Title: Standard vs. Retentive Polyethylene Liner in RTSA: An Intercompany Product Comparison

Running Title: RTSA Liners: An Intercompany Product Comparison

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ABSTRACT

Introduction: This study aims to evaluate how different manufacturers define and distinguish between standard and retentive liners, addressing a current gap in uniform classification and helping guide surgical decision-making in RTSA.

Methods: Data on polyethylene liners were collected through direct communication with representatives and engineering teams from major RTSA implant manufacturers in the United States. Constraint ratios were calculated using liner depth and glenoid radius, and for select designs, lip heights were used. All available sizes and diameters were analyzed, and data were cross-referenced with published literature and product manuals.

Results: The mean constraint ratio for standard liners was 48.78% (SD = 5.74%), with values ranging from 40% (Medacta Shoulder System) to 62% (Stryker Reunion S). Several devices fell outside one standard deviation from the mean, indicating notable inter-company variability. A one-way ANOVA confirmed significant differences among standard liner designs ($p = 2.35 \times 10^{-16}$). For retentive liners, the mean constraint ratio was 63% (SD = 3%), ranging from 47% to 71%. Again, multiple devices fell outside the expected range, and ANOVA results demonstrated significant variation across manufacturers ($p = 9.31 \times 10^{-11}$).

Conclusion: Significant variability exists among manufacturers in defining standard and retentive liners in RTSA, with constraint ratios ranging widely despite average values of 49% and 63%, respectively. This inconsistency can complicate surgical decisions, especially during revisions or when switching systems, potentially leading to unintended biomechanical outcomes. Standardized definitions and metrics are needed to guide liner selection and improve predictability in joint stability.
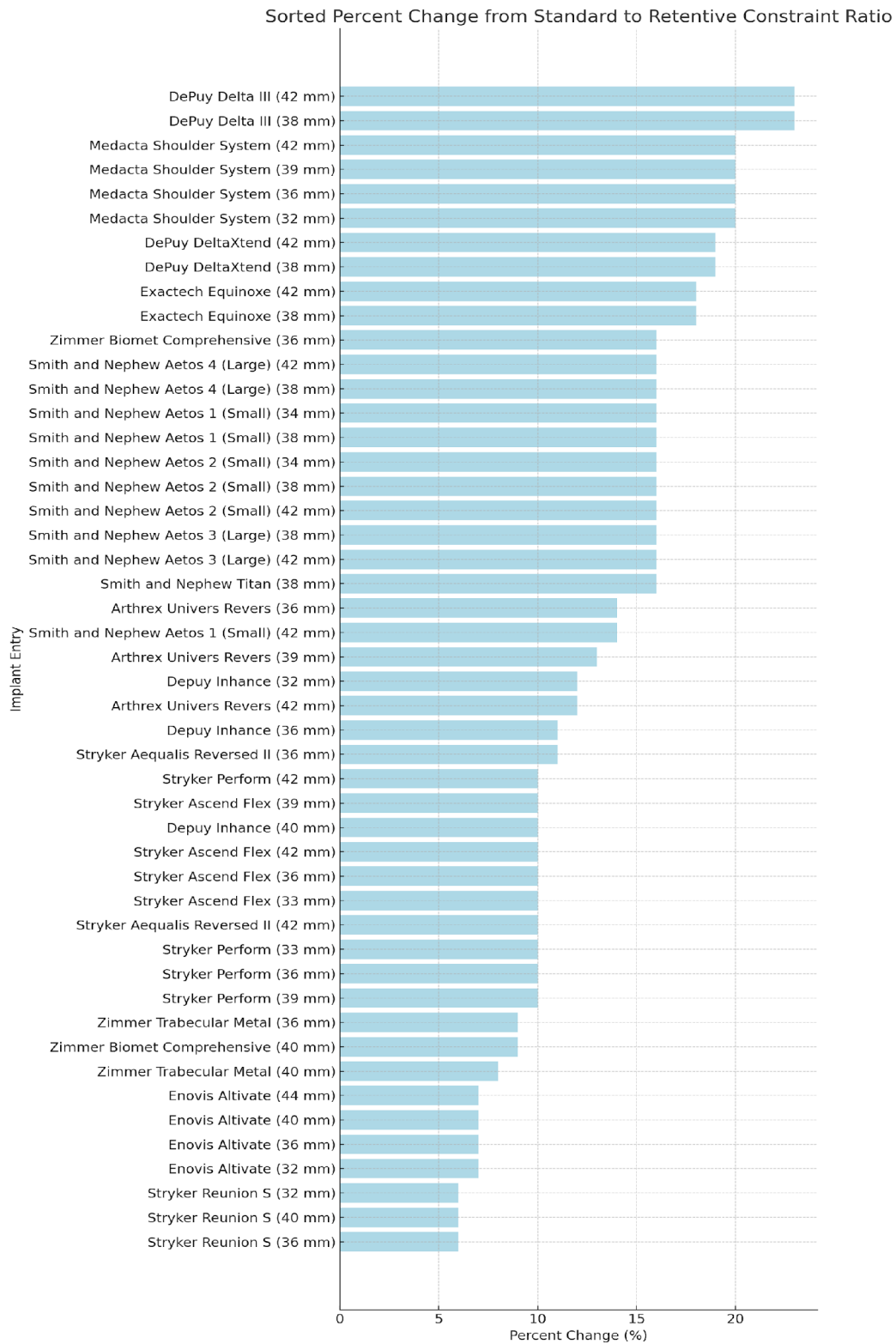
FIGURES

Figure I. Percent Change from Standard Liner to Retentive Liner