INTRODUCTION
CHAPTER 1

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Paraplegia and quadriplegia secondary to concomitant traumatic injury to spinal cord is one of the most devastating injury suffered by man. Although, mortality following spinal cord injury (SCI) is low but morbidity is considerably high. Spinal cord injury necessitates lot of changes in patient's life depending upon the extent of physical and psychological loss, apart from the immobility imposed by the injury and loss of sensations. There are also other unpleasant effects of injury like impaired sexual functions, incontinence of bladder and bowel and back pain etc. These physical problems result in vocational and social losses and impose great demands on family and relationships. Moreover, the complications like urinary tract infection (U.T.I.), pressure sores and septicemia take their own toll and add to the misery. Under the effect of these physical problems one would easily suspect psychological disruption following SCI.

The severity and type of psychological problems also depend upon the pre-injury psychological status of the patient and personality type of such patients. Before proceeding to the explanation of psychological consequences of SCI, it will be appropriate to present anatomy & physiology of spinal cord.

Anatomy and Physiology of Spinal Cord

One of the most important characteristics of living creatures is their capacity to respond to stimuli. The response to stimuli is controlled and mediated by nervous system in living
Fig. 1-A: Diagram of a portion of spinal cord to show the mode of formation of a typical spinal nerve.
organisms. The spinal cord, a part of central nervous system, is a long cylindrical cord like structure in human beings which is lodged in vertebral canal. It is continuous with medulla oblongata above and terminates as conus-medullaris below at level of L vertebra. The spinal cord in humans has 31 segments out of which 8 are cervical, 12 thoracic, 5 lumbar, 5 sacral and 1 coccygeal segment. The spinal cord is divided in two symmetrical halves by anterior median and posterior median fissures. From the spinal cord on both sides arise two types of nerve roots i.e. anterior root which is efferent (motor) in supply to effect organs and posterior root which is sensory in nature and brings sensory information from different organs.

The spinal cord is covered by three connective tissue coverings of which outer one is duramatter middle one is arachanoid and inner most is the pia mater. The space above duramatter is called extradural space and space between duramatter and arachanoid is called subdural space and below arachanoid is termed as subarachanoid space which contains a clear transparent fluid i.e. cerebrospinal fluid.

Spinal cord consist of grey cellular matter and white matter made up of nerve fibres. The grey matter consist of nerve cell bodies and white matter consist of axon of these cells. The various nerve cells are grouped into anterior, posterior and lateral columns which carry out specific motor and sensory functions.

The basic function of spinal cord is mediated through reflex arc. Whenever any stimulus is given to the receptor organ
Fig. 1-B: The lower end of the spinal cord, the filum terminale and the cauda equina. The dura mater and the arachnoid have been opened and spread out.
the sensation is taken to spinal cord by posterior root. then the action is carried by effective organs through anterior root fibres. The information is also integrated into brain and that information is transmitted to spinal cord and ultimately to effector organ. The dorsal and lateral tracts carry sensations of touch, pain, temperature, position and vibration. The anterior horn fibers carry out only motor functions.

Spinal Cord Injury

There are increased number of patients suffering from spinal cord injury today. The various causes of spinal cord injury are as under.

(1) Motor vehicle accidents
(2) Fall of heavy objects/weight on head and back
(3) Fall from height
(4) Miscellaneous causes like electric shock, sports injury etc.

The injury can be in any region of spinal cord but most frequently cervical region and thoracolumbar-junction are involved because of their excessive mobility.

The injury to the spine is seen in the form of fracture, dislocation or both. The injury could be stable if only appendicular structures are damaged and unstable injury if there is a fracture dislocation. Following spinal cord injury complete or partial or no neurological loss may occur. Paraplegia following SCI means the complete loss of motor and sensory functions in both lower limbs. The term quadriplegia is used when there is a total loss of functions in all the four limbs. Besides injury to the cord the paraplegia could be due to
tuberculosis of spine, tumors, and other miscellaneous diseases.

Although the general management of paraplegics is same in all cases except the specific treatment is constituted according to the disease or type of injury. In case of fracture/dislocation which unfortunately produces severe form of paraplegia and most of these chronically ill patients develop numerous complications which can produce permanent disability or leave a bad scar on patient's mind or even prove fatal to the life.

The complications following SCI could be physical as well as psychological. As per saying that "a healthy body has a sound mind", so any illness of bodily system can affect the mental equilibrium of the patient. The spinal cord injury is not an exception to it. The various types of psychological disturbances following SCI are usually seen in form of personality disturbances, depression, anxiety and adjustment problems and even other severe form of psychoses. The psychological problems following SCI can be attributed to trauma of injury itself, malnutrition, infection and septic stress, bed sores, uncontrolled bowel and bladder & fear of loss of sexual functions. Despite these obstacles many patients manage to cope very well and create a reasonable life for themselves. The degree of severity of psychological illness is also dependent upon social and family structure and psychological status of a person & family and so eial support of the patient etc.

Management of Spinal Cord Injury

In recent years the management of spinal cord injury and its complications has found an important place in modern medical
sciences. Before constituting the management, an injured is always examined for injury to other vital organs. The management of injury to vital organs like chest, abdomen and head is always preferred as compared to management of SCI. In managing SCI patient the diseases or anomalies of spinal cord are always kept in view as management will differ accordingly. The stable SCI patient is always investigated by X-rays of the part. The overall management of an SCI is based on clinical history, social history, neurological status, investigations and facilities available. The general management of SCI is based on principals of :

(1) Absolute bed rest

(2) Nursing care

(3) Management of bladder incontinence by catheterization

(4) Analgesics and steroids

(5) Maintainence of nutritional status

(6) Operative management if indicated

The specific treatment of complications includes management of the accompanying problems such as control of infection in cases of UTI, operative management for bed-sores and so on. Psychological problems are treated by psycho-therapy, chemotherapy and, electro-convulsive therapy as per the requirement of a particular case.

This implies that the management of SCI patients should ideally be integrated and exhaustive. The primary aim should be total rehabilitation of such patients.

Although the orthopedic specialist undertake the
responsibility of total management and rehabilitation of the patient but some of the problems associated with SCI are of the nature which require management by specialist from different disciplines. Spinal cord injured patients under go severe physical, psychological and social stresses and react in different way to cope with stress. While doing so they may exhibit psychological disturbances, some of which may interfere with their treatment and rehabilitation. Judd, Burrows (1986) and Guttman (1976) have stressed the importance of psychological responses to severe spinal injury and in its management.

Proper evaluation and assessment of psychological problems, environmental and social factors aggravating the physical problems and their management may supplement the efforts of an orthopedician. A number of specialist from both the disciplines orthopedics as well as psychology/ psychiatry have reported research work individually or jointly to provide empirical insight into the various aspects of the problem. The vital role of a psychiatric team in the multi disciplinary care of SCI patients is being increasingly recognised in a recent study conducted at Madras as Madras paraplegia project a qualitative improvement in life was observed in patients requiring psychiatric or psychological assistance after the advent of a multidisciplinary specialists team.

The focus of research is how do we teach people to cope with these environmental barriers. However in a number of recent researches (Richmond 1990; Judd 1988) the involvement of the family in the management of patients has also been stressed SCI
is visualized to occur to the family members as well as the stress introduced by the changes which the disability imposes on entire family constellation and the pace of life which slows down, the income must be allocated differentially, social activities change and therefore, there is a considerable change in the equilibrium of the family.

The concern with psychological reactions after SCI, especially in the area of adjustment, has increased in recent years. Consequently, a number of psychological and social theories have evolved. A brief description of these is presented in the following section.

Psychological Theories

A traumatic injury to SCI presents as a sudden, overwhelming threat to the individual's safety. Crisis intervention is directed to the survival of the injured with increasing success. Parry (1990) described some responses which may result from the reaction of the person to his crisis. There may be short term unreality and anaesthesia, anxiety and depression. Parry's description of responses to the trauma or crisis may be exacerbated by the environment and medical interventions to manage the crisis.

Hopkins (1971) stated that immediately after trauma, the patient denies the problem in order to cope with it. The denial implies rejection or refusal, and it is likely to occur in the early weeks following injury. Horn (1989) stated that this phase may be passed in a dream like state in which adaptation has not begun and new learning has yet to take place.
Stage Theories

After the psychological theory, the attention has been focused upon the stage theories concerning adjustment and other psychological problems to SCI. Hohmann (1975) wrote that normal individual experiences a sequence of attitude and feelings as he strives to cope with his injury. The stages include a sequence of defense reactions such as denial, hostility and reaction against dependence. Similarly Bracken and Shephard (1980) delineated the following stages i.e., denial, rage and anger, bargaining, depression and acceptance. Versluis (1983) also describe distinct phases of adjustment to disability, including regression, which is characterized by dependence on others and a more infantile level of weakness. This is an interesting theory since it so accurately describes the early physical manifestations of the SCI itself.

The phase theory was accepted by Bracken (1980) and Donovan (1982). Although this work was based on the observations of authors but it gives more objective analysis of adjustment process. Indeed professionals have been shown to exaggerate the distress of the SCI patients and these misperceptions tend to worsen progressively with the length of clinical experience. However, these theories have been challenged particularly for their empirical validity (Trieschmann 1986; Silver and Wortmann, 1980).

Woodbury and Redd (1987) found that no single theory of response to crisis or adjustment to disability seems to account adequately for the total picture of the patient's psychological
process. Oliver (1983) states stage theory as a problem because they fail to describe the personal experience of such persons who may not grieve or mourn or pass through series of adjustment stages. He also believes that some questions regarding whether an individual can be viewed in isolation or as a part of family and social network remains unresolved.

Personality theory

After the stage theory many authors here emphasised the importance of personality type in adjustment to SCI. Frank and Elliott (1989) reported that SCI patients who believe that they are primarily responsible for their health show less depression and more adaptive behaviour than who have more externalised beliefs. In a study Majzulla (1984) supported the view that those individuals who exhibited an internal locus of control were more able to adjust to the spinal injury on the other hand Trieschmann (1986) stated that a person with quadriplegia have less control over his immediate circumstances and this does not necessarily change the generalised expectancy of control over the rewards in life nor satisfaction with life. Majzulla (1984) emphasises that the control issue is not the reality of control over reinforcement but the belief of control. Trieschmann (1980) supports the theory by the view that internal locus of control is associated with successful rehabilitation outcome but he further emphasises that other variables, such as being young, having financial resources, the ability to solve problems, having many goals and having warm and loving background and interpersonal support, these help the person in setting goals and making
realistic choices. So, two critical features of personality are willingness to accept responsibility for one's life and will to live following SCI.

Maslow (1970) defined human needs as existing in a hierarchy. There are total five levels in hierarchy and each need level must be satisfied before man can seek satisfaction at a higher level, the lowest level is of basic physiological needs and ascends through security, love and belongingness, self esteem and self actualization. Strack (1980) studied 25 peoples with SCI who were living in the community and ascribed their stated problems to one of Maslow's five levels of needs. Basic physiological needs included were such problems as muscle spasticity, tissue damage, paralysis, loss of sensations and autonomic hyperreflexia. Security problems included loss of mobility, transportation, difficulties, financial insecurity and insecurity concerning long term care "Love and belongingness" included problems related to sexual love, adjustments, limitation in social activities and in touching. Frustration with architectural barriers, discomfort in asking for help and dissatisfaction with education or occupation were included under the "self esteem". Problems with self actualization included lack of spontanity in life, boredom and dissatisfaction with meaning and purpose in life.

It appears doubtful that this model can be usefully applied to an individual but this listing does provide a challenge to the rehabilitation programme, emphasising the importance of providing support and attention to every aspect of
a person's life.

Sociological Theories

Oliver (1981) argues that in most of the psychological approaches to adjustment to the disability, only individual person have been given attention and not the family members so he suggests the adjustment to sudden, traumatic SCI is often more difficult for other members than for the injured person himself. Recent literature has recognized the impact of injury on the whole family. Richmond (1990) states that SCI occurs not only to the individual but to the entire family.

Oliver, et al (1988) believe that the process of social adjustment arises both from the interactions between the individual and his physical and social environment and more importantly from the meanings which these interactions have for both the individual and his family.

Butt (1989) and Treischmann (1988) described the outcome as a complex interactional equation of many factors. These factors included age, intellectual capacity, philosophical relationships, academic background, previous losses, coping abilities and symbolic meaning which SCI has for the individual. Others are medical complications, medications, endurance, strength, coordination, pain and degree of impairment. Environmental variables include income, transportation, architectural and geographical barriers, educational and vocational resources and family and interpersonal support. They feel that the interactions of so many variables will make it possible to identify a course of adjustment which is predictable.
solitary and uniform.

The above theories suggest that there are number of psychological factors which require the attention of care takers and researchers some of these have been discussed in the following section.

Adjustment

Psychological and adjustment is the harmonious relationship with environment involving the ability to satisfy most of one's needs and meet most of the demands, both physical and social that are put upon them.

A traumatic injury to spinal cord presents a sudden overwhelming threat to the individual's psychological safety & which may create many adjustment problems. The early adjustment to traumatic injury is both adaptive and protective to the patient. It becomes maladaptive only when it begins to interfere with the realistic efforts and plans. Various causes contribute towards the evolution of adjustment problem. The causative factor could be a minor stress persisting for long period or stress of greater magnitude coming all of a sudden. Trauma to spinal cord is one of the major stress factors and due to this traumatic injury there is always some adjustment problems. Most commonly the personal, family and social type of maladjustments occur. So, during the past decades many health care professionals have turned their attention and has tried to described the process of adjustment to traumatic SCI.

Oliver;Zarb;Sliver;Moore (1988) believed that process of social adjustment arises both from the interactions between the
Due to injury the person show unwillingness to work, avoid social-contacts and loss of previously acquired ambulation. There are some variables that have been found to be associated with unfavourable adjustment to SCI and includes older age, low education, low social-support and having a complete lesion. Bingley (1990) reports that person with a recent, traumatic severe spinal cord injury is predominantly young, male and action-oriented. He experiences the trauma as one of the most devastating of all non-fatal injuries.

Despite this, discussion of process of adjustment experienced by the SCI person is frequently neglected in texts. Such adjustment indices do not show how much deterioration has occurred because of adverse life situations, rather they focus used on one's ability to adapt and fit into the changed conditions. Thus, in the medical specialities, adjustment has a less important role to play in understanding the effects of adverse situations. Because of this limitation, the term disability came into usage. Likewise, the definitions stressing on adjustment as "an impairment or defect of a bodily organ or member or loss of one or more functions, severe enough to be a handicap." (English and English 1970) came into existence. Following this, Srinivasan (1981) defined it as "a disability affecting normal growth and development and also adjustment to life over a substantial period, if not permanently".
Both the above definitions considered adjustment in terms of a handicap or disability. A more recent term which has gained popularity in research and clinical circles is "dysfunction". Wolmen (1973) has precisely defined dysfunction as a failure of an organismic process, organ or system to work properly.

Adjustment to SCI has generally been examined in the literature solely from the viewpoint of the injured person. Little attention has been focused on the family, although several writers stress the importance of strong family support as being a major factor in the process of adjustment. Adjustment to sudden traumatic SCI is often more difficult for other family members than for injured person himself. Rich mond (1990) states that spinal cord injury occurs not just to the individual but to the entire family.

Judd et.al. (1988) proposed that the objective of rehabilitation team should therefore include facilitation of the family's adaptation to their changed circumstances. Earlier work on adjustment focused on the adjustment problems following SCI or any other medically adverse situations without giving regard to their premorbed adjustment levels. Another prominent lacuna in the existing literature on adjustment appears to be that in earlier works adjustment as a whole was studied. However, there may be individual differences in sensitivities and adaptations, owing to which different individuals may exhibit varying levels of adjustment difficulties in different areas of life. Research attempts need to be more precise to point out the specific areas
which intervention efforts should be emphasized. An Adjustment Inventory has been introduced by Parsad, Verma, Malhotra and Malhotra (1985) which not only incorporated the concept of dysfunction for adjustment but also measured adjustment with reference to premorbid levels. An additional advantage of the scale is that it encompasses scales for number of areas of adjustment and renders separate scores for each.

Anxiety

Fear and anxiety have long been regarded as fundamental human emotions. In eleventh century, Ibn Hazm unequivocally asserts the universality of anxiety as a basic condition of human existence. In 19th century, Darwin believed that the potential for experiencing fear was an inherent characteristic of men and animals which had evolved as an adaptive mechanism over countless generations. Darwin (1872) provided a vivid description of the typical manifestation of fear as rapid palpitation of the heart, trembling, increased perspiration, erection of the hair, dryness of the mouth, change in voice quality, dilatation of the pupils and this description very clearly resemble the symptoms of anxiety.

In the 20th century, anxiety has emerged as central problem and a predominant theme of modern life. Sigmund Freud was undoubtedly the most important contributor to understanding of anxiety. Freud (1936) defined anxiety as "something felt", an unpleasant emotional (affective) state that is universally experienced. Prior to 1950, however, there were relatively few experimental investigations of anxiety in humans. The complexity
of anxiety phenomena was due to the lack of appropriate instruments for assessing anxiety and ethical problems associated with inducing it in the laboratory have all contributed to the paucity of research.

Interest in anxiety research at mid century was further stimulated by the development of Taylor’s (1951 and 1953) Manifest Anxiety Scale and Sarason and Mandler’s (1952) Test Anxiety Questionnaire etc. Some psychometric instruments were also designed to assess anxiety in adults. Subsequently, self report scales have been developed for measuring general and test anxiety in children.

Rose (1950) has defined anxiety as a serious symptom that arises from faulty adaptations to the stresses and strains of life, as well as faulty adaptation as a cause of anxiety. To him "anxiety is a reaction to the unapproachable inner or subjective difficulties, of which the individual has no idea".

On the basis of its nature, the anxiety could be divided into two parts. There are some situations in which any individual may possibly experience anxiety that is normal or real anxiety. There are some other persons who feel anxiety without any real cause. This type of anxiety neither normal nor every individual experiences it. The clinicians named it free-floating anxiety so the anxiety can be both state as well as free floating. Further work on anxiety was done by Spielberger (1966). He gave a state and trait theory of anxiety. Spielberger (1966) reports two different anxiety constructs, state and trait anxiety. State anxiety (A-state) may be conceptualized as a
transitory emotional state or condition of the human organism that varies in intensity and fluctuates over time, this condition is characterized by subjective, consciously perceived feelings of tension and apprehension and activation of the autonomic nervous system. The level of A-state should be high in circumstances that are perceived by an individual to be threatening, irrespective of the objective danger. A-state intensity should be low in non-stressful situations or in circumstances in which an existing danger is not perceived as threatening. A-trait may also be regarded as reflecting individual differences in the frequently and the intensity with A-state which have been manifested in the past, and in the probability that such states will be experienced in the future. Person who are high in A-trait and tend to perceive a large number of situations as dangerous or threatening than persons who are low in A-trait.

Whatever be its kind the individual having anxiety, exhibit some common symptoms that could be either physical or mental. Mental symptoms include fear, tension, suspicion, excessive excitement, uneasiness sleep-disturbances, frightening, dreams etc. And physical symptoms include loss of weight, fatigue, headache, muscular tension, increases in heart beat and pulse rate, dizziness, perspiration, loss of appetite etc.

Anxiety is more relevant part of patient's life, specially of SCI patients. The process of anxiety starts as the stress enters in the life of patients, such as seen in paraplegic patients. The symptoms may be of acute on set or may have a fluctuating course. They complains about weak legs,
nausea, sinking sensations in abdomen palpitations, dry-mouth, choking throat, shallow breathing etc. Hancock, Craig, Dickson (1993) reported that anxiety is prevalent in 25% patients following injury.

The individual may suffer from transient blindness or paraesthesia, can feel losing control or going insane. The attacks of symptoms may be short-lived or prolonged. The process of anxiety ensues when the willpower and positive motivation fail to yield results. The incidence of anxiety is 10% in hospital patients as compared to 2 to 5% in general population.

Most of the research work in this area focused on studying anxiety by measuring it with general anxiety questionnaires. These studies have provided good insights into this problem following SCI. However, more adequate or situation specific anxiety measured such as those developed by Spielberger, etal (1973) can render more specific findings.

Depression

Depression is a commonly known and seen psychological disorder prevalent in about 2.4% of general population and about 24% in hospital population. Depression is not only fatal in itself but also is a contributory factor to gravity of problem in other terminal diseases including spinal cord injury and cancer etc. The suffering associated with a depression produces its ripple effects which extend in varying degree to family members and society.

Depressive disorders have been recognised and described for as long as the history has been recorded. It has been
referred differently by different researchers and clinicians in ancient Egypt, for over 3,000 years, the depressive disorders were treated by the priests who recognized that depression was often associated with the experience of a psychological loss. It was not until approximately the 6th century B.C., however, that the observation of the mentally ill began to enter the domain of the healer more than continuing to lie a part of the theological tradition.

Depressive illness is characterized by pervasive lowering of mood, with loss of interest or pleasure in all activities. Depression presents with symptoms of sleep and appetite disturbances, psycho-motor retardation or agitation, loss of energy, fatigue, feeling of worthlessness, inappropriate guilt, poor concentration or show thinking indecisiveness and suicide tendencies. Any depressive illness to be clinically significant should meet DSM-III criteria for major affective disorders such as dysphoric mood or loss of interest or pleasure in all or almost all usual activities and past times, poor appetite, insomnia or hypersomnia, feeling of worthlessness and suicidal thoughts etc.

Depression as per is a complex psychological and psychiatric problem for which various etiological factors has been proposed. The etiology could be biological or sociopsychogenic.

Depression is a consequence of SCI and has been observed to occur in all. The literature contains much theoretical discussion about depression in patients with SCI, but provides
little evidence to support claims made. Some writers have stated depression should be considered normal for all patients (Withhower, et al (1954); Stewart, 1977) that depression is an inevitable consequence of spinal cord injury (Hohman 1975; Stewart 1977) and that spinal patients who are not depressed are cause for concern Tiller (1969) Judd, Brown, (1968) reports anxiety and irritability in elderly depressed patients.

There are some features by which a patient of depression can be identified. The important of assessment of depression in such patients only dependence on the clinical observation may not be sufficient, because the literature reveals the fatal consequences of depression and such conclusions are based only on clinical observations and judgements, not on empirical research evidence. Only in recent years objective assessment of depression in such patients has been given attention. A very recent study done by Trieschmann (1992) reports that most the patients are not depressed and only a very small percentage of newly spinal injured people exhibit major depression which is more in acute treatment phase and tends to resolve within a week or before discharge.

The term depression can have day to day meaning as well as clinical meaning. It is very common for a person with the physical problem and especially problem of SCI, which can have life long consequences, to experience depression. Although feeling of depression vary from individual to individual or personality to personality and coping strategies/styles etc.

Some people may be more depressive and are able to
convey their feelings through their actions, others may be less expressive and not able to do so. For overall management of patient, extent of depression needs to be determined. In previous studies, only it is assumed to be present, but not assessed. It is necessary to measure the extent of depression as it can be fatal.

Many scales have been developed for measurement of depression. There are certain scales which commonly used in clinical set-up such as Hamilton Rating Scale and Beck Depression Inventory etc. MMPI is a very popularly used scale of personality assessment which has been used over the past five decades. The Indian adaptation of MMPI in the name of JMPI is also currently available.

Assessment of depression with the help of standardized tools made it possible to conduct empirical research and determine the degree of depression. The overall intervention of SCI patients may also include management of their depression along with the other aspects of their illness.

The psychological disorders as seen after only illness has been a subject of concern but it is the least explored field to day and various aspects of psychology of a SCI patient is the most neglected area.

The importance of any scientific investigation lies in its applications to welfare of humanity. The exploration into psychological effects of an illness i.e. spinal cord injury will not only broaden our field of concern to SCI patients, but will also prove useful in the integrated and total rehabilitation of
these victims, which should help in maintaining normal structure of any society.

Any injury (acute or chronic) not only disrupts physical functions of body but also disrupts psychological integrity of an individual. Past the ages, today a significant improvement in management of SCI patients has been achieved. The saying that "body is to soul, soul is to body" seems to prove itself in relation to SCI patient's today.

Nikas, etal (1990) reported that many SCI patients from world war II were saved because of use of improved management techniques for these victims. The spinal cord injured are an integral part of this world. Guttman (1964) said that it should be the aim of every one concerned with resettlement of SCI sufferers to return as much as possible to their homes to live a near normal life within community. The SCI man with his will or help of society can prove to be an example to a society. A glaring example comes from life of Franklin Roosevelt was paralysed in 1921 and became a successful leader of U.S.A later.