

ACCULINE: Hybrid Powered Surgical Stapler with Real-Time Tissue Sensing Technology

Thomas G Wenchell; Stephen Lampkin; Joseph Leveillee | RevMedica™, Inc



BACKGROUND

Surgical staplers are widely used in surgery; however, current platforms provide limited objective feedback to help gauge tissue thickness and compression.

FDA MAUDE (2019–2023) identified 9,832 Stapler malfunctions - 1,758 serious injuries or deaths.

ACCULINE™ has received the U.S. Food and Drug Administration’s (FDA) Safer Technology Program “STeP” designation and features:

- Integrated real-time tissue sensing
- Controlled staple deployment - improved overall performance
- Universal ergonomics
- Sustainable, re-usable hybrid system

METHODS

The ACCULINE system incorporates a reusable Precision Control Module (PCM) with integrated force and tissue compression resistance sensing to inform surgeons.

- Real-time tissue thickness and stability measurement
- Target compression range: 8–15 g/mm²
- Adaptive deployment speed control
- Time-stamped procedural data capture

Compression and force–distance data are used for machine inference learning to inform the proprietary algorithm.

RESULTS

Controlled testing demonstrated:

- Cartridge selection guidance based on measured tissue parameters
- Maintenance of target compression ranges
- Automated alerts at excessive deployment forces and obstruction detection
- Consistent staple formation across various resistance profiles

Clamp pressure thickness-deployment force relationships and on-device feedback are shown below.

DISCUSSION

Direct intraoperative tissue compression assessment remains limited in current stapling platforms, which rely on inferred measurements with less accuracy.

Real-time sensing may improve cartridge selection accuracy and standardize compression within physiologic ranges.

Quantitative compression force data enables intraoperative decision-making. Correlating metrics with clinical outcomes supports ongoing optimization and performance refinement.

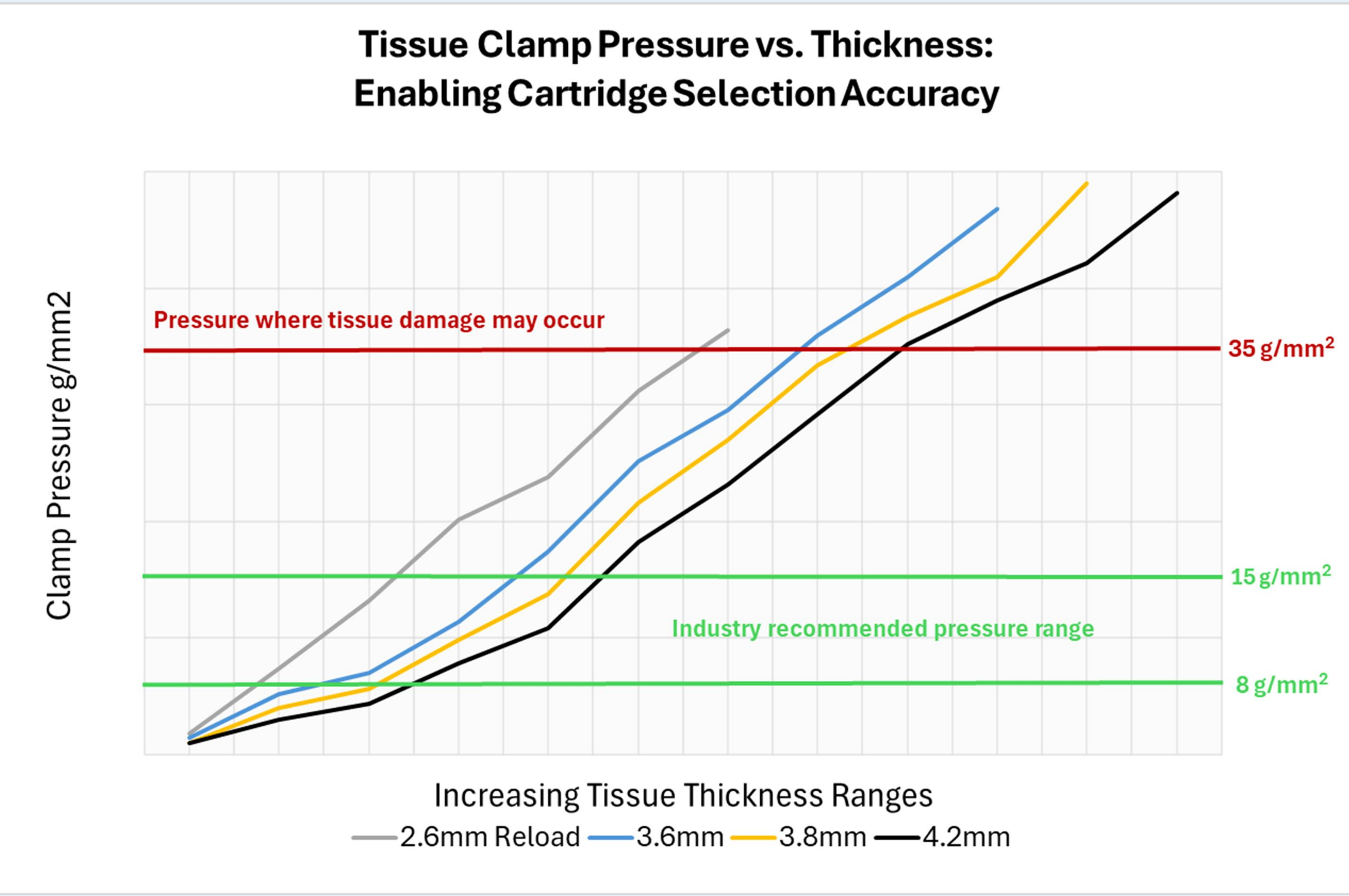


Figure 1. Tissue Clamp Pressure vs. Thickness – Cartridge Selection Accuracy

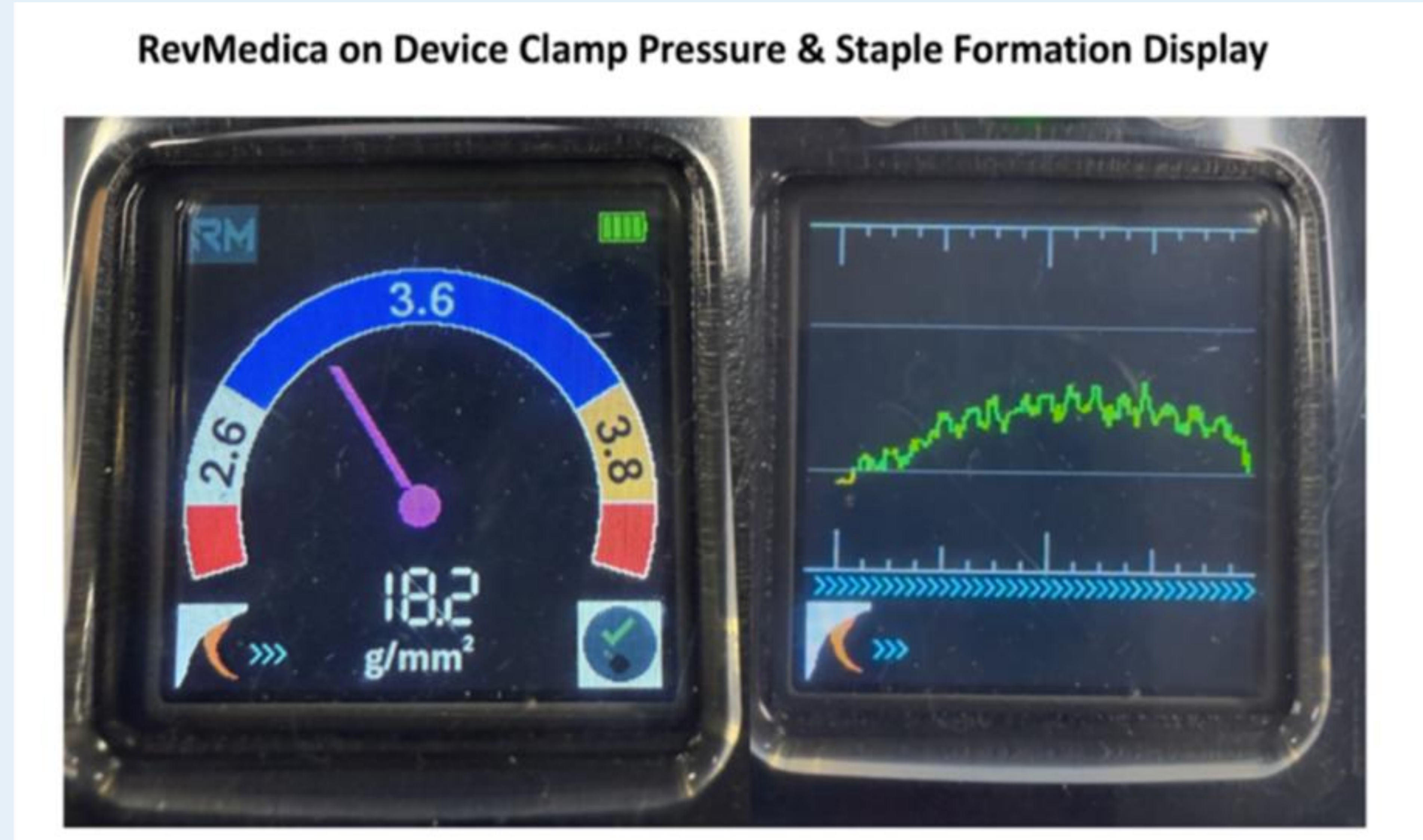


Figure 2. ACCULINE Clamp Pressure and Active Staple Formation Display