

MANAGING ORTHOSTATIC HYPOTENSION IN ACUTE SPINAL CORD INJURY: A SYSTEMATIC REVIEW

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SPINAL CORD INJURY PRACTITIONER- CLINICAL LEAD

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BACKGROUND

- Orthostatic hypotension (OH) is a common and debilitating complication following spinal cord injury (SCI)
- In the acute rehabilitation setting OH can severely limit tolerance to upright positioning, delaying rehabilitation progression and impacting psychological wellbeing.
- Effective management of OH is critical for enabling early mobilisation and improving participation in therapeutic activities.
- Clinical practice is challenged by limited, heterogeneous evidence on optimal interventions for this population.



ORTHOSTATIC HYPOTENSION

Definition

Orthostatic (OH) is the sustained reduction of systolic blood pressure (SBP) of at least 20mmHg or diastolic blood pressure (DBP) of at least 10mmHg within three minutes of changing position from supine to upright posture, regardless of symptoms (Freeman et al., 2011)



CLINICAL FEATURES OF OH

Presyncope symptoms

Lightheadedness, dizziness, visual changes (blurring or tunnel vision), and feelings of warmth or sweating.

Syncope

Fainting, with a possible delayed onset after standing or sitting up too quickly.

Cognitive impairment

Slowed thinking and difficulty concentrating due to reduced blood flow to the brain.

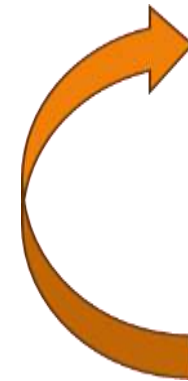
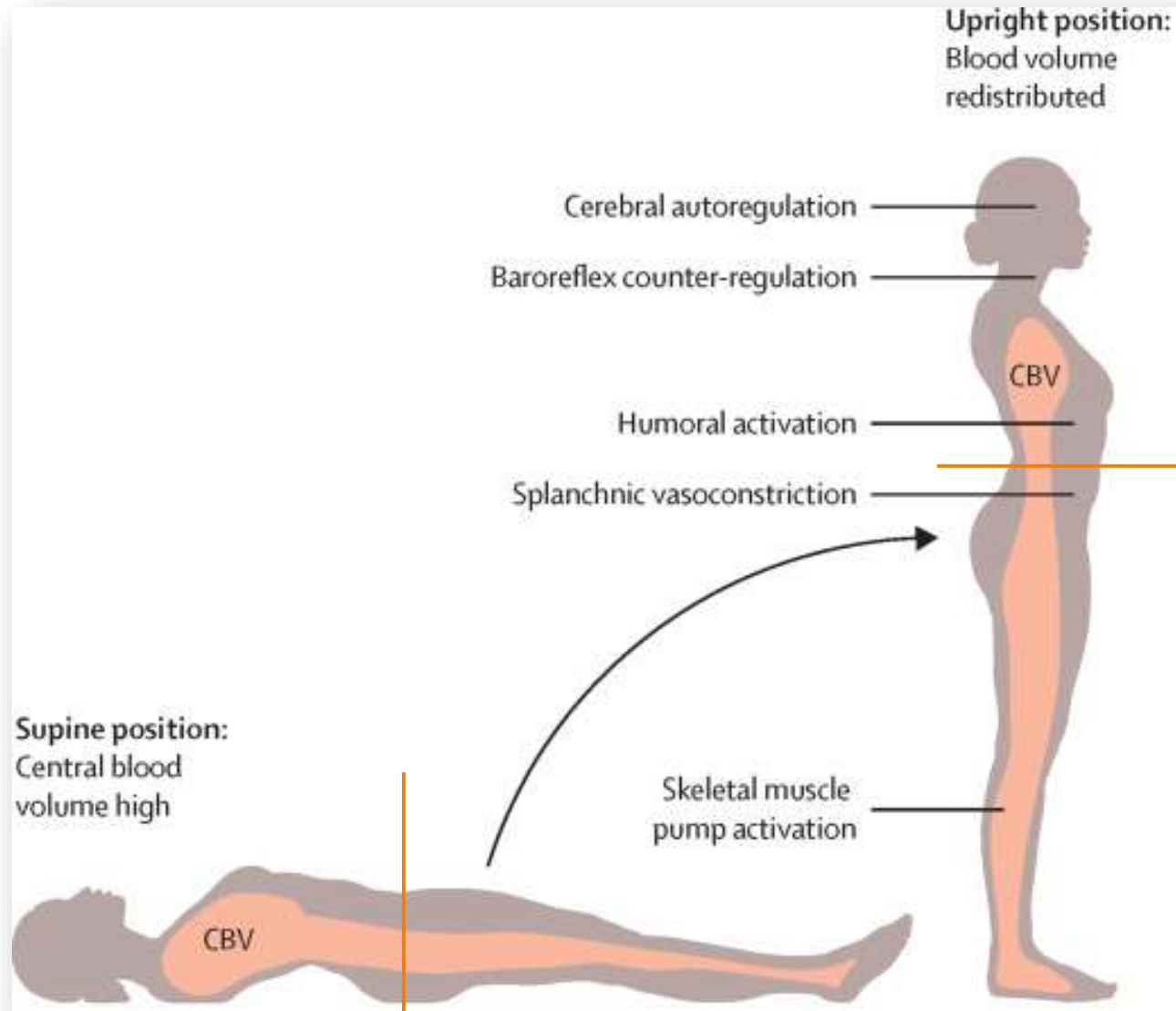
Fatigue and weakness

General feelings of lethargy and muscle weakness.

Autonomic symptoms

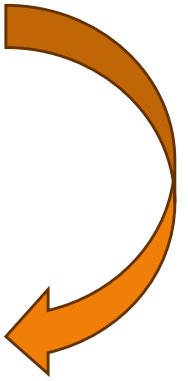
Patients may also experience diminished or absent sweating in affected areas.

PHYSIOLOGICAL EFFECTS OF OH



Compensatory mechanisms

Redistribution of circulating blood volume



ORTHOSTATIC HYPOTENSION IN SCI

Nervous System Dysfunction

Central

Interruption to the sympathetic pathways, resulting in reduced out flow and loss of tonic sympathetic tone.

Carotid and aortic baroreceptor dysfunction

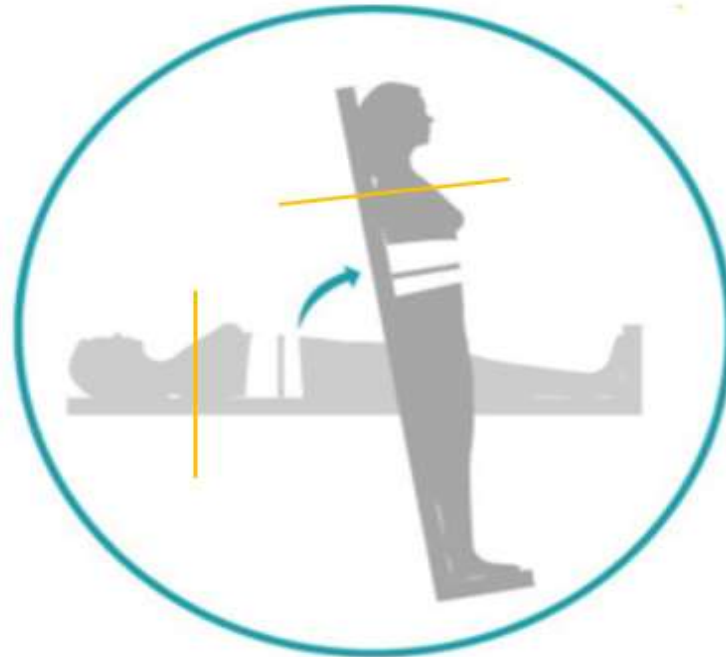
Peripheral

Lack of voluntary skeletal muscle pumps

Loss of splanchnic vasoconstriction

Dysregulation of blood volume redistribution

Reduced cerebral blood flow



Haemodynamic Dysfunction

Venous pooling in lower limbs

Decreased central blood volume

Decrease in stroke volume

Reduced cardiac output

Reduced blood pressure

Increase in heart rate

Reduced cerebral blood flow

Symptoms of orthostatic intolerance

PUT INTO PERSPECTIVE: UK STATISTICS



- Approx 105,000 SCI patients living in the (67/million in the UK)
- 4,440 per year new patients per year
- Approx 1,070/yr are traumatic SCI - 16/million/yr
- 50 -60% Cervical TSCI - **535 -643 patients**

ORTHOSTATIC HYPOTENSION AND SCI – A CLINICAL PERSPECTIVE

Prevalent complication in cervical and upper thoracic injuries

Affects 74% SCI patients in the first month of injury.

OH reported in 74% during physiotherapy treatment

59% are symptomatic of orthostatic intolerance

43% limitation in participation with physiotherapy

50- 79% of injuries involve the cervical spine

Higher the level of injury, the higher the levels of clinical symptoms

Growing Dilemma

IMPACT OF OH IN SCI

Participation in rehab – especially during the acute phase

Cognitive performance

Fatigue

Increase in morbidity

Secondary complications

Fear – negative psychological components



THERAPEUTIC INTERVENTIONS IN SCI

Non-Pharmacological

- Compression garments
- Exercise
- FES
- Biofeedback
- Gradual HUT/Tilt table

Pharmacological

- Midodrine
- Fludrocortisone
- Ephedrine
- Droxidopa

WHAT DO CURRENT GUIDELINES SAY?

“Abdominal binders and compression stockings should be considered to help optimise BP, OH and patient ability to participate in rehabilitation”

Rehabilitation after traumatic injury (NG211, NICE 2022)

- Across NICE, ISCoS, SCIRE, and rehabilitation literature —
Non-pharmacological interventions are first-line for orthostatic hypotension following spinal cord injury.
- Abdominal binders and compression stockings are part of that non-pharmacological toolkit, but they are **not the only first-line measure**.
- Pharmacological treatments (like midodrine or fludrocortisone) are **second-line** if these measures are insufficient, alone or in combination

WHAT DO CURRENT GUIDELINES SAY?

HOWEVER....

- Guidelines based on best available evidence at the time
- Most of the recommendations for management of OH in SCI have low levels of evidence
- Arguably a potential risk
- Predominantly research has been based on chronic SCI
- No SR solely explores management of OH in the acute SCI patient

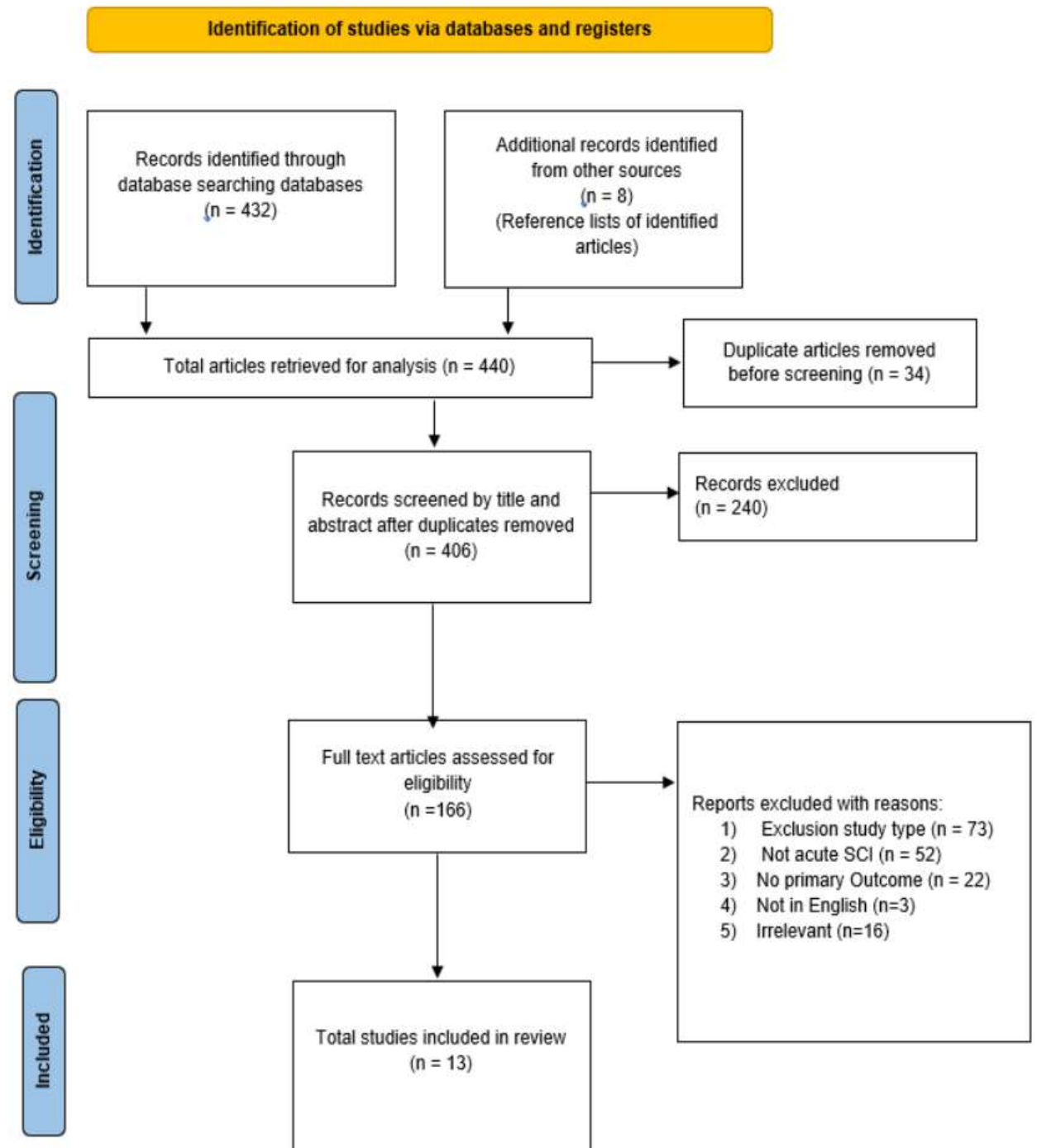
QUESTION

What are the most effective strategies to help prevent and manage OH in SCI patients in the acute setting?

OBJECTIVE

To systematically review the literature on the management of orthostatic hypotension in spinal cord injured patients during the acute in-patient rehabilitation phase.

PRISMA FLOWCHART OF STUDY SELECTION



RESULTS

Intervention Type	Number of Studies	Example Interventions	Evidence Summary
Pharmacological	2	Midodrine	Consistent BP improvement; reduced symptoms
Non-Pharmacological	11	Exercise, compression garments, functional electrical stimulation (FES), biofeedback	Variable findings; compression most effective

DISCUSSION

- The review analysed 13 studies on managing orthostatic hypotension (OH) in spinal cord injury (SCI) patients during acute rehabilitation. Strong evidence supported two interventions: midodrine and compression of the abdomen or legs.
- Midodrine showed the highest evidence level (Level 1) of good-quality studies reporting no major side effects.
- Compression studies (also Level 1) with good methodological quality confirmed that abdominal compression is more effective than lower limb compression in maintaining blood pressure.
- Overall, both methods appear effective, but more research is needed to determine the optimal midodrine dosage and amount/type of compression required for consistent results.

DATA SYNTHESIS

- Clinical diversity and lack of homogeneity of the studies included in this review deemed statistical comparison via a meta-analysis inappropriate, and impossible.
- Alternatively, synthesis without meta-analysis was conducted to compare the results and draw conclusions.



KEY FINDINGS

- Midodrine demonstrated consistent improvements in orthostatic BP control and tolerance.
- Compression therapy (abdomen and/or legs) reduced BP drops and improved symptoms.
- Evidence for FES, exercise training, and biofeedback was promising but of lower quality and inconsistent.
- Study quality was variable; most had small sample sizes and limited blinding

CONCLUSIONS



Abdominal compression is the most effective non-pharmacological intervention as first line option for acute SCI



Current evidence supports midodrine as the pharmacological drug of choice.



Evidence base remains limited; larger, high-quality studies are needed to confirm optimal treatment protocols



CLINICAL RELEVANCE

Evidence based practice reinforced

Helps maintain BP and effects of cardiovascular instability

Helps reduce symptoms of orthostatic intolerance

Timely intervention in the acute setting

Enables early mobilisation in the acute rehabilitation phase

Potential to reduce secondary complications

Helps to optimise patient outcomes



CASE STUDY

Patient Profile

- **Age/Sex:** 44-year-old female
- **Diagnosis:** C5/6 fracture–dislocation, *ASIA Impairment Scale B* (sensory incomplete)
- **Symptoms:** Marked dizziness, presyncope, and reduced cognition occurring within in therapy. three minutes of moving from supine to sitting. These symptoms, with a systolic BP drop >30 mmHg, significantly limited her ability to sit out in a chair and engage

Intervention Plan - A multimodal management approach was implemented including;

1. full-length compression stockings and an abdominal binder.
2. gradual postural adaptation – achieved by incrementally increasing the head-of-bed elevation with close BP monitoring.
3. Pharmacological management – *midodrine* introduced gradually and titrated to 10 mg three times daily (TDS).
4. Hydration strategy – maintained optimal fluid intake with oral electrolyte supplementation.

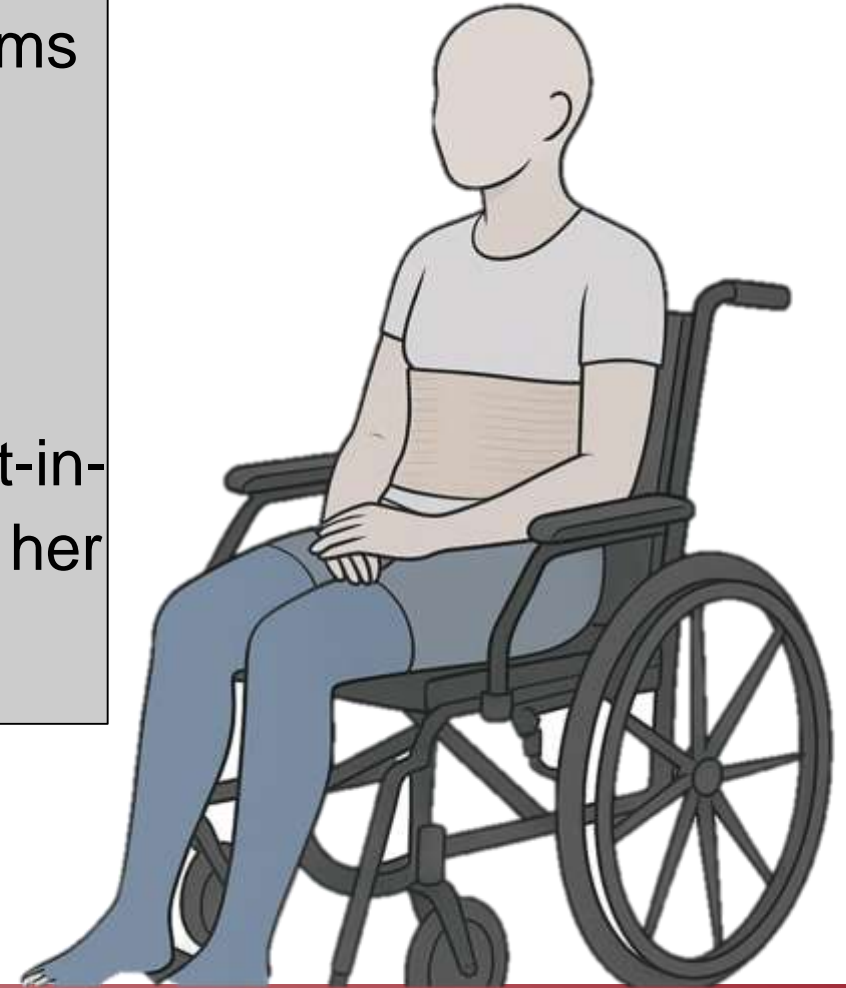
CASE STUDY

Outcomes

- Improved BP stability and marked reduction in symptoms of dizziness, presyncope, and cognitive slowing.

Functional gain

- Patient achieved her personal goal of sitting out in a tilt-in-space chair and was able to get married in hospital on her original wedding date



MANAGING ORTHOSTATIC HYPOTENSION IN ACUTE SPINAL CORD INJURY: A SYSTEMATIC REVIEW

Authors

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Background

Orthostatic hypotension (OH) is a common and debilitating complication following spinal cord injury (SCI), often resulting in dizziness, presyncope, cognitive slowing, and reduced functional participation. In the acute rehabilitation setting, these symptoms can severely limit tolerance to upright positioning, delaying rehabilitation progression and impacting psychological wellbeing. Effective management of OH is critical for enabling early mobilisation and improving participation in daily and therapeutic activities. However, clinical practice is challenged by limited, heterogeneous evidence on optimal interventions for this population.

Objective

To systematically review the literature on the management of orthostatic hypotension in spinal cord injured patients during the acute in-patient rehabilitation phase.

Methods

Search Strategy:

A comprehensive search of PubMed, CINAHL via EBSCO, and Cochrane Central Register of Controlled Trials was performed for human studies (January 1950 – May 2024). Bibliographic searches of reference lists identified additional relevant studies.

Study Selection:

Prospective experimental studies testing pharmacological and non-pharmacological interventions for managing OH and orthostatic intolerance symptoms in acute SCI were included.

An initial search identified 440 articles, screened by title and abstract. Full-text review by two independent reviewers resulted in 13 studies meeting inclusion criteria.

Data Extraction and Quality Assessment:

Two independent reviewers extracted data on: Systolic, diastolic, and mean arterial pressures Orthostatic intolerance symptoms

Pre-, during-, and post-intervention outcomes

Risk of bias was assessed using the PEDro Scale (for RCTs) and Downs & Black checklist.

Results

Intervention Type	Number of Studies	Intervention	Evidence Summary
Pharmacological	2	Midodrine	Consistent BP improvement; reduced symptoms
Non-Pharmacological	11	Exercise, compression garments, Functional Electrical stimulation (FES), biofeedback	Variable findings, compression most effective

- Significant clinical diversity and lack of methodological homogeneity prevented meta-analysis.
- Narrative synthesis was therefore performed.

Key Findings

- **Midodrine** demonstrated consistent improvements in orthostatic BP control and tolerance.
- **Compression therapy** (abdomen and/or legs) reduced BP drops and improved symptoms.
- Evidence for FES, exercise training, and biofeedback was promising but inconsistent.
- Study quality was variable; most had small sample sizes and limited blinding.

Conclusions

- Current evidence supports midodrine and compression therapy as effective interventions for OH in acute SCI.
- Evidence base remains limited; larger, high-quality studies are needed to confirm optimal treatment protocols

Case Study: Management of Orthostatic Hypotension in a Female with C5/6 Spinal Cord Injury (ASIA B)

Patient Profile:

Age/Sex: 44-year-old female

Diagnosis: C5/6 fracture-dislocation, ASIA Impairment Scale B (sensory incomplete)

Symptoms: Marked dizziness, presyncope, and reduced cognition occurring within in therapy. Three minutes of moving from supine to sitting. These symptoms, with a systolic BP drop >30 mmHg, significantly limited her ability to sit out in a chair and engage

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Outcomes:

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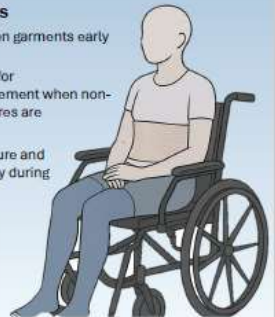
Functional gain: Patient achieved her personal goal of sitting out in a tilt-in-space chair and was able to get married in hospital on her original wedding date.

Clinical Reflection:

A combination of compression therapy, gradual postural adaptation, and titrated midodrine led to improved hemodynamic stability, functional participation, and personal achievement. Enhanced hydration and electrolyte support likely contributed to success. This case exemplifies the systematic review's findings supporting multimodal, patient-centered interventions in the management of orthostatic hypotension following acute SCI.

Clinical Implications

- ✓ Integrate compression garments early during rehabilitation.
- ✓ Consider midodrine for pharmacological management when non-pharmacological measures are insufficient
- ✓ Monitor blood pressure and symptoms systematically during postural transitions.



Managing Orthostatic Hypotension in Acute Spinal Cord Injury: A Systematic review

Poster Presentation

THANK YOU FOR LISTENING

ANY QUESTIONS?



HOW CAN THE ABDOMINAL BINDER HELP?

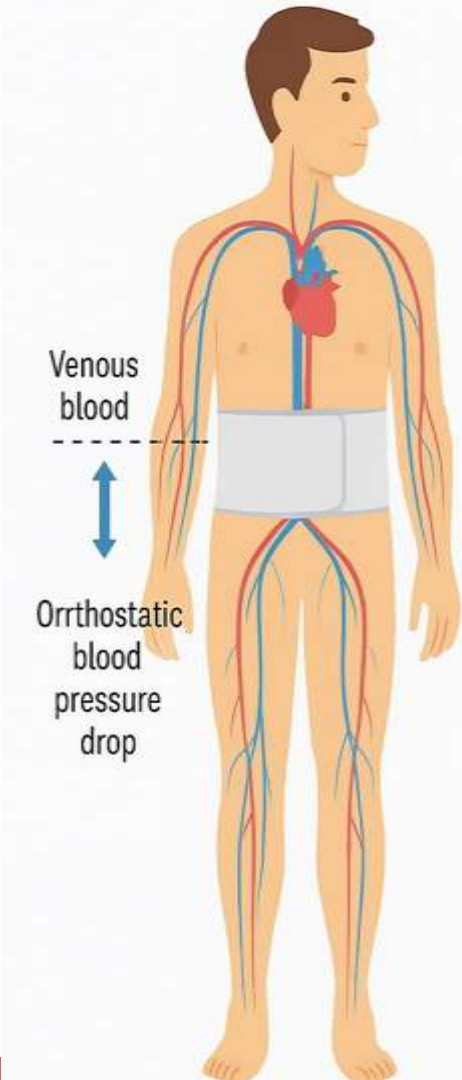
Compresses the abdomen

Increases intra-abdominal pressure

Improves venous return

Raises/stabilizes BP when upright

Improves tolerance of sitting/mobilization



1 INCREASES VENOUS RETURN
Abdominal compression prevents blood from pooling in the abdomen, increasing preload and cardiac output

2 REDUCES ORTHOSTATIC BLOOD PRESSURE DROP
Can decrease the fall in blood pressure upon standing

3 ENHANCES POSTURAL TOLERANCE
Improves symptoms of dizziness and supports standing activities

SIMPLE AND NON-PHARMACOLOGICAL
Can be a useful treatment option for orthostatic hypotension

ORTHOSTATIC HYPOTENSION

Definition

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