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## POST CONCUSSION SYNDROME

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### INTRODUCTION:

Concussion is an extremely common event, especially in Southern California, where we tend to rely on automated transport so heavily. The post concussion syndrome, namely that complex series of events occurring after concussion, naturally is also very common. Let us first define our terms: Concussion refers to a brief loss of consciousness after a head injury. As time has gone by, however, we have begun to realize that the post concussion syndrome can happen even after whiplash or other forms of minimal head trauma, even when the patient is momentarily stunned or "sees stars," etc., etc.

About 10 million people in the United States suffer from a mild head injury every year. Everybody involved in this most common of disorders suffers from a lack of clarification and lack of real knowledge of the disorder. On the one hand, the unfortunate patient is burdened with symptoms physical, emotional and intellectual, leaving him or her in pain, debilitated and depressed, causing the doctors to scratch their heads in confusion and the lawyers to throw up their arms in despair trying to figure out what is "physical or psychological."

The term "concussion" comes from the Latin verb concutere, meaning to dash together or shake violently. The post concussion syndrome is a syndrome which may follow concussion and consists of the following:

1. A mood disturbance in which depression and irritability are prominent.
2. An intellectual disturbance with impairment of short term memory, concentration and attention.
3. Physical symptoms such as headache and vertigo. Other symptoms may accompany these, such as fatigue, insomnia, sexual dysfunction, an over-sensitivity to light, sound and alcohol.

### HISTORY:

The post concussion syndrome has been recognized for several hundred years. One of the earliest recordings was made in 1694, when a Swiss physician, J. Wepfer, was asked to give an opinion regarding a 26 year old maid who had been hit over the head with a stick. She complained of retrograde amnesia, and six months later she complained of headaches, dizziness, ringing of the ears and tiredness. When asked his opinion,

the physician said, "We cannot say anything definite, but it is certain that this will leave its mark in the form of an impediment."

Naturally, post concussion syndromes were quite rare in the days when we had to rely on our feet and horses, instead of automated transport. With the advent of the industrial revolution in the early 19th century, and especially since the construction of extensive railway systems in the mid to late 19th century, the frequency with which these accidents occurred of course have increased. For instance, in 1883 in Britain, 1,167 people were killed and 4,187 people were injured in railway accidents. It was therefore in the latter part of the 19th century that mankind began to travel in large numbers at speed and thus began to have accidents in which acceleration/deceleration forces on the head and brain were of major degree. With the advent of the automobile, this, of course, has spiraled out of control and they are now the most frequent cause of head injury.

Up until recently, the majority of medical professionals felt that there was no link between minor head injury and the constellation of symptoms and signs which developed thereafter. There was a very clear innuendo that such symptoms were secondary to psychological factors or motivated by greed or malingering. Only in recent years, with the combination of laboratory and epidemiological studies, has a contrary view begun to emerge.

Let us now take a closer look at the syndrome in its entirety before we begin to discuss causative factors.

## SYMPTOMS:

### Headache:

Headache is the dominant symptom of the post concussion syndrome. It usually appears within 24 hours of the head injury, although 6-10 per cent of patients do not experience headache until some days or even weeks afterwards. The headache usually worsens over a period of days to weeks and then gradually improves over a similar time. Most patients experience a dull, aching constant generalized discomfort with worsening which may be quite localized, either to the frontal or the occipital regions of the head, namely, the back of the head. Symptoms may persist for several hours. The patient will often state that their necks crack or pop and that they have a tight band-like sensation around the head.

Other patients will have a more typical migrainous type syndrome. The pain may be throbbing in quality, worsened by effort, stooping, coughing or rapid movements of the head and may be accompanied by nausea and vomiting. The usual medicines with which we treat migraine are often very effective in these cases.

The neck symptoms so frequently seen after whiplash injuries must also be considered here, because most often head injuries occur commonly together with neck trauma. Cervical sprains, disc disease or exacerbation of pre-existing degenerative conditions in the neck may occur. The headaches may be caused directly by neck pathology rather than being due directly to the head injury.

Other patients, especially the elderly group, will develop symptoms suggestive of "occipital neuralgia." There may be shooting, burning pain which may shoot up from the back of the scalp and sometimes be felt in the side of the head or up in the front and even down into the eye and into the cheek. Yet others may develop evidence of temporomandibular joint dysfunction with tenderness on palpation of the TMJ, popping, clicking or decreased opening of the jaw.

Yet another type of headaches is pins and needles or tingling and pain over the site of the scalp laceration or over the site of the original trauma, even without a laceration.

To summarize, a variety of headaches may occur after head trauma. The headaches may be continuous or episodic. Many patients have more than one type of headache. Not infrequently, patients have headaches with both muscle contraction and vascular elements termed "mixed headaches." By no means is this condition always self-limited within a matter of weeks, as many physicians would have us optimistically believe. Post traumatic headache syndromes may last for many years. In some patients, especially children, the head trauma may precipitate migraine which may last for the life span of the individual.

#### Vertigo:

Vertigo or lightheadedness or giddiness occur almost as often as headaches in over 80 per cent of patients. It may occur independently of headaches. The sensation is experienced as an illusion of spinning, although sensations of rocking, falling, tilting and rising off the ground have been noted as well. The dizziness is often made worse by movement of the head or by rapid changes in body position.

#### Visual Disturbance:

Many patients after head trauma often complain of blurring of their vision, double vision or some other vague visual disturbance which is very hard for them to characterize.

#### Intellectual Disturbance:

Impaired concentration and memory, easy fatiguability and irritability occur with remarkable uniformity in many patients occasionally even in the absence of headache or vertigo. It has recently become clear that virtually all those who suffer concussion are unable to process information at a normal rate and also manifest impaired reaction times. The common clue to this disability is that the patient complains that he or she cannot remember names, loses objects and cannot keep his or her mind on reading material. Psychological testing may demonstrate no real memory loss; rather, the complaints stem from impaired attention and concentration. The patient is preoccupied with self and is paying attention to internal feelings, with reduced awareness of the external environment.

### Irritability:

The spouse describes, with feeling, the patient's loss of humor, his or her impatience and quick anger over trivial matters. A common complaint is that the patient finds the offsprings' noisiness particularly irritating. "He used to come home and wrestle with the boys on the lawn; now they don't dare come near him." In many cases, frequent flare-ups of anger and lashing out so strain the marital relationship that the spouse seriously considers leaving.

### Sexual Inhibition:

Reduction of sexual capacity and interest is a symptom in more than 90 per cent of patients with post concussion syndrome. Usually such information is not volunteered. If the physician approaches the sexual inhibition as a legitimate topic, the patient's sense of relief is often apparent, particularly when the physician can assure him or her that the condition is probably only temporary.

### Anxiety:

Many patients describe free-floating anxiety or "nervousness." They are often extremely anxious about getting back into their automobile and are constantly looking over their shoulders to see if they are going to get hit again. Very often they will show classic startle reactions as a feeling of sudden panic when surprised by an unexpected noise, just as a door slamming or even a telephone's first ring. There is a general intolerance to noise and commotion, as though the patient has a "hyperirritable nervous system."

### Sleep Disorder:

In my experience, virtually all patients who suffer from the post concussion syndrome have a disruption of their sleeping patterns. It is very rare for me to see prolonged "muscle tension" states without an accompanying sleep disorder.

### Social Withdrawal:

Finally, the patient may withdraw from friends, neighbors or relatives because he is reluctant to be in crowds. A patient who will customarily go out with the boys, attend clubs, church or social gatherings may withdraw, much to the puzzlement of his friends and family.

### CHILDREN:

Children who sustain head injuries and develop post traumatic syndromes often respond differently from adults. They become hyperactive with poor anger control and attention, often bed-wetting. These symptoms may

occur as the dominant symptoms of the syndrome. Headache may be a less severe symptom, and vertigo is rare. Somnolence, irritability and vomiting may occur and have a tendency to recur. As I mentioned earlier, it is not uncommon for me to see migraine develop for the first time after what seems to be relatively trivial head trauma.

In the case of children, special attention must be paid to their school performance, and I often recommend to families and teachers that the child be put through a less demanding work schedule than prior to the accident.

The occurrence of these seemingly "neurotic" symptoms may be nothing more than a psychological reaction to the fact that the patient is being asked to perform and do things as before while having a damaged nervous system. The patient who returns to his work the day after his accident feels that jobs that he or she could easily have completed before now require his or her entire attention and are soon tiring. Simultaneous attention to multiple tasks may be beyond the patient's capacity, and the anxiety generated from this circumstance, aggravated by doubting and non-supportive doctors, may very well result in anxiety, depression, hypochondriasis, etc.

#### OPINIONS ON CAUSE:

There have always been two widely different opinions as regards to the "etiology" or cause of the post concussion syndrome. For a hundred years or so, it has been popular wisdom that the patient is malingering or is "neurotic." In recent years, however, studies have accumulated which show without a doubt that the brain can suffer quite severe damage when it is subjected to rapid acceleration/deceleration forces. Work in gelatin models of the brain shows that in cases of trauma to the head, the force responsible for producing the abnormality was not the impact itself but, rather, acceleration of the brain. These studies have also revealed that head injury occurs more commonly when the head is free, in other words, when it is allowed to accelerate than when it is fixed. Multiple other studies which will not be cited here show evidence of microscopic damage, micro-hemorrhages and disruption of the axons or nerves in the brain following what appears to be minor head injury. Recent studies in guinea pigs show that single or multiple concussive blows to the head insufficient to produce death produce nerve cell damage in the brain stem, and that the animals perform poorly in maze running tests when compared with the controls, although they appeared otherwise normal. Other groups have shown that cerebral concussion may be produced in animals by rotational displacement of the head on the neck without any significant head impact. These studies are too numerous to go into in detail, but suffice it to say that a growing body of knowledge has emerged which proves beyond the shadow of a doubt that subtle, definite neurological damage is inflicted after the brain is subjected to acceleration/deceleration forces. The recent development of powerful tools, such as the brain stem auditory evoked responses, shows abnormality in 61 per cent of patients who complain of dizziness following head trauma.

## SUMMARY OF CAUSES:

There is now ample evidence to show that neurologic or biologic factors play a major role in the symptoms of the post concussion syndrome. The experimental, as well as the clinical evidence, supports the idea that concussion may transiently disturb brain function within the central nervous system, giving rise to the clinical phenomenon of the concussed patient. Protracted symptoms following concussion may occur because of variable delays in the reinstatement of these processes; thus, a prominent British neurologist, Sir Charles Symonds, put the matter clearly when he wrote, "It is questionable whether the effects of concussion, however slight, are ever completely reversible."

## EPIDEMIOLOGICAL STUDIES:

It is often assumed that patients with concussive head injuries sustained in circumstances where there is compensation do worse than those wherein no compensation is involved. Other people have claimed that as soon as the patients get a settlement to their liking, the symptoms disappear, and others have claimed that the post concussion syndrome is prominent only in the impoverished and poorer classes who have obvious secondary gain motivation. To make a long story short, all of these assumptions are incorrect. Seventy-six per cent of patients return to work before insurance compensation, with complete recovery. Seventy-one per cent of cases in several studies did not involve insurance compensation. These studies were performed in New Zealand, where there is a no-fault insurance policy in place. Seventy-one per cent of cases of post concussion syndrome involved managerial and professional groups. Again, these studies are too numerous to mention in detail, but suffice it to say that virtually all of these studies have detonated for once and for all our previously facile assumptions concerning this syndrome.

Finally, one study in 1944 showed that symptoms may persist for more than one year in one-third and for more than three years in 15 per cent of cases, and that the persistence and severity of symptoms is not necessarily diminished by time.

## DISCUSSION:

Where does all of this leave us? The evidence presented here shows very strongly that there is an "organic basis" to most post concussion syndromes. You may ask why this evidence has had such a slow and incomplete acceptance. The answer may very well lie in the fact that both physicians and patients alike are trained in the "medical model of disease." In this model, whenever there is pain, there is injury. If the patient is complaining of something, then there must be something structurally or physically wrong. The post concussion syndrome is a syndrome with many symptoms but usually with no outward physical signs of the ordinary kind, and doctors tend to be suspicious of patients with such an illness, perhaps because of the emphasis in their training on the

discovery of objective physical signs. More recently, on laboratory and imaging investigations, for many doctors the normal CAT scan or normal MRI essentially means that there is nothing physically wrong with the patient. This suspicion is heightened when compensation is an issue.

I would like to put forward another idea: The post concussion syndrome occurs in a human being who has been injured and not to a piece of biological engineering which many doctors would have us believe. Every human being has his own vulnerability and his own susceptibilities which color his reaction to any form of injury. Some patients react stoically and others do not. We cannot "blame people" because some react differently than others.

It is a very significant aspect of the human being that when they are severely injured with outward physical signs, such as head fracture or broken bones, there is usually a less severe, if any, post concussion syndrome. The answer to this riddle comes in the fact that significant physical damage seems to bind up and neutralize the reactive anxiety that the patient might reasonably be expected to manifest. He or she has "something real" rather than intangible to cope with. Visible evidence of "battle injury" which tends to inhibit the development of a neurotic complex of symptoms includes the following: Medical and nursing ministrations, bed rest, bandages, traction, harness, plaster cast, etc., etc....the acceptable and sometimes required state of invalidism and the legitimately and socially condoned period of convalescent inactivity. However, on the other hand, a sudden frightening accident causing little or no physical damage is more likely a precipitant of a psychiatric disorder. After that fact, nobody puts the traumatized psyche to bed between cool white sheets. The hyperirritable nervous system is not soothingly bandaged or fed intravenously, and the invisible ego laceration is not legal tender for special considerations.

The answers for this are also not too obscure. At a physiological level, the fight or flight mechanism operates automatically to the autonomic nervous system, as well as to the consciously controlled skeletal musculature to equip the person either to attack and reduce or destroy the source of danger, or to retreat and lessen or avoid the threat entirely. In accident cases, the patient may first become aware that an accident has occurred when he or she regains consciousness after the fact. They have no reason to think that they were in danger, but once they are told what has happened, the fight/flight mechanism finds no target to set against. There is no need for action; it is irrelevant, but even so, the person is flooded with apprehensive alarm and panic results. Take an example quoted in a recent journal: A 52 year old man is stranded at a railroad crossing. Through the night he sees the great yellow eye of the train bearing down on him. Finally at the last moment he gets his car activated and is able to pull away. Afterwards he becomes severely depressed, loses 26 pounds, loses his job and almost his wife. A year after the event, he is still virtually an invalid due to severe anxiety and depression. The reason for this is that the unfortunate young man's autonomic nervous system has become overactive. There is no physical injury to bind the anxiety, and the unfortunate young man must bear the

consequences of his hyperirritable autonomic nervous system being out of control. His symptoms are not too dissimilar from the "post concussion syndrome." In that case, there had been no injury whatsoever, but, rather, the extraordinary degree of "reactivity" as a result of the incident.

Other factors which tend to worsen the situation of the head-injured patients occur when they go to the emergency room. The patient has the usual x-rays or CAT scans, and when nothing is found, he or she is told to go back to work the next day. The patient returns to work but finds he or she cannot do his or her work as before; they become irritable, upset and anxious. They go to the doctor, and after failing to respond to the usual narcotics and sedatives are told again, this time a little more curtly, that there is "nothing wrong with them." They may be sent to a specialist, who does his best to find something wrong, but invariably cannot. Finally, in frustration they are referred to the psychiatrist, and the sense of outrage is complete. Many patients react by saying, "There is nothing wrong with me psychologically." The problem is further compounded by the legal profession, who are always seeking to determine what is physiological and/or psychological. They hire experts for the defense and for the plaintiff. Both of them line up on totally opposite points of view, one saying that everything is real, and the other saying that everything is unreal. The fact is that both camps completely miss the point. It is not a question of what is real or what is unreal. The fact is that every head-injured patient suffers both physiological and psychological damage which intertwine in an inextricable fashion.

#### TREATMENT:

How should we treat this complex disorder? Well, some clear principles emerge:

1. The patient should be reassured immediately that this is "not all in their mind." They have to be impressed with the fact that this is a legitimate neuropsychological disorder, with both physical and psychological elements combining in an intertwined fashion. The nature of the disorder must be explained, and they must be protected from their inability to perform up to their usual level. If the child is going to school, the teachers have to be informed. It may often be a great help for the neurologist to communicate with the boss of the company and explain what the patient may be going through. The more that is explained to the patient and the more they are reassured that this is not just a psychological problem, the more they will begin to settle down and get themselves back on the road to health.
2. Certain medicines such as narcotics, sedatives and sleeping medications, should not be used except for the initial very brief period. The only medications that I find of great value in this case are the use of certain anti-depressant medicines which tend to foster rapid restoration of health. Certain types of anti-migraine drugs may also be very effective in these circumstances.
3. The use of physical therapy, especially where the patient is instructed on home use, is often extremely valuable.



4. Counseling is again a critical part of the treatment protocol. This is simply not conventional psychoanalysis, which would be worthless. We find it very helpful to address the "emotional fallout" with a behavioral psychologist and to begin to explore methods and techniques of "cooling down" the autonomic nervous system. Techniques such as biofeedback, muscle relaxation, etc., etc., are all very useful in helping the patient to soothe the irritable nervous system.

My own experience tells me that when this type of approach is taken, very often the patient gets better and returns to work and is restored to full functionality, regardless of compensation issues. I do not mean to imply that there are not certain individuals who are definite malingerers or who will attempt to exploit the legal system for their own gain. Studies show, however, that in these forms of protracted post concussion syndromes, the degree of malingering is no more than say 6 to 10 per cent. It is unfortunate, however, that the clever malingerer often lingers long in the memory of the doctor.

#### SUMMARY:

In summary, then, a post concussion syndrome is a complex disorder which is the result of an injury to the nervous system which is then acted upon by a conscious and introspective human being who is capable of developing psychological and autonomic nervous system reactions to the brain injury. Thus, it is the injury itself, as well as the patient's reaction to the injury that accounts for the full-blown spectrum of this disorder. It is not a "psychological disorder" in the conventional sense of the word, although psychological components may be a very vital part. The combination of headache, dizziness, blurriness of vision, poor memory, diminished concentration and diminished intellectual ability are all very, very real factors and may be devastating for most people. To treat this properly, the patient must not be viewed as a disembodied organ or as a piece of machinery that has broken down, but rather as a living, breathing, feeling human being who has suffered a frightening and sudden event in his or her life which has punctured their sense of invulnerability. Physical, emotional and psychological aspects must all be taken into account if we are to really "treat" the person.

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