A prospective and comparative study of referrals to neurosurgeons in an emergency department: does use of guidelines for head trauma affect the assessment made by non-neurosurgeons?

Acil serviste beyin cerrahlarından görüş alışları üzerinde ileriye dönük ve karşılaştırmalı bir çalışma: Kafa travması konusunda kılavuz kullanılmasının beyin cerrahı olmayanların yaptığı değerlendirmelerde etkisi var mıdır?

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BACKGROUND

Restriction of the direct admission of all head-injured patients to the neurosurgical unit remains common practice in many parts of the world. This study was conducted to assess if the initial neurological examination of patients with a head trauma and their management are adequately performed before the referrals and also to determine whether strict use of guidelines for the management of patients with head injuries can be effective.

METHODS

The referrals of head-injured patients from different doctors in the emergency department to the same neurosurgeon were assessed prospectively in two separate 6-month periods: the period before training of the non-neurosurgeon physicians on the selection of cases that require a neurosurgical intervention and the period after training.

RESULTS

The first part of study showed that initial neurological examination of patients with a head trauma and their management were not performed correctly by the non-neurosurgeon physicians. However, the second study period showed that non-neurosurgeon physicians performed a more accurate selection of patients requiring a neurosurgical intervention after receiving systematic neurosurgical training for at least 6 months.

CONCLUSION

In hospitals where there are no specialist trauma surgeons, neurosurgeons should train non-neurosurgeons regarding the accurate selection of neurosurgical cases that need an emergency intervention. In this training, use of guidelines for the management of head injuries is very effective.

Key Words: Emergency department; guidelines; head trauma; neurosurgery; referral.

AMAÇ

Kafa travmalı hastaların doğrudan beyin cerrahisi birimlerine kabul edilmesindeki kısıtlılık dünyanın birçok bölümünde pratikte yaşanan ortak bir durumdur. Bu çalışma, kafa travmalı hastaların beyin cerrahlarından görüş alınmasından önceki ilk nörolojik muayenelerinin ve tedavilerinin yeterli derecede yapılıp yapılamadığını değerlendirmek ve aynı zamanda kafa yaralanması olan hastaların tedavisinde, kılavuzların sıkı bir şekilde kullanımının etkilerini saptamak için yapıldı.

GEREÇ VE YÖNTEM

Acil servisteki farklı doktorların, aynı beyin cerrahına kafa travmalı hastaları danışmaları, ileriye dönük olarak iki farklı altı aylık dönemde incelendi: Beyin cerrahı olmayan doktorların kafa travmalı hastalardan beyin cerrahisi girişimleri gerektirenlerin seçimi konusunda eğitim almadıkları birinci dönem ve eğitim sonrası ikinci dönem.

BULGULAR

Birinci dönem; kafa travmalı hastaların ilk nörolojik muayeneleri, tedavileri beyin cerrahı olmayan doktorlar tarafından doğru olarak gerçekleştirilemiyordu. Buna karşın ikinci dönem, beyin cerrahı olmayan doktorlar en azından altı ay sistematik nöroşirürji eğitimi aldıktan sonra beyin cerrahisi girişimleri gerektiren hastaları daha doğru olarak seçebiliyorlardı.

SONUÇ

Uzmanlık eğitimi almış travma cerrahlarının bulunmadığı hastanelerde, beyin cerrahları acil serviste nöroşirürjikal olguların seçimi konusunda beyin cerrahı olmayan doktorları eğitmelidirler. Bu eğitimde, kafa yaralanmalarının tedavisi kılavuzlarının kullanılması çok etkilidir.

Anahtar Sözcükler: Acil servis; kılavuzlar;kafa travması; nöroşirürji; konsültasyon.

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Due to limitations in resources, restriction of the direct admission of all head-injured patients to the neurosurgical unit remains common practice in many parts of the world. However, problems arise in the proper management of neurosurgical cases in the emergency departments of hospitals, regardless of their facilities, before these cases can be seen by neurosurgeons. The specific aims of our study were to answer the following questions:

1. Are the referrals to neurosurgeons from the emergency department appropriate?

2. Are the patients evaluated appropriately with regard to currently available literature?

3. Can the strict use of guidelines for management of head-injured patients be effective?

MATERIALS AND METHODS

Between 1 November 2002 and 30 April 2003, 276 referrals were made out of a total of 303 patients with a head trauma. The referrals of these 276 head-injured patients from 10 different doctors to the same neurosurgeon at our hospital were assessed to determine whether the general status and altered consciousness of the patients were adequately described as well as whether initial management and stabilization of the patients were made before the referrals. Data were collected over 30 different days of 24-hour on-call duty of the same neurosurgeon during a 6-month time period. All referrals were included regardless of whether patients had a minor head trauma or a serious head trauma and even if the cause of unconsciousness was not actually a head trauma. A standard form was used to record prospective information about each patient. Spinal emergencies were excluded from this study.

After completion of the first 6-month period of the investigation, non-neurosurgeons were trained in neurotrauma, and were advised to refer to the guidelines for the management of patients with minor head injuries as developed by the Italian Society for Neurosurgery.[1] Six months later, the same study was repeated between 1 November 2003 and 30 April 2004 and results were compared with those of the previous period.

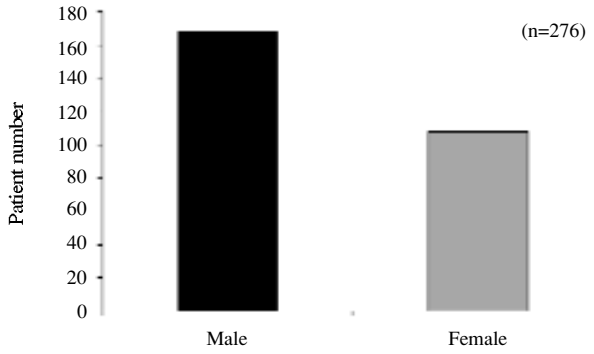

Fig. 1. Gender of the patients in Study Group 1.

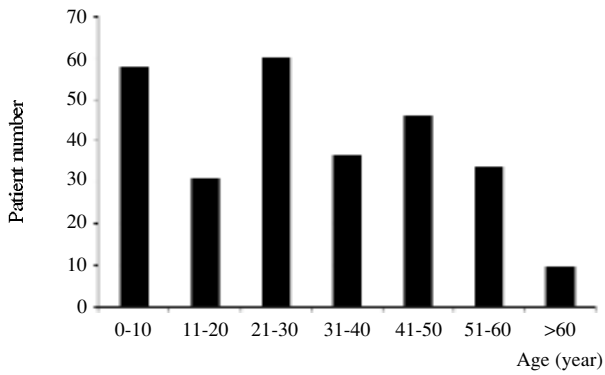

Fig. 2. Age distribution of the patients in Study Group 1.

RESULTS

Study Period 1:

General demographic information about the patients is given in Figs. 1, 2 and 3. Initial admission physicians are shown in Fig. 4. The referral physicians are shown in Fig. 5. The referral time is shown in Fig. 6. The ability of referral physicians to provide the correct information to the neurosurgeon is shown in Fig. 7. In Fig. 8, the management of

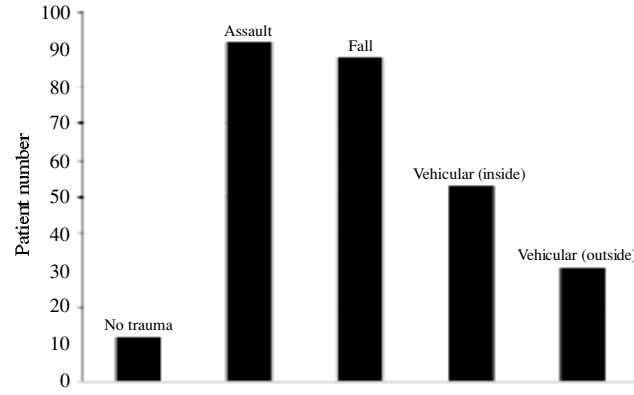

Fig. 3. Major reasons for the head trauma in Study Group 1.

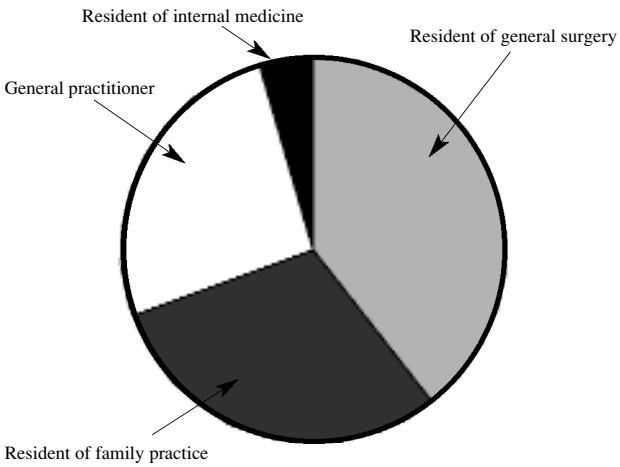

Fig. 4. The initial admitting physicians.

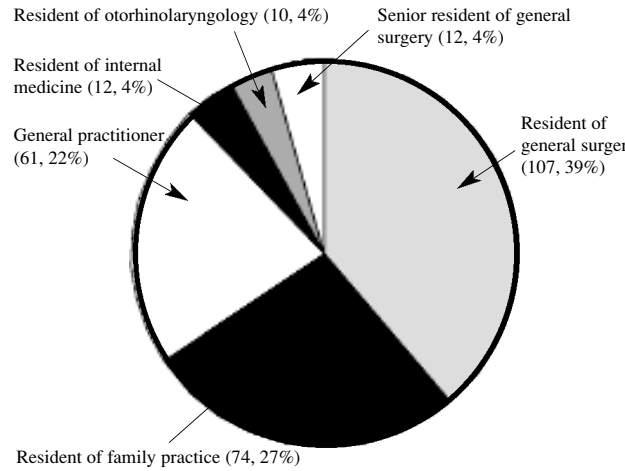

Fig. 5. The referring physicians.

patients by the non-neurosurgeon physicians, before the referrals, is summarized.

There were extra-cranial injuries in 192 patients. These were maxillofacial injuries, bone fractures/dislocation in the extremities, ecchymoses and edema in the extremities or in the trunk, renal hemorrhage, pneumothorax and hemorrhagic lesion in the lungs, and hemorrhage from external ear laceration.

In 174 cases, the request for consultation with the neurosurgeon was made as soon as the patient was seen in emergency. In the others, a call for the neurosurgeon was made several hours after the patient had been evaluated and managed in emergency.

After consultation, it was disclosed that 168 patients were neurologically intact and had a minor head trauma or a maxillofacial trauma. In 96 patients, observation or intensive care was necessary. Seventy-five of these 96 patients had concussion. Twelve patients were unconscious but had no head trauma. Thirty-two patients had basal fractures and traumatic subarachnoid hemorrhage and

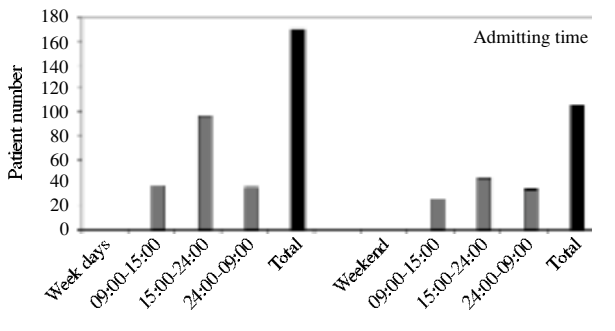

Fig. 6. The referral time, weekdays and weekends separately.

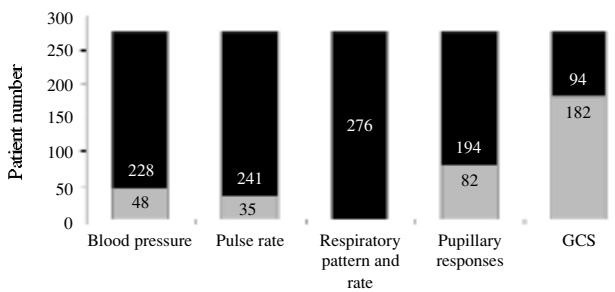

Fig. 7. The dark part of the bars shows the number of cases in which the parameter written below the corresponding bar was not correctly conveyed to the neurosurgeon. In all patients, the referring physicians were unable to inform the neurosurgeon about the patient's respiratory pattern and rate.

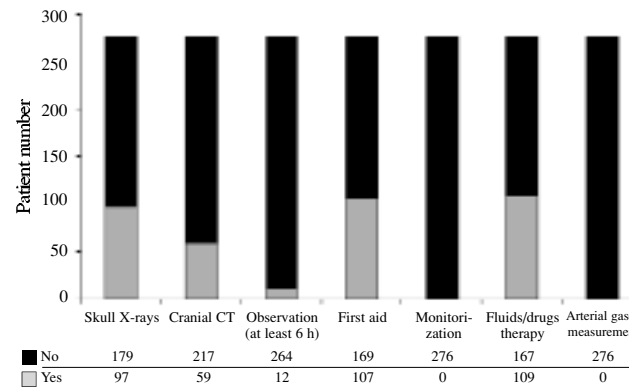

Fig. 8. The management of the patients before the referrals (Study Group 1).

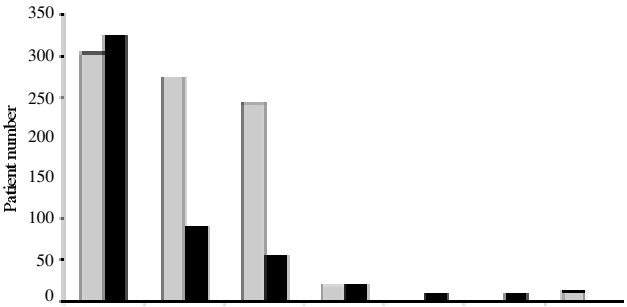

Fig. 9. Comparison of the two study periods with regard to the neurosurgical severity of the referred cases.

pneumocephalus. Twenty-two patients had a linear skull fracture. Only one patient with a depression skull fracture required neurosurgical intervention. Transfer to another neurosurgical unit with intensive care facilities was needed for 24 patients. Reasons for transfer included lack of a bed for observation or intensive care, a computed tomography (CT) scan examination in other hospitals because of particular patient health insurance, an inability to evaluate radiographic images, and because of emergency clinic overload.

Study Period 2:

During the second period, 90 out of 325 head-injured patients were referred. Of 11 patients who had severe head trauma, 3 were operated and 8 were admitted to our intensive care unit or transferred to another institution after stabilization when the available intensive care unit bed did not exist. Twenty-one out of the 90 patients referred had moderate head trauma, and 7 of them were operated. Hence, 10 of 90 patients were operated. These included 2 depression fractures, 2 epidural hematomas, 2 acute subdural hematomas, 3 chronic subdural hematomas and 1 gunshot injury.

Fifty-eight patients had a mild head trauma. Of these 58 patients, 50 had a Glasgow Coma Scale (GCS) of 14 or 13. Only 8 patients had a GCS of 15 and these had a risk factor. There were an additional 3 patients who were referred to a neurosurgeon with a formal written paper from other institutions and therefore these patients were not included in the study. The peak age group in the mild head injury group (GCS 13-15) was the 0-5-years-old group. All cases in the second study period were referred after their initial management and diagnostic studies had been completed. The two study periods were compared according to the neurological severity of the referrals and the selection of the cases operated (Fig. 9). There was no mortality in either study group.

Statistical analysis

Statistical analysis was made using Fisher's test:

	2003	2004
Referred cases	276	90
Operated cases	1	10

The test results proved to be extremely significant (p=0.0001).

DISCUSSION

It is seen that problems occur in the proper management of neurosurgical cases in the emergency departments of hospitals, regardless of their facilities, before these cases can be seen by neurosurgeons. The reasons could be attributed to:

1. Deficiencies in initial assessment and injury determination.

2. Overloading of the emergency department with minor injuries.

3. Lack of highly specific prognostic indicators of head injury such as a biochemical marker, although we have relatively sensitive methods such as Glasgow coma scoring, skull X-rays, and CT to exclude low-risk head-injured patients.

4. A natural tendency to manage the primary head injury component of a multiple-injured victim without due regard for other determinants of immediate mortality and secondary brain damage.

5. Anxiety created by the thought of the risk of development of a traumatic intracranial hematoma and the need to achieve early detection and evacuation of the clot.[2-4]

There are different definitions of minor or mild head injury.[5] However, the only reliable parameter is GCS on admission, even though some authors accept GCS of 15 as minor or mild head injury, while others accept 13, 14 or 15 as a minor or mild

head trauma. In this study, the Italian guidelines for minor head injury in adults were used.[1] In these guidelines, three groups of patients with mild head injury are distinguished: groups 0, 1 and 2. In group 0, the patients have GCS 15, without loss of consciousness, amnesia, diffuse headache, or vomiting. Patients in group 1 again have GCS 15, but additionally have loss of consciousness and/or amnesia and/or diffuse headache and/or vomiting. In group 2, the patients have GCS 14 with or without loss of consciousness, amnesia, diffuse headache and vomiting.

As reported previously, a single uncomplicated mild head injury (GCS 13-15) produces no permanent disabling neurobehavioral impairment in the great majority of patients who are free from preexisting neuropsychiatric disorders and substance abuse.[6] Only 3% of such patients will require an operative procedure.[6,7] However, the selection of these cases is very important because the number of mild head traumas in the population is higher than of moderate and severe head traumas.

In the first part of our investigation, it was seen that most of the cases referred were minor head traumas and most were neurologically intact. Moreover, some cases were not even a head trauma and in fact these patients had idiopathic epilepsy, a primary intracerebral hemorrhage, or were unconscious because of hypoxemia due to extra-cranial massive hemorrhages. This showed that these cases could not be easily detected by physicians who are unfamiliar with cases of neurotrauma, or that the overloading of the emergency department did not permit a detailed evaluation of the cases. It was interesting that there were only 38 (38/171 22%) referrals during week days between the hours of 9:00-15:00, which is when the most staff are working. This may suggest that during this period, patients could be correctly evaluated neurologically and a referral was not requested. Overloading of the emergency clinic may explain why the initial neurological examination of patients and their follow-up could not be performed correctly by the general practitioners, residents of family physicians, or the general surgery residents who saw the patients in the emergency department.

Extra-cranial injuries may cause secondary brain damage and this is especially crucial in moderate head traumas (GCS 9-12), since this group of patients could benefit the most by attempts to ensure the best care.[8,9] There are two main causes: delayed diagnosis and treatment of intracranial hematomas and failure to correct systemic hypoxemia and hypotension.[3] An isolated head injury is almost never the cause of shock. However, many head-injured patients arrive at the neurosurgical units in hypovolemic shock from missed and untreated extra-cranial injuries or from gagging on an endotracheal tube because of poor use of relaxant or sedative drugs.[3] It is well known that secondary insults to the brain can be prevented by relatively simple measures.[2] An unstable patient should not be transported.[2,10,11] In this study, it was observed that if a multiple-injured patient had a head trauma, his cardiovascular and respiratory problems were considered to be the result of the head trauma and were undervalued. Other surgical injuries, such as orthopedic, abdominal and urologic, were also undervalued.

There were also problems related to disorganization. Although our hospital is equipped for CT, CT scan was not ordered since it was thought that the scan could be evaluated only by a neurosurgeon. This deficiency was especially noted at night since there was no radiologist available. On the contrary, cranial CT scanning was used unnecessarily in some cases. The patients were not being observed because of a lack of beds in the emergency department and the general ward. There was a problem regarding qualified nursing and general management in the care of infant patients. Severe multiple-injured patients were being transferred immediately before being evaluated thoroughly and stabilized as well as without intrahospital referral or telephoning to the neurosurgical unit to which the cases were transferred. This may explain why there was only one case operated on study period 1. Furthermore, there were unnecessary transfers to the hospitals, which did not have the facilities to manage the non-neurosurgical injuries of the patients, such as orthopedic, urologic or abdominal injuries. We have no information regarding whether some of the transferred patients died. In contrast, unnecessary hospital stays to await neurosurgical referral in the emergency clinics and time loss between the hospitals disturbed the minor head-injured patients both physically and mentally.

During study period 1, 91% of the patients

recorded as having a head trauma were referred to neurosurgery, whereas during study period 2, only 27% of the patients recorded as having a head trauma were referred to neurosurgery. This decrease in the number and percent of the referred cases may demonstrate that non-neurosurgeons were able to better evaluate the patients with a head trauma and better select the cases for referral. This is supported by the fact that although the number of the referred cases decreased during study period 2, the number of operated cases increased (study period 1: 1 patient, 0.3%; study period 2: 10 patients, 11%). The absolute number of cases with a moderate head trauma did not change. However, the referred number and percent of the cases with mild head trauma decreased in the second group, whereas the referred number and percent of the cases with a severe head trauma increased. This is probably because severely injured patients had been better followed and managed; therefore, it is likely that transfers to other institutions decreased during study period 2.

In summary, in the second part of our investigation, it was seen that the number of referred cases with a minor head injury decreased as well as the total number of referred cases. However, the absolute number of the operated cases and the proportion of the operated cases to the total number of referred cases increased as compared to the study one year before. This proved that after training and when applying guidelines on minor head injuries, head-injured patients could be evaluated better and selected more accurately for an intervention if necessary. Use of special guidelines will help to decrease overloading of the emergency department and permit the selection and comprehensive evaluation and management of moderate and severely injured patients. The drawback of this study can be the inclusion of pediatric cases, despite the fact that the Italian guidelines include only adult cases. However, this is unlikely to have affected the results of the study since additional training about head injury in children was also provided.

Lastly, the ABC (airway-breathing-circulation) is the most important area to control in the management of head-injured patients as in all other patients. A debate persists about the significance of skull fracture as a risk factor for intracranial hematoma in mildly head-injured patients. However, skull radiographs are of value only when CT is not available.[5] The availability of 24-hour CT scanning services minimizes inappropriate use of neurosurgical resources.[12] However, the timing of CT scanning is important. The wide use of CT studies does not necessarily increase the early detection of intracerebral lesions since the accumulation of blood takes time to manifest itself on the scans.[5] If available, such facilities as image link would be beneficial to contact a neurosurgical unit.[13] We also suggest that referrals should be written; a standardized information sheet that includes the patient's medical information, obtained in a very short time but still detailed, should be used when referring to a neurosurgeon and transferring between hospitals. This is especially important in multiple-injured patients.

CONCLUSIONS

In hospitals where there are no specialist trauma surgeons, neurosurgeons should train the non-neurosurgeons who serve in the emergency department.

In this training, use of guidelines for the management of adult patients with minor head injuries developed by the head injury study group of the Italian Society for Neurosurgery proved to be very effective.

It was observed that at least 6 months' training of non-neurosurgeons is necessary for a prominent change in the more accurate selection of patients requiring a neurosurgical intervention, especially when physicians are on frequent work shifts in the emergency department.

Organized trauma systems can help reduce a host of problems. When well organized, cases such as epidural hematomas and acute subdural hematomas, which necessitate an urgent neurosurgical intervention, can be detected earlier and treated.

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