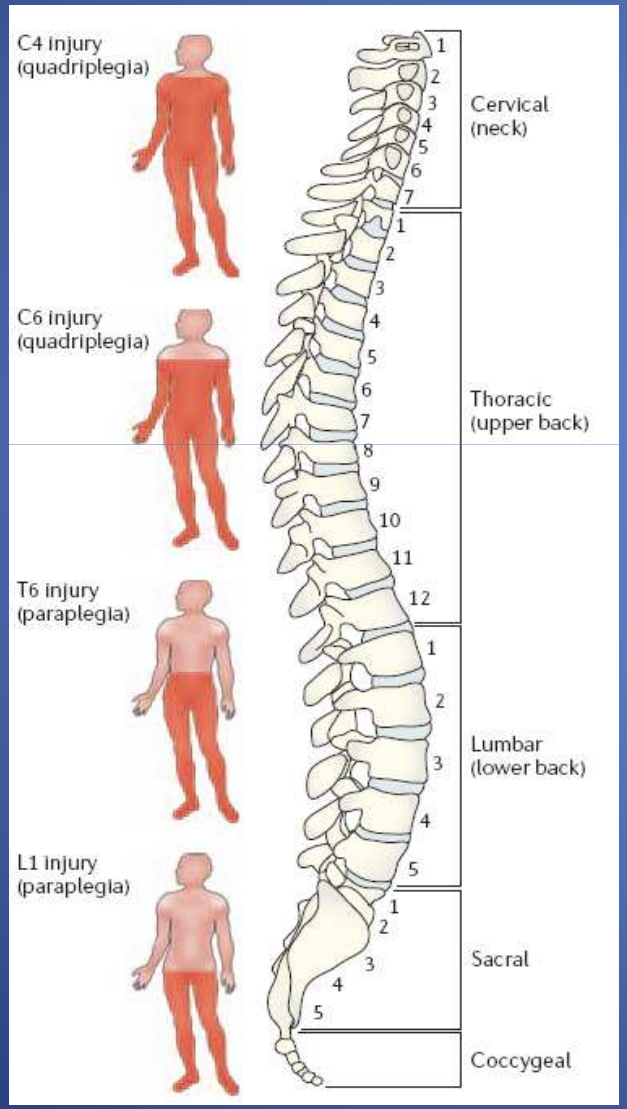
TRAUMA RAQUIMEDULAR



TRAUMA RAQUIMEDULAR (TRM)

IMPORTANCIA

28-55 cpm

12 000 CASOS /AÑO (USA)

EDAD 30 – 40 AÑOS

MASCULINO 70 80%

LESIONES CERVICALES (55%)

MORTALIDAD POR TRM AISLADO 11%

85% - SOBREVIVE MASDE 24 HORAS

ESTADIA HOSPITALARIA PROLONGADA

REPERCUSIONES/COSTOS !! U$S

ETIOLOGÍA

ACCIDENTES VEHICULARES/OH (45%)

VIOLENCIAS

CAIDAS (PROX. 20%)

DEPORTES (ZAMBULLIDA)

TRAUMA PENETRANTE 10-20%

J Am Acad Orthop Surg (2010)

Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)

EPIDEMIOLOGÍA

2 % DE TRAUMAS CERRADOS

EN EL 5% PTG

2/3 S/D NEUROLOGICO

1/3 C/D NEUROLOGICO

ASOCIACION TEC TRM (15-50%)

MAYORIA TRM CERRADOS

ASOCIACION CON TMF

Pre-Hospital Care Management of a Potential Spinal Cord Injured Patient: A Systematic Review of the Literature and Evidence-Based Guidelines

Henry Ahn,[1] Jeffrey Singh,[2] Avery Nathens,[3] Russell D. MacDonald,[4] Andrew Travers,[5]

JOURNAL OF NEUROTRAUMA 27:1–21 (XXX 2010)

LESIONES NEUROLOGICAS TARDIAS ?

HASTA DEMOSTRACION DE LO CONTRARIO :

- ✓ **TEC CON ALTERACION DE CONCIENCIA**
- ✓ **PTG ALCOHOLIZADO / INTOXICADO**
- ✓ **DOLOR CERVICAL**
- ✓ **CUADRO CLINICO TIPICO:**

TRAUMA RAQUIMEDULAR (TRM)

CLAVES ESPINALES (10)

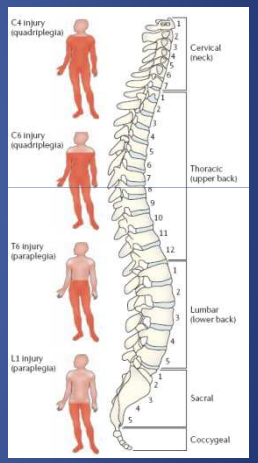
HIPOTENSION-BRADICARDIA	GESTOS SIN RESP ESPINAL
RESP PARADOJAL	NIVEL ANATOMICO RESP NOCICEPTIVA
PRIAPISMO	SIN RESPUESTA AL EST NOCICEPTIVO
PARAPARESIA MMSS/MMII	NIVEL DE SUDORACION
HORNER	BROWN-SEQUARD

ALTA SOSPECHA

TRAUMA RAQUIMEDULAR (TRM)

FORMA CLINICA DE PRESETACION

CUADRIPLEJIA INCOMPLETA	**30.1%**
PARAPLEJIA COMPLETA	**25.6%**
CUADRIPLEJIA COMPLETA	**20.4%**
PARAPLEJIA INCOMPLETA	**18.5%**



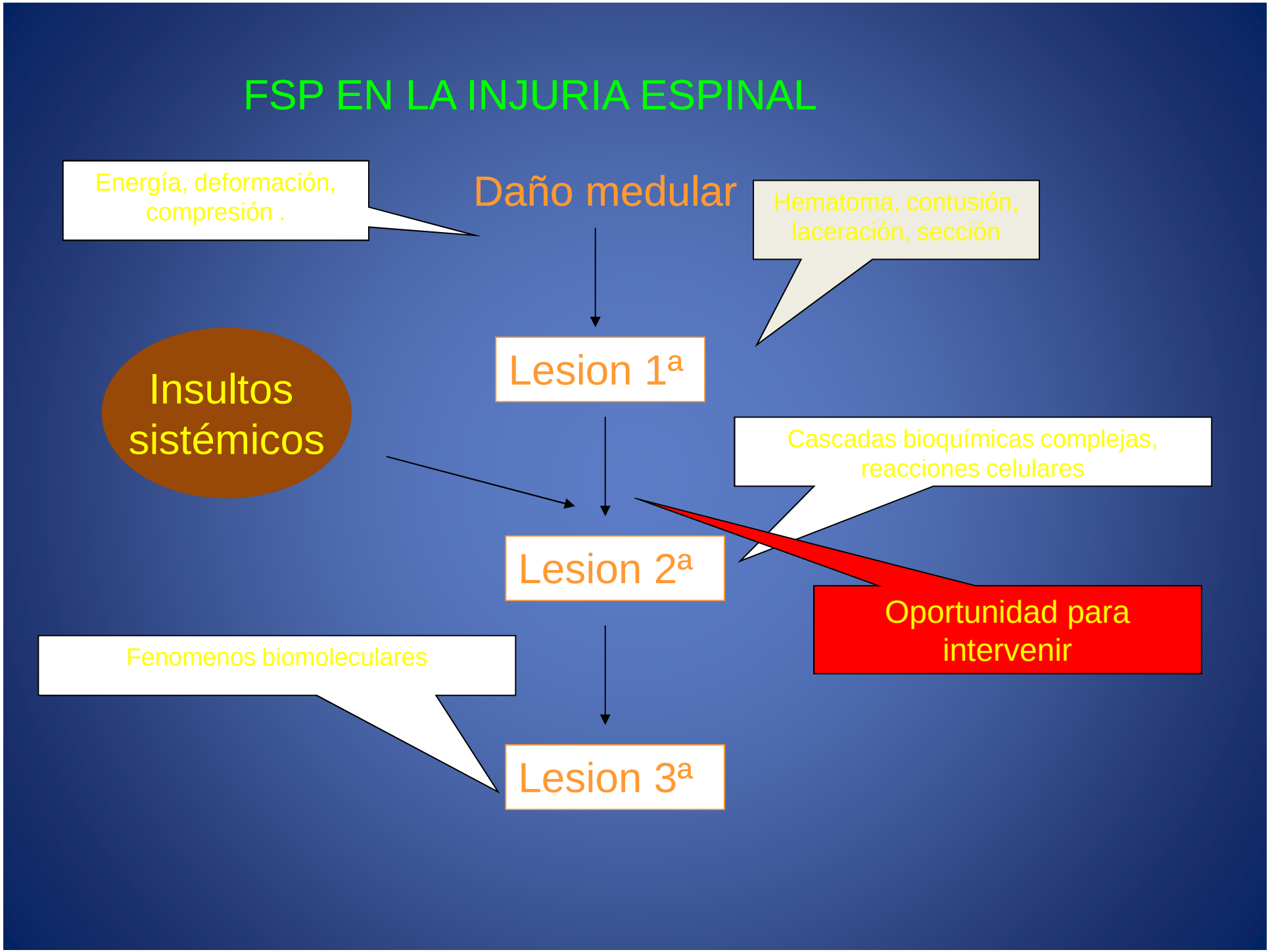
NIVEL ANATOMICO MAS FRECUNTEMENTE AFECTADO:
CERVICAL 55%

TX
T11-L2
LUMBOSACRO

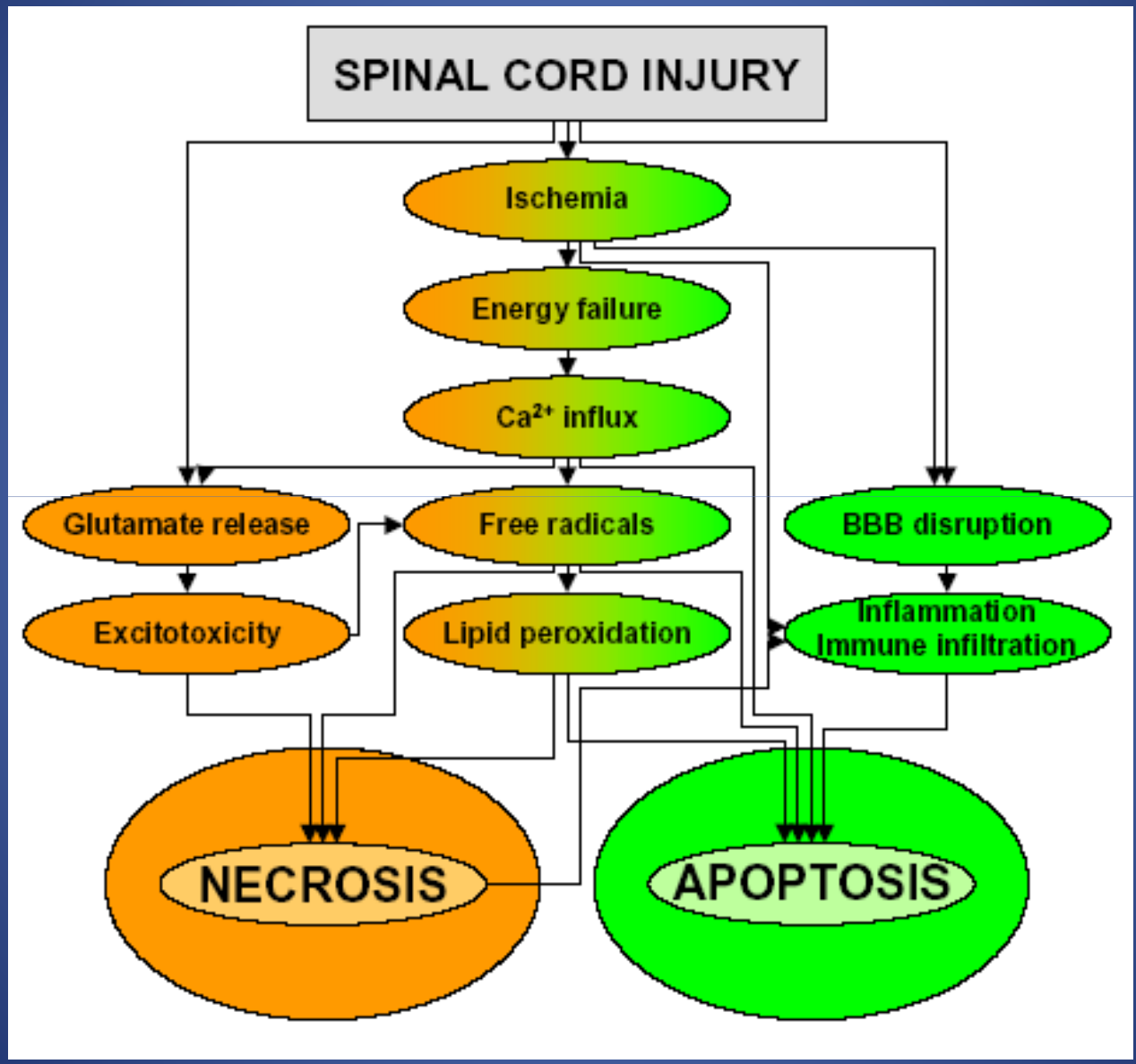
J Am Acad Orthop Surg (2010)

La medula contiene 20 millones de fibras nerviosas que llevan o traen información entre el encéfalo y el cuerpo.

Su injuria conlleva pérdida de la función motora y sensitiva por debajo de la lesión.

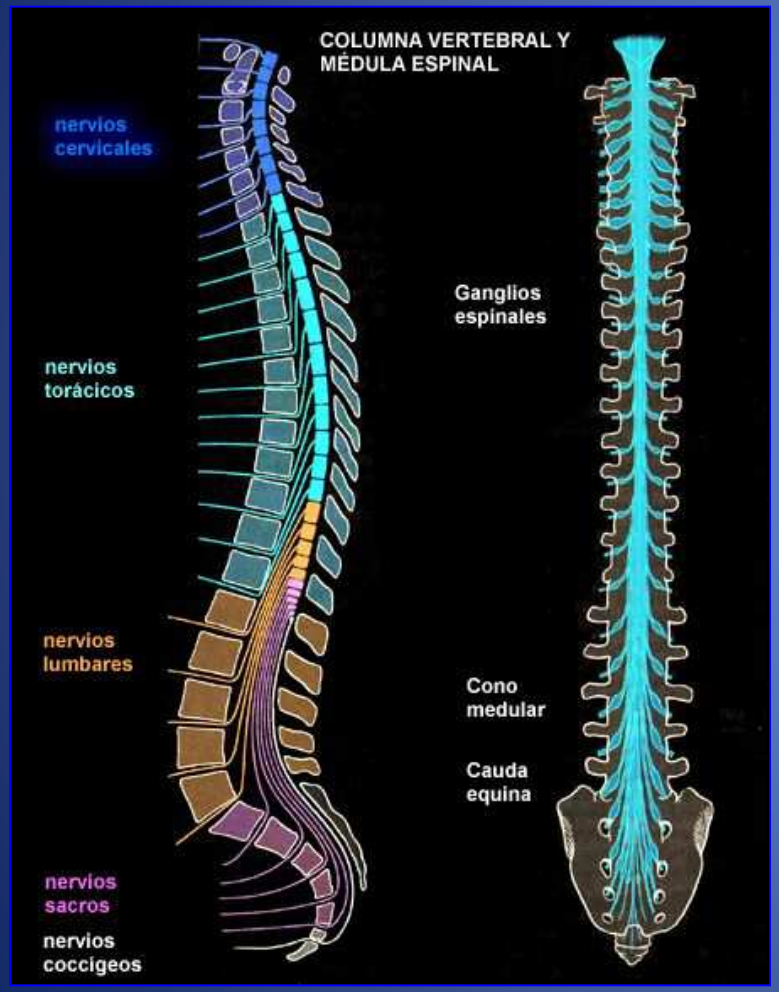

FSP EN LA INJURIA ESPINAL
Energía, deformación, compresión .
Daño medular
Hematoma, contusión, laceración, sección
Insultos sistémicos
Lesion 1ª
Cascadas bioquímicas complejas, reacciones celulares
Lesion 2ª
Oportunidad para intervenir
Fenomenos biomoleculares
Lesion 3ª

TEORIAS DE INJURIA SECUNDARIA TRM



FASES TEMPORALES DE INJURIA ESPINAL

TRAUMA RAQUIMEDULAR (TRM)



TRES REGIONES Ó UNIDADES

VERTEBRAL MEDULAR VASCULAR

MEDULA → C1----------L1

SEGMENTOS MEDULARES DESPLAZADOS

IMPORTANCIA CLÍNICA → **NIVEL LESIONAL**

FLUJO SANG. MEDULAR → AUTORREGULACION
(FSM) (60-120)

TRAUMA RAQUIMEDULAR (TRM)

FISIOPATOLOGIA

SIMILAR AL TEC

LESION PRIMARIA: RESULTA DE LA TRANSFERENCIA DE ENERGIA MECANICA

(DISRUPCION ANATOMICA O FUNCIONAL)

LESION SECUNDARIA : **POR HIPOXIA Y FSM** → **ISQUEMIA MEDULAR**

CAUSAS DE DISMINUCION DEL FSM:

- ✓ **DISMINUCION DE LA PRESION DE PERFUSION MEDULAR (PPM)**
- ✓ **REDUCCION DEL DIAMETRO DEL CANAL RAQUIDEO**

REACCION GLIAL VARIABLE __ R. INFLAMATORIA __ ESCARA GLIAL __ REGENERACION

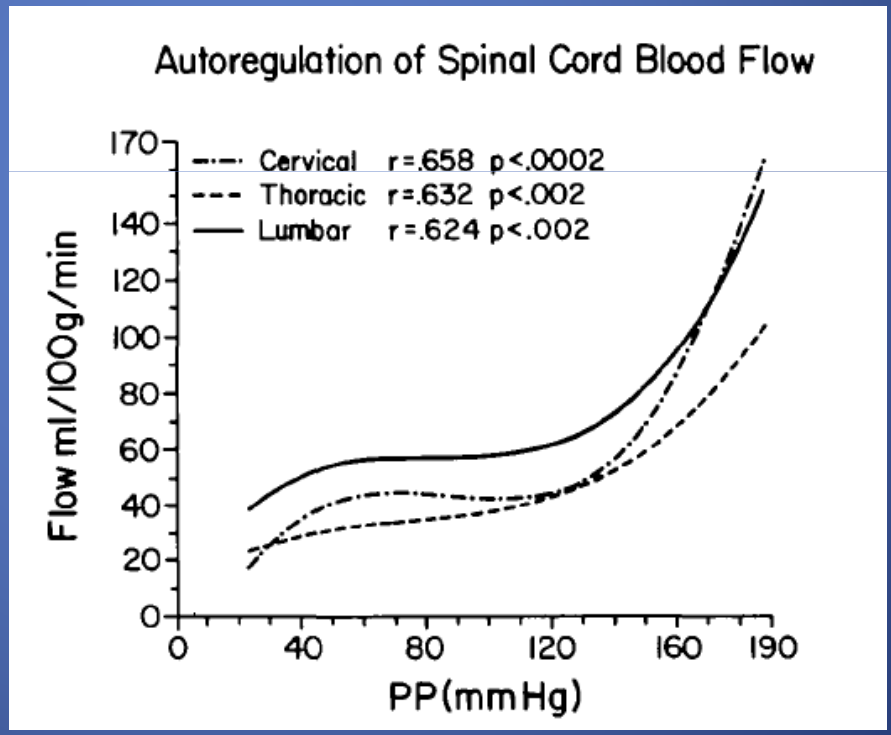
1183

Autoregulation of Spinal Cord Blood Flow: Is The Cord A Microcosm Of The Brain?

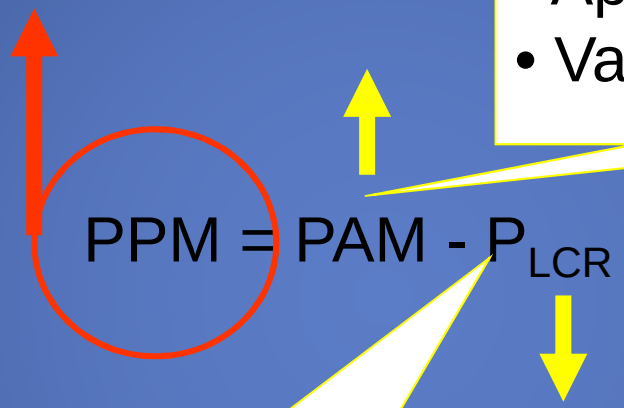
ROSEMARY HICKEY, M.D., MAURICE S. ALBIN, M.D., M.SC., (ANES.) LEONID BUNEGIN, B.S., AND JERRY GELINEAU, B.S.

HIPOTENSION CON VOLEMIA NORMAL
SHOCK NEUROGENICO

VULNERABLE A LOS CAMBIOS SISTEMICOS EN EL FLUJO SANGUINEO



PRESION DE PERFUSION MEDULAR (PPM)



- Aporte de fluidos
- Vasopresores

- Drenaje de LCR
- Laminectomia decompresiva

ENVOLTORIO RÍGIDO (DURA MADRE Y PARED OSEA)

CONGESTION EDEMA HEMORRAGIA

AUMENTO DE PRESION LOCAL

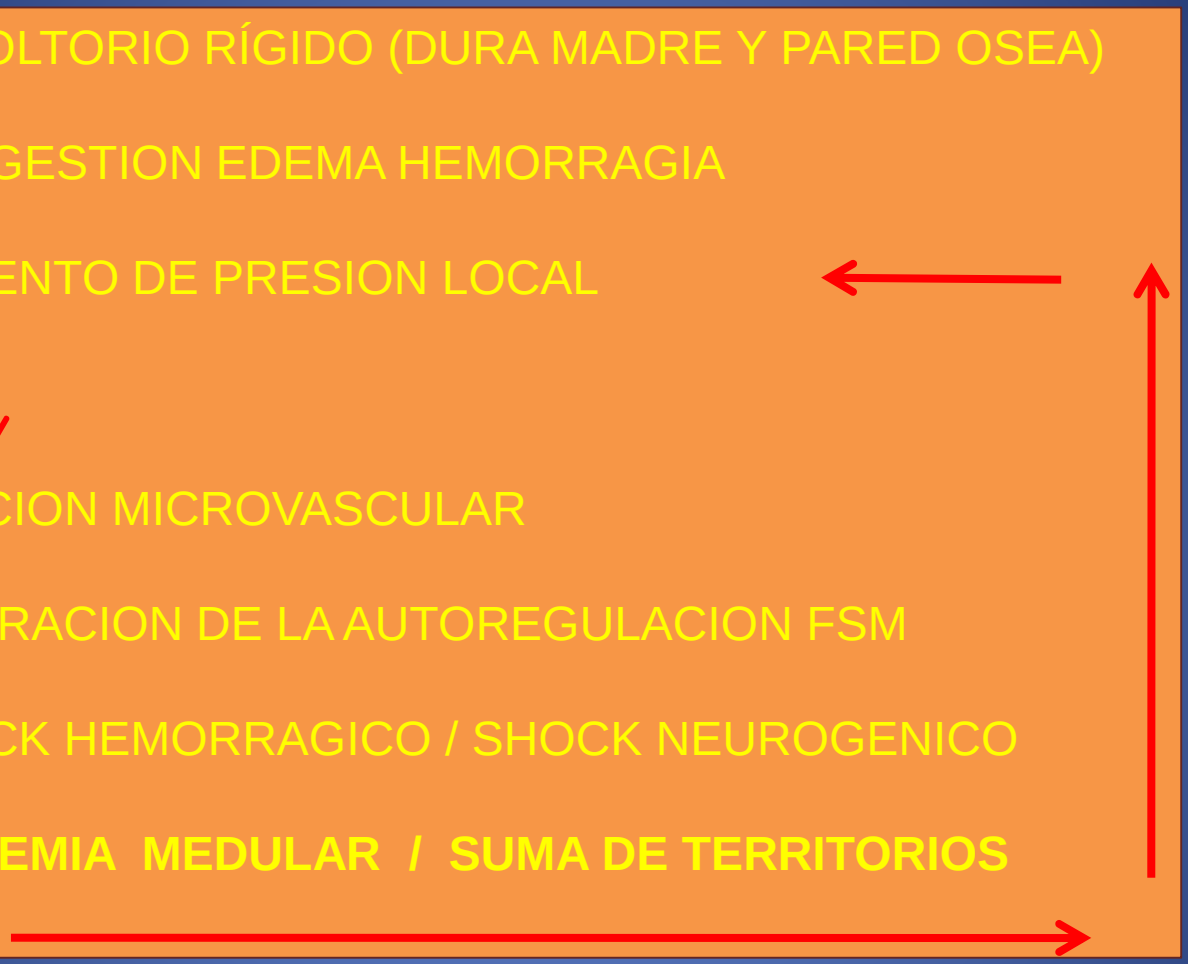
FSM

SECCION MICROVASCULAR

ALTERACION DE LA AUTOREGULACION FSM

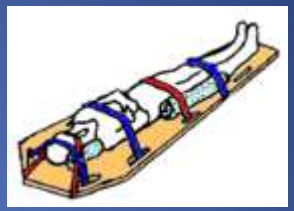
SHOCK HEMORRAGICO / SHOCK NEUROGENICO

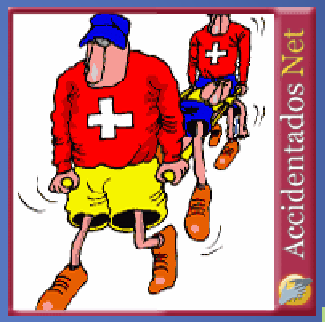
ISQUEMIA MEDULAR / SUMA DE TERRITORIOS



TRAUMA RAQUIMEDULAR (TRM)

PREHOSPITALARIO





- PERSONAL ENTRENADO Y ESPECIALIZADO
- PROTOCOLOS ABCD
- “TRACCION CEFALICA ADECUADA”
- EVITAR FLEXO EXTENSION AP y LATERAL
- COLLARETES CERVICALES SEMIRIGIDOS
- INMOVILIZACION COMPLETA DE LA COLUMNA
- ESTRICACION – TABLAS *
- PRONOSTICO
- MINIMIZAR LESION SECUNDARIA 3-25%

Crit Care Clin 20 (2004)

JOURNAL OF NEUROTRAUMA 27:1–21 (2010)

J Am Acad Orthop Surg (2010)

TRAUMA RAQUIMEDULAR (TRM)

JOURNAL OF NEUROTRAUMA 27:1–21 (XXX 2010)

DOI: 10.1089/neu.2009.1168

Pre-Hospital Care Management of a Potential Spinal Cord Injured Patient: A Systematic Review of the Literature and Evidence-Based Guidelines

Recommendations

All recommendations were derived from the systematic reviews, statements from the authors, and the Delphi process. The latter was reported using the level of agreement and the comments and suggestions of experts.

Question 2. During airway manipulation in the pre-hospital setting, what is the ideal method of spinal immobilization?

- Airway management of acute SCI patients requiring intubation in the pre-hospital setting should include the use of manual in-line cervical spine traction.
- Intubation of patients with acute SCI in the pre-hospital setting should not rely solely on cervical collar neck immobilization.
- Indirect methods of intubation may cause less cervical movement than with direct laryngoscopy with a Miller blade.

TRAUMA RAQUIMEDULAR (TRM)

PREHOSPITALARIO

ABCD

Manejo de VA complicado/ INMOBILIZACION

IOT con ESTABILIZACION CERVICAL POSICION NEUTRA

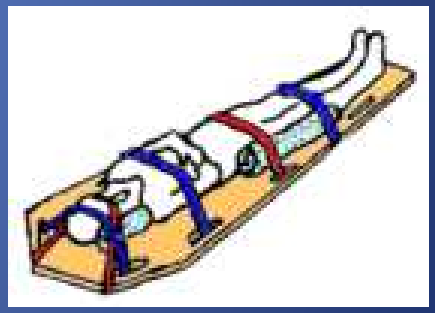
M. SELLICK

NASO VS ORO

of semirigid fiber-optic stylets: the Shikani (*top*) and Levita

ABCD

EVITAR HIPOPERFUSION/HIPOTENSION (VOLUMEN Y VASOPRESORES) PAM 85 – 90 mmhg



EVITAR INJURIA O LESIÓN SECUNDARIA

TODO PTG TIENE TRM HASTA DEMOSTRACION DE LO CONTRARIO

Crit Care Clin 20 (2004)

JOURNAL OF NEUROTRAUMA 27:1–21 (2010)

J Am Acad Orthop Surg (2010)

TRAUMA RAQUIMEDULAR (TRM)

SHOCK NEUROGENICO

HIPOTENSION

SIN TAQUICARDIA

RESPUESTA HEMODINAMICA PARCIAL

PIEL CALIENTE

HABITUAL EN LESIONES T6

VASOPLEJIA

AUMENTO DEL RV Y ALFA AGONISTAS

"SHOCK MEDULAR O ESPINAL"

PERDIDA FUNCION MOTORA SENSITIVA Y AUTONOMICA SIMPATICA DISTAL A LA LESION

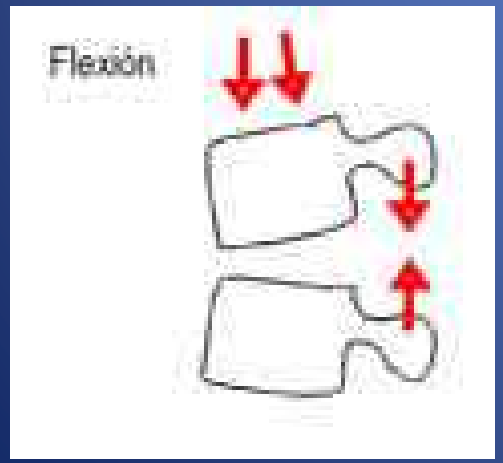
TRAUMA RAQUIMEDULAR (TRM)

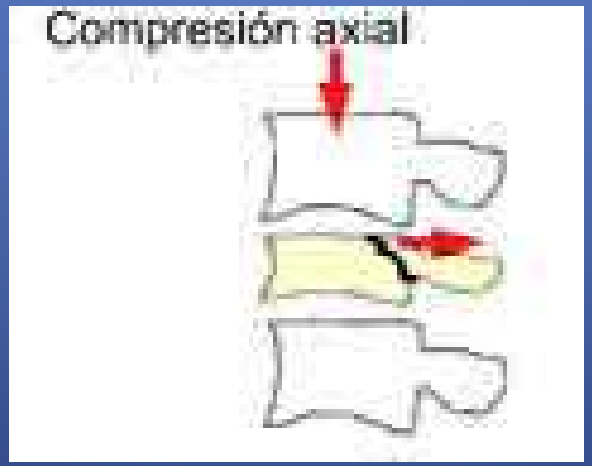
Mecanismos de producción: *MULTIPLES Y COMPLEJOS*

La lesión espinal se debe a las fuerzas que actúan sobre un segmento de la columna vertebral, originando:

1.- **Flexión**: ruptura de los ligamentos posteriores con o sin lesión ósea asociada.

2.- **Compresión axial**: Puede originarse una fractura conminuta del cuerpo vertebral, con fragmentos óseos retropulsados en el interior del canal raquídeo. Los ligamentos posteriores permanecen intactos.





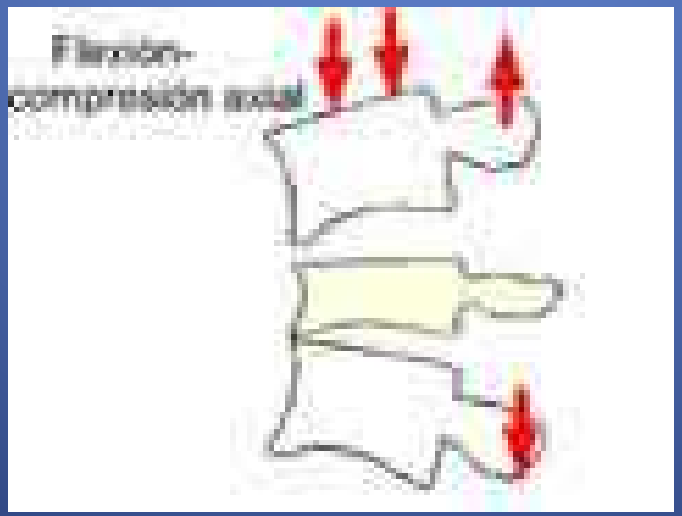
LESION :
OSEA ARTICULAR
LIGAMENTOSA
MEDULAR
NERVIOSA Y
RADICULAR

TRAUMA RAQUIMEDULAR (TRM)

3.- **Flexión-compresión axial**: Produce tres grados de lesiones:

Fractura en cuña, con aplastamiento del cuerpo vertebral *menor del 50%* de su altura, Generalmente los elementos óseos y ligamentos posteriores están indemnes.

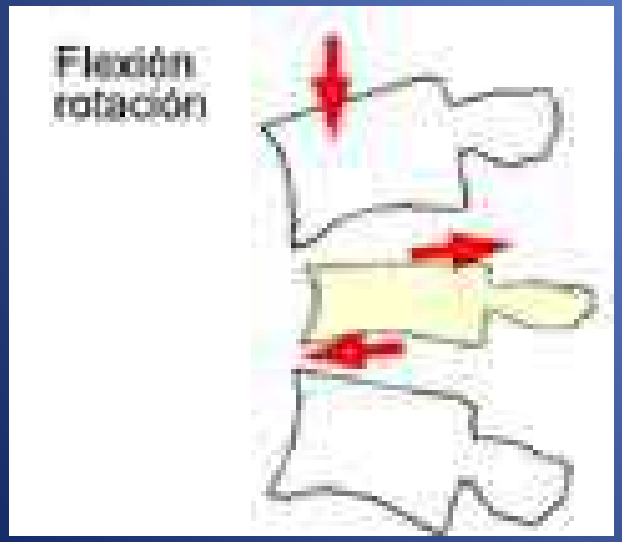
- ***Fractura en cuña*** del cuerpo vertebral, con aplastamiento que excede el 50% de su altura. Se acompaña habitualmente, de rotura de ligamentos posteriores, con o sin fractura del arco posterior.
- ***Fractura estallido***, con fragmentos óseos invadiendo el canal, lesión de ligamentos posteriores y frecuentemente acompañada de fractura del arco posterior.



TRAUMA RAQUIMEDULAR (TRM)

4.- **Flexión-rotación**: Provoca una fractura-luxación, con el fragmento craneal rotado sobre el caudal. Las fuerzas de flexión producen una fractura en cuña o estallido, mientras que las de rotación provocan fractura de la apófisis articular de la vértebra inferior.

5.- **Hiperextensión**: Originan una lesión ligamentosa anterior con desplazamiento hacia atrás del segmento craneal. Puede haber una lesión del disco y frecuentemente se desprende un fragmento óseo de uno de los ángulos anteriores del cuerpo vertebral, que es arrancado junto con el ligamento vertebral común anterior



TRAUMA RAQUIMEDULAR (TRM)

CONCEPTO DE LAS TRES COLUMNAS DE DENIS

COLUMNA ANTERIOR

COLUMNA MEDIA

COLUMNA POSTERIOR

DEFINICION DE INESTABILIDAD RAQUIS

La posibilidad de modificación de las posiciones de vertebras o fragmentos óseos, que pueda producir lesión neurológica

- ✓ AGUDA O CRÓNICA
- ✓ 2 DE LAS 3

TRAUMA RAQUIMEDULAR (TRM)

AMERICAN SPINAL INJURY ASOCIATION (ASIA)

TRM : LESION TRAUMATICA DEL RAQUIS Y LA MEDULA ESPINAL, QUE RESULTA EN ALGÚN GRADO DE COMPROMISO TRANSITORIO O PERMANENTE DE LAS FUNCIONES NEUROLOGICAS

NIVEL: SEGMENTO MAS CAUDAL CON FUNCION MOTORA Y SENSITIVA CONSERVADA

Buscar el segmento normal más caudal.

Zona de parcial preservación.

Nivel óseo por TAC y Rx

LESION COMPLETA: NO HAY EVIDENCIA DE FUNCION ALGUNA POR DEBAJO DEL NIVEL

LESION INCOMPLETA: HAY EVIDENCIA DE FUNCION ALGUNA POR DEBAJO DEL NIVEL **(2/3)**

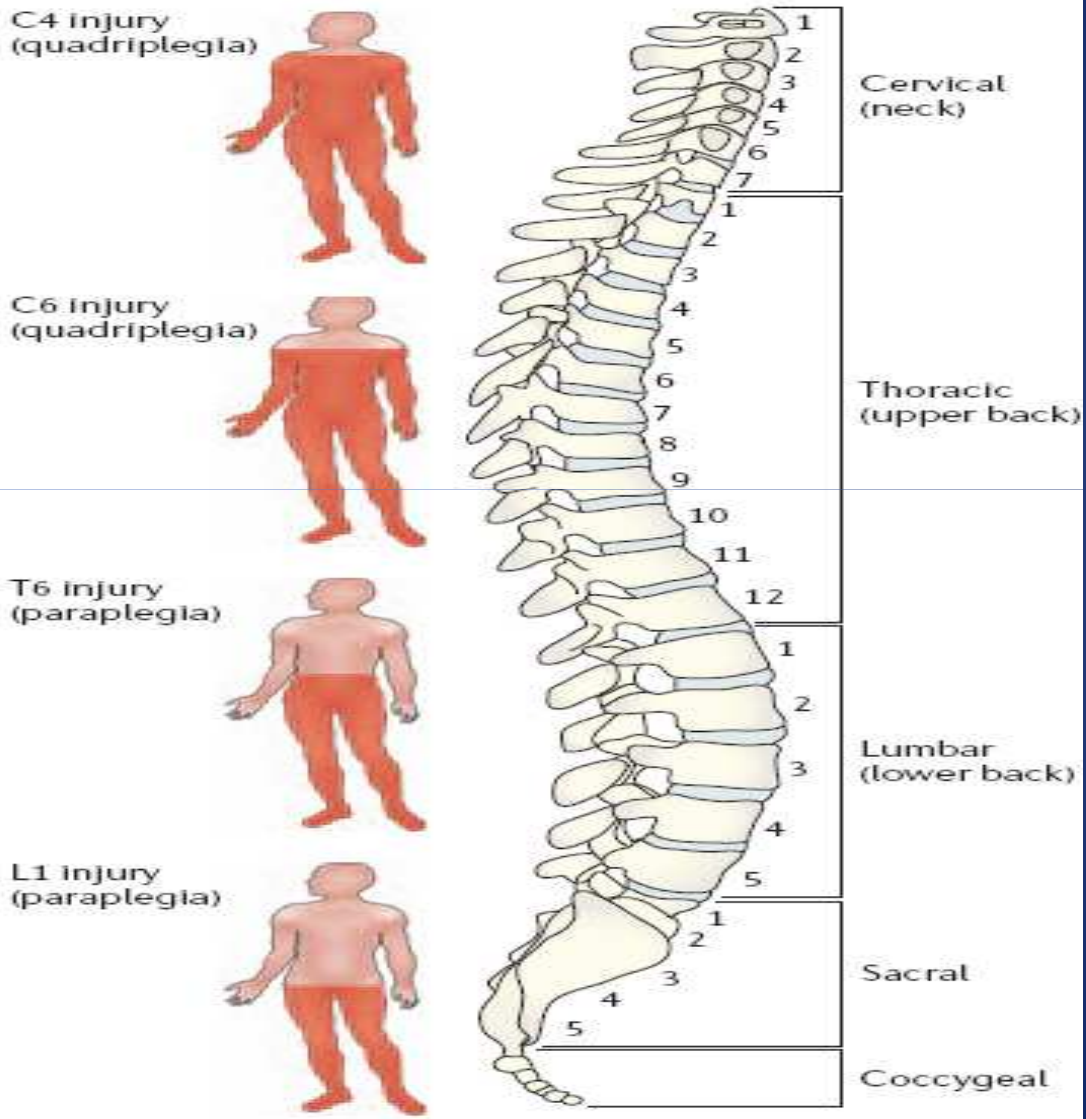
COMPARATIVA Y PRONOSTICA

Box 1 | **The ASIA Impairment Scale**

Classification of spinal cord injury (SCI) severity using the American Spinal Injury Association (ASIA) Impairment Scale. The main categories of the Impairment Scale are as follows:

- A (complete): No motor or sensory function is preserved in the sacral segments S4–S5.
- B (incomplete): Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4–S5.
- C (incomplete): Motor function is preserved below the neurological level, and more than a half of key muscles below the neurological level have a muscle grade of <3.
- D (incomplete): Motor function is preserved below the neurological level, and at least a half of key muscles below the neurological level have a muscle grade of ≥3.
- E (normal): Motor and sensory functions are normal.

Extent of injury after damage to specific spinal segments is illustrated in the figure (see American Spinal Injury Association in Online links box for the complete standard neurological classification of SCI).



ESCALA DE ASIA

La Escala de Asia habla de la intensidad de la lesión medular.
A - Lesión completa - *ninguna función a nivel S4 y S5 (Sin sensibilidad anal).*
B - **Lesión incompleta** - *con función sensitiva a nivel S4 - S5 (Cuadriparético con reflejo anal).*
C - Incompleta - *función motora < de 3.*
D - Incompleta - *función motora > de 3.*
E - Normal

TRAUMA RAQUIMEDULAR (TRM)

Síndrome de Injuria Completa que puede ser:

✓Con zona de Preservación parcial (PP), (sectores encima de S4 y S5 mantienen algo de función)

✓Sin zona de PP, no tienen ninguna función de preservación por encima S4 Y S5

Síndrome de injuria Incompleta

Hemisección medular o síndrome de Brown-Séquard
- Pérdida de fuerza ipsilateral
- Pérdida contralateral de la sensibilidad al dolor y temperatura.
- Pérdida de sensibilidad profunda ipsilateral

Síndrome centromedular de Schneider
- Paresia flácida en miembros superiores (afectación de 2ª neurona)
- Disminución termoalgésica en miembros superiores
- Dolores por desaferentización en miembros superiores
- Sin afectación de miembros inferiores o menor que en extremidades superiores. Esta paresia es espástica (afectación 1ª neurona).

Síndrome cervico-bulbar
- Puede simular el Schneider por disociación motora similar, pero traduce una lesión más alta y de peor pronóstico
- Etiología traumática o vascular (art. vertebrales)

Otros: Cordonal ant y post, cono medular y cola de caballo

TRAUMA RAQUIMEDULAR (TRM)

SHOCK ESPINAL **"ES A LA MEDULA, LO QUE EL COMA A ENCEFALO"**

Es la pérdida de la función motora, sensitiva y autonómica simpática distal a la lesion que tiene un individuo inmediatamente después de una lesión, debido a una injuria espinal grave

Por encima de D6 mayor compromiso neurogénico hipotensión y bradicardia.

Similar a la fase del impacto en el caso de los TCE.

La médula deja de funcionar (shock) por un período variable de horas a días

Si recupera función en las primeras 24 horas se debe pensar que tuvo un shock espinal.

Más alta la lesión, más severa la injuria espinal, mayor severidad y duración del Shock Espinal. (D6)

***La pérdida de la función somática y sensitiva que persiste más de 24 horas, es daño patológico*, orgánico y no por shock espinal.**

TRAUMA RAQUIMEDULAR (TRM)

DIAGNOSTICO IMAGENOLOGICO

Valorar:

Estructura ósea, ligamentosa, partes blandas, Tejido nervioso
Alineación, Estabilidad, Compresión (I/E)

No existe diagnóstico imagenológico ideal para las 4 partes.
No existe estudio radiológico único que descarte lesiones en el paciente sintomático

La RX simple valora muy bien la estructura ósea
La TAC es adecuada para el sector óseo y partes blandas pero no para lo ligamentoso
La RNM es ideal para la médula y los ligamentos.

Para interpretar la estabilidad de la columna es imprescindible la colaboración del **traumatólogo.**

RX: Recomendación 3 Rx simples (perfil cervical, torax frente y panoramica de pelvis)

- ✓ **Primer "screning"**
- ✓ **Menos de 10% de lesiones oseas desapecibidas**

TRAUMA RAQUIMEDULAR (TRM)

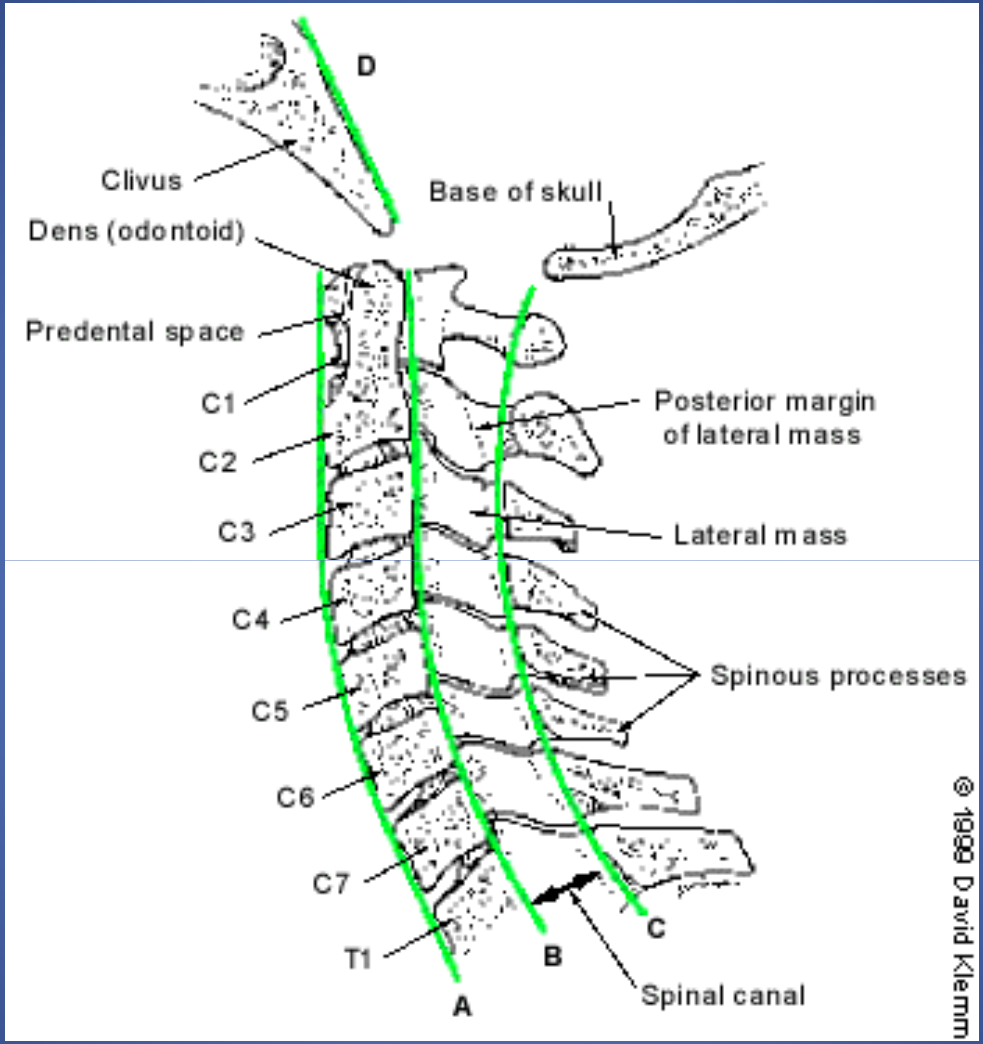


Figure 3. Schematic lateral view of the cervical spine. Note the odontoid (dens), the predental space and the spinal canal. (A=anterior spinal line; B=posterior spinal line; C=spinolaminar line; D=clivus base line)

TRAUMA RAQUIMEDULAR (TRM)

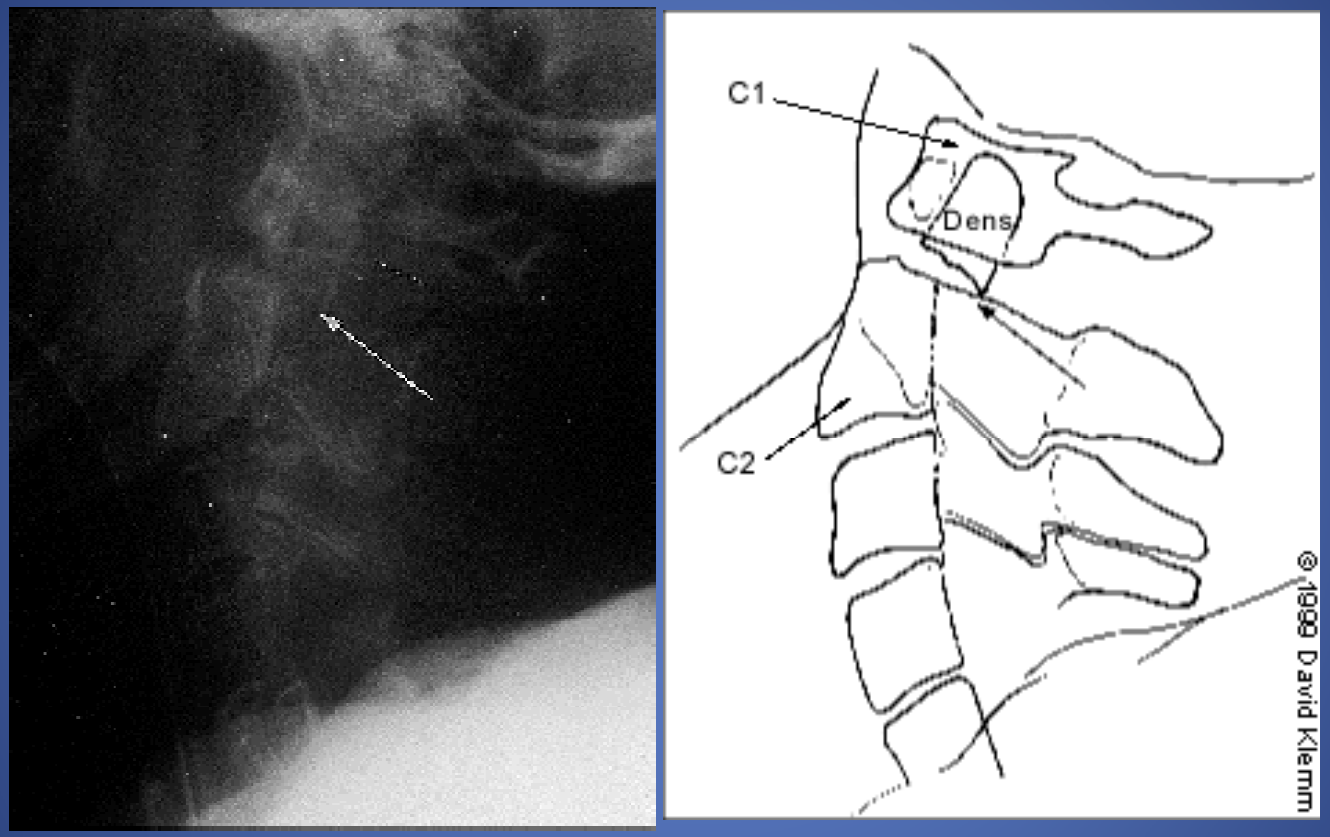


Figure 1. A type II dens fracture. Lateral radiograph shows a fracture through the base of the odontoid process (dens) with the dens and C1 posterior to C2 *(arrow indicates fractured base of dens)*.

TRAUMA RAQUIMEDULAR (TRM)

DIAGNOSTICO IMAGENOLOGICO

La TAC sin reconstrucción de imágenes puede dar una falsa tranquilidad porque las lesiones en el plano horizontal se pueden no ver. (fracturas)
Se debe hacer "surview" (topograma).

La asociación de TC axial y Topográma = no ve lesiones en < del 1 %

Sector difícil de ver (RX) que es C7 - D1 zona que se aprecia bien con la TAC

La RNM ha tomado lugar prominente.
Valora ligamentos y la médula . No es un sustituto total.
Tiempo, traslado
La RNM nos permite conocer el grado, severidad y estadio de la lesión de la médula.

TRAUMA RAQUIMEDULAR (TRM)

DIAGNOSTICO IMAGENOLOGICO

RX: **Recomendación 3 Rx simples (perfil cervical, torax frente y panoramica de pelvis)**

- ✓ **Primer "screning"**

Asintomático

Sintomatico RX y la TAC VPN 99 – 100 % (les. espinales significativas)

Persiste la DUDA se podrá realizar RNM

RNM :

- **Déficit sin lesión ósea.**
- **Previo a IQ decompresión.**

TRAUMA RAQUIMEDULAR (TRM)

TIPOS DE LESION

INTRINSECA

- ✓ CONCUSION
- ✓ CONTUSION
- ✓ HEMORRAGIA
- ✓ LACERACION

EXTRINSECA

- ✓ LESION COMPRESIVA (ESQUIRLAS, HEMATOMAS, DISCAL,PROYECTIL)
- ✓ AVULSION DE RAICES

LESIONES TARDIAS

- ✓ ATROFIA, ARAQNOIDITIS, MIELOPATIA QUISTICA

TRAUMA RAQUIMEDULAR (TRM)

Figure 1. C6-C7 fracture-dislocation with cord edema, typical of complete quadriplegic injuries.

TRAUMA RAQUIMEDULAR (TRM)

that CT identified 99.3% of all fractures. The one cervical and one thoracic fracture missed by CT required minimal treatment with a rigid cervical collar or no treatment, respectively [24]. In a registry-based retrospective analysis [redacted] 54 [redacted] of 70 [redacted]

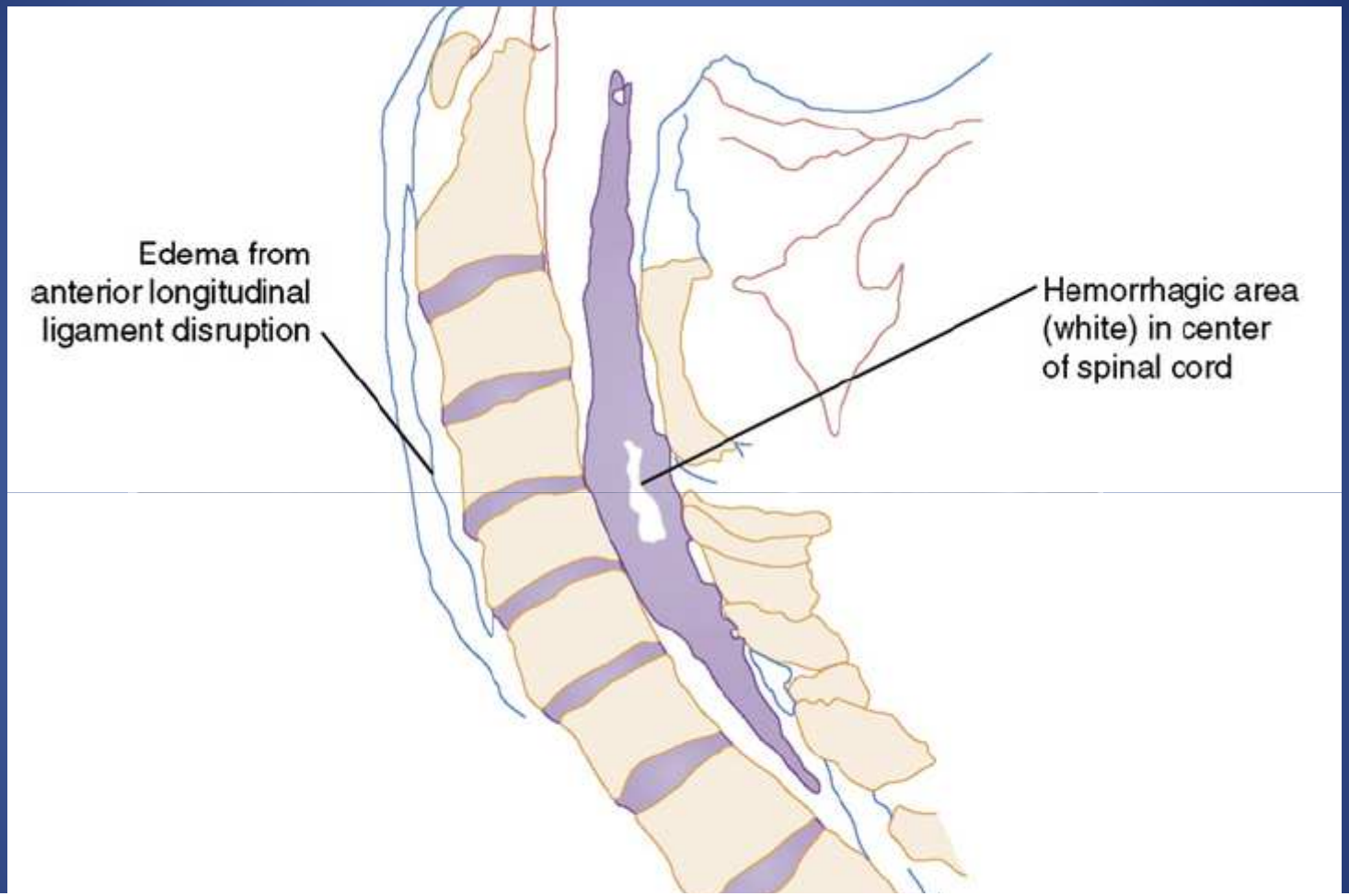
SCIWORA : SPINAL CORD INJURY WITHOUT RADIOGRAPHIC ABNORMALITY
DEF: DEFICIT NEUROLOGICO EN AUSENCIA DE APARENTE INJURIA RX
FRECUENTE EN NÍÑOS Y HASTA 12 % DE LOS CASOS EN ADULTOS
LIGAMENTOSO – DISCAL – CONTUSION- EDEMA

MRI is widely accepted as the imaging modality that best delineates the integrity of the spinal cord itself, intervertebral discs, surrounding soft tissue, ligamentous structures, the vertebral arteries, and SCIWORA [36]. The most common MRI findings among SCIWORA patients include central disc herniation, spinal stenosis, cord edema, and contusion (Fig. 1) [7,37]. MRI has also been shown to have prognostic value in SCIWORA, because patients with minimal cord changes have the best outcome, followed by those with cord edema, hemorrhage, and finally, contusion [6].

In addition to aiding in the determination of acuity of bony injuries, MRI is helpful in diagnosing the causes of delayed and progressive neurologic deterioration in spinal injury patients. There are characteristic findings indicative of myelomalacia, syrinx formation, cord tethering, and progressive

Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)



in the acute and subacute setting, MRI can help discriminate between neurologic deficits caused by hemorrhage or edema, as well as injury to the cord itself from those caused by extrinsic compression [38].

TRAUMA RAQUIMEDULAR (TRM)

JOURNAL OF NEUROTRAUMA 27:1–11 (XXXX 2010)

DOI: 10.1089/neu.2009.1236

The Role of Magnetic Resonance Imaging in the Management of Acute Spinal Cord Injury

Magnetic resonance imaging (MRI) has become the gold standard for imaging neurological tissues including the spinal cord. The use of MRI for imaging in the acute management of patients with spinal cord injury has increased significantly. This paper used a vigorous literature review with Downs and Black scoring, followed by a Delphi vote on the main conclusions. MRI is strongly recommended for the prognostication of acute spinal cord injury. The sagittal T2 sequence was particularly found to be of value. Four prognostication patterns were found to be predictive of neurological outcome (normal, single-level edema, multi-level edema, and mixed hemorrhage and edema). It is recommended that MRI be used to direct clinical decision making. MRI has a role in clearance, the ruling out of injury, of the cervical spine in the obtunded patient only if there is abnormality of the neurological exam. Patients with cervical spinal cord injuries have an increased risk of vertebral artery

TRAUMA RAQUIMEDULAR (TRM)

A qué paciente se le debe solicitar imagenología del raquis cervical?

TRAUMA RAQUIMEDULAR (TRM)

1) EL PACIENTE EN LA EMERGENCIA, ¿SACAR O NO EL COLLARETE?

2)¿ A QUIEN?

3) ¿CUANDO?

4) ¿CUANDO Y A QUIEN SOLICITAR RX DE COLUMNA CERVICAL?

5) ¿CUANTOS ENFOQUES?

TRAUMA RAQUIMEDULAR (TRM)

-**Habitualmente se solicitan Rx Columna cervical a pacientes con riesgo de lesión RM, aunque este sea mínimo.**

-**En las emergencias de EE.UU., hasta el año 2002 se solicitaban Rx al 97% de los traumatizados**

-**En Canadá se ven 410.000 traumatizados por año.**

-**De ellos, 185.000 están alertas y colaborando.**

-**Mas del 98% de las Rx solicitadas son normales.**

Stiell IG et al. Can J Emerg Med 2002;4(2)84-90

Yealy DM, N Eng J Med 2003;349:2553-2555

TRAUMA RAQUIMEDULAR (TRM)

-**En EEUU se tratan mas de 1.100.000 de pacientes por año que pueden tener una lesión RM traumática.**

-**Se hacían mas de 800.000 Rx de columna cervical por año. (2000)**

- **Bajo costo económico individual, pero elevado en el volumen total .**

-**Alto porcentaje de estudios normales.** SOLO 4% FRACTURAS

-**Aumento de tiempos de internación/inmobilización.**

- **Dos reglas NLC / CCR**

Hoffman JR et al. N Eng J Med 2000;343:94-99.
Stiell IG et al. JAMA 2001;286(15):1841-1848
Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)

1) Entonces, ¿hay algún predictor clínico confiable para descartar a un paciente como portador de lesión raquídea?

2) ¿Es sensible y específico?

3)¿Es sustituible el examen clínico por algún estudio paraclínico?

Stiell IG et al, N Engl J Med 2003;349:2510-8.
AANS, Neurosurgery 2002;50(3 suppl):s30-s36
Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)

PRIMER REGLA (MPOS)

NEXUS **(National Emergency X-Radiography Utilization Study)**

-Se estudiaron más de 34.000 pacientes con trauma no penetrante en EEUU.

-Se clasificaron dos grupos: asintomáticos y sintomáticos según 5 criterios:

- 1) No alteraciones del estado de conciencia (GCS 15)
- 2) Ausencia de dolor o contractura cervical
- 3) Ausencia de drogas o alcohol.
- 4) No injuria extraneurológica mayor.
- 5) No déficit focal neurológico. NLC

-**SI REUNE LOS 5 ES CONSIDERADO ASINTOMATICO**
- **A todos se les realizó Rx.**

Hoffman JR, N Engl J Med 2000;343:94-9
Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)

De 34.069 pacientes estudiados 578 presentaron lesiones raquídeas.

Ocho de ellos fueron catalogados como asintomáticos por el examen clínico.

Uno presentaba fractura dudosa, otro fue mal catalogado.

Las “fallas” de esta regla son cerca de 1 cada 4.000

EN SUMA:

Sobre 34.069 pacientes, 8 lesiones se subdiagnosticaron clínicamente.

SENSIBILIDAD 99.6%

Valor predictivo negativo: 99.8% NLC

Hoffman JR, N Engl J Med 2000;343:94-9
Emerg Med Clin N Am 25 (2007)

TRAUMA RAQUIMEDULAR (TRM)

Table 1. The NEXUS Low-Risk Criteria.* NLC

Cervical-spine radiography is indicated for patients with trauma unless they meet all of the following criteria:

No posterior midline cervical-spine tenderness,†

No evidence of intoxication,‡

A normal level of alertness,§

No focal neurologic deficit,¶ and

No painful distracting injuries.‖

NEXUS: National Emergency X-Radiography Utilization Study.

Stiell IG et al., N Engl J Med 2003;349:2510-8.

TRAUMA RAQUIMEDULAR (TRM)

The Canadian Cervical Spine Rule (CCR)

Box 2. Canadian C-spine Rules

A. *Any* high-risk factor that mandates radiography? If yes, then radiograph; if no, then proceed to questions in section B.
   1. Age >65 years
   2. Dangerous mechanism (fall from ≥3 feet or 5 stairs; axial load to the head; motor vehicle accident at a high speed [>100 km/h]), rollover, or ejection; collision involving a motorized recreational vehicle; bicycle collision
   3. Paresthesias in extremities

B. Any low-risk factor that allows safe range of motion assessment? If no, then radiograph; if yes, then proceed to question in section C.
   1. Simple rear-end motor vehicle accident
   2. Sitting position in the emergency department
   3. Ambulatory at any time
   4. Delayed neck pain onset
   5. No midline cervical tenderness

C. Able to rotate neck actively (45 degrees left and right)? If no, radiograph; if yes, then no radiography is indicated.

-Estudian 8924 pacientes.

- Hubo 148 lesiones raquídeas, de ellas 10 fueron en el grupo asintomático según criterios del NEXUS.

- Plantean un nuevo protocolo que incluye la edad del paciente, el mecanismo traumático y la motilidad del raquis.

- Sensibilidad 100% (151)

Stiell IG et al. N Engl J Med 2003;349:2510-8

Stiell IG et al. Can J Emerg Med 2002;4(3):185-193.
Stiell IG et al. Can J Emerg Med 2002;4(2):84-90.
Emerg Med Clin N Am 25 (2007)

TRM)

The Canadian C-Spine Rule

For alert (GCS=15) and stable trauma patients where cervical spine injury is a concern

1. Any High-Risk Factor Which Mandates Radiography?

Age ≥ 65 years
or
Dangerous mechanism*
or
Paresthesias in extremities

→ **Yes** → **Radiography**

↓ **No**

2. Any Low-Risk Factor Which Allows Safe Assessment of Range of Motion?

Simple rearend MVC **
or
Sitting position in ED
or
Ambulatory at any time
or
Delayed onset of neck pain ***
or
Absence of midline c-spine tenderness

→ **No** → **Radiography**

↓ **Yes**

3. Able to Actively Rotate Neck?

45° left and right

→ **Unable** → **Radiography**

↓ **Able**

No Radiography

* **Dangerous Mechanism:**
- fall from elevation ≥ 3 feet / 5 stairs
- axial load to head, e.g. diving
- MVC high speed (>100km/hr), rollover, ejection
- motorized recreational vehicles
- bicycle collision

** **Simple Rearend MVC Excludes:**
- pushed into oncoming traffic
- hit by bus / large truck
- rollover
- hit by high speed vehicle

*** **Delayed:**
- i.e. not immediate onset of neck pain

Can J Emerg Med 2002;(2):84-90.

TRAUMA RAQUIMEDULAR (TRM)

La sensibilidad de CCR para detectar pacientes con lesiones es de casi el 100%, el de NEXUS 99.6%.

Ambas son diferentes, pero seguras.
Se ahorran entre 20 y 50% de Rx.

Yealy DM, N Eng J Med 2003;349:2553-2555

Tal vez lo mejor es agregar a las pautas de NEXUS el examen del raquis cervical

Stiell IG, N Engl J Med 2004;350:1468-9

TRAUMA RAQUIMEDULAR (TRM)

1) Entonces, ¿hay algún predictor clínico confiable para descartar a un paciente como portador de lesión raquídea? **SI**

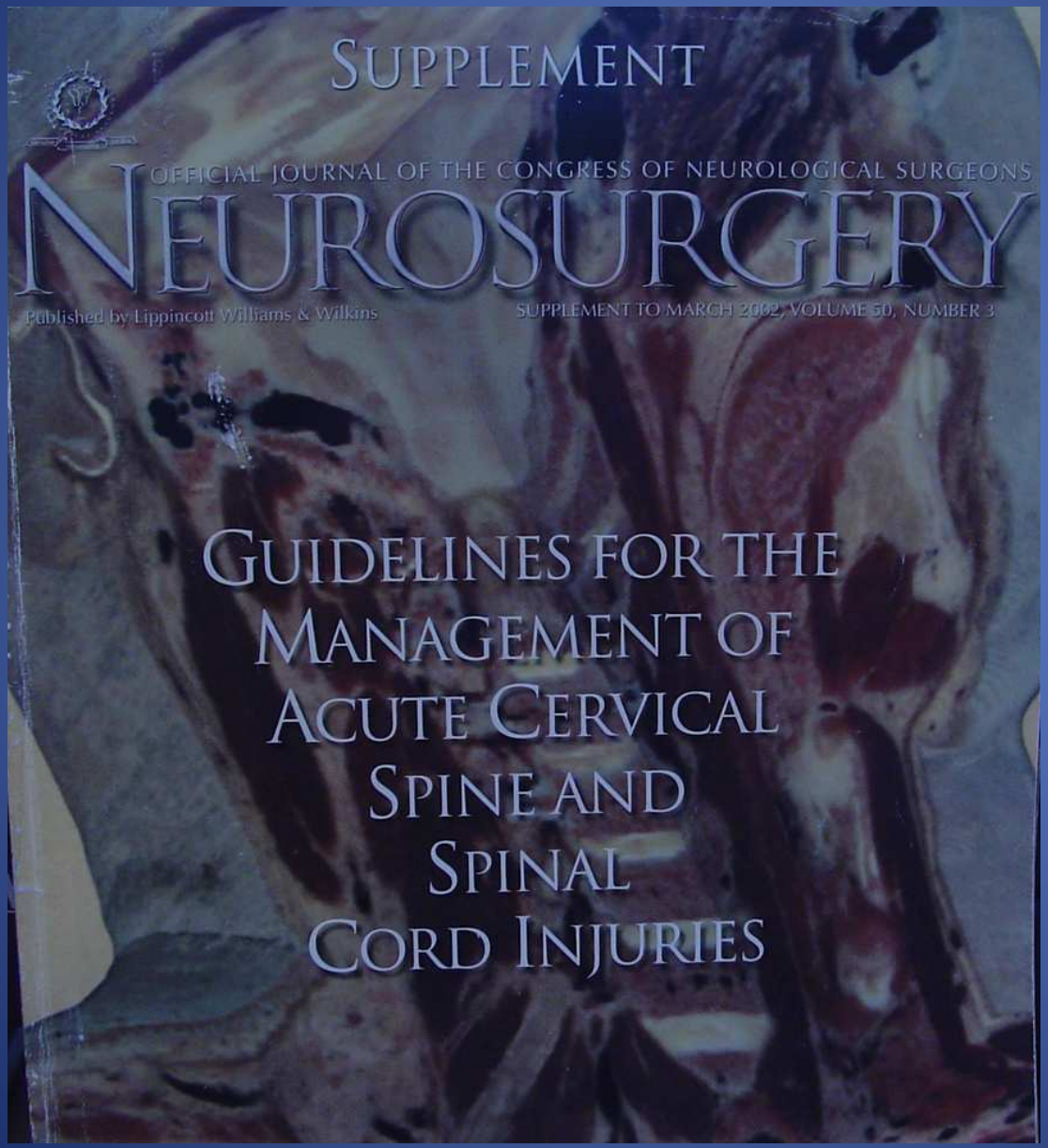
2) ¿Es sensible y específico? **SI**

3)¿Es sustituible el examen clínico por algún estudio paraclínico? **NO**

Stiell IG et al, N Engl J Med 2003;349:2510-8.
AANS, Neurosurgery 2002;50(3 suppl):s30-s36
Emerg Med Clin N Am 25 (2007)

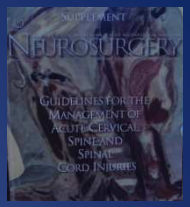
TRAUMA RAQUIMEDULAR (TRM)

TRAUMA RAQUIMEDULAR (TRM)



CONSULTAR ESPECIALISTAS

TRAUMA RAQUIMEDULAR (TRM)



INMOVILIZACION CERVICAL ANTES DE LA ADMISION HOSPITLARIA

RECOMMENDATIONS

STANDARDS: There is insufficient evidence to support treatment standards.

GUIDELINES: There is insufficient evidence to support treatment guidelines.

OPTIONS:

- All trauma patients with a cervical spinal column injury or with a mechanism of injury having the potential to cause cervical spine injury should be immobilized at the scene and during transport by using one of several available methods.
- A combination of a rigid cervical collar and supportive blocks on a backboard with straps is effective in limiting motion of the cervical spine and is recommended. The long-standing practice of attempted cervical spine immobilization using sandbags and tape alone is not recommended.

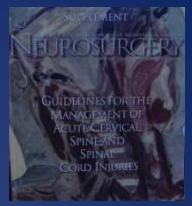
VALORACION RADIOGRAFICA DE LA COLUMNA CERVICAL EN PACIENTES TRAUMATIZADOS ASINTOMATICOS

RECOMMENDATIONS

STANDARDS: Radiographic assessment of the cervical spine is not recommended in trauma patients who are awake, alert, and not intoxicated, who are without neck pain or tenderness, and who do not have significant associated injuries that detract from their general evaluation.

NLC vs. CCS

TRAUMA RAQUIMEDULAR (TRM)



RECOMMENDATIONS

STANDARDS: There is insufficient evidence to support treatment standards.
GUIDELINES: There is insufficient evidence to support treatment guidelines.
OPTIONS:

- Management of patients with acute spinal cord injury, particularly patients with severe cervical level injuries, in an intensive care unit or similar monitored setting is recommended.
- Use of cardiac, hemodynamic, and respiratory monitoring devices to detect cardiovascular dysfunction and respiratory insufficiency in patients after acute cervical spinal cord injury is recommended.

RECOMMENDATIONS

STANDARDS: There is insufficient evidence to support treatment standards.
GUIDELINES: There is insufficient evidence to support treatment guidelines.
OPTIONS:

- Hypotension (systolic blood pressure <90 mm Hg) should be avoided if possible or corrected as soon as possible after acute spinal cord injury.
- Maintenance of mean arterial blood pressure at 85 to 90 mm Hg for the first 7 days after acute spinal cord injury to improve spinal cord perfusion is recommended.

TRAUMA RAQUIMEDULAR (TRM)

JOURNAL OF NEUROTRAUMA 27:1–17 (xxxxxx 2010)

DOI: 10.1089/neu.2009.1156

Original Article

A Systematic Review of Intensive Cardiopulmonary Management after Spinal Cord Injury

Steven Casha and Sean Christie

Riesgo elevado de complicaciones cardiovasculares y respiratorias

Y el resultado final neurológico, la frecuencias de complicaciones y morbimortalidad, pueden ser mejoradas en centros especializados con acceso a cuidado critico (UCI)

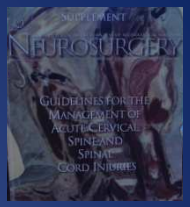
El período de inestabilidad hemodinámica en agudo es mas pronunciado pero el riesgo existe entre 1 y 2 semanas

PAM mayor a 85 mmHg (1 semana)

Los predictores de complicaciones CV (lesiones cervicales altas y completas)

resuscitation. We review the literature in five areas: management of SCI patients in specialized centers, risk in SCI patients of cardiopulmonary complications, parameters for blood pressure and oxygenation/ventilation support following SCI, risk factors for cardiopulmonary insufficiency requiring ICU care after SCI, and preventative strategies to reduce the risks of cardiopulmonary complications in SCI patients. The literature supports that, in

TRAUMA RAQUIMEDULAR (TRM)



TVP /TEP

RECOMMENDATIONS

STANDARDS:

- Prophylactic treatment of thromboembolism in patients with severe motor deficits due to spinal cord injury is recommended.
- The use of low-molecular-weight heparins, rotating beds, adjusted dose heparin, or a combination of modalities is recommended as a prophylactic treatment strategy.
- Low-dose heparin in combination with pneumatic compression stockings or electrical stimulation is recommended as a prophylactic treatment strategy.

GUIDELINES:

- Low-dose heparin therapy alone is not recommended as a prophylactic treatment strategy.
- Oral anticoagulation alone is not recommended as a prophylactic treatment strategy.

OPTIONS:

- Duplex Doppler ultrasound, impedance plethysmography, and venography are recommended for use as diagnostic tests for deep venous thrombosis in the spinal cord-injured patient population.
- A 3-month duration of prophylactic treatment for deep venous thrombosis and pulmonary embolism is recommended.
- Vena cava filters are recommended for patients who do not respond to anticoagulation or who are not candidates for anticoagulation therapy and/or mechanical devices.

TRAUMA RAQUIMEDULAR (TRM)

TVP /TEP

SPINE Volume 32, Number 17, pp 1908–1916

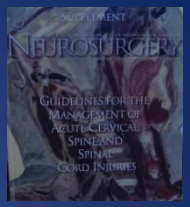
Role of Screening Tests for Deep Venous Thrombosis in Asymptomatic Adults With Acute Spinal Cord Injury

An Evidence-Based Analysis

Julio C. Furlan, MD, MBA, MSc, PhD, and Michael G. Fehlings, MD, PhD, FRCSC, FACS

Conclusion. There is insufficient evidence to support (or refute) a recommendation for routine screening for DVT in adults with acute traumatic SCI under thrombo-prophylaxis. However, there is level II-2 evidence that screening could detect asymptomatic DVT in 22.7% of those individuals. Although additional investigation is needed, we hypothesize that weekly screening for DVT during the first 13 weeks post-SCI could detect most of the asymptomatic DVT events in this patient population.

TRAUMA RAQUIMEDULAR (TRM)



RECOMMENDATIONS

CORTICOSTEROIDS:

Standards: There is insufficient evidence to support treatment standards.

Guidelines: There is insufficient evidence to support treatment guidelines.

Options: Treatment with methylprednisolone for either 24 or 48 hours is recommended as an option in the treatment of patients with acute spinal cord injuries that should be undertaken only with the knowledge that the evidence suggesting harmful side effects is more consistent than any suggestion of clinical benefit.

GM-1 GANGLIOSIDE:

Standards: There is insufficient evidence to support treatment standards.

Guidelines: There is insufficient evidence to support treatment guidelines.

Options: Treatment of patients with acute spinal cord injuries with GM-1 ganglioside is recommended as an option without demonstrated clinical benefit.

TRAUMA RAQUIMEDULAR (TRM)

1) COMPLICACIONES RESPIRATORIAS:

IR HIPODINAMICA:

- ***a) Lesión completa y grave por encima de C4 compromiso del diafragma.*** Pentaplejia.
- ***b) Lesión debajo de C4 - C5.*** Tetraplejia IR de inicio. ARM prolongada
- ***c) Lesión cervical baja y dorsal alta.*** *Es la más frecuente.* Estos tienen una paraplejia alta. Compromete cincha abdominal y músculos intercostales. Hacen una IR diferida, 4to. día. Están comprometidos los flujos espiratorios.
- ***d) Otros problemas respiratorios:*** **Atelectasias, embolia pulmonar, aspiración, neumonía**.

TRAUMA RAQUIMEDULAR (TRM)

2) Problemas Cardiovasculares
a) Desconexión simpática e hipertonía parasimpática..
b) Disminución del tono vasomotor
c) Hipotensión sin vasoconstricción, Bradicardia, Estasis venosa
Reposición /Vasopresores:

3) Problemas Nutricionales
4) Problemas de la Piel
Equipos de cuidado de la piel. prevención y profilaxis UPP

5) Problemas Psicológicos
Manejo precoz y específico Antidepresivas. Destrucción de la personalidad.

6) Problemas urologicos

Objetivos terapéuticos

Preservar la función neurológica presente
Revertir los déficits

-Manejo cardiopulmonar , inmovilización, transporte
-Mantener buena PP
-Prevenir nueva injuria con estabilización de fractura Inestable.

Table 1. Strategies of Medical Intervention in the Treatment of Acute SCI With Clinical Evidence or Nearing Clinical Trial

Treatment Strategy	Mechanism	Clinical Status
Primary injury: regeneration		
Stem cell transplantation	Implantation of pluripotential progenitor cells that differentiate into functional neuronal and glial tissues	Phase I (feasibility and safety)
Gene therapy	Reprogramming surviving cells to adopt a regenerative profile	None
Electrical stimulation	Manipulation of nerve growth and guidance along electrical gradients	Phase I (feasibility and safety)
Secondary injury: neuroprotection		
Support of oxygenation and spinal cord perfusion pressure	Reduction of the ischemic penumbra surrounding the zone of primary necrosis	Class III clinical evidence: recommended treatment
Methylprednisolone	Free radical scavenger and inhibition of lipid peroxidation	Class I clinical evidence controversial: treatment option
GM-1 ganglioside	Anti-excitotoxic properties, reduced apoptosis	Class I clinical evidence: no sustained effects
Minocycline	Pro- and anti-inflammatory properties, inhibition of free radical production, reduced apoptosis	Phase I (feasibility and safety)
Cethrin	Rho inhibition, which causes down-regulation of growth inhibitor production	Phase I (feasibility and safety)
Activated macrophage implantation	Cytokine secretion, antigen-presenting activity	Phase I (feasibility and safety)

TRAUMA RAQUIMEDULAR (TRM)

TRATAMIENTO QUIRURGICO

a) **Inmovilización**- estabilización

b) Reducción-alineamiento

c) Fijación. Esta a su vez puede ser:

1. ***Espontánea***, con consolidación de la fractura, ayudada con inmovilización mediante ortosis externas (halo cervical, corsé...).

2. Quirúrgica

Artrodesis

TRAUMA RAQUIMEDULAR (TRM)

TRATAMIENTO QUIRURGICO

Precoz - Dentro de las primeras 24 horas

Tardía - Está vinculada a la reducción y estabilización de la columna (traumatólogo).

Precoz (72 horas) o tardía después de los 15 días.

SPINE Volume 31, Number 11 Suppl, pp S28–S35

The Timing of Surgical Intervention in the Treatment of Spinal Cord Injury: A Systematic Review of Recent Clinical Evidence

Michael G. Fehlings, MD, PhD, FRCSC, and Richard G. Perrin, MD, FRCSC

Decompresión precoz

■ Key Points

- There are currently no standards regarding the role and timing of decompression in acute SCI.
- Studies in animal models have consistently shown that neurologic recovery is enhanced by early decompression.
- There is evidence that early (<24 hours) decompressive surgery can be performed safely after acute SCI (guideline).
- There is evidence to support urgent closed reduction of bilateral locked facets in a patient with incomplete tetraplegia or urgent decompression in a patient with neurologic deterioration following a SCI (guideline).
- We recommend urgent decompression (<24 hours) following isolated acute cervical SCI, provided hemodynamic stability is maintained (option).

TRAUMA RAQUIMEDULAR (TRM)

JOURNAL OF NEUROTRAUMA 27:1–29 (MONTH 2010)

DOI: 10.1089/neu.2009.1147

Timing of Decompressive Surgery of Spinal Cord after Traumatic Spinal Cord Injury: An Evidence-Based Examination of Pre-Clinical and Clinical Studies

discrepancies in the results of those pre-clinical studies, there is evidence for a biological rationale to support early decompression of the spinal cord. Of 153 abstracts of clinical studies, 22 fulfilled the inclusion and exclusion criteria. While the vast majority of the clinical studies were level-4 evidence, there were two studies of level-2b evidence. The quality assessment scores varied from 7 to 25 with a mean value of 12.41. While 2 of 22 clinical studies assessed feasibility and safety, 20 clinical studies examined efficacy of early surgical intervention to stabilize and align the spine and to decompress the spinal cord; the most common definitions of early operation used 24 and 72 h after SCI as timelines. A number of studies indicated that patients who undergo early surgical decompression can have similar outcomes to patients who received a delayed decompressive operation. However, there is evidence to suggest that early surgical intervention is safe and feasible and that it can improve clinical and neurological outcomes and reduce health care costs. Based on the current clinical evidence using a Delphi process, an expert panel recommended that early surgical intervention should be considered in all patients from 8 to 24 h following acute traumatic SCI.

DECOMPRESION PRECOZ

Hasta que no se conozcan los resultados del estudio STASCIS la decompresión precoz tiene nivel de OPCION terapeutica

THE SURGICAL TREATMENT OF ACUTE SPINAL CORD INJURY STUDY

RECOMENDACIONES PARA EL USO DE MPSS EN LA INURIA ESPINAL

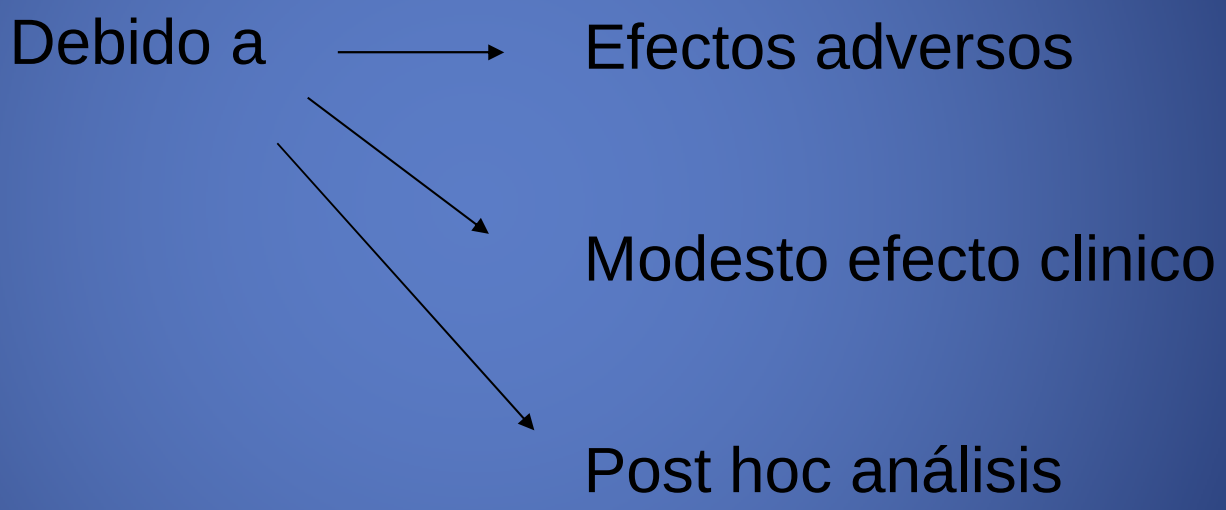
CRITERIOS DE LA U TORONTO

Clinical scenario	Strength of evidence	Level of recommendation
Acute nonpenetrating SCI (<3 hours following injury)	Class II (RCT with negative primary analysis; benefits limited to subgroup analysis)	MPSS should be given as per NASCIS II protocol: 30 mg/kg iv loading dose within the first hour followed by 5.4 mg/kg/hr iv over the next 23 hours.
Acute nonpenetrating SCI (>3 hours, but <8 hours following injury)	Class II (RCT with negative primary analysis; benefits limited to subgroup analysis)	MPSS should be given as per NASCIS III protocol: 30 mg/kg iv loading dose within the first hour followed by a 48 hour infusion of 5.4 mg/kg/hr.
Acute nonpenetrationg SCI (>8 hours after injury)	Class I (RCT showing a lack of an effect; potentially deleterious)	MPSS should not be administered (standard).
Acute penetrating SCI	Class III (Lack of an effect; increased wound complications)	MPSS is not recommended (option).

iv = intravenous; MPSS = methylprednisolone sodium succinate; NASCIS = National Acute Spinal Cord Injury Study; RCT = Randomized clinical trial; SCI = Spinal cord injury.

RECOMENDACIONES PARA EL USO DE MPSS EN LA INURIA ESPINAL

AANS/CNS



RECOMENDACIONES PARA EL USO DE MPSS EN LA INURIA ESPINAL

AANS/CNS

Consideran el uso de MPSS

OPCION TERAPEUTICA

Scientific Review

High dose methylprednisolone in the management of acute spinal cord injury – a systematic review from a clinical perspective

DJ Short*[1], WS El Masry[1,3] and PW Jones[2,4]

[1]*Midlands Centre for Spinal Injuries, Robert Jones & Agnes Hunt Orthopaedic & District Hospital NHS Trust, Oswestry, Shropshire, SY10 9DP, UK;* [2]*Department of Mathematics, Keele University, Staffordshire, ST5 5BG, UK*

Conclusion: The evidence produced by this systematic review does not support the use of high dose methylprednisolone in acute spinal cord injury to improve neurological recovery. A deleterious effect on early mortality and morbidity cannot be excluded by this evidence.

Spinal Cord (2000) 38, 273–286

RCT TRIALS SOBRE INJURIA ESPINAL FINALIZADOS

Trial	Treatment arms	Conclusions
NASCIS I	**MPSS** (100 mg for 10 days) **MPSS** (1000 mg for 10 days)	No difference.
NASCIS II	*MPSS Naloxone Placebo	Improved neurological recovery with early (less than 8 hours of SCI) MPSS treatment.
Japan MPSS	***MPSS** **MPSS** (100 mg for 7 days)	Improved neurological and sensory recovery with MPSS treatment within 8 hours of SCI.
NASCIS II	***MPSS** ****MPSS** **MPSS** (30 mg/kg bolus) + TM	Improved neurological recovery with MPSS treatment.
Maryland GM-1	GM-1 Placebo	Improved neurological recovery with GM-1 treatment.
Sygen® GM-1	*MPSS + low-dose GM-1 *MPSS + high-dose GM-1 *MPSS + placebo	Negative primary outcomes; trend for enhanced secondary outcomes.
Thyrotropin releasing hormone (TRH)	TRH Placebo	Improved neurological recovery with TRH treatment.
Gacyclidine (GK-11)	**Gacyclidine** (0.005, 0.01, or 0.02 mg/kg: 2 doses) Placebo	No difference overall. Trend for increased motor recovery in cervical incomplete SCI patient strata.
Nimodipine	*MPSS Nimodipine Nimodipine + *MPSS Placebo	No difference.

TRAUMA RAQUIMEDULAR (TRM)

Resultados dudosos y discutibles en cuanto a la metodología de los NASCIS

Hurlbert,JR The Role of Steroids in Acute Spinal Cord Injury An Evidence-Based Analysis

Spine 2001;26:S39–S46

Conclusions. From an evidence-based approach, methylprednisolone cannot be recommended for routine use in acute nonpenetrating SCI. Prolonged administration of high-dose steroids (48 hours) may be harmful to the patient. Until more evidence is forthcoming, methylprednisolone should be considered to have investigational (unproven) status only. [Key words: spinal cord injury, methylprednisolone, steroids, NASCIS, pharmacotherapy, evidence-based medicine, practice guidelines] **Spine 2001;26:S39–S46**

TRAUMA RAQUIMEDULAR (TRM)

Resultados dudosos y discutibles en cuanto a la metodología de los NASCIS

Hurlbert,JR The Role of Steroids in Acute Spinal Cord Injury An Evidence-Based Analysis

Spine 2001;26:S39–S46

Critical Care and Perioperative Management in Traumatic Spinal Cord Injury. Journal of Neurosurgical Anesthesiology, Vol. 15, No. 3, 2003

Chesnut, RM Management of brain and spine injuries Crit Care Clin 20 (2004) 25– 55

NASCIS III	**SIN CAMBIOS SIGNIFICATIVOS AL AÑO**
	NEUMONIA
	SEPSIS (TENDENCIA)
	MORTALIDAD (TENDENCIA)

TRAUMA RAQUIMEDULAR (TRM)

USO DE CORTICOIDES EN LA LESIÓN MEDULAR

- **SI O NO ¿**
- **¿CUANDO?**
- **¿QUE DOSIS?**
- **-¿POR CUANTO TIEMPO?**

- **La evidencia científica disponible no avala ni descarta su uso**

OPCION TERAPEUTICA (III)

TRAUMA RAQUIMEDULAR

FUTURO

Neuroprotectores
Hipotermia local
Factores de crecimiento
Transplante: Bridge
Técnicas quirúrgicas especializadas en el "gap"

"STEM CELL" CELULAS MADRE IMPLANTE

REHABILITACION

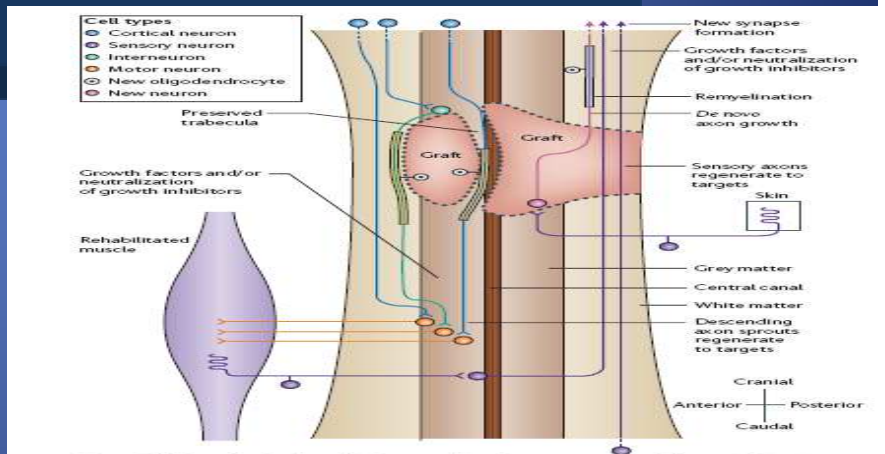


Figure 3 | **Injured spinal cord after combination treatments.** Schematic showing a sagittal view through injured cervical spinal cord after a hypothetical combination of potential therapies. Cysts are filled by vascularized grafts and trabeculae are spared. Grafts provide remyelinating cells, and inhibitory molecules in the scar regions and in intact spinal cord are neutralized using antibodies, peptides or enzymes. Grafted neurons allow the formation of new relay circuits or the regeneration of injured axons back to their original targets. Furthermore, rehabilitation may allow correct synapses to be stabilized and reverses muscle atrophy.

TRAUMA RAQUIMEDULAR

FUTURO

Neuroprotectores
Hipotermia local
Factores de crecimiento
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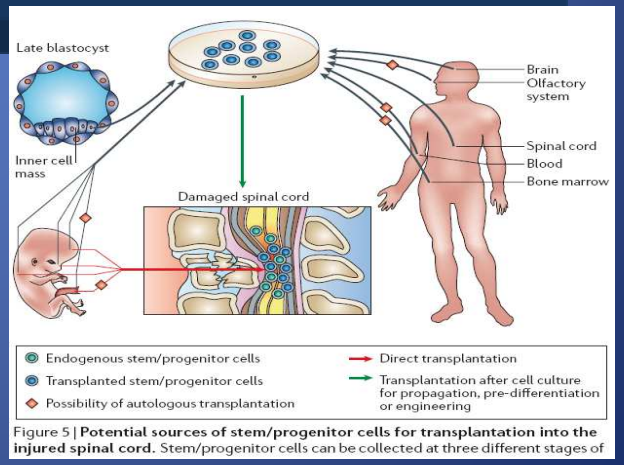
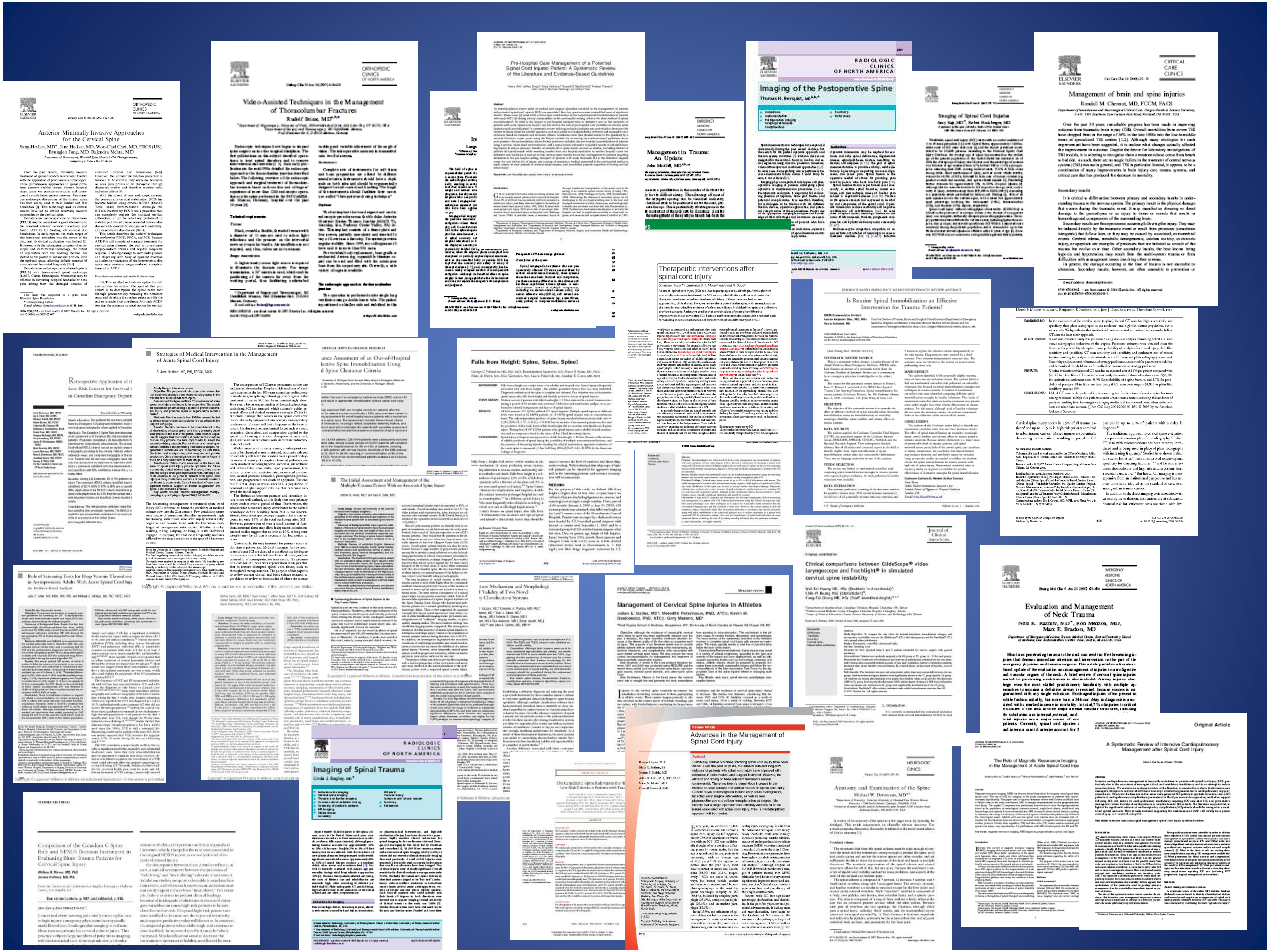


Figure 5 | **Potential sources of stem/progenitor cells for transplantation into the injured spinal cord.** Stem/progenitor cells can be collected at three different stages of


Anterior Minimally Invasive Approaches for the Cervical Spine
Video-Assisted Techniques in the Management of Thoracolumbar Fractures
Pre-Hospital Care Management of a Potential Spinal Cord Injured Patient: A Systematic Review of the Literature and Evidence-Based Guidelines
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Clinical comparisons between GlideScope® video laryngoscope and Trachlight® in simulated cervical spine instability
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