

## Objective:

- Study pressure injury (PI) category **II-IV** (including suspected deep tissue injury and unstageable PIs) cumulative incidence and PI category **III-IV** wound evolution in the sacral (sacrum, ischium and ilium) in this single patient case within the community.
- Observing the patient and family's experience and perceptions of factors such as pain and mattress comfort.

## Study Timeframe:

- **6** months of AdaptAir™ Mattress System on a 1-in-2 cell alternation, 10 minute cycle.

## Patient Profile:

- **Weight** - 160kg.
- **Presenting Condition** - Bilateral transfemoral amputations (under the hip).
- **Mobility** - Hoist transfer only. Minimal weight shifting, spends the majority of time in bed or a powered wheelchair.
- **Sleeping Position** - The required 45° sleeping position due to respiratory issues is a known factor that increases shear and friction issues, which can drive tissue breakdown over time.
- **Presenting Issue** - Chronic, non-healing stage 3-4 pressure injuries on the sacral/coccyx area, has been present for over 18 months.

## Background & Challenges:

- High - acuity case with multiple, compounding risk factors for persistent injuries.
- Patient's bilateral amputation significantly reduced surface area for pressure redistribution, thus concentrating pressure to the patient's sacrum and coccyx area.
- Patient's respiratory issues required a 45° sleeping position which dramatically increased shear and friction forces, a primary driver of tissue breakdown over time.
- Despite regular repositioning and wound care, the patient's injuries showed no sign of tissue repair or healing for over 18 months.
- This non-healing status underscored that standard support surfaces were unsuccessful in resolving this patient's complex injuries.

## Intervention:

- The AdaptAir™ Mattress System was introduced. Given the patient's unique anthropometric profile, a custom configuration was designed to concentrate air-therapy in the necessary areas.

## Configuration & Rational:

- **Mattress Core** - Full-Air system in a 1-in- 2 cell alternation mode on a 10 minute cycle.
- **Foot Section** - Five air-cells were removed from the foot of the mattress and replaced with high-pressure relief foam (HygroFlex™), due to the patient being a bilateral amputee, the patient had a shorter effective body length. Removing these cells allowed the system's air volume and pressure to be directed to the sacral region with concentrated therapy.
- **Head Section** - Three cells were removed at the head to further optimise the system for his shorter surface area and elevated resting position.

## Advanced Pump & Data Monitoring:

- **High Performance Pump** - The system was powered by a high-capacity 10 L/min pump to rapidly inflate and cycle the reduced number of cells in the custom configuration, thus supporting optimal off-load time.
- **Local Connectivity & Live Pressure Monitoring** - The system featured a wireless - connected app that allowed the clinical team to:
  1. **Precisely Calibrate Pressure** - Ensuring the mattress was operating within the ideal therapeutic pressure thresholds for this specific patient.
  2. **Prevent “Bottoming-Out”** - Continuous monitoring to ensure the patient's body was not compressing the cells to the point where he was in contact with the base of the mattress; a primary factor in causing pressure injury.
  3. **Proactive Adjustments** - Allows for data-informed local adjustments to take place, thus maintaining optimal therapeutic pressure.

Buttocks beginning of trial  
(Jan 2025)



Buttocks during trial stage -1  
(April 2025)



Buttocks during trial stage -2  
(April 2025)



Buttocks 6-months after intervention  
(July 2025)



*(Patient consent was obtained for anonymous use of images and clinical detail)*

## Conclusion:

- This case study demonstrates that a data-driven, individually configured pressure-management strategy incorporating an alternating support surface may be inversely associated with improvements in skin integrity in a patient presenting with complex, long-standing pressure-related tissue compromise.
- In this instance, the support surface, used in conjunction with a high-air-flow pump, was adjusted within the parameters of its adaptive design to create a controlled therapeutic environment. This enabled targeted, mmHg-specific pressure modulation, providing a mechanism to mitigate the risk of “bottoming out” while allowing for more precise adjustments to key factors, including envelopment.
- On balance, the data suggests that the capacity to monitor and verify alternating pressure delivery within a controlled environment—while simultaneously preventing bottoming out—may be associated with the resolution of an 18-month cycle of non-healing.