

Ergonomic Advantages of the Synergy Shaver™ Handpiece

Arthrex Research



INTRODUCTION

Ergonomic performance is a critical component of shaver handpiece design, directly influencing surgeon comfort, control, and overall efficiency during arthroscopic procedures. Prolonged use of handpieces that are not optimized for ergonomics may contribute to hand fatigue, reduced precision, and workflow inefficiencies during surgery.

Ergonomics in this context is defined not by a single attribute, but by the balance and integration of multiple design characteristics, including device shape and size, grip comfort, surface texture, weight and balance, button accessibility and tactile feedback, and suction valve accessibility and actuation force. This study¹ aims to evaluate and compare the ergonomic performance of four shaver handpieces by assessing these attributes collectively, providing a holistic understanding of how handpiece design influences comfort, ease of use, and control in a simulated surgical environment.

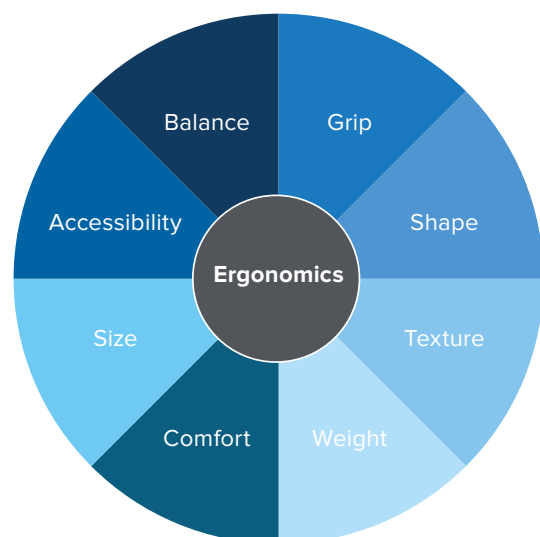
MATERIALS AND METHODS

A within-subjects study design was used to evaluate the ergonomic performance of four shaver handpieces, Synergy Shaver™ handpiece (Arthrex), Formula CORE Shaver Handpiece (Stryker), PLATINUM Shaver Handpiece (Smith & Nephew), and Ergo™ Shaver Handpiece (ConMed). Nine orthopedic surgeons (aged 41 to 60 years; 7 right-handed, 1 left-handed, 1 ambidextrous) were selected. Although recruiting was limited to nine participants and a formal *a priori* power analysis was not performed, statistically significant differences with a large observed effect size (partial η^2) were identified. Users completed a series of simulated surgical tasks with each device to replicate real-world hand movements, grip styles, and manipulations commonly performed during arthroscopic procedures. All branding was concealed to minimize bias, and devices were presented in a randomized order for each participant.

Testing was performed in a controlled environment incorporating a simulated shoulder model and an arthroscopic visualization system to ensure realistic hand positioning and handling conditions.

During each evaluation, handpieces were powered off to isolate ergonomic feedback independent of cutting performance. Participants completed standardized Likert-scale assessments, a 5-point scale ranging from strongly disagree (1) to strongly agree (5), for each device, rating eleven ergonomics-related attributes including shape, size, comfort, grip security, texture, balance, weight, button accessibility and tactile feedback, and suction valve accessibility and actuation force. These measures were selected to capture a comprehensive view of device ergonomics across all relevant handling characteristics.

Data were analyzed using repeated measures analysis of variance (ANOVA) and the Mauchly's test of sphericity to evaluate differences in average ergonomics ratings between devices. Planned pairwise comparisons were used to assess specific differences while controlling individual variability.



RESULTS

Descriptive statistics showed that the Synergy Shaver™ handpiece (Arthrex) received the highest average ergonomic rating (4.158), while the Ergo Shaver Handpiece (ConMed) received the lowest average ergonomic rating (3.480). Statistical significance was defined as $P \leq .05$. Mauchly’s test of sphericity was not significant ($P = .433$), indicating that the assumption of sphericity was met, and standard ANOVA results could be interpreted without correction. ANOVA revealed a statistically significant effect of device on ergonomics ratings, $F_{4,32} = 6.044$; $P < .001$, with a large effect size ($\eta^2 = 0.430$; Table 1). This white paper summarizes key findings from a broader analysis documented in the referenced report.

Table 1: Mean Ergonomic Score

Handpiece	Mean Ergonomic Score (95% CI)
Synergy Shaver Handpiece (Arthrex)	4.16 (3.60 to 4.72)
Formula CORE Shaver Handpiece (Stryker)	3.790 (3.40 to 4.20)
PLATINUM Shaver Handpiece (Smith & Nephew)	3.639 (3.00 to 4.28)
Ergo Shaver Handpiece (ConMed)	3.480 (2.81 to 4.16)

Figure 1. Synergy Shaver Handpiece

The planned contrasts testing showed that the Synergy Shaver handpiece (Arthrex) was significantly higher than the PLATINUM Shaver Handpiece (Smith & Nephew) ($P = .033$) and the Ergo Shaver Handpiece (ConMed) ($P = .005$). While the difference between the Synergy Shaver handpiece (Arthrex) and the Formula CORE Shaver Handpiece did not reach statistical significance, the effect size suggests a moderate to large difference in ergonomic ratings for various ergonomic attributes.

CONCLUSION

Overall, the evaluation identified measurable differences in ergonomic performance between devices. The Synergy Shaver handpiece (Arthrex) handpiece received a higher overall average ergonomic rating across multiple factors when compared with competitive devices. These findings are supported by statistically significant differences and large effect sizes in key comparisons, indicating meaningful advantages in perceived comfort, control, and ease of use.

Reference

- 1. Arthrex, Inc. Data on file (1108614). Naples, FL; 2025.

