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Title: Leveraging a 3D-Printed Spine Model to Study Medication Spread in Spinal Anesthesia

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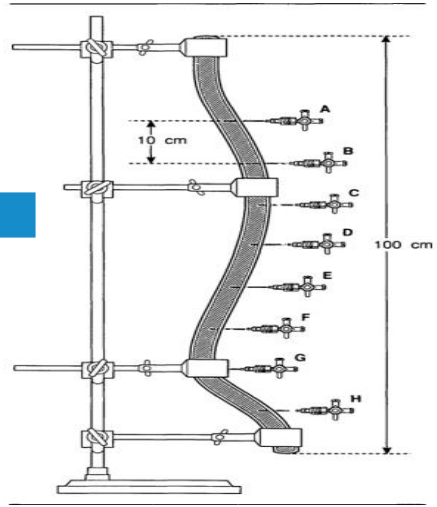
Background: How Does the Medication Spread within the CSF to achieve Effective Block?

Glass tubing

Curved Tygon tubing



Adams, C. N. (2005). Arthur Barker and the 'glass spine'. *Anaesthesia & Intensive Care Medicine*, *6*(8), i. https://doi.org/10.1383/anes.2005.6.8.i

Lui, A. C., Munhall, R. J., Winnie, A. P., & Selander, D. (1991). Baricity and the distribution of lidocaine in a spinal canal model. *Canadian Journal of Anaesthesia*, *38*(4 Pt 1), 522–526. https://doi.org/10.1007/BF03007593

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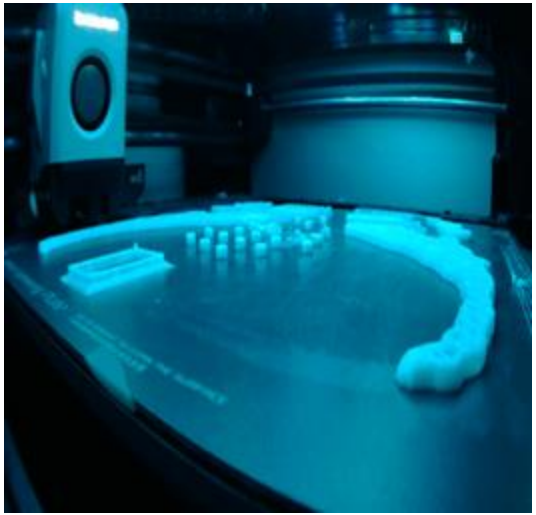
The Creation of the 3D Spine Model

Modeling in Blender

Preparing for 3D printing

Manufacturing



Final

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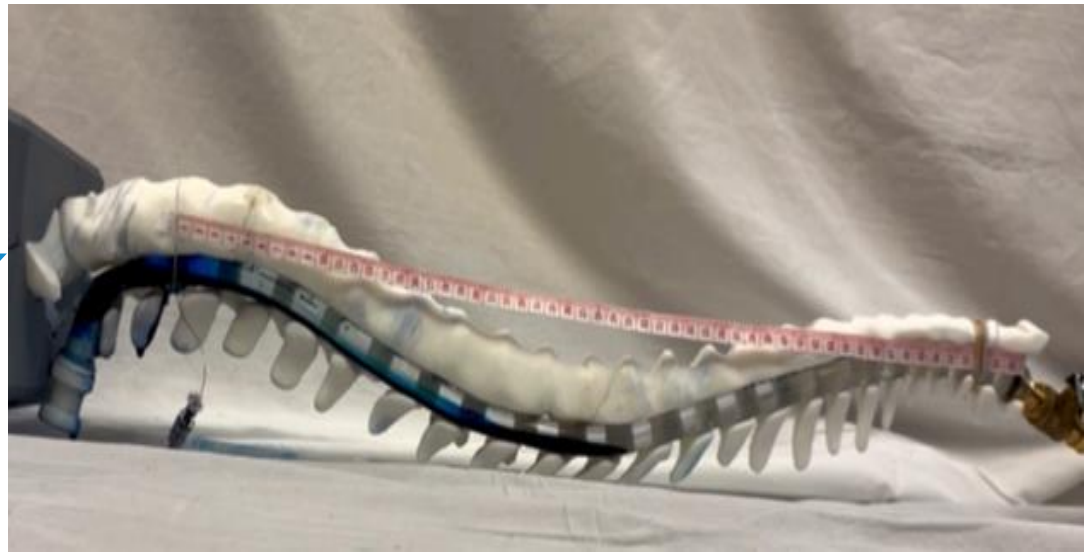
The Experiment…



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The results…

Figure 1: Spread of medication (cm) over time with corresponding vertebral levels.

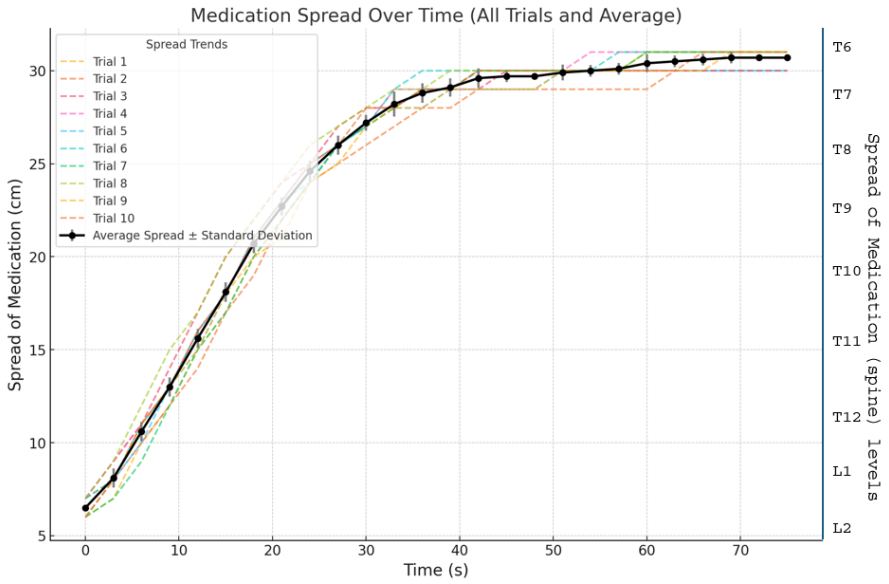
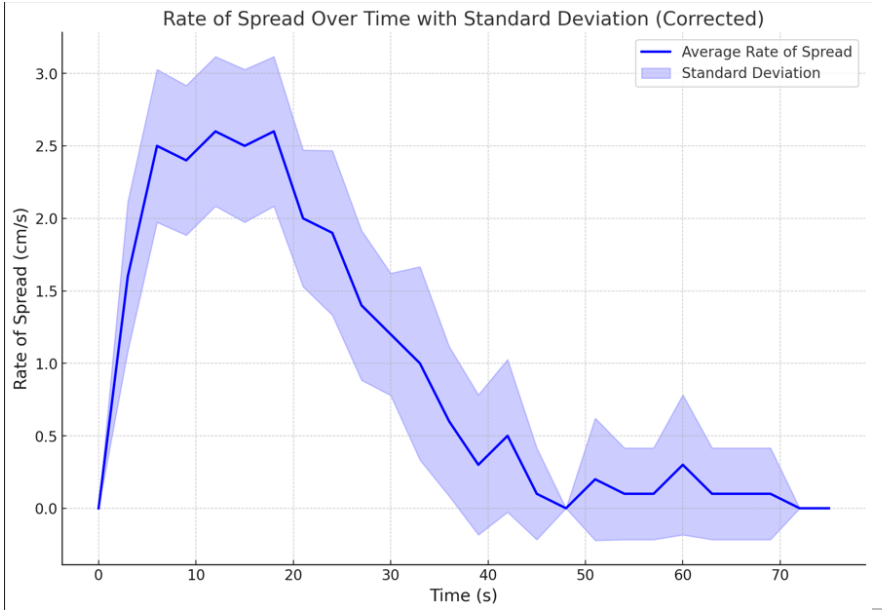


Figure 2: The rate of medication spread over time.



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Conclusions and further studies…

-In all 10 trials, the methylene blue solution spread proximally to a mean distance of 30.7 cm ± 0.316 cm, corresponding to the T6–T7 interspace.
-The average time it took to reach T6-T7 interspace was 42 seconds post injection
-The most rapid spread occurred within the first 30 seconds post-injection (Figure 1), with a peak rate of spread of approximately 2.5 cm/s between 6 and 18 seconds which can be attributed to the lumbar lordosis

- Future investigations could explore how different volumes, positions, and vertebral anatomy influence anesthetic spread after intrathecal injection.

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