

INTRODUCTION

Background :

- **Spinal cord injury** (SCI) leads to motor, sensory, and autonomic impairments affecting mobility and daily life.¹

Why Exoskeletons?

- Enable activity², but use in high SCI patients could be challenging³
- This study aimed to assess Atalante (Figure 1) **exoskeleton safety** in high paraplegia and tetraplegia patients.

ATALANTE X FUNCTIONALITIES

WALKING

- **Forward:** Active/Passive mode
- **Backward & Lateral:** Passive

MODES

- **Passive mode:** fully assisted walking without active participation
- **Active mode:** variable assistance with active participation; ranging from 100% to -25%

BALANCE TRAINING

- **Activities:** reaching, squats, activities such as badminton



Figure 1. Tetraplegic patient during training with the Atalante exoskeleton (Wandercraft, France)

METHODS

Study design:

- **Retrospective safety study** in high SCI (tetraplegia/high paraplegia, Neurological Level of Injury (NLI) \leq T4) (Figure. 2).
- Inclusion: \geq 1 **Atalante exoskeleton** training session.

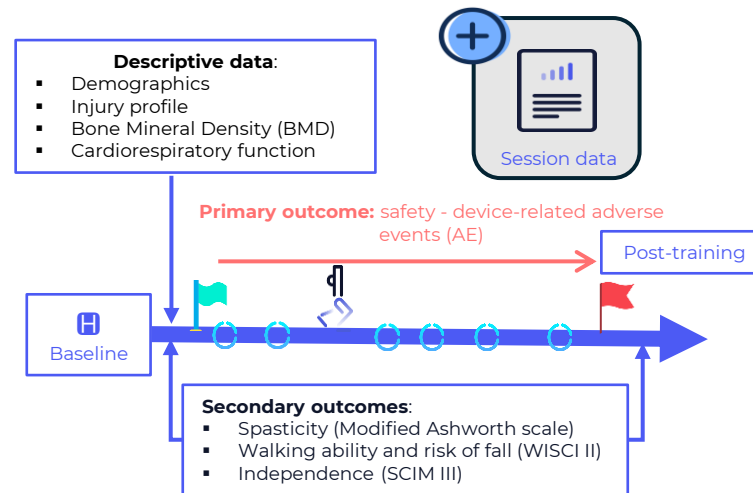


Figure 2. Study flow-chart and outcomes measures

RESULTS

Participants (n = 33 SCI)

- 22 complete SCI (12 tetra / 10 para)
- 11 incomplete SCI (10 tetra / 1 para)
- **Time since injury:** 2.6 ± 4.7 yrs

Atalante training sessions

- 17 \pm 21 sessions/patient
- 32 \pm 12 min/session
- 635 \pm 398 steps/session

Primary outcome

Safety: 1 AE / 547 Atalante sessions

- T1 complete SCI patient
- Fatigue, dizziness, hypotension, occurred after 12 training sessions

Secondary outcomes

Post-training: WISCI II & SCIM improved (Figure 3) ; other measures unchanged

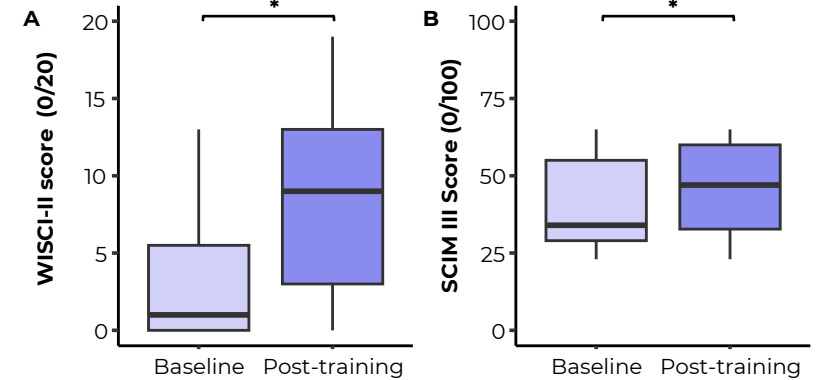


Figure 3. (A) WISCI II and (B) SCIM III scores, baseline vs post-training with Atalante in incomplete SCI participants. $p < 0.05$ (Wilcoxon test)

DISCUSSION - CONCLUSION

- **Safe use of Atalante in tetraplegia/high paraplegia** with few AE, consistent with SCI literature.¹
- Functional gains (WISCI II, SCIM) : **favorable risk-benefit ratio.**
- Further studies needed to confirm the benefits of exoskeletons in high SCI.

REFERENCES

¹Rodriguez Tapia G, et al. Wearable powered exoskeletons for gait training in tetraplegia: systematic review. Acta Neurol Belg. 2022;122(5):1149-62; ²Molteni F, et al. Exoskeleton and end-effector robots for limb rehabilitation: narrative review. PM R. 2018;10(9 Suppl 2):S174-88; ³Wecht JM, et al. International Standards to document autonomic function after SCI (ISAFSCI), 2nd ed. Top Spinal Cord Inj Rehabil. 2021;27(2):23-49.