

Biomechanical Investigation of the Colonoscopy Procedure: Is Practitioner Injury Risk Greater with Patients in the Right or Left Lateral Decubitus Position?

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Summary

Colonoscopies have been associated with physician injury. They are completed in three positions to improve visualization of the colon: the left and right lateral decubitus (LLD, RLD) and supine positions. We studied the effect of patient posture on physician ergonomic risk factors (discomfort, muscle activity, posture) during a simulated procedure. The Rapid Upper Limb Assessment (RULA) score was significantly higher in the RLD and supine positions compared to LLD, no other outcomes were significantly different between patient positions. However, the RULA score indicated an elevated injury risk: that all three postures should be changed and would not necessarily be safe at high volumes and for extended durations. While additional analyses are run on the current data set, more research is needed using longer durations and real-world settings to determine how colonoscopy procedures can be changed to reduce physician injury risk.

Introduction

Colonoscopies have been related to increased physician musculoskeletal injury risks, but little evidence exists about the physical demand on the back. They are traditionally performed with the patient left lying (LLD) but the right (RLD) position in combination with left and supine improves colon visualization [1]. Our earlier field study determined that physicians generally prefer the LLD position (89%), and both left and right positions are associated with increased musculoskeletal injury risk [2]. The purpose of this study was to explore the effect of patient posture on back posture and muscular demand and perceived pain and exertion using a simulated colonoscopy procedure.

Methods

Eighteen endoscopists (8M/10F) completed simulations with the three positions in a block randomized order (10-min). At the start and end of each trial, participants completed ratings of perceived discomfort (100 mm visual analog scale) and exertion for the lower back (CR-10 Borg scale). Surface EMG of the bilateral lumbar erector spinae at L1 (RLS and LLS) was measured throughout the trials (Desktop DTS, Noraxon, Phoenix, AZ, USA). Trunk and neck angles were measured using 3D motion capture (3D Investigator, Northern Digital Inc., Waterloo, ON, CA). RULA was scored on a subset of participants. Average normalized EMG (%MVC), neck and truck angle, and baseline-removed perceived discomfort and exertion were compared between conditions with a one-way MANOVA or Wilcoxon signed-rank test and Tukey post hoc tests ($p < 0.05$).

Results and Discussion

LLD was associated with significantly lower RULA scores than RLD and supine. Other outcomes were not significantly different. RULA for RLD and supine indicated “further investigation required, change soon” whereas LLD indicated “further investigation required, change may be needed”. Suggesting elevated risk for all postures at high volumes and for extended durations. Future research should examine longer durations and real-world scenarios to better understand the impact of patient positioning on injury risk. Additional data analyses are being run on the current data set.

Table 1: Average \pm SD for the patient positions. * $p < 0.05$

Study Outcomes		RLD	LLD	Supine
EMG (%MVC)	RLS	9.24 \pm 3.96	8.05 \pm 3.91	9.24 \pm 4.60
	LLS	9.76 \pm 4.11	7.99 \pm 3.63	9.19 \pm 3.63
Spine Angle (°)	Neck	7.34 \pm 11.63	5.79 \pm 12.25	9.53 \pm 13.73
	Back	-4.44 \pm 9.60	-4.19 \pm 8.89	-5.44 \pm 9.15
RULA Score		5.9 \pm 1.45	4.1\pm1.45*	5.5 \pm 1.65
Perceived Exertion (CR-10 BORG)	Neck	1 \pm 1	0 \pm 0	0 \pm 1
	Lower Back	2 \pm 2	1 \pm 1	1 \pm 1
	Right Hand	1 \pm 1	1 \pm 1	2 \pm 1
	Left Hand	1 \pm 1	0 \pm 1	2 \pm 1
Perceived Discomfort (VAS /100mm)	Neck	6 \pm 14	1 \pm 3	2 \pm 6
	Lower Back	13 \pm 22	2 \pm 8	4 \pm 10
	Wrist/Hand	9 \pm 11	5 \pm 11	9 \pm 10

Conclusions

All three physician postures require change and are not necessarily safe for extended durations and likely contribute to elevated physician injury risk. More research is needed to identify what possible ergonomic modifications should focus on. Ergonomic training, with consideration of patient position, should be considered in the meantime to reduce endoscopists' back discomfort and risk of injury during colonoscopy.

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References

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- [2] Landry et al (2023). *BMC MSK Disord*, 24(1), 475.