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In Shortly about Concussion

Sinisa Franjic*

Independent Researcher, Europe

***Corresponding author:** Sinisa Franjic, Independent Researcher, Europe.

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Abstract

A concussion is a brief loss of consciousness and sometimes memory after a brain injury that has not caused obvious physical damage. A blow to the head is a common injury that usually passes without consequences. There is a possibility that there were also more serious injuries, including a concussion, and sometimes a fracture of the bones of the head. A concussion is a mechanical injury to the head that did not cause permanent damage, but only a short-term disruption of function. A traumatic brain injury can be caused by a direct blow to the head, face, neck or a blow to another part of the body, with the effect of the force being then indirectly transmitted to the head. A concussion is a form of mild traumatic brain injury, and is defined as a complex pathophysiological process caused by biomechanical forces that lead to a temporary disruption of brain function. It is typically manifested by disturbances in memory and orientation, and may be accompanied by loss of consciousness.

Keywords

Brain; Head injury; Traumatic brain injury; Patient; Health

Introduction

Traumatic brain injury (TBI) is a main purpose of morbidity and mortality worldwide [1]. The extensive majority of accidents are labeled as “mild” the usage of modern-day diagnostic standards, and concussion is taken into consideration the mildest shape of TBI. Concussion and mild TBI (mTBI) are phrases which are frequently used interchangeably, with a few controversies. Many role statements and scientific exercise hints from expert agencies use the time period “concussion/mTBI,” and at the same time as all concussions are labeled below the umbrella of mTBI, all mTBIs aren't concussions. When there are intracranial abnormalities on mind imaging, a category of “complex mTBI” have to be implemented in preference to concussion and can be related to worse results. The time period “postconcussion syndrome” has traditionally been used to explain a chronic constellation of signs and symptoms following concussion/mTBI. However, those long-lasting signs and symptoms can also replicate opportunity diagnoses together with premorbid scientific situations.

The term “persistent postconcussive symptoms” can be preferred, in component to reduce misattribution of signs and symptoms to ongoing or lively mind harm, and to reduce maladaptive views in the direction of recuperation for each sufferer and their clinicians. “Subconcussive head trauma” refers to effect without scientific symptoms and symptoms or signs and symptoms assembly the brink for concussion/mTBI analysis, aleven though publicity to copy subconcussive head trauma has been related to neurodegenerative disease, together with chronic traumatic encephalopathy (CTE).

Despite category because the mildest shape of TBI, concussion/mTBI can also additionally purpose a huge variety of debilitating signs and symptoms with associated useful impairment spanning the intense and persistent postinjury intervals. Early recognition, reassurance, and systematic remedy techniques can also additionally enhance results and assist manual secure return-to-activity parameters. There are several role statements and exercise hints from expert agencies that cope with the recognition, analysis, and control of concussion/mTBI, and those are up to date often. This bankruptcy specializes in the scientific method to concussion/mTBI in adults and highlights this complicated situation as a treatable entity.

Head Injury

Concussion has to be described and now no longer used loosely to explain the outcomes of head harm [2]. Concussion is lack of awareness thru a blow to the pinnacle and awareness is defined as non-stop attention of self and environment and the recording of non-stop reminiscence. Concussion is related to retrograde amnesia, that is, the absence of reminiscence for the occasions previous the blow and on this specific, concussion differs from maximum different varieties of lack of awareness, e.g. fainting or epilepsy.

In realistic phrases topics that've been concussed have an opening of their reminiscence beginning moments (or longer) earlier than the head injury and persevering with for a variable time period after the head injury. A post-traumatic amnesia of seconds indicates a minor harm which include is probably sustained within side the boxing ring and is not likely to be related to everlasting brain damage. A post-

traumatic amnesia with length measurable in minutes (up to at least one hour) implies a mild head harm and amnesia of hours is typically related to extreme head harm and the opportunity of extreme and persisting mind harm.

"Unconsciousness" with inside the lay thoughts indicates a kingdom comparable to sleep with unrousability, however it's miles clean from the above that someone can be reputedly wide conscious and responsive however now no longer recording reminiscence and as a result still suffering from "concussion". If such a topic is submitted to unique assessments of alertness, impairment is demonstrable. For instance, if they're requested to subtract 7 serially from 100 (or repeat returned 7 digits or opposite the order and repeat returned five digits) they may be proven to be unable. But questions that may be replied semi-automatically (e.g. call and cope with, age, etc.) can also additionally fail to signify any abnormality of mind characteristic.

The significance of recognizing persevering with concussive states is twofold. The severity of a head harm can be underestimated and a affected person taken into consideration now no longer to have suffered an harm possibly to purpose mind harm in the event that they reputedly wakened quickly after the injury. Secondly, peculiar behavior can be because of concussion however attributed to different reasons specifically intoxication. Thus, the driving force who behaves in an obstreperous manner (possibly refusing breath or blood evaluation for alcohol) can be doing so thru a state of concussion in preference to because the end result of alcoholic intoxication.

Retrograde amnesia is the diagnostic characteristic of concussion. Where unconsciousness is alleged however reputedly there's reminiscence of the effect to the head, it's miles not likely that concussion has occurred. In this case the head injury may be assumed to be non-concussive and much less possibly to be related to brain damage; however additionally the opportunity of willful exaggeration ought to be taken into consideration.

Post-traumatic amnesia has to be "absolute", i.e. there have to be a complete absence of reminiscence. It isn't rare for a topic to record an "island" of reminiscence - after they have been being loaded into an ambulance, for instance - accompanied with the aid of using a similarly hole in reminiscence. The length of post-traumatic amnesia is taken because the time from harm to the first "island" of reminiscence.

Head injury, whilst related to concussion, will typically have proof of scalp or face wounds. But those wounds do now no longer correlate properly with the severity of the injury. Rather they correlate with the item which induced the blow to the head. Thus a flat yielding surface (e.g. soft earth) can also additionally purpose no scalp harm however despite the fact that be concussive, while a stab wound from a pointy tool can also additionally purpose widespread facial or scalp accidents without concussion. And a missile (e.g. a bullet) can also additionally purpose a penetrating brain injury without immediate loss of consciousness.

Traumatic Brain Injury (TBI)

Traumatic Brain Injury (TBI) can purpose various stages of harm to the cranium and brain tissue [3]. Primary accidents arise on the time of effect and encompass cranium fracture, concussion, contusion, scalp laceration, brain tissue laceration, and tear or rupture of cerebral vessels. Secondary troubles that get up quickly after and are the end result of the number one injury include hemorrhage and hematoma formation from tear or rupture of vessels, ischemia from interrupted blood flow, cerebral swelling and edema, infection (e.g., meningitis or abscess), and Extended Intracranial Pressure (IICP) or herniation, any of that can interrupt neuronal characteristic. These secondary accidents or occasions boom the volume of preliminary injury and bring about poorer recuperation and better chance of death. Cervical neck accidents are generally related to TBIs. Because of the ability for spinal cord injury, all TBI sufferers have to be assumed to have cervical neck injury till it's miles conclusively dominated out with the aid of using cervical spine x-ray exam.

Most TBIs end result from direct effect to the head. Depending on pressure and perspective of effect, the mind can also additionally go through harm without delay below the factor of effect (coup) or with inside the location contrary the factor of effect (countercoup) due to mind rebound motion with inside the cranium, or tissue tearing or shearing can also additionally arise someplace else due to the rotational motion of the mind with inside the cranial vault. TBI can be labeled with the aid of using location, severity, volume, or mechanism (contact, acceleration, deceleration, rotational). Common reasons encompass motor automobile injuries; falls; and sports activities-associated accidents, which include the ones going on in soccer or boxing. Acts of violence, which includes gunshot or stab wounds, frequently, bring about missile or impalement TBIs. This is specifically an actual associated with army TBI. This populace represents a unique subset of TBI sufferers due to the fact recuperation additionally consists of coping with comorbid states which include posttraumatic stress syndrome (PTSD).

TBI is related to a complicated syndrome characterised with the aid of using cognitive (reminiscence, interest and got troubles), basic neurological signs and symptoms (headache dizziness, vertigo, and imbalance), neuropsychiatric impairment (tension, despair, irritability, irascibility, mania, disinhibition, impulsivity) [4]. Symptoms can be tremendously slight to extreme and can be gift with ordinary neuroimaging or even anatomical pathology main to common misdiagnosis and below appreciation of the severity of the syndrome. Key to expertise the complexity of those syndromes is the modern-day expertise of the pathophysiology.

The dramatic advances in neuroimaging and changes within side the biochemistry and vascular system may exceptional be defined as a networktopathy with neurotransmitter and vascular perturbations that frequently break out anatomical imaging. The consciousness that vasospasm is a common accompaniment at some stage in concussion and TBI has cause transcranial Doppler have a look at tasks as a unique manner of non invasive monitoring. Default mode community imaging can also additionally show to be the maximum touchy diagnostic device but in analysis.

Epidemiology

Concussion/mTBI is a purely clinical diagnosis [1]. Characteristics encompass a record of altered

neurologic characteristic because of an outside pressure transmitted to and thru the brain, frequently main to brief modifications within side the stage of alertness or orientation. Concussion/mTBI can also additionally arise in a various variety of circumstances. Common examples encompass blunt non-penetrating head trauma from network occasions which include falls or assault, acceleration and deceleration forces from whiplash in visitor's collisions, frame checking in touch or collision sports activities, or blast harm amongst army personnel. Based on scientific functions ascertained at time of harm (on occasion particular as inside 30 minutes from index event), a analysis of concussion/mTBI may be prominent from mild and extreme TBI in numerous approaches the usage of the modern-day system of injury stratification. There is mostly a transiently altered stage of alertness or orientation, no or most effective brief (zero to half-hour) lack of awareness, peri- or posttraumatic amnesia lasting much less than 24 hours, the onset of neurologic or different symptom straight away or inside 1 to 2 days, and a Glasgow Coma Scale (GCS) rating of 13 to 15.

Concussion/mTBI is a worldwide health problem. In the USA alone, there can be at the least 2.5 million TBI-associated emergency branch encounters annually, and that is possibly an underestimate because of unrecognized concussive injury, affected person or clinician misappropriation of signs and symptoms to opportunity diagnoses, or below-reporting. The majority (80 to 90% or more) of all head accidents are labeled as concussion/mTBI. Traffic and different network injuries can also additionally arise indiscriminately, however there are numerous businesses at specific chance for maintaining head harm, together with athletes, older adults (from falls), army personnel, and people with a previous records of TBI. Different mechanisms of harm can also additionally instigate wonderful pathophysiologic sequelae, which include with blast publicity. There will also be precise affected person or populace stage attributes that have an effect on acute and sub acute intervals (e.g., bodily resilience in athletes, cognitive vulnerability in older adults). Nonetheless, current injury classifications and next control techniques are implemented extensively to become aware of and deal with concussion/mTBI given that there's a paucity of proof right now to sell appreciably differing control techniques totally primarily based totally at the mechanism of injury. Patient-level traits have to constantly be considered as with all complicated medical condition.

Commonly applied post injury epochs encompass the immediate duration (week 1), the intense duration (weeks 1 to 6), the post acute or sub acute duration (weeks 7 to 12), and the persistent duration thereafter. Many people get better promptly after concussion/mTBI inside hours to days (commonly 1 to two weeks), eleven though signs and symptoms can also additionally expend over numerous weeks in others. A often used benchmark for whole symptom decision is three months, even though a few people continue to be symptomatic for weeks or maybe months afterward.

The majority of people with records of concussion/mTBI can nonetheless count on a complete recuperation even though signs and symptoms persist after three months. However, at the least 10 to 25 percentage of these with records of concussion/mTBI can also additionally have a long symptom burden extending properly past the historically quoted time intervals cited above. In this placing it can end up tough to disentangle unmasked or exacerbated premorbid situations which include temper, headache, or sleep problems from the ones persisting after harm. An extra complicating aspect is that

lots of those identical comorbid situations can also additionally area an man or woman at chance for a long recuperation direction possibly because of as-yet undefined pathophysiologic or psychosocial vulnerabilities. Moreover, neuroendocrine disorder is an under recognized outcome of concussion/mTBI and, like impaired sleep, can intensify symptom burden.

Pathophysiology

Concussion/mTBI and more severe TBIs are related with the aid of using a not unusual place pathophysiology on a continuum of growing complexity which is changed with the aid of using (1) mechanism of injury; (2) the type, direction, and depth of forces; and (3) a range of accompanying disturbing wounds together with penetrating accidents, cranium base fractures, intracranial lesions, and associated situations which include seizure or cerebral edema [1]. Subsequent secondary or tertiary systemic and neurologic abnormalities similarly propagate neurologic injury.

By historic definition, generally used scientific neuroimaging techniques which include computed tomography (CT) and magnetic resonance imaging (MRI) have to now no longer screen mind structural abnormalities in concussion, and there have to be no proof of diffuse axonal harm, the so-referred to as pathognomonic lesion of extra extreme accidents related with doubtlessly worse results. Characterization of the underlying styles and distribution of micro structural, biochemical, physiologic, and useful connectivity modifications after concussion/mTBI is an lively place of research the usage of superior noninvasive structural and useful neuroimaging strategies together with diffusion tensor imaging, useful MRI, magneto encephalography, and positron emission tomography.

Following concussion/mTBI, specific critical anxious system cell types launch severa materials, a number of that are in the end detectable within side the systemic circulation. Many of those materials were investigated for his or her application as biomarkers, together with glial fibrillary acidic protein (GFAP), ubiquitin carboxylterminal esterase L1 (UCH-L1), S100 calcium-binding protein B (S100-B), neuron-specific enolase (NSE), α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptor (AMPA) peptide, and tau. Tests measuring peripheral GFAP and UCH-L1 specifically have obtained FDA clearance to help acute diagnostic opinions of adults with mTBI within side the emergency placing, mainly to choose folks who have to go through brain imaging. However, a clinically indicated head CT even after such choice might not screen acute abnormalities in sufferers imparting inside concussion/mTBI. A share of those sufferers will exhibit abnormalities on short-c program language period follow-up mind MRI that have been undetectable on CT, apart from a analysis of concussion in desire of at the least slight or complex slight TBI. Recently, highly increased plasma GFAP attention measured inside 24 hours of harm turned into proven to become aware of people possibly to have peculiar MRI findings and, with the aid of using proxy, ongoing follow-up needs, even if the preliminary head CT was negative. GFAP degrees have been nonetheless increased to a point in MRI-poor mTBI instances as compared with a manipulate institution. It isn't but recognized whether or not monitoring plasma GFAP or different protein levels at some stage in recuperation similarly stratifies scientific direction. Combining measures from various modalities can also additionally provide extra prognostic information. For care past the emergency branch, maximum latest role statements and scientific exercise hints do now no longer but advocate

recurring use of the above assessments at some stage in recuperation to manual control.

The heterogeneous scientific manifestations of concussion/mTBI replicate complicated pathophysiological mechanisms inside and distal to the epicenters of brain injury, possibly modulated with the aid of using several affected person-stage functions which include age at time of injury, type of injury, genetics, robustness and endurance of any innate inflammatory or different physiologic responses, and comorbid situations. A perfect biomarker or set of biomarkers have to be extensively available, realistic, inexpensive, and predictive of acute brain injury, recuperation, and decision. Recovery and return-to-activity steerage continue to be clinical determinations, necessitating systematic but tailor-made remedy tactics till such markers are available. Symptom burden within side the days following concussion/mTBI can be the presently maximum constant predictor of slowed recuperation.

Subtypes

Accumulating proof helps distinct concussion/mTBI phenotypical subtypes characterised in keeping with the number one symptomatic presentation [1]. Subtypes encompass cognitive, ocular-motor, headache/migraine, vestibular, and tension/temper categories. Features of those subtypes aren't jointly different and might transition to different subtypes at some point of recuperation. Current investigative techniques encompass the usage of multimodal evaluation strategies to completely symbolize those proposed subtypes. Detailed scientific phenotypes can also additionally in the end permit for in advance remedy goal identification, extra correct prognostication, and subtle remedy trial choice standards. Position statements and hints do now no longer but speak variations in control for those concussion subtypes, however in well-known focused on the maximum bothersome signs and symptoms for diagnostic and remedy techniques is endorsed.

Patient

Concussion is commonly controlled within side the outpatient placing [5]. While the maximum crucial components of the ED (emergency department) come upon encompass ruling out life- and limb-threatening accidents, organizing an analysis of concussion will have profound effect at the long-time period results of the man or woman. A suspicion of concussion has to set off a referral to a concussion professional. Depending on nearby exercise, this can be a General Practitioner with an interest in sports medicine, a neurologist or a neurosurgeon. In large centres, the experts frequently paint collectively with inside the assessment and control of the affected person. In the intense duration after a concussion, the affected person is mainly prone to similarly harm due to impaired response and decision-making abilities.

One of the important thing factors to set up is the concussion records of the affected person. A records of a couple of concussions, ever with regularly longer recuperation times, have to set off caution to the affected person that similarly harm ought to cause appreciably extra morbidity and mortality. The outcomes of performance-enhancing drugs and illicit substance use in a concussed man or woman are arguable however have to be taken into account, and screening have to be taken into consideration.

No remedy has been confirmed to hurry recuperation from a concussion. Some propose for strict relaxation (no physical activities, no reading, no television/computers/phones) for 5-7 days, however compliance can be an issue. Others have cautioned an early lively rehabilitation method together with strict relaxation within side the first day or two, accompanied with the aid of using the slow creation of intellectual sports and finally regularly extreme physical activities.

With a negative CT test, the affected person have to be discharged, furnished there's a person handy to oversee him at domestic, with each written and verbal commands of the ordinary signs and symptoms of concussion and red flags which include extended drowsiness, seizures, focal neurology and ongoing vomiting. Should the affected person become worse at domestic or if the carer is concerned, they have to go back to the ED for reassessment. On occasion, sufferers can also additionally have behind schedule bleeds, which can also additionally necessitate re-scanning.

Patients with a GCS of eight or much less are taken into consideration to have extreme TBI and could require superior hospital therapy within side the prehospital placing in addition to neurocritical care control [6]. Severe TBI is related to substantial neurologic harm frequently with structural lesions discovered with the aid of using neuroimaging (e.g., head computed tomography [CT] test revealing cranium fracture, intracranial hemorrhage, and early diffuse cerebral edema). After preliminary resuscitation and stabilization withinside the field, sufferers with extreme TBI have to be evacuated to the closest Level 1 trauma middle with neurosurgical capability. Patients imparting with moderate TBI (GCS 9–12) have to additionally be handled withinside the essential care placing at the same time as people with mild TBI (GCS thirteen–15) can also additionally or might not require health center admission.

It has to be cited that similarly to the GCS parameter, slight TBI is officially described because the presence of lack of awareness for 30 minutes or less, post-disturbing amnesia now no longer extra than 24 hours, any alteration in intellectual reput on the time of harm, or focal neurologic deficit. In scientific exercise, concussion and slight TBI are frequently used interchangeably; however, the phrases are subtly wonderful if most effective due to the fact they have been independently defined with the aid of using specific professional panels. The American Academy of Neurology (AAN) defines concussion as a trauma-induced alteration in intellectual reput with confusion and amnesia being the hallmarks. As the GCS does now no longer offer sufficient element to provide a beneficial scientific photograph in instances of slight TBI or concussion, loads of scales were advanced.

A wonderful deal of clinicopathologic heterogeneity exists in head harm classifications and so medical doctor judgment thinking of the whole clinical picture in addition to neuroimaging findings is paramount. While the classifications and grading scales advanced with the aid of using professional consensus are clinically beneficial, their use is commonly now no longer supported with the aid of using elegance I proof.

Post Traumatic Complications

Following TBI, sufferers frequently bitch of indistinct signs and symptoms together with complications, nausea and vomiting, dizziness, tension and irritability, and insomnia [7]. They will have problems with attention, reminiscence, cognitive processing, and attention. Of those complaints, posttraumatic complications are typically the maximum chronic. These complications are frequently variable in nature and may be exacerbated with the aid of using modifications in role, movement, tension, or pressure. The endurance and severity of those signs and symptoms may be without delay associated with the severity of the head trauma. Some sufferers with slight or mild head accidents have an identifiable impairment of cognitive processing, inattention, and reminiscence disturbances.

Posttraumatic complications are treated supportively. Patients are reassured that the signs and symptoms are brief and have to solve with time. Non-narcotic medicinal drugs are endorsed for complications and lowdose benzodiazepines may be prescribed for vertigo. Posttraumatic despair is exceptional handled with selective serotonin reuptake inhibitors (SSRI). A referral has to be made for neuropsychological assessment for any affected person with chronic cognitive problems.

Post Concussion Syndrome

Approximately 40% of sufferers who've sustained minor or extreme accidents to the mind bitch of headache, dizziness, fatigue, insomnia or hypersomnia, blurred vision, tinnitus, irritability, restlessness, and incapability to concentrate [8]. Often, there's overlap with signs and symptoms of tension and despair. This institution of signs and symptoms is called postconcussion syndrome. It may be gift for only some weeks or persist for years (15%). Post Concussion Syndrome is quite misleadingly named; due to the fact affected people do now no longer want to have suffered lack of awareness. There aren't any standards that make it viable to outline the function of both physiological and mental elements within side the etiology. Patients can be significantly disabled however have ordinary findings on neurologic exam and no proof of mind harm on MR studies. The correlation among the severity of the authentic harm and the severity and length of later signs and symptoms is poor. For instance, the occurrence of post concussion syndrome does now no longer correlate with the length of retrograde amnesia, coma, or post-traumatic brief anterograde amnesia. In a few sufferers, signs and symptoms can be associated with mind harm visible on MRI. A worse final result was related to residual focal atrophy of a frontal or temporal lobe, ensuing in govt disorder or persona change. Other proposed mechanisms are disorder of the hypothalamic-pituitary-adrenal axis, inflicting despair, and glucocorticoid-prompted harm to dendrites within side the hippocampus. In different sufferers, signs and symptoms appear to be completely psychogenic (eg, dissociative amnesia).

Post-traumatic signs and symptoms are much more likely to arise in sufferers with psychiatric signs and symptoms earlier than the harm. Social elements which include home or financial problems, unrewarding occupations, and the choice to attain compensation, financial or otherwise, generally tend to supply and might extend the signs and symptoms when they have advanced.

The analysis for sufferers with post concussion syndrome is uncertain. Generally, modern development can be expected. Duration of signs and symptoms isn't associated with the severity of the harm. In a few

sufferers with most effective slight harm, signs and symptoms maintain for a protracted duration, while sufferers with extreme accidents can also additionally have most effective slight or brief signs and symptoms. Most frequently, 2-6 months elapse earlier than headache, dizziness, or intellectual modifications display tons development. Treatment of post concussion syndrome consists of psychotherapy, cognitive and occupational therapy, vocational rehabilitation, and antidepressants or anxiolytics [1-8].

Conclusion

80 to 90% of patients who experience a concussion recover after 7 to 10 days. In the case of prolonged recovery, it is necessary to consider the existence of other diseases, which requires a multidisciplinary approach. Recovery in children and adolescents requires more time and they should be approached much more cautiously and conservatively in treatment. Contrary to the belief of most people, concussion in 90% of cases is not accompanied by loss of consciousness, but by symptoms in the form of neurological function disorders. Symptoms usually appear quickly, are highly variable, often non-specific, of short duration and generally resolve spontaneously. However, symptoms can sometimes develop, change, and evolve, in a shorter or longer period of time than a traumatic brain injury.

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