

REPERCUSSION OF MEDULLARY LESIONS ON THE BLADDER DYNAMICS: FOLLOW-UP PERSPECTIVES

REPERCUSSÃO DAS LESÕES MEDULARES TRAUMÁTICAS NA DINÂMICA VESICAL: PERSPECTIVAS DE SEGUIMENTO

REPERCUSIÓN DE LAS LESIONES MEDULARES TRAUMÁTICAS EN LA DINÁMICA VESICAL, PERSPECTIVAS DE SEGUIMIENTO

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ABSTRACT

Spinal cord injuries represent a significant percentage of causes of disability in Mexico and worldwide, being the third largest cause, with a percentage of more than 25%. These patients suffer from multiple complications, one of which relates to the urological system, which often does not receive appropriate follow-up. Among the lesions of the neurological pathways that innervate the bladder, one or more aspects of its physiology may be affected, whether in the filling, storage or voiding phases, depending on the nerve area affected and the nature of the injury. These lesions should be handled by the urologist, who should select the most suitable therapeutic option within his or her area of competence and taking into account the advantages and disadvantages of each option, as this will have an impact on the quality of life of the patient, as well as continuing a monitoring program for timely detection of complications. Urinary catheterization is, in particular, a fundamental pillar for the management of traumatic lesion of the spinal cord, as it can help reduce complications.

Keywords: Spinal cord; Urinary bladder; Urological diseases; Traffic accidents.

RESUMO

As lesões da medula espinhal representam um percentual significativo das causas de deficiência no México e no mundo, sendo a terceira causa, com um percentual acima de 25%. Estes pacientes sofrem de múltiplas complicações, e uma delas é do sistema urológico, ao qual muitas vezes não é dado seguimento adequado. Entre as lesões das vias neurológicas que enervam a bexiga, pode ser afetados um ou mais aspectos da fisiologia, seja na fase de o armazenamento, esvaziamento ou enchimento, dependendo da área do nervo afectado e da natureza da lesão, tais lesões devem ser tratadas pelo urologista, que deve seleccionar a opção terapêutica apropriada em sua área de competência, levando em conta os prós e contras de cada um, pois isso impacta a qualidade de vida dos pacientes, bem como continuar um programa de monitoramento para a detecção de complicações em tempo hábil. A cateterização urinária é, particularmente, um pilar fundamental para a gestão da lesão traumática da medula espinhal, uma vez que pode contribuir para a redução de complicações.

Descritores: Medula espinhal; Bexiga urinária; Doenças urológicas; Acidentes de trânsito.

RESUMEN

Las lesiones en la médula espinal representan un porcentaje importante como causa de discapacidad en México y en el mundo, siendo la tercera causa con un porcentaje superior a 25%. Este tipo de pacientes sufre múltiples complicaciones y una de ellas es la que corresponde al sistema urológico al que muchas veces no se le da un seguimiento de manera regular. Dentro de las lesiones de las vías neurológicas, que inervan a la vejiga, pueden afectar a uno o varios aspectos de la fisiología, ya sea su fase de llenado, de almacenamiento o de vaciamiento, lo anterior según el área nerviosa alcanzada y la naturaleza de la lesión; estas lesiones deben ser manejadas por el mismo urólogo que debe seleccionar la opción terapéutica adecuada en su ámbito de competencia, tomando en cuenta los pros y contras de cada una de ellas, ya que esto tendrá una repercusión en la calidad de vida del paciente, así como continuar un programa de seguimiento para la detección de complicaciones de manera oportuna. Particularmente el cateterismo urinario es pilar fundamental para el manejo de las lesiones medulares postraumáticas, ya que puede contribuir a la disminución de las complicaciones.

Descriptores: Médula espinal; Vejiga urinaria; Enfermedades urológicas; Accidentes de tránsito.

INTRODUCTION

Spinal cord lesions represent a significant proportion of causes of disability in Mexico and worldwide. Among young adults (aged 15-29 years) with disability, traumatic causes represent the third highest cause, with 10.1%, and in adults, this percentage increases to 27.2%.¹

Accidents represent just over a third of the male population with motor disability; it is notable that the risks associated with daily practices to which the male population could be exposed, whether due to practices inherent to their gender or to occupational hazards, have a

significant impact on these statistics: the proportion is almost doubled in men, compared with women, according to 2010 data from the National Institute for Geographical Statistics (INEGI).^{2,3}

Traffic accidents represent the main cause of death among young adults, and this is, without doubt, one of the main causes of incapacitating injuries in young adults. In Mexico in 2010, 144,033 injuries caused by traffic accidents were reported, with 7,144 deaths by the same cause, and an estimated 4 million accidents per year.

Driving under the influence of alcohol is the main cause of accidents, causing 60% of disabilities, according to data published

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in 2008 by the National Center for Accident Prevention (CENAPRA).³ The interest in traffic accidents and their repercussions is of global interest, as reported by the World Health Organization (WHO).^{4,5}

Of the subjects affected by spinal cord injuries, just over 50% present quadriplegia, and this percentage increases with the age of those affected. Of this population, less than 1% fully recovers from their injuries,⁶ 45% present complex injuries involving total loss of sensitivity and motor function, and 55% have partial injuries.⁴

The recovery that takes place following spinal cord injuries generally relates to sensitivity, such as proprioception and heat sensitivity, owing to the fact that regeneration of the spinal cord is greater in the neuronal bodies than in the long tracts.⁵ In the central nervous system there is minimal regenerative capacity, unlike the peripheral nervous system, where axonal regeneration is clearly identified.⁷

Isolated lesions of the neurological tracts that innervate the bladder can affect one or more aspects of its physiology, whether in the filling, storage or voiding phases, depending on the nerve area affected and the nature of the lesion.⁸

When the spinal cord injury occurs above level C3, the majority of victims die immediately or just before they can receive medical attention. In cases where medical attention is possible, the patient presents, from the urinary point of view, involuntary vesical contractions with coordinated urethral sphincter function.

The sensitivity and function of the sphincter may be preserved, but delayed. These injuries may be present at the start, or later, without any subsequent improvement in detrusor areflexia, or the opposite effect, with subsequent incontinence due to detrusor hyperreflexia.

If the spinal cord injury occurs between levels T6 to S2 and is complete, involuntary bladder contractions and lack of sensitivity may be present at the start, with synergy of the smooth sphincter by dyssynergia of the striated sphincter. Urinary retention may be present, due to an overactive external sphincter, or incontinence due to overactive bladder muscles.

In lesions below the level of S2, bladder areflexia is commonly observed, with a progressive loss of bladder capacity, while the striated sphincter maintains a continuous residual tone.⁸

The patient with voiding pathology secondary to spinal cord injury should be assessed holistically, with the development of an adequate clinical history and correct physical examination.

The clinical history should always include information on: the mechanism of spinal cord injury, date, treatments, surgeries, medications, lifestyle, quality of life and survival expectations.

From a urological perspective, voiding habits should be analyzed, to determine whether it is a retention or incontinence pathology, any sensitivity, and information on bladder voiding (catheterization).

Bowel habits are very important, therefore the frequency of bowel motions or incontinence should be recorded, along with accompanying tenderness, capacity to perform these motions, and whether initial digital stimulation is necessary.

Issues related to sex should record the presence sexual dysfunction, genital sensitivity, erectile dysfunction and ejaculatory capacity in men, and dyspareunia and tenderness in women. The subject's state of consciousness, mental capacity, sensitivity, and level of mobility and independence should also be noted.⁹

The physical examination should be as complete as possible, specifically investigating the presence of reflexes: sacral sensitivity and reflexes, genital sensitivity, anal tone, voluntary contraction of the anal sphincter, and bulbocavernous reflex, as normality of these factors indicates that the innervation of the bladder and striated sphincter are intact.⁸⁻¹⁰

The subject should be submitted to complete serological tests, which should include urinalysis and blood chemistry with determination of serum urea and creatinine being essential, supplemented, where possible, with uroflowmetry and daily voiding.⁹

Once the patient has been fully and urologically assessed, the treatment goals should be defined. The basic goals are: protecting upper urinary tract function; protecting renal function; correcting or preventing symptoms, especially incontinence; restoring lower

urinary tract function; and improving the patient's quality of life as far as possible.⁹

It is important to emphasize the protection of renal function, as renal failure is the main cause of mortality in patients with spinal cord injury, therefore one of the most important treatment goals in these patients is to maintain bladder pressure within safe limits,¹¹ because like control of urinary tract infections, which can migrate upwards causing kidney damage, control and prevention of incontinence lead to better quality of life for the patient, and significantly decrease the incidence of urinary tract infections.¹² (Figure 1).

In the planning of treatment measures and actions for this group of patients, we must consider each case separately, in order to personalize the treatment. This is a diverse group of individuals, each with a specific degree of dysfunction, with different physical and mental abilities, from different socio-economic backgrounds and with different family or healthcare dynamics.¹⁰

Treatment may begin with a non-invasive approach, which consists of recommending exercises for the pelvic floor or abdominal muscles, Valsalva or Credé maneuvers, or stimulating the sacral or lumbar dermatomes to induce detrusor contraction. These techniques are indicated in patients with partial spinal cord injuries, but have shown high morbidity when used alone, without continuous medical supervision.^{8,9}

The use of drugs is an effective line of treatment; antimuscarinic drugs represent the first line of treatment in detrusor overactivity disorders in patients with spinal cord injuries, as these drugs stabilize the detrusor muscle and decrease parasympathetic activity.

Thanks to the decreased activity of the bladder musculature, impaired renal function decreases over the long term. It should be considered that these patients may require higher doses of antimuscarinic drugs than are required for other etiologies of overactive bladders with different drugs of this type. Depending on the patient's response and the various side effects of these medications, other drugs that can be used are phosphodiesterase inhibitors, but these are still under study.

DDAVP may be useful as a co-drug.⁹ Alpha blockers such as tamsulosin are reported in studies showing improved bladder function in animal models.¹³

To promote bladder muscle contraction, the use of cholinergic drugs may be indicated, such as bethanechol chloride, which promotes contraction of the detrusor and bladder voiding, but its

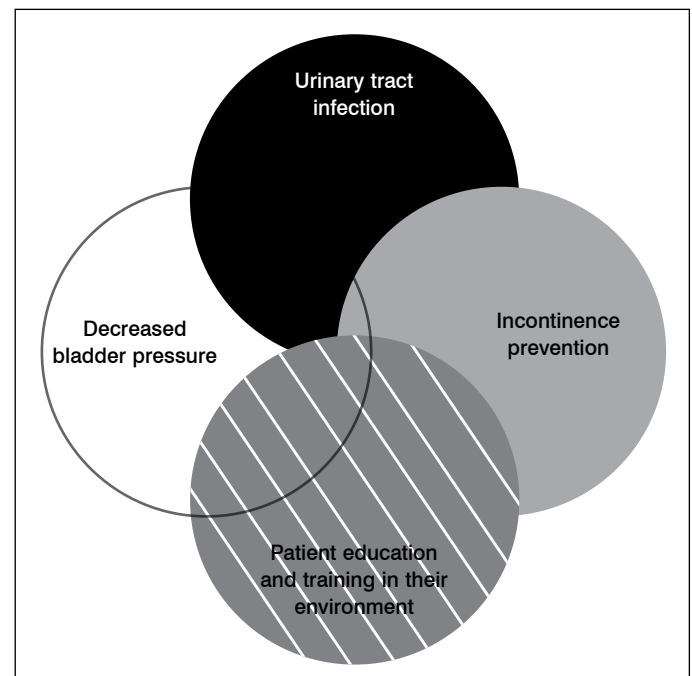


Figure 1. Associated factors.

application is limited due to its parasympathetic side effects.⁹

One of the minimally invasive techniques is catheterization, which is considered the gold standard in the treatment of neurogenic bladders due to spinal cord injury, and is indicated in cases of hyperactive or hypoactive bladders.

Catheterization should be performed six times a day with 12-14fr silicone urinary catheters, which are exchanged at least once every 2 weeks. Each voiding should contain approximately 400 ml of urine, no more, as decreasing the frequency increases the risk of infections and injury to the upper urinary tract.

This practice presents fewer complications than continuous catheterization. A disadvantage, however, is that the patient must be capable of understanding the procedure, and carrying out and maintaining the necessary hygiene measures, which is not always the case.⁹

There are studies that favor suprapubic catheterization, particularly in men, due to difficulties with urethral catheterization. These studies demonstrate a lower rate of infections compared with urethral catheterization, and a lower incidence of secondary lithiasis.¹⁴

The application of intravesical drugs is another alternative to treatment of the bladders with detrusor overactivity, and without doubt, the most popular of these is the application of botulinum toxin type A, which is performed by an endoscopic technique with the injection of 100-300 units of the toxin directly into the detrusor muscle, in 20-40 different sites.

This technique presents a significant response, decreasing bladder pressure and uninhibited contractions. The response to this therapy lasts around 6 to 9 months, and is indicated for patients who cannot tolerate the side effects of antimuscarinic drugs, other intravesical drugs such as vanilloids and anticholinergics, but these are not nearly as effective as the application of botulinum toxin.¹⁵

Another treatment approach for spastic bladders is surgical vesicle remodeling. Although it should be used only as a last resort, this invasive measure is justified when there is deterioration of the upper urinary tract secondary to vesicoureteral reflux.

Surgical planning should be based on the capabilities and conditions of each patient, but a more moderate technique should always be preferred for subsequent intermittent catheterization.¹⁰

Sphincterotomy and vesical cervicotomy are techniques with less morbidity and great success in the treatment of bladder retention. The application of an artificial sphincter is not recommended or justified in any management guide.^{8,9}

Another treatment goal for patients with neurogenic bladder secondary to spinal cord injury is preventing urinary tract infections. Diagnosing such infections is complex, as the normal diagnosis and treatment criteria do not apply fully in patients undergoing intermittent catheterization. Urinary infection is considered to be present when the urine contains more than 10^5 CFU/ml, with or without symptoms. Others recognize, in these cases of urinary infection, the presence of pyuria. The presence of asymptomatic bacteriuria may or may not be a parameter for starting treatment.^{6,9}

The prophylactic use of antibiotics in patients with recurrent bacteriuria or urinary infection is favorable for multiresistant pathogens.^{9,16}

Patients with bladder voiding disorders secondary to bladder trauma require careful monitoring by the urologist, with reviews every six months, and general studies to determine the status of the upper urinary tract, or earlier if the patient presents symptoms. Renal ultrasound is indispensable in the follow-up, to look for complications of the upper urinary tract, as it does not expose the patient to radiation and it has high detection capability. Therefore it should accompany study of the bladder, carefully monitoring its morphology, residual urine symptoms, or kidney stones.⁹

Serum creatinine levels should be routinely monitored, although its sensitivity is low in detecting a decline in renal function in its initial stages. Therefore 24-hour urine creatinine clearance is essential in these patients. (Table 1)

Urodynamic studies are not clearly indicated in the follow-up of these patients; however, it is desirable to carry these studies at

baseline and during follow-up, to determine the evolution of the disease and make adjustments to the treatment based on the results.

It is also necessary to check for kidney stones and cancer of the bladder.⁶

One of the key points of the treatment of traumatic neurologically impaired bladders is maintaining the patient's quality of life, therefore the urinary tract symptoms should be evaluated in neurological patients and where possible, regular quality-of-life questionnaires be given to the patient.⁹

Patients with spinal cord injuries should be closely monitored, as often as needed until there is stabilization, and patients and/or family members should be taught how to manage and detect complications. (Figure 2)

Multidisciplinary management of patients with spinal cord injury significantly affects the patient's quality of life. The effectiveness of the urological treatment aimed at urodynamic function of the bladder is a determining factor in the patient's quality of life.

Table 1. Follow-up studies in patients with spinal cord injury and bladder disorders.

Study	Frequency
Complete urinalysis	Every two months
Physical exam	Every two months
Laboratory tests CBC Serum creatinine and urea 24-hour urine creatinine clearance	Every six months
Ultrasound of the bladder and kidney	Every six months
Urodynamic studies	Every two years

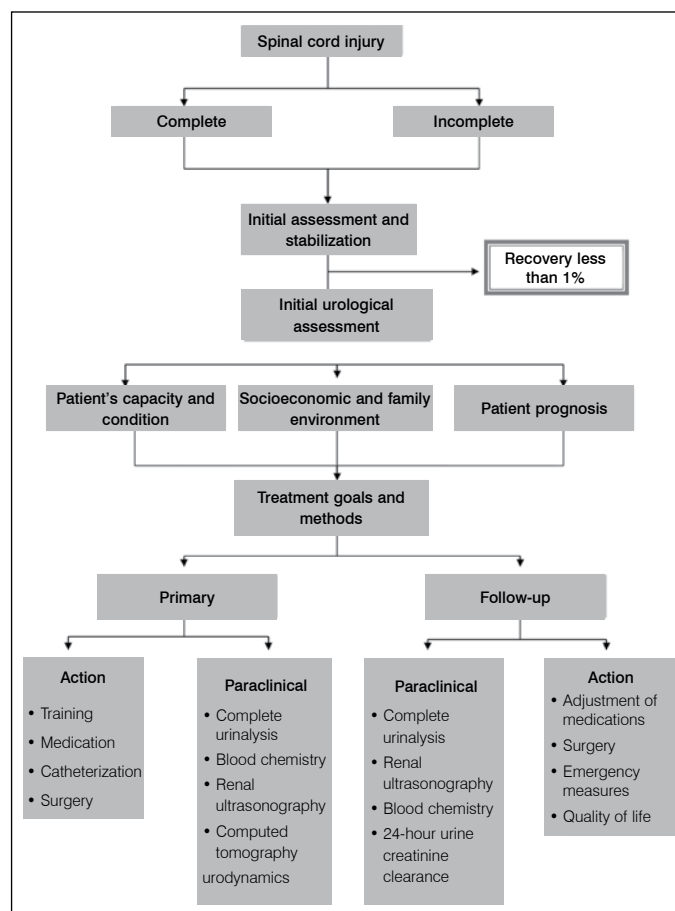


Figure 2. Algorithm. Dynamic bladder management in spinal cord-injured patients.

Quality of life is a reflection of the individual's ability to adapt to their new living situation, despite the limitations that may arise from neurological injury. Appropriate treatments allow patients to remain socially independent, as far as possible, and if these measures not carried out, this can directly affect the patient's home environment, their adaptability, productivity, self-esteem, economic stability, education, and psychosocial environment. In addition, quality of life is also influenced by age and sex in these patients.

At present there is no quality-of-life questionnaire specific to bladder dysfunction and spinal cord injury. The only validated ones are generic tools, such as the visual analog scale for assessing symptoms of discomfort secondary to spinal cord injury and multiple sclerosis.⁹

The consequences of this type of disorder range from psychological symptoms (insecurity, anxiety, aggression, depression), to poor social relations (isolation, reduced social activities, social disintegration) family problems (economic concerns, loss of interpersonal roles, abuse, neglect) and personal problems (negative feelings, low morale, frustration, burnout syndrome).¹⁷

FINAL CONSIDERATIONS

Traumatic spinal cord injuries as a result of traffic accidents are common, and result in a high incidence of urinary tract disorders.

The psychological, personal and economic repercussions affect not only the patient, but also his or her environment, therefore the importance is emphasized of an integrated management approach to the patient's reintegration into society.

The management of spinal cord-injured patients must be multi-disciplinary, in order to detect, assess, treat and limit any complications of this type of injury. We must not neglect the functional aspects of the digestive and urinary tract, which require prompt, personalized diagnosis, with therapies being adapted to the patient's conditions and expectations.

The urologist should select the most appropriate therapeutic option within his or her field of competence, taking into account the advantages and disadvantages of each, as this will have an impact on the patient's quality of life, and continue a monitoring program to ensure timely detection of complications.

In particular, urinary catheterization is a cornerstone in the management of traumatic spinal cord injury, as it helps decrease complications.

All authors declare no potential conflict of interest concerning this article.

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