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Spinal Cord Injuries in the Developing World

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Introduction

Spinal cord injury (SCI) is a devastating neurological injury, resulting in varying degrees of paralysis, sensory loss and sphincter disturbance which are permanent and irreversible in cases. It was labeled as "an ailment not to be treated" in the Edwin Smith papyrus 5000 years ago (Feldman and Goodrich 1999). Unfortunately not much has changed, in many parts of the world known as the underdeveloped countries. SCI has been studied in detail in the Developed world, and thousands of manuscripts have been published in the last few decades. These include large scale epidemiologic surveys, multicenter research on interventions in acute SCI, reports on complications from acute and chronic SCI, results of rehabilitation interventions and functional outcomes. But all this covers only a part of the world population.

More than 80 percent of the world's population lives in the more than 100 developing countries (Soubbotina 2000), but we know little about SCI form this part of the world. There can be many reasons such as constraints of resources and research funding, priority of curable diseases over incurable SCI lesions, and lack of general interest in the medical community to address a prolonged and often permanent disability.

A brief overview of the problem in the developing countries is presented. It is based on electronic /manual literature search, discussion with experts and the author's personal experience of working at the largest spinal injuries rehabilitation center in Pakistan.

Demographics and epidemiology

There are no established national trauma or SCI registries in the developing countries. Similarly there is no population based data on SCI available from majority of the developing world countries. This is complicated by the fact that medical record keeping is poorly managed in most of the hospitals (Thanni and Kehinde 2006). Most of the data are single center hospital based surveys representing less than 15 countries of the developing world (Toe 1978, Chacko et al. 1986, Maharaj 1996, Otom et al. 1997, Levy et al. 1998, Igun et al. 1999, Deconinck 2003, Quinones et al. 2002, Singh et al. 2003, Gosselin and Coppotelli 2005, Shrestha et al. 2007, Rathore et al. 2008, Rahimi-Movaghar et al. 2009). Many of them are retrospective surveys. The general demographics of SCI in the developing world share some similarities with the epidemiological pattern reported from the developed countries. For example SCI is primarily a disease of the young males. But there are many important differences as well that need to be considered. Motor vehicle accidents are the leading causes of death in the developed countries followed by falls (Divanoglou and Levi 2009). The reverse is true for most of the developing countries (Chacko et al. 1986, Maharaj 1996, Singh et al. 2003, Rathore et al. 2008). Diving and sports injuries are another important cause of traumatic SCI in the Western world (Boden and Jarvis 2009) but this has rarely been reported from the developing countries. Among the non traumatic SCI, spinal tuberculosis is still an important cause in the underdeveloped countries of the world (Turgut 2001), while it is rarely seen in the developed countries nowadays.

Because of the prevalent social customs in the underdeveloped regions, majority of the patients with SCI are married at the time of their injury (Rathore et al.2008). This goes to the advantage of the patient as after discharge from the hospital, the spouse remains the only and most dedicated care giver in many cases. The divorce rates after SCI are high in the developed world (Kreuter 2000), but this isn't the case for most of the developing countries.

Most of the patients in the developed world have incomplete cervical spine injury at presentation. In contrast the commonest pattern reported from the developing world is of complete paraplegia (Chacko et al. 1986, Maharaj 1996, Singh et al. 2003, Rathore et al. 2008). Possible causes of this disparity are discussed in the next section.

Poor evacuation protocols and inadequate pre-hospital care

Immobilization and log roll of a suspected SCI patient at the trauma site is of utmost importance as it prevents further neurological deterioration and cord compression (Shooman and Rushambuza 2009). Spinal board is the standard of care in the developed world for evacuation and transport of a SCI patient (Stagg and Lovell 2008). Pre Hospital trauma care, first aid at site and infrastructure for transport of spinal trauma patients are inadequate in most of the developing countries (Solagberu et al. 2009, Nguyen et al. 2008). Ambulance rescues services, if any, are available in major cities only. Most of the patients are initially managed by the by standers, with no training in first aid. All kind of transports (including buses, auto rickshaws, jeeps, carts, home made hammocks and even animal backs) totally unsuitable for transport of a suspected SCI patient are used (Singh et al. 2003, Shrestha et al. 2007, Rathore et al. 2008). In many instances spinal immobilization and log roll is not performed, even by the ambulance staff (Rathore et al. 2008). An organized pre-hospital care is very rare. This can be one of the reasons that complete injury is the most common mode of presentation at admission in the developing world. The other possibility is that a patient with cervical spine injury is unlikely to survive the poor pre-hospital care and careless handling of the spine at the trauma site, thus resulting in a large number of paraplegics at the time of presentation.

Inadequate access to advanced radiological imaging techniques

Plain radiographs can miss fractures, especially facet fractures. The detailed evaluation of a suspected SCI needs advanced radiological imaging techniques like Computerized Tomographic (CT)-scan and Magnetic Resonance Imaging (MRI), to see the extent of damage to the vertebral column, spinal cord and asses the spinal stability (Winter and Pattani 2008).

Radiology is not well established and advanced imaging techniques are not available in many of the hospitals in the developing world (Udosen et al. 2007, Hitimana et al. 2009,Standertskjöld 2009). It has been estimated that more than half of the low income countries do not have established neuro rehabilitation and neuroradiology services (Salinas and Medina 2006). Management based on plain X-rays of the spine often results in treatment failure and prolonged periods of immobilization and morbidity for the patient.

Access to dedicated spinal injury wards/centers

Spinal units were established in the West as early as World War II; these units were dedicated to the treatment and rehabilitation of SCI patients in order to manage their needs in a comprehensive manner (Guttmann 1979). In many developed countries regional and national model SCI centers are working for the last 50 years. There are only few centers established in the developing world catering for a small population. The ones which are available many a times don't have all the members of a standard multidisciplinary rehabilitation team available (Rathore et al. 2008).

As a result most of the SCI in the developing world are managed in the neurosurgical, orthopedic and even in general surgical wards (Nwankwo and Katchy 2003, Udosen et al. 2007) with no established protocols for SCI management and rehabilitation. In many cases the treating physician/surgeon lacks the skills of spinal instrumentation/fixation and conservative management. Moreover a case of orthopedic or general surgery takes precedence over a SCI as "there is not much to offer to a SCI patient".

Spinal cord injury rehabilitation services in the developing world

SCI management doesn't end with spinal instrumentation or a decision to pursue a conservative management regime. SCI rehabilitation is the only intervention that ensures a successful community reintegration of a SCI patient as an active member. In the developed world it is a continuum of care

available to most, if not all SCI patients. Spinal Cord Injury Medicine is established as a subspecialty in many parts of the developed world.

Rehabilitation medicine is poorly developed in most of the developing countries and "confused with physiotherapy, rather than with a concept of multidisciplinary approach" (Rathore et al. 2007). The number of specialists trained in rehabilitation medicine or in spinal cord injury management is very small in many developing countries and in many places they don't exist (Haig et al. 2009). In many places orthopedic surgeons and physical therapists are running the department of rehabilitation medicine. This approach addresses only a few aspects like exercises, mobility and gait training and use of gait aids. Other equally and sometimes more important aspects like bladder and bowel training, psychological assessment, skin care, sexual dysfunction and fertility management, addressing vocational concerns, peer counseling and recreational therapy are either neglected or tactfully avoided. In many cases false reassurances are given regarding outcome and prognosis (Rathore et al. 2008).

This is a reason that many patients in the developing world do not have access to adequate and appropriate rehabilitation services necessary for community re-integration even though initial surgical management is adequate.

Complications

SCI results in complications affecting nearly all systems of the body, leading to an increased morbidity and mortality in this group of patients. The complications profile reported from the developing countries are similar to that of the developed world with notably increased incidence (Chacko et al. 1986). The high frequency of preventable complications indicates a general lack of awareness in the health care professionals as well as inability of the patients to adhere to a life long prevention regime. In developing countries the problem of pressure ulcers is more critical because of lack of access to specialized technologies and adequate medical and pressure ulcer risk assessment. In some cases these pressure ulcers even prove fatal for the patient (Rathore et al. 2008, Gosselin and Coppotelli 2005). Urinary tract infections also occur with a very high frequency with possible etiological factors as indicated by Rathore and colleagues, 2007. Another important factor may be inability to use disposable catheters for clean intermittent catherization due to the expenses involved. The reported incidence of thromboembolic disorders like pulmonary embolism and deep vein thrombosis in the SCI population in West is high (Weingarden 1992, Green 2003) despite adequate use of thromboprophylaxis. A vast majority of SCI patients in the developing world are not given standard thromboprophylaxis. Still the frequency of PE and DVT in these patients, especially from Asian region is low in many studies (Toe 1978, Lee et al. 2000, Rathore et al. 2008). The reason for this disparity is not clear although many mechanisms have been proposed. These include genetic factors, low prevalence of obesity and heart failure in the developing world, and possibly early mobilization and massage of lower limbs and role of dietary factors (Kalstky et al. 2000, Bagaria et al. 2006, Aito et al. 2007, Rathore et al. 2008).

Other reported complications include spasticity, depression, contractures, gastrointestinal complications, heterotopic ossification and pain.

Community reintegration and return to work after SCI

In the West, even quadriplegics can reintegrate in the society and resume community ambulation with the help of high technology assistive devices, adapted vehicles and motorized wheel chairs. The rate of return to work in the West has been estimated from 21 to 67%. Exact estimates are not available for the developing world, but in the developing countries even low thoracic paraplegics find it hard to move around in community independently and return to work .This is due to the social and mobility barriers, unfriendly transport system, stigmatization of disability, social rejection by the community and lack of vocational and avocational opportunities.

Follow up issues and life expectancy

Data on long term mortality statistics is not available in the literature for the SCI patients in the developing world. Long term follow up of disabled SCI patients is a big problem in many of the developing countries, because of poorly developed transport and communication infrastructure as well as inadequate access to spinal injury centers necessary for follow up. This is many a times compounded by the low educational status of the patient and family who cannot understand and do not respond to the questionnaires sent to them. While in developed countries there has been a dramatic reduction in mortality due to urinary tract complications and pneumonia and non ischemic heart disease are the leading causes of death, in developing countries mortality and morbidity due to renal failure and septicemia following bed sore, chest infections etc may still be the main cause of morbidity and mortality.

Lack of peer support groups

SCI patients are a viable force and form an important part of the patient community in the developed world. National Spinal Cord Injury Association, American Paraplegia Society, Paralyzed Veterans of America, Wings for life, The Christopher and Dana Reeve Foundation, United Spinal Association, Determined2heal Foundation are few of the many vibrant and active SCI support groups and research funding organizations in the West. They have helped hundreds of thousands of patients to learn about their disease and cope with their disability.

The developing world lacks a major SCI forum where the patients can raise their voices and struggle for their rights. Small organizations and self help groups are established in many developing countries but their impact and work is not noticeable. Moreover there is in adequate focus on a very important aspect i.e. prevention of spinal cord injuries.

Conclusions

In many parts of the developing world, even today SCI is neglected and poorly managed. Research is sparse and data is missing. The demographics, epidemiological pattern of SCI in the developing world is different from the developed world and this should be considered while formulating polices for the SCI in future. Large scale multi center trials or population based surveys are needed to assess the true magnitude of the problem in the developing world. Trauma evacuation protocols need to be developed and pre hospital care of suspected SCI patient should be improved. Regional and national spinal injury centers providing comprehensive treatment and multidisciplinary rehabilitation should be established. There is a need to establish peer support groups to further the cause of SCI in the developing world.

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