medical staff, poor communication and missed diagnosis (4, 5).

Imaging has undergone a major revolution for years. Many radiological procedures have been introduced into clinical practice and these diagnostic tools have expanded our ability to diagnose previously hidden conditions. Imaging studies plays a critical role in achieving an accurate and timely diagnosis, especially for evaluation of gastrointestinal emergencies, traumatic injuries, pediatric patients who were complicated due to limited history and physical examination in ED (6,7). However, the prevalence of CT or MRI use during emergency department visits for injury-related conditions increased significantly, although there is not an equal increase in the prevalence of life-threatening conditions (8).

Additionally, studies announced that CT utilization particularly in the adolescent population has increased at a rate far exceeding the growth in ED patient volume and this issue whether the more increase in utilization results the more improved patient outcomes is still a debate (9,10).

We aimed to supply information about missed diagnosis in ED with confirmation of imaging techniques (CT and/or MR). We searched for the critical role of clinical history on the evaluation algorithm in the emergency conditions even in the presence of imaging systems availabilities. Moreover, we discussed the breakdowns in radiological evaluation on guidance of clinical history in ED.

## MATERIAL AND METHODS

The present study was reviewed retrospectively from the archives of 2921 patients who were admitted to ED between December 2007 and November 2008. We investigated age, gender, complete medical history of the patients, initial emergency symptoms while admitting to ED, initial pre-diagnoses, radiologic evaluations and end-diagnoses. We selected patients who were investigated with CT and or MRI during pre-diagnosis, then figured out the individuals with the completely different initial pre-diagnoses from end-diagnoses. Thereafter we obtained their CT and/or MRI to reevaluate the clinical and radiological algorithm. We overviewed the role of the clinical history on the breakdowns of these diagnostic radiological imaging methods; we investigated these imaging materials again with the guidance of all medical records and tried to find out the missing points even though we had used such high technological tools in ED.

We recruited subjects who do not have CT and/or MRI due to the absence of optimal objective data while reevaluating the subjects.

## RESULTS

We found that 119 patients (4,07 %) had different initial pre-diagnoses from end-diagnoses in medical records and we were able to obtain CT and/or MRI investigations of 25 patients (0,85 %) among them. After the detailed reevaluation of radiologic investigations of these patients in consideration with clinical history and all medical records, all attentions about these patients have changed to a different point; lack of initial clinical history led radiologists wrongly even it could be diagnosed correctly at the first sight of CT and/or MRI. The data of breakdowns about the patients were summarized in **Table 1** and explained by some striking related figures (Figs 1-5) in **Table 2**.

No	Cases	G	A	First-Missed Diagnosis	Corrected-True diagnosis
1	Headache	M	62	CT: Caudotalaric hematoma	MRI: MCA watershed infarct
2	Left flank pain	M	32	CT: Pleural thickening	MRI: Acute pleural hematoma
3	Abdominal pain	M	69	CT: Jejunal mass	Thin Section CT: Foreign body
4	Hematochezia	M	72	CT: Colonic foreign body	Control CT: Normal
5	Right flank pain	F	78	US, CT: Nephrolithiasis	IVP: Normal
6	Epigastric pain	M	23	US: Invagination	CT: Alternating invagination
7	Chest pain	M	58	CT: Myocardial penetration by pace catheter	3D-CT: Partial volume effect on coronal reformat sections
8	Headache, ataxia	M	11	MRI: Suprasellar epidermoid cyst (previously known)	Control MRI: Ruptured epidermoid to subarachnoid space
9	Lumbalgia	M	38	MRI: Normal postoperative changes (discectomy)	3D-CT: Spinal foreign body (Catheter)
10	Right-upper quadrant pain	F	33	CT: Hypodense defects through the gallbladder	US: Normal
11	Traffic accident	M	42	CT: Ischial fracture	Clinical and X-Ray: Variation
12	Swollen right cruris	M	58	Doppler US: Thrombosis of right popliteal vein. CT: VCI thrombosis	CT: Juxtacaval fat variation at thin section contrast enhanced CT
13	Abdominal pain	F	63	CT: Necrotic colonic segment	Colonoscopy: No mass Surgery: Gossypiboma
14	Nausea	M	24	CT: Gastric bezoar	Endoscopy: Food retention in hypotonic stomach
15	Headache	M	74	MRI: Neurocysticercosis	Follow-up MRI: Subacute infarct
16	Inguinal pain	M	16	X-ray: Normal	MRI: Osteochondrosis ischiopubica
17	Left flank pain	M	38	CT: Left perirenal hematoma	Follow-up and biopsy: Lymphoma
18	Abdominal pain	M	29	CT: Appendicitis?	CE-thin section CT: Inflammation of the bladder auricle in inguinal canal
19	Ankle pain	M	21	CT: Fragmented fracture	CE-CT: Pathological fracture
20	Abdominal pain	M	53	US, CT: Appendiceal mucocele	Tru-cut biopsy: Liposarcoma
21	Left flank pain	F	68	CT: Dysplastic cyst, absent left kidney	MRI: Left atrophic cystic ovary
22	Right femoral pain	M	17	CT: Myositis ossificans	MRI: Central enhancement contrary to common peripheral pattern in myositis ossificans
23	Severe arm pain	M	19	X-ray: Osteosarcoma	Follow-up: Resolution of the findings
24	Persistent cough	M	51	CT: Bronchiectasis	Thin section CT: Calcified lymph node eroding the right tracheal wall
25	Trauma and neck pain	F	41	X-ray: Fracture of spinous process of C7 vertebra	CT: Variation, fragmented ossification of posterior elements of C7 vertebra

Abbreviations: CT: Computarized Tomography; US: Ultrasonography; MRI: Magnetic Resonance Imaging; MCA: Middle Cerebellary Artery; VCI: Vena Cava Inferior

**Table 1.** Patients with the first diagnosis, radiologic evaluations and decisions, retrospective re-evaluations and summary of the related clues.

Statistical analysis was summarized as percentage for qualitative variables.

## DISCUSSION

The most complex and challenging tasks facing physicians is the need to make a diagnosis. Thus, doctors need to be aware of their power when they deal with patients. In particular, imaging has undergone a major revolution. Many new procedures are introduced into medical practice and they have expanded our ability to diagnose previously hidden conditions and also our knowledge of these conditions. Therefore, the technology encouraged the physicians while making accurate diagnosis with the increased availability and diagnostic capabilities and a desire on the part of physicians for diagnostic certainty (9). Radiography, ultrasonography, and contrast material-enhanced CT and in especially difficult or complex cases, MRI offered to be appropriate modalities for an initial examination in the evaluation of pediatric patients in the emergency setting (6). Moreover, accurate and rapid diagnostic imaging is essential for the appropriate management of acute gastrointestinal conditions; CT is the modality most often used in this setting (7, 11). But the leading breakdowns in the diagnostic process were mostly attributed to failure to order an appropriate diagnostic test and failure to perform an adequate medical history or physical examination in ED (5). Particularly, the crucial role of clinical history is essential to help efforts to identify and prioritize strategies in order to prevent diagnostic errors in ED. For example, in our

investigation, a mass lesion at the small bowel that resembles malignant tumor has been proved to be an inflammation caused by a fish bone perforation ingested probably months before. The other one was diagnosed as acute appendicitis initially but the end-diagnosis was iatrogenic bladder auricle injury in the course of a previous inguinal hernia repair surgery. We presented these clinical conditions with missing points in clinical history and illusive radiologic appearances in **Table 2**

Cases	Detailed points from the clinical history
1	Transient ischemic attack was obtained in medical history. Neurologic examination is not compatible with caudothalamic hematoma (Fig 1)
2	Sudden chest pain was noted after a sudden cough crisis caused by an accidental aspiration of meal a few days ago (Fig 2)
3	Localized abdominal pain lasted 2-3 days with rigidity in the same location started 3 months ago after a fish meal (Fig 3)
4	Purgative solutions were used frequently for colonic dysfunction in our dementia patient.
5	Pain was not a colic pain and localized in right upper epigastric region.
6	We recognized intermittent pain attacks but not compatible with colic pain.
7	Any complication was not reported during the perioperative and late postoperative period by operation team.
8	With comparing the previous hardcopy films, determination of epidural particles distributed through subarachnoid spaces confirmed the rupture of the existent epidural tumor.
9	Neurologic findings are not related with the level of surgery and accompanying fever.
10	Symptoms are not compatible with biliary colic or acute cholecystitis but seems to be dyspepsia. (CT: Partial volume of the duodenal gas particle.)
11	The region is not related to trauma but localized another asymptomatic localization.
12	Although the suspicion of the thrombosis of VCI, the left lower extremity was totally normal.
13	We noted hysterectomy history and persistent pain, fever in postoperative period in dementia case.
14	Endoscopy of the upper digestive system for evaluation of the dyspeptic attacks was reported as normal which was performed one-week ago. And the history of huge consumption of salad with spaghetti for last two meals is explanatory for illusive CT appearance of gastric sections.
15	There was no history of travel to the risky regions and symptoms were acute-subacute (Fig 4).
16	Whereas there was a long time biking history and right inguinal pain, pubic bone tenderness was noted.
17	We figured out that hematuria was absent, and repletion on the left side existed before the trauma and weight loss in last 3 months.
18	Unresponsive dysuria to treatment after a repair of right inguinal hernia (15 months ago) (Fig 5).
19	The trauma was disproportional for a displaced-fragmented large bone (calcaneal) fracture.
20	Long lasting right lower quadrant pain attacks and mildly progressive abdominal distention which existed for last two years (Fig 6).
21	Left renal agenesis and nonvisualization of the left ovary by ultrasonography that was previously done

	during childhood.
22	Although a year passed after trauma, persistence of central enhancement pattern of the lesion denied myositis ossificans which anticipated to enhance only peripherally, at the late maturing phase.
23	The patient was a psychotic young boy. The history of contrast extravasation from the antecubital venous access during TVP examination was obtained from his family.
24	Healed tuberculosis history during childhood was a clue of the existence of calcified paratracheal lymph node.
25	No pain was defined during palpation and the cervical area that was not affected primarily from the mentioned in-vehicle traffic accident.

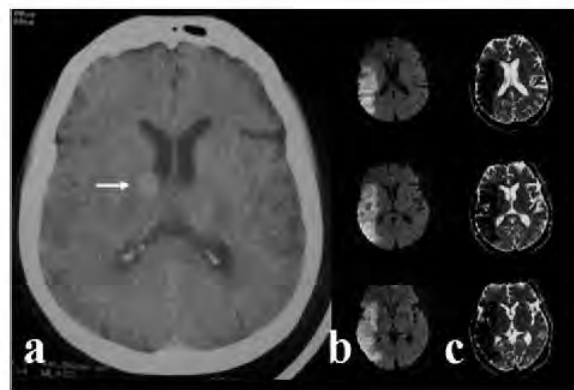
**Table 2.** The retrospective evaluation of the missing points in anamnesis of cases.

Diagnosis errors are frequent and important, but represent an underemphasized and understudied area of patient-safety (12). Herein, we take notice the legend role of clinical history in the diagnosis errors in ED. Medical practice deals with both modern imaging and patient history; all the end-diagnoses have been achieved by further specified radiologic examinations under the guidance of detailed history and laboratory examination of patients.

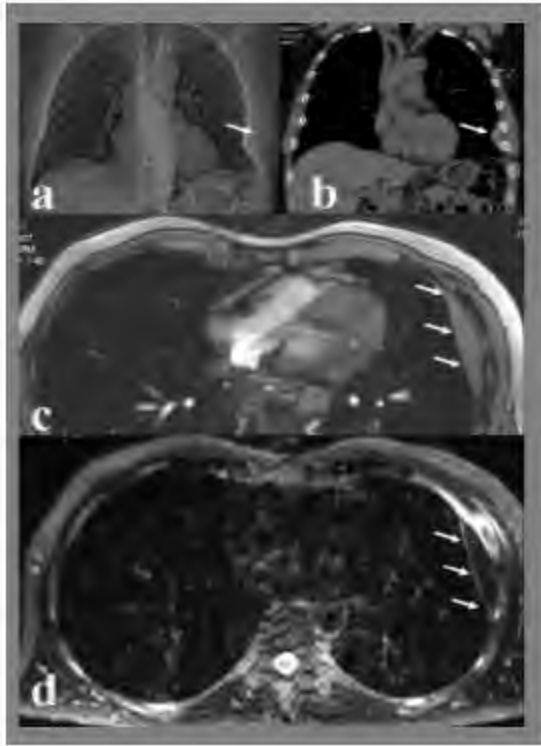
In conclusion, although it seems time-consuming at first sight, investigating the detailed clinical history of the patients can change and fasten the evaluation algorithm (including radiologic examinations) in the emergency conditions.

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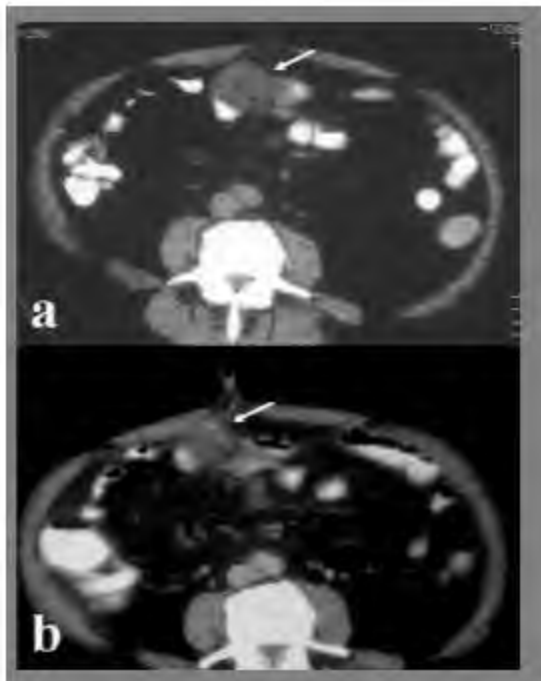
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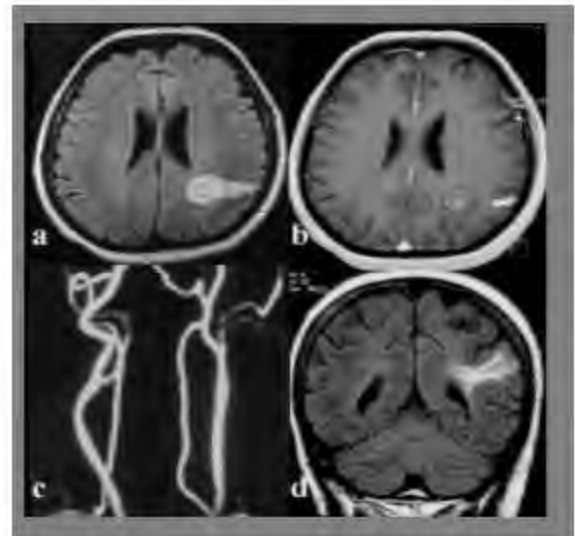
**Figure 1.** A 62-year-old female patient was admitted with sudden onset of confusion and headache, a) A hyperdense lesion at caudothalamic notch was being reported in line with hematoma (arrow) in noncontrast cranial CT. Then, the clinically deteriorating patient had to be evaluated with MRI. At this examination, especially on diffusion restriction on ADC maps (b, c) confirmed an acute infarct of the middle cerebral artery watershed area. The first caudothalamic lesion which was not visualized on MRI scans and has been thought to be consistent with an artifact on CT.



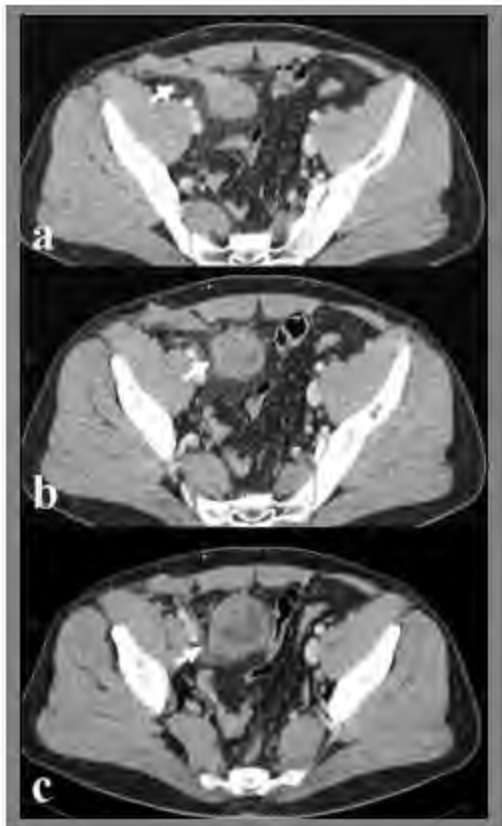
**Figure 2.** A patient presented with left chest pain after severe coughing attacks. On CT scout image (a, b), a fusiform thickening of the pleural space on the left side is seen. On MRI evaluation which was performed to identify the internal nature of the lesion, signal characters were consistent with acute phase of bleeding products on T1W (c) hyperintense and T2W (d) hypointense (arrows in a, b, c, d).



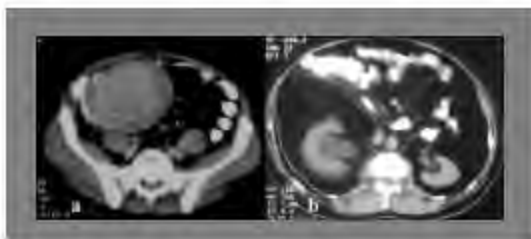
**Figure 3.** A 72-year-old male patient was admitted to the emergency room with intermittent abdominal pain. Since abdominal radiographs were normal, he was evaluated with CT. (a) At the axial images, a lesion could not be clearly separable which settled in the small intestine anterior wall has been identified and was reported in favor of a tumoral mass. After surgical diagnosis (focal perforation and granulation due to fishbone) with the adjustment of slice thickness, window levels of the previous CT sections (b) hyperdense linear, foreign body could be visualized in the pseudomass lesion (arrows in a and b).



**Figure 4.** A 58-year-old female patient was admitted to the emergency room with headache, dizziness and with complaints of new onset of memory problems. MRI has been performed for elimination of an intracranial pathology. a) The hypointense nidus of the left parieto-occipital white matter T2W-hyperintense lesion shows rim-like enhancement on CE-T1W sequences (b). This appearance has been mostly encountered with scolex formation of the neurocystisercosis. However, the patient history and laboratory findings were not compatible with an infectious disease. At MR-angiography (c), especially in the proximal left internal carotid arteries and bilateral carotid bulbs wall irregularities and multiple non-critical stenosis were identified. The coronal FLAIR image after two weeks (d) showed the retraction and volume loss in the lesion area which was confirming for the sequela with gliosis. Diagnosis: Early subacute infarction.



**Figure 5.** A male case suffered from abdominal pain. The tubular, thick walled bowel like structure at right lower quadrant CT sections, joins with urinary bladder in consecutive sections (arrows in a, b and c). Surgical diagnosis: Iatrogenic ligation of the right auricularary variative extension of the bladder during hernia repairing operation.



**Figure 6.** a) A huge mass lesion located at right lower quadrant on axial pelvic CT section. Tru-cut biopsy (repeated): Necrotic tissue. Control abdominal CT after 3 months: (b), although the persistence of the first detected huge lesion (not shown), the enlargement of lipomatous right perirenal soft tissue thickening was discernible with optimal window level adjustment (dashed area). Diagnosis: Retroperitoneal liposarcoma with necrotic component of right lower quadrant.