# INDEX NEUROTRAUMA (INCLUDING SPINAL CORD INJURIES)

# Prehospital care in patients with severe traumatic brain injury: does the level of prehospital care influence mortality?

Aubuchon M M F, Hemmes B, Poeze M, Jansen J, Brink P R G.

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10.1007/s00068-012-0218-6

***Introduction and purpose***
The controversy between the "scoop and run" versus the "stay and play" approach in severely injured trauma patients has been an ongoing issue for decades. The present study was undertaken to investigate whether changes in prehospital care for patients with severe traumatic brain injury in the Netherlands have improved outcome.

***Methods***
In this retrospective study, files (n = 60) were analyzed from a prospectively collected database including all patients admitted to one of six hospitals in the Limburg region in the Netherlands with a Glasgow Coma Scale (GCS) score <= 8 on admittance over the period from January 2006 to December 2008. All patients had traumatic brain damage proven on computed tomography (CT) or magnetic resonance imaging (MRI). Relevant prehospital and clinical data from the present cohort were compared to data from a similar study (n = 30) conducted 20 years ago. The primary outcome assessed was mortality.

***Results***
The two study groups had similar characteristics with regard to the GCS score. In the historic cohort, Basic Life Support (BLS) and the "scoop and run" approach in patients with major traumatic brain injury was common, with an average time on scene of 7.5 min. Currently, prehospital care is performed mainly on the level of prehospital Advanced Life Support (ALS), with the average time on scene being about four times as long as in the historic cohort. However, the overall mortality rate for the current cohort compared to the historic cohort has not changed.

***Conclusion***
Despite more on-site ALS in severely head injured patients nowadays compared to the historic cohort, there was no reduction in mortality.

**Keywords**
traumatic brain injury - prehospital care - mortality - advanced life support - basic life support - severe head-injury - advanced life-support - quality-of-life - endotracheal intubation - controlled-trial - management - outcomes - impact - system – hypotension

# Contralateral extraaxial hematomas after urgent neurosurgery of a mass lesion in patients with traumatic brain injury.

Lasierra J L F, Fuentes C G, Vazquez D T, Fernandez M C, Aznarez S B, Lopez E A.

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10.1007/s00068-013-0268-4

The development of a contralateral extraaxial hematoma has repeatedly been described in small series and descriptive studies. However, the evidence available to date is limited.
To evaluate the incidence and risk factors leading to the development of a contralateral extraaxial hematoma and to describe the characteristics of cases.
A retrospective cohort study with prospective data collection was undertaken. All patients admitted to an intensive care unit (ICU) from 2006 to 2010 were studied. The inclusion criteria were as follows: severe trauma [Injury Severity Score (ISS a parts per thousand yen 16)], neurosurgery (NeuroSx) in the first 24 h. The following were excluded: subacute/chronic subdural hematomas, first bilateral NeuroSx. Cases were those who required immediate contralateral NeuroSx after the first NeuroSx due to the occurrence of a new extraaxial injury or significant growth of a previous one. Controls were those patients those who did not require second NeuroSx or who required reoperation due to ipsilateral lesions. The variables considered were: demographics, neurological assessment, traumatic injuries and severity, image and surgical findings, clinical course, and outcome. Statistics analysis comprised descriptive, inferential, and multivariate analysis by logistic regression.
A total of 120 patients were included, among which there were 11 cases (incidence 9.2 %). The cases showed a significantly higher frequency of coma or severe traumatic brain injury (TBI) at admission, contralateral injury and contralateral skull fracture in the preoperative computed tomography (CT) scan, as well as decompressive craniectomy. There were no significant differences in the severity scores, clinical course, or outcomes. The presence of contralateral fracture was identified as an independent risk factor [relative risk (RR) 47.9, 95 % confidence interval (CI) 5.2-443].
Contralateral extraaxial hematoma is a rare entity, although it has a high mortality rate. Therefore, it requires a high index of suspicion, especially in patients with severe TBI, with minimal contralateral injury and mainly with contralateral skull fracture on the initial CT scan.

**Keywords**
delayed post-traumatic extracerebral hematomas - contralateral acute epi- or subdural hematoma - bilateral acute epidural hematoma - alternating delayed intracranial hematomas - traumatic brain injury - acute subdural-hematoma - acute epidural hematoma - decompressive surgery - extradural hematoma - evacuation

# Glasgow Coma Scale score at intensive care unit discharge predicts the 1-year outcome of patients with severe traumatic brain injury.

Leitgeb J, Mauritz W, Brazinova A, Majdan M, Janciak I, Wilbacher I, Rusnak M.

Eur J Trauma Emerg S. 2013;39(3):285-292.
10.1007/s00068-013-0269-3

To analyse the association between the Glasgow Coma Scale (GCS) score at intensive care unit (ICU) discharge and the 1-year outcome of patients with severe traumatic brain injury (TBI).
Retrospective analysis of prospectively collected observational data.
Between 01/2001 and 12/2005, 13 European centres enrolled 1,172 patients with severe TBI. Data on accident, treatment and outcomes were collected. According to the GCS score at ICU discharge, survivors were classified into four groups: GCS scores 3-6, 7-9, 10-12 and 13-15. Using the Glasgow Outcome Scale (GOS), 1-year outcomes were classified as "favourable" (scores 5, 4) or "unfavourable" (scores < 4). Factors that may have contributed to outcomes were compared between groups and for favourable versus unfavourable outcomes within each group.
Of the 538 patients analysed, 308 (57 %) had GCS scores 13-15, 101 (19 %) had scores 10-12, 46 (9 %) had scores 7-9 and 83 (15 %) had scores 3-6 at ICU discharge. Factors significantly associated with these GCS scores included age, severity of trauma, neurological status (GCS, pupils) at admission and patency of the basal cisterns on the first computed tomography (CT) scan. Favourable outcome was achieved in 74 % of all patients; the rates were significantly different between GCS groups (93, 83, 37 and 10 %, respectively). Within each of the GCS groups, significant differences regarding age and trauma severity were found between patients with favourable versus unfavourable outcomes; neurological status at admission and CT findings were not relevant.
The GCS score at ICU discharge is a good predictor of 1-year outcome. Patients with a GCS score < 10 at ICU discharge have a poor chance of favourable outcome.

**Keywords**
traumatic brain injury - severe - glasgow coma scale score - glasgow outcome scale score - long-term outcomes - admission characteristics - prognostic value - epidemiology - management - validation - impact

# The impact of anemia in moderate to severe traumatic brain injury.

Okoye O, Inaba K, Kennedy M, Salim A, Talving P, Plurad D, Lam L, Demetriades D.

Eur J Trauma Emerg S. 2013;39(6):627-633.
10.1007/s00068-013-0307-1

***Purpose***
The impact of anemia and restrictive transfusion strategies in traumatic brain injury (TBI) is unclear. The purpose of this study was to examine the outcome of varying degrees of anemia in patients who have sustained a TBI.

***Methods***
We performed a retrospective study of all adult patients with isolated blunt TBI admitted between January 2003 and June 2010. The impact of increasing severity of anemia (Hb <= 8, <= 9, or <= 10 g/dl measured on three consecutive draws within the first 7 days of admission) and transfusions on complications, length of stay, and mortality was examined using univariate and multivariate analysis.

***Results***
Of the 31,648 patients with blunt trauma admitted to the trauma service during the study period, 812 had an isolated TBI, among which 196 (24.1 %) met at least one of the anemia thresholds within the first 7 days [ 78 % male, mean age 47 +/- 23 years, Injury Severity Score 16 +/- 8, and head Abbreviated Injury Scale 3.3 +/- 1.0]. Using a logistic regression model, anemia even as low as 8 g/dl was not associated with an increase in mortality [ AOR(8) = 0.8 (0.2, 3.2), p = 0.771; AOR(9) = 0.8 (0.4, 1.6), p = 0.531; AOR(10) = 0.6 (0.3, 1.3), p = 0.233] or complications. However, for all patients, the transfusion of packed red blood cells was associated with a significant increase in septic complications [ AOR = 3.2 (1.5, 13.7), p = 0.030].

***Conclusion***
The presence of anemia in patients with TBI as low as 8 g/dl was not associated with increased mortality or complications, while the transfusion of red blood cells was associated with a significant increase in septic complications. Prospective evaluation of an optimal transfusion trigger in head-injured patients is warranted.

**Keywords**
traumatic brain injury - surgery - outcome measures - guidelines - critically-ill patients - intensive-care-unit - blood-cell transfusion - cerebral oxygenation - critical illness - iron-metabolism - shock severity - erythropoietin - requirements - safe

# The prognostic reliability of the Glasgow coma score in traumatic brain injuries: evaluation of MRI data.

Woischneck D, Firsching R, Schmitz B, Kapapa T.

Eur J Trauma Emerg S. 2013;39(1):79-86.
10.1007/s00068-012-0240-8

***Purpose***
To clarify the predictive power of the Glasgow coma score (GCS) after traumatic brain injury (TBI) and in the context of brain stem lesions.

***Methods***
In 143 patients who had suffered severe TBI, the GCS was correlated to brain damage as visualized by cranial magnetic resonance imaging (MRI). This technique evaluates the damage to the brain stem in particular. The Brussels coma score (BCS) was also used.

***Results***
The GCS was not significantly correlated to brain stem lesions when it was only scored at the time of admission. When MRI was not used later on, the GCS showed a poor ability to predict the outcome. After 24 h, and on the day of MRI screening, the GCS was significantly correlated with two parameters: outcome (the higher the GCS, the better the outcome) and the frequency of patients without injuries to the brainstem in MRI (the higher the GCS, the higher this frequency). These correlations were much more evident when the BCS was used. The prognostic power of the GCS was found to vary over time; for example: a GCS of 3 at admission was associated with a favorable prognosis; a GCS of 4 signified a poor prognosis, irrespective of the time point at which the GCS was scored; and the prognostic power of a GCS of 5 deteriorated from the day of the MRI onwards, whereas the prognostic power of a GCS of 6 or 7 varied little over time.

***Conclusions***
We only recommend the use of the GCS for prognostic evaluation in a multidimensional model. Study protocols should contain additional brain stem function parameters (BCS, pupil condition, MRI).

**Keywords**
traumatic brain injuries - head injuries - glasgow coma score - brussel coma score - brain stem - prognosis - magnetic-resonance - severity score - practical scale - stem lesions - head-injury - acute stage - classification - mechanism - damage

# Serum cleaved tau protein and traumatic mild head injury: a preliminary study in the Thai population.

Wuthisuthimethawee P, Saeheng S, Oearsakul T.

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10.1007/s00068-013-0263-9

To determine the correlation between serum cleaved tau protein and traumatic mild head injury (MHI) (GCS 13-15).
A prospective observational study was conducted. Blood specimens from 12 healthy persons and 44 adult patients with traumatic MHI were collected in the emergency department to measure the cleaved tau protein level using a Human Tau phosphoSerine 396 ELISA kit. A brain computed tomography (CT) scan was done in all patients. The serum cleaved tau protein level was considered positive at a cut-off point of 0.1 pg/ml. An intracranial lesion was defined as any abnormality detected by brain CT scan.
The mean age of the traumatic MHI patients was 34.9 +/- A 15.6 years (range 15-74). The median GCS was 15. The median time from injury to arrival at the emergency department was 30 min. There were 11 intracranial lesions detected by brain CT scan (25.0 %). Serum cleaved tau protein was not detected in either healthy or traumatic MHI patients.
As it was uncorrelated with traumatic MHI, serum cleaved tau protein proved to be an unreliable biomarker to use in the early detection of and decision-making for traumatic MHI patients at the emergency department.

**Keywords**
serum cleaved tau protein - traumatic mild head injury - emergency department - biomarker - brain-injury - cerebrospinal-fluid - neuronal damage - markers - quantification - tomography - diagnosis - biomarker - surgery - release

# Efficacy of N-acetylcysteine on neuroclinical, biochemical, and histopathological parameters in experimental spinal cord trauma: comparison with methylprednisolone.

Cavus U Y, Yilmaz A, Aytekin M N, Taburcu G, Albayrak A, Yildirim S, Agir I.

Eur J Trauma Emerg S. 2014;40(3):363-371.
10.1007/s00068-013-0349-4

N-acetylcysteine (NAC) is an antioxidant agent that has been shown to have beneficial effects when treating various diseases. The aim of this study was to investigate the effects of NAC on spinal cord injury in an experimental rat model.
A total of 48 adult male wistar albino rats were divided into six groups. Group C included the control rats, group L included the rats that underwent laminectomy, and group T included the rats in which spinal cord trauma was induced by the weight-drop method after laminectomy. Groups M (the methylprednisolone group), N (the NAC group), and MN (the methylprednisolone + NAC group) were the treatment groups. In the fourth group (group M), 30 mg/kg methylprednisolone (MP) was administered as a bolus intraperitoneally (IP), and a standard MP treatmentat a dose of 5.4 mg/kg was applied for 24 h. In the fifth group (group N), only 300 mg/kg NAC was administered as a bolus IP. In the sixth group (group MN), the standard MP treatment and a single 300 mg/kg dose of NAC were administered as a bolus IP. The motor functions of the rats were evaluated on the 1st, 7th, and 14th days using the inclined plane test defined by Rivlin and Tator and the motor scale defined by Gale et al. Spinal cord samples were obtained on the 14th day. The samples were evaluated using pathological and biochemical analysis.
In the neuroclinical assessment, no differences were observed between groups T and M in terms of motor improvement. However, statistically significant differences were observed between group T and groups N and MN ($p < 0.001$, $p = 0.01$, respectively). Statistically significant differences were also seen between group M and groups N and MN on the 1st and 7th days ($p < 0.017$, $p < 0.01$, respectively). Additionally, when groups N and MN were compared with groups T and M,the pathological and biochemical analyses were found to be statistically different ($p < 0.05$, $p < 0.001$, respectively).
It was concluded that NAC treatment and the combined NAC + MP treatment may be more useful for healing in rats with experimental spinal cord injury in terms of neuroclinical, pathological, and biochemical results than MP-only therapy.

**Keywords**
n-acetylcysteine - methylprednisolone - rat model - spinal cord injury - ischemia-reperfusion injury - lipid-peroxidation - rats - brain - recovery - models

# The prognostic value of plasma Delta-copeptin levels in patients with isolated traumatic brain injury.

Cavus U Y, Yildirim S, Gurer B, Dibek K, Yilmaz D, Ozturk G, Buyukcam F, Sonmez E.

Eur J Trauma Emerg S. 2014;40(3):373-378.
10.1007/s00068-013-0357-4

Traumatic brain injury (TBI) is one of the most common causes of death among trauma patients. Earlier prediction of possible poor neurological outcomes, even upon admission to the emergency department, may help to guide treatment. The aim of this prospective study was to assess the predictive value of plasma copeptin levels for early morbidity and mortality in patients with isolated TBI.
This prospective study comprised 53 patients who were admitted to the emergency department with isolated TBI. Forty-two of these patients (group I) survived at least 1 month after the TBI; the other 11 (group II) did not. Plasma levels of copeptin were measured in these TBI patients at admission and 6 h after trauma, and were compared with those of healthy volunteers (group III).
At admission, the copeptin levels of the TBI patients (groups I and II combined) were not statistically significantly different from those of the control group (III). The copeptin levels 6 h after trauma were also not statistically significantly different from those at admission. Delta-Copeptin levels (the difference between the copeptin level at the 6th hour after trauma and that at admission) were higher in the patients who died within a month of the TBI. Further, Delta-copeptin levels were higher in patients who showed no improvement in the modified Rankin score when compared with patients with an improved modified Rankin score. The best cutoff point for Delta-copeptin was 0.51 ng/ml for predicting mortality and 0.23 ng/ml for predicting improvement in the modified Rankin score.
Plasma Delta-copeptin levels may help physicians predict the prognoses of patients suffering from traumatic brain injury.

**Keywords**
copeptin - delta-copeptin - prognostic value - traumatic brain injury - severe head-injury - intracerebral hemorrhage - vasopressin precursor - risk stratification - ischemic-stroke - stable peptide - mortality - prediction - biomarker

# The impact of body mass index on treatment outcomes among traumatic brain injury patients in intensive care units.

Chabok S Y, Yazdanshenas H, Naeeni A F, Ziabakhsh A, Bidar S S, Reihanian A, Bazargan-Hejazi S.

Eur J Trauma Emerg S. 2014;40(1):51-55.
10.1007/s00068-013-0314-2

Obesity is a risk factor in treatment outcomes of critically ill patients. This study was conducted to determine the impact of obesity on the likelihood of recovery from traumatic brain injury (TBI) in intensive care unit (ICU) patients.
We carried out a prospective study on 115 head injury patients who were admitted to the ICU of Poursina Hospital, Rasht, in the one-year period between July 2006 and June 2007. Obese patients (body mass index [BMI] a parts per thousand yen 30 kg/m(2)) were compared with non-obese patients (BMI < 30 kg/m(2)). Demographic information, acute physiology and chronic health evaluation scores, Injury Severity Scores (ISS), Glasgow Coma Scale scores, and ICU mortality incidences were recorded.
Obese patients had significantly higher ICU mortality rates compared to non-obese patients ($p = 0.02$). Furthermore, we observed a trend towards a higher ICU mortality rate in obese patients with ISS > 25 ($p = 0.04$). Moreover, obesity was associated with prolonged mechanical ventilation, ICU length of stay (ILOS), and hospital length of stay (HLOS) ($p < 0.001$).
Obesity was associated with increased ICU mortality and prolonged dependency on mechanical ventilation, ILOS, and HLOS in patients with TBI. However, further prospective studies with larger sample sizes are needed to substantiate these findings.

**Keywords**
obesity - body mass index - icu - traumatic brain injury - mortality - hospital length of stay - icu length of stay - glasgow coma scale - blunt trauma - respiratory-function - morbidly obese - mortality - risk - icu - lung

# The role of decompressive craniectomy in children with severe traumatic brain injury.

Hindy N, Stein K P, Hagel V, Dammann P, Sure U, Mueller O.

Eur J Trauma Emerg S. 2014;40(4):481-487.
10.1007/s00068-013-0337-8

Severe traumatic brain injury (TBI) remains the leading cause of death in children. The present study analyses the outcome of children after severe TBI treated by decompressive craniectomy (DC) due to elevated intracranial pressure (ICP) in a single centre.
Fifty-six consecutive children (age < 16 years) were treated for severe TBI at our institution between 2001 and 2011. For study purposes, children with severe generalized traumatic brain swelling without concomitant mass lesion were further analysed. Descriptive statistics were used to report clinical conditions as well as outcome measurements after conservative treatment only in comparison to secondary decompressive craniectomy.
Of 56 children, a total of eight children presented with generalized and progressive traumatic brain swelling and impending brain herniation. Four children were treated conservatively following standardized local protocol for anti-oedematous management, with ICP amenable to intensified therapy. Four children required decompressive surgery due to progressive oedema refractory to intensified conservative management. Children receiving secondary DC had a longer stay in the intensive care unit as well as a longer average time of assisted ventilation compared to children treated conservatively. Concomitant injuries were more severe in the DC subgroup. Yet, Glasgow Outcome Scale was equally distributed in both groups.
In children with refractory ICP conditions due to severe TBI, decompressive surgery might lead to a similar favourable outcome compared to children in whom ICP can be controlled only by conservative management. Timing of surgery depends on the neurological deterioration of the patients and a continuous ICP monitoring.

**Keywords**
children - decompressive craniectomy - outcome - traumatic brain injury - refractory intracranial hypertension - pediatric head trauma - age - adolescents - hypothermia - craniotomy - management - therapy - adults - sex

# Rethinking bicycle helmets as a preventive tool: a 4-year review of bicycle injuries.

Joseph B, Pandit V, Zangbar B, Amman M, Khalil M, O'Keeffe T, Orouji T, Asif A, Katta A, Judkins D, Friese R S, Rhee P.

Eur J Trauma Emerg S. 2014;40(6):729-732.
10.1007/s00068-014-0453-0

Traumatic brain injury is a leading cause of disability in bicycle riders. Preventive measures including bicycle helmet laws have been highlighted; however, its protective role has always been debated. The aim of this study was to determine the utility of bicycle helmets in prevention of intra-cranial hemorrhage. We hypothesized that bicycle helmets are protective and prevent the development of intra-cranial hemorrhage.
We performed a 4-year (2009-2012) retrospective cohort analysis of all the patients who presented with traumatic brain injury due to bicycle injuries to our level 1 trauma center. We compared helmeted and non-helmeted bicycle riders for differences in the patterns of injury, need for intensive care unit admissions and mortality.
A total of 864 patients were reviewed of which, 709 patients (helmeted = 300, non-helmeted = 409) were included. Non-helmeted bicycle riders were more likely to be young ($p < 0.001$) males ($p = 0.01$). There was no difference in the median ISS between the two groups ($p = 0.3$). Non-helmeted riders were more likely to have a skull fracture ($p = 0.01$) and a scalp laceration ($p = 0.01$) compared to the helmeted riders. There was no difference in intra-cranial hemorrhage between the two groups ($p = 0.1$). Wearing a bicycle helmet was not independently associated ($p = 0.1$) with development of intra-cranial hemorrhage.
Bicycle helmets may have a protective effect against external head injury but its protective role for intra-cranial hemorrhage is questionable. Further studies assessing the protective role of helmets for intra-cranial hemorrhage are warranted.

**Keywords**
helmet laws - traumatic brain injury - bicycle injury - united-states - legislation - children

# The impact of ETOH intoxication on the development of admission coagulopathy after traumatic brain injury: a prospective evaluation.

Karamanos E, Sivrikoz E, Talving P, Inaba K, Resnick S, Demetriades D.

Eur J Trauma Emerg S. 2014;40(1):45-50.
10.1007/s00068-013-0308-0

Coagulopathy after severe traumatic brain injury (sTBI) results in a ten-fold increased risk of death. Our aim was to investigate the effect of ETOH intoxication on admission coagulopathy after sTBI.
Patients with sTBI [Glasgow Coma Scale < 9 or evidence of intracranial pathology on computed tomography (CT)] from 1/2010 to 12/2011 were prospectively enrolled. Demographics, clinical characteristics, laboratory values, head CT scan findings, physical examination, injury severity indices, and interventions were recorded. ETOH blood levels were obtained. The incidence of admission coagulopathy was compared between patients who were ETOH-positive (ETOH+) and those who were ETOH-negative (ETOH-). Logistic regression was performed to identify independent risk factors.
A total of 216 patients were enrolled. 20.4 % were ETOH+. Admission coagulopathy was significantly lower for ETOH+ patients (15.9 vs. 39.0 %, adjusted p = 0.020). Prothrombin time (PT) and International Normalized Ratio (INR) on admission were significantly lower for ETOH+ patients (16.7 vs. 14.3, adjusted p = 0.016 and 1.35 vs. 1.13, adjusted p = 0.040, respectively). Injury Severity Score a parts per thousand yen25, hypotension, and loss of gray/white differential were identified as independent risk factors for the development of admission coagulopathy. ETOH intoxication was the only protective predictor [AOR (95 % CI): 0.32 (0.12, 0.84), adjusted p = 0.021].
ETOH intoxication is associated with a lower incidence of admission coagulopathy in patients with sTBI. Further research is warranted.

**Keywords**
severe traumatic brain injury - etoh intoxication - coagulopathy - human endothelial-cells - fibrinolytic-activity - ethanol intoxication - alcohol-abuse - blood - fibrinogen - pai-1 - gene

# Titanium osteosynthesis hardware in maxillofacial trauma surgery: to remove or remain? A retrospective study.

Pan Z, Patil P M.

Eur J Trauma Emerg S. 2014;40(5):587-591.
10.1007/s00068-013-0348-5

***Introduction***
A 5-year retrospective study evaluated the incidence and causes for removal of titanium miniplates.

***Material and Methods***
The surgical records of 156 patients treated with rigid internal fixation after maxillofacial traumas were reviewed. Study variables included age, sex, site of fracture, site and number of plates, time of plate removal and reasons for plate removal.

***Results***
Of 384 plates used for fixation, 35 plates (9 %) in 21 patients (13.5 %) were removed due to hardware related complications. Statistical significance ($p<0.01$) was observed in mandibular body and parasymphysis fractures with regards to both fracture site location and plate removal rates. Most plates were removed within the first year after placement ($p<0.01$). The highest number of fractures were observed in the 20-30 years group ($p<0.01$) while most cases of removal were in the 30-40 years group ($p<0.01$). Secondary reconstruction/growth facilitation (11/156, 7 %) ($p<0.01$) was the main cause of plate removal while infection/wound dehiscence (9/156, 6 %) ($p<0.01$) was the main cause for complication related plate removal. A significantly greater number of plates placed via intraoral incisions ($p<0.01$) needed removal.

***Conclusions***
The low incidence of complication related plate removal (7 %) in the mid and upper face in this study suggests that routine removal of asymptomatic titanium miniplates after maxillofacial trauma at these sites may not be beneficial. The high rate of mandibular site complications (19 %) in this study suggests that routine removal of titanium hardware from mandibular sites may be indicated.

**Keywords**
osteosynthesis - removal - maxillofacial trauma - complications - titanium miniplate - rigid fixation - orthognathic surgery - facial fractures - bone plates - miniplate removal - screws - fate - policy

# Autonomic dysreflexia: a possible trigger for the development of heterotopic ossifications after traumatic spinal cord injury?

Putz C, Helbig L, Gerner H J, Zimmermann-Stenzel M, Akbar M.

Eur J Trauma Emerg S. 2014;40(6):721-726.
10.1007/s00068-013-0353-8

The aim of this study was to investigate the influence of the initial American Spinal Injury Association Impairment Scale (AIS) category and the conversion rate in acute traumatic tetraplegic patients on the development of heterotopic ossifications (HO). The second objective was to prove the hypothesis that tetraplegic patients with autonomic dysreflexia (AD) develop HO more often than patients without AD.
A retrospective analysis from 2002 to 2009 of 330 patients with spinal cord injuries was performed and led to the inclusion of 77 traumatic tetraplegic patients. Clinical data was reviewed to determine the appearance of HO (n = 8) and its possible coincidence with AD during urodynamics. Spearman's correlation coefficient was calculated to test the relationship between HO and initial AIS category or the change in AIS category within 6 weeks. A matched pair (age, neurological level of injury) analysis of two samples (n = 8 with/without appearance of HO; total n = 16) was performed.
The appearance of HO was significantly correlated with an initial AIS A compared to incomplete tetraplegia at baseline ($p < 0.017$). The conversion of AIS A into incomplete tetraplegia was highly correlated with the incidence of HO ($p < 0.003$). AD showed a positive correlation with HO ($r = 0.97$, $p = 0.001$).
An initial AIS A that converts early into an incomplete tetraplegia constitutes a risk factor for the development of HO. Additionally, AD constitutes an important trigger in the development of HO in acute traumatic tetraplegic patients.

**Keywords**
tetraplegia - heterotopic ossification - spinal cord injury - conversion rate - autonomic dysreflexia - brain-injury

# Diagnosing isolated nasal fractures in the emergency department: are they missed or overdiagnosed? Ten years experience of 535 forensic cases.

Sener M T, Kok A N, Kara C, Anci Y, Sahingoz S, Emet M.

Eur J Trauma Emerg S. 2014;40(6):715-719.
10.1007/s00068-014-0373-z

Nasal bone is the most common broken bone of the face. Incorrect assessments of nasal trauma are frequently encountered in forensic evaluations. Here, we aimed to determine the reasons and frequency of erroneous assessments of nasal trauma in emergency department (ED).
This is a cross-sectional multicentric study analyzing the Forensic Medical Department archive retrospectively. Epidemiologic features, type of fracture (depressed or non-depressed), and specialty of the doctor examining the cases in ED were studied. Forensic evaluation was reported by analyzing all radiologic examinations (CT and X-ray), medical records, and after repeated physical examination of nasal trauma by the forensic council, consisting of a forensic expert, a radiologist and an otolaryngologist. Nasal fracture was diagnosed when at least two of three physicians agreed.
A total of 535 cases (mean age 31.7 +/- A 14.4, 87.1 % males) were analyzed. The most common causes of injuries were assault (81.8 %), followed by traffic accident (15.3 %) and falls from a height (2.1 %). There were misdiagnoses in ten patients (1.9 %) and overdiagnosis in 135 (24.5 %). The possibility of fracture overdiagnosis was 13.5 times higher than missing it. General practitioners and emergency physicians have 19.7 times (95 % CI 5.5-22. 3) and 3.4 times (95 % CI 1.5-7.8) the tendency to report soft tissue nasal injuries as non-depressed fractures, respectively.
We found that nasal fractures are rarely missed while the overdiagnosis was very common. Examination of patients by a general practitioner or an emergency physician without consultation with a specialist and using only plain radiographs were found to be independent parameters affecting overdiagnosis.

**Keywords**
forensic - legal - nasal injury - face - fracture - computed-tomography - bone-fractures - ultrasonography - accident - children - trauma