Chapter 5

Intracerebral Hemorrhage: Issues in Rehabilitation

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Abstract

While the advancements in the management of the spontaneous intracerebral hemorrhage (SICH) have resulted an increase in survival, this has also resulted in the number of survivors with significant functional morbidity that require long-term care and rehabilitation services. SICH can lead to various impairments, and the deficits related to SICH may include impairment in motor and sensory functions, emotional labiality, language dysfunctions, perception deficits and cognitive dysfunctions. In the present chapter, we present an overview of the issues in rehabilitation which are faced by medical personnel's while managing the patients with SICH.

Keywords: intracerebral hemorrhage, physical impairment, disability, rehabilitation

1. Introduction

Spontaneous intracerebral hemorrhage (SICH) is characterized by nontraumatic bleeding into the brain parenchyma [1]. Further the term "primary spontaneous intracerebral hemorrhage" denotes a spontaneous hemorrhage into the brain parenchyma without any secondary cause (i.e., vascular abnormality, brain tumor, etc.) [2]. SICH accounts for approximately 10–20% of all stroke cases, carries a 30-day mortality of up to 50%, and causes significant and persistent disability in survivors [3–7]. Advances in the management of the SICH have resulted an increase in survival, particularly in cases of smaller lesions; however, larger SICH lesions remain a significant cause of morbidity and mortality globally [8, 9]. Literature suggests that in comparison with ischemic stroke, SICH causes more morbidity and mortality [10]. SICH can lead to various impairments including motor and cognitive deficits, sensorimotor impairment, impaired mobility, depression, swallowing dysfunctions, constipation and urinary incontinence [11]. The rehabilitation in SICH patients is targeted to facilitate the recovery process, avoid complications and optimize the functional outcomes acute as well as well as in post-acute recovery phase [11].

2. Overall management

The management of SICH can be divided into medical management, surgical management (when indicated) and rehabilitation both in acute as well as post-acute recovery phase [12]. The medical and surgical management intend to stabilize the general as well as the neurological condition of the patient and to prevent the secondary brain injury (either due to mass effect or presence of clotted blood in the brain parenchyma) [13–15]. In the acute phase, the major medical complications that can occur includes pneumonia (because of dysphagia and aspiration), aspiration, respiratory failure/distress, pulmonary embolism and sepsis [16, 17]. The most important step in the initial management, is the control of hypertension, which is the major risk factor that increases the risk of developing SICH by approximately four times [2].

3. Rehabilitation concepts

The deficits related to SICH are variable and may include impairment in motor and sensory functions, emotional labiality, language dysfunctions, perception deficits, and cognitive dysfunctions [18]. A number of factors decide the functional outcome as well as the treatment protocol for a given patient. While assessing a patient with SICH for rehabilitation, we need to identify whether the stroke has affected the dominant or nondominant side, whether the patient is having monoplegia, hemiplegia, or any other paralytic syndromes, are there any cognitive or speech disturbances (i.e., aphasia, dysphasia, dysarthria or fluency disorder), whether there is impairment of swallowing or if the patient is on tracheostomy. Additionally, this detailed evaluation should detect the presence of any pressure ulcers, their numbers and sites. Neuroplasticity is often regarded as a physiological basis for recovery after brain insults [19]. There is a dearth of reliable efficient post-stroke rehabilitative therapy implying a significant clinical need [20–22], and there is a significant "therapeutic window" that exists for the SICH patients to recover functionally [23].

4. Rehabilitation and recovery

In the case of hemorrhagic stroke, it has been documented in the literature that gait, limb motor and sensory function generally continue to recover until 3 months after onset; however, gait could improve up to 6 months from onset and it has been shown that upper limb recovery could persist up to an year [24]. This prolonged recovery is a witness to the beneficial outcome of rehabilitation during the subacute phase of recovery in stroke patients [25]. Neuronal plasticity is a subject of dedicated study today and is defined as the ability of the brain to recover functionally due to neuronal reorganization after a cerebral insult. It can usually occur actively following any cerebral insult, albeit for a limited time. It has been postulated that in acute phase and early stages of recovery following SICH delayed metabolic changes, continued neuronal damage and apoptosis in perihematomal tissue can continue

to cause more active inflammatory damage, which is mediated by cellular and noncellular components, leading to more widespread consequences [26–30]. Thus, in comparison with an equivalent-sized ischemic infarct, in patients with SICH, an intraparenchymal blood leads to an increased inflammation and a greater cell death [26, 31]. There is growing evidence that recovery in functions is better in patients with SICH than in patients with ischemic strokes [6, 32–42]. The recovery process starts in the acute phase and can continue for months in the recovery phase [38, 43, 44].

5. Right versus left hemisphere stroke

There is a conflicting evidence whether which hemisphere stroke corroborates with a better outcome [45–47]. The controversy stems from various factors including the varied outcome scales used, measurement domain, presence of hemineglect and the timing of evaluation; for example, in considering vocational rehabilitation, patients with the right hemisphere stroke appear to have a better outcome [48]. The left hemisphere controls speech and language function along with the right half of the body. Strokes in this half of the brain demonstrate a right hemiplegia and aphasia [49]. Preservation of language function is considered one of the primary reasons for a higher percentage of right afflicted people returning to work; however, this cohort of patients are usually the one who most frequently develop social shortcomings in contrast to the left-sided stroke patients [50]. Further studies with exclusion of hemineglect patients may help to exemplify the difference in the disabilities between left and right hemisphere stroke patients [51].

6. Impaired motor function

Restoration of the motor function and mobility is one of the most important components of stroke rehabilitation [52]. Although most stroke patients regain walking independence, many have continuing problems with mobility due to impaired balance, motor weakness, and decreased walking velocity [18]. Impaired motor functions can be due to paralysis or paresis of the muscles (depending on the site of the lesion), which results from the damage to the brain parenchyma (motor cortex or descending/ascending pathways in the internal capsule and corona radiata), resulting in abnormal regulation of spinal motoneurons, alterations in postural and stretch reflexes and loss of voluntary movements [18, 53–56]. If the lesions involve the internal capsule, thalamus, periventricular white matter, and/or premotor cortex, the recovery of the upper limb motor functions is poorer [25, 57]. Regarding the functions in the lower limbs, in a study, it was shown that approximately 51% of subjects were without walking function at the time of admission to the rehabilitation unit and 12% of the subjects needed assistance during ambulation [58]. One of these patients was subjected to rehabilitation protocol, and the number of subjects with no walking function was reduced to 18% [58].

7. Sensory dysfunctions

Stroke survivors may have sensory impairment that may be either central or peripheral. The latter includes loss of primary sensory modalities such as hypoesthesia/paresthesia, proprioception and position sense loss or loss of pain and temperature sensations, or they may have more complex sensory impairments such as agraphesthesia and astereognosis, which are impairments of the central sensory mechanisms [49]. These contribute to requiring additional assistance for these patients to relearn cognitive and motor skills. The processing of sensory modalities begins with reception which is the registration of the pure sensations and stimuli received from the various sensory organs such as eyes, ears, nose, tongue, skin, joints and the internal organs. These received sensations are then rerouted to the corresponding primary sensory cortices. The interpretation of these received stimuli is called perception. Perception is a higher cortical function of the brain involving various regions and is more complex than reception [49].

8. Cognitive dysfunction

Among all the factors portending a negative outcome, cognitive dysfunction has been described as the most potent [59, 60]. It has been suggested in recent studies that cognitive impairment and dementia may be reduced by satisfactory control of hypertension and by using drugs such as acetylcholinesterase inhibitors commonly used in Alzheimer's disease (donepezil, galantamine, rivastigmine) [61, 62]. A step forward in the pharmaceutical approach to post-stroke cognitive impairment, mainly related to language function, fluency and repetition, has been a randomized, placebo-controlled, double-blind study with levodopa which reported positive results [63].

9. Sphincter dysfunction

Usually, transient up to 20% of patients report persistence of urinary incontinence at discharge from rehabilitation [64, 65]. The commonest bladder dysfunction is the uninhibited bladder usually resolving with timed voiding training. Anticholinergic drugs such as tolterodine or oxybutynin may be indicated to relax the bladder. Sphincter recovery parallels and accompanies other functional recovery. Bladder unawareness in addition to lower limb weakness and cognitive impairment is a poor prognostic factor. Significant cognitive impairment may remain a lifelong disability [49]. Dual incontinence involving both bladder and bowel is much common than an isolated incontinence [65].

10. Other impairments and disabilities sequel to stroke

Many stroke survivors require tracheostomy, some permanently. This does increase the risk of pulmonary aspiration since laryngeal elevation during deglutition is impaired. Careful

selection of the texture of food and scrupulous monitoring during swallowing are essential to prevent aspiration in these patients [49]. Post-stroke depression is notable and has been postulated to be the main reason for suicide in these patients [66]. Morbidity in many clinical scenarios is considered a worse outcome than death, especially in neurological disorders in which the patient may be "alive but dependent" [67].

11. Role of dedicated rehabilitation services

Exercise, in general, has been shown to impart several favorable effects in neural recovery [68, 69]. Rehabilitation of stroke patients is increasingly demanding as far as the resources are considered. In general, most rehabilitation units have inadequate resources making the selection process an imperative component of the assessment [37]. Stroke care units that incorporate rehabilitation services generally claim better clinical outcomes in comparison to other models of stroke care units [70]. A decreased incidence of mortality, morbidity and dependency have been reported in stroke patients who undergo therapeutic training in an inpatient unit than those who receive general rehabilitation in a nondedicated unit [71]. Medically stable neurological patients need to be placed in the best possible unit for which several deliberations need to be considered [11]. On termination of a course of inpatient rehabilitation, further therapy may be instituted on an outpatient basis or an extended functional training at home may be considered [11].

12. Conclusion

The overall outcome of the SICH patients depends on access to acute care facilities, availability and affordability of post-acute care and rehabilitation services. The provision of stroke rehabilitation services has received considerable attention in recent years. There is a large amount of literature that support the rehabilitation of acute and subacute phase of SICH that has potential for improvement in the functional outcome of these patients. However, more studies are needed to further define and compare different methods for rehabilitation in patients with SICH.

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