Head-to-Head:
A Biomechanical Comparison Between the AMS™ LGX 700 and The Coloplast™ Titan

The penile implant is designed to emulate an erection in the form of a hydraulic pump.

- Penetration (longitudinal column rigidity).
- Horizontal lie of the penis (horizontal rigidity).

Highlight the inherent differences between the two penile implant devices in an ex-vivo setting.

- Circumferential expansion
- Longitudinal and circumferential expansion
Coloplast™ and AMS™ devices have many similarities. However, there is sparse data to support which device is advantageous and in what scenario a surgeon should choose one manufacturer over the other. Are the devices so similar that we can leave the device placement to “surgeon’s preference”? 

Introduction
Discrepancies in Devices

- Dissatisfied with the rigidity of their device for penetration after being trained on proper use.

- Men noticed that the phallus hung in a more dependent position after placement of the IPP.
Methods

- **Penetration** (longitudinal column rigidity).
  - Column compression.
  - Defined device failure as a visible cylinder kink denoted.

- **Horizontal lie** of the penis (horizontal rigidity).
  - Cantilever test.
  - Simulated resistance to bending with gravity with and without weights.
  - Large deflection angles signify less rigidity.
Methods/Testing

- Rice University Materials Science and Nano-Engineering Department (Houston, TX, USA)
- ADMET eXpert 7600 Single Column Testing Machine
- ASTM D747-10
Methods

- **Implants**
  - Coloplast Titan (18 and 22 cm)
  - AMS 700 LGX (18 and 21 cm)
  - A 60 cc syringe as surrogate reservoir.
  - Cylinders were inflated with 0.9% NS to various fill pressures then clamped off. The cylinders were pressurized into an intact column by pumping.
  - We compared each device at an inflation pressure of 10, 15, and 20 pounds per square inch.
  - We tested both cylinders from each manufacturer to minimize intra-cylindrical variation within a device.
**Methods**

- **Column Compression** *(To Simulate Penetration)*:
  - The cylinders were compressed along their longitudinal axes.
  - The testing machine compressed the implants longitudinally at an automated setting of 1 inch/minute (2.54 cm/min).
  - Sensors recorded the length of compression sustained until the implant kinked (device failure).
  - Device failure was noted as the force required to generate a kink in the cylinder which was determined both visually and by a sudden drop in load pressure during testing.
Longitudinal Column Rigidity (Pressure Loading)
Longitudinal Column Rigidity (Kink Position)
Methods

- **Cantilever Test (Horizontal lie):**
  - Device angle in a loaded and an unloaded setting in the form of a cantilever test.
  - The inflated cylinders were hung horizontally and were fastened into a custom-machined metal holder secured on a horizontal surface.
  - Horizontal bend was measured with the device unloaded and with a weight of 20 g applied 76 mm the base of the implant to simulate a bending load.
Methods

Deflection
Horizontal Rigidity
10 PSI
Horizontal Rigidity
10 PSI Loaded
Cantilever Test

Unloaded Cantilever

Angle of Displacement (degrees)

Fill Pressure (psig)
- 10
- 15
- 20

LGX 18 cm  LGX 21 cm  Titan 18 cm  Titan 22 cm
Device

Loaded Cantilever

Angle of Displacement (degrees)

Fill Pressure (psig)
- 10
- 15
- 20

LGX 18 cm  LGX 21 cm  Titan 18 cm  Titan 22 cm
Device
The Coloplast™ Titan was more resistant to longitudinal and horizontal forces especially at lower pressures (fill volumes).

The Coloplast™ Titan was less sensitive to changes in fill pressures.

The AMS™ 700 LGX implants became longer with increasing pressures, with the 21-cm implant having the most change in cylinder length.

Coloplast cylinders had changes in length only at higher pressure loads.
Patients who have partners who require increased pressures to achieve penetration also might benefit from the increased longitudinal strength of the Coloplast™ devices, especially at lower pressures.

Patients who may not be motivated or capable of filling the device to higher volumes may benefit from a circumferential expansion devices as these are less dependent on filling pressures.
Conclusions

- Axial loading may translate to more biomechanical issues for patients who have corporal fibrosis as they may need high pressures to achieve a rigid straight erection.

- Our results suggest that differences in longitudinal load response during penetration are due more likely to differences in manufacturer design and materials than to the size of the device.
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