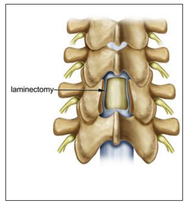
College of Engineering | School of Chemical, Biological and Environmental Engineering

MAPPING SPINE SURGICAL DECISION MAKING AND OUTCOMES

Phillip Hernandez[1], Morgan B. Giers[1]
[1]Oregon State University, Corvallis, OR, USA

BACKGROUND

The majority of people suffer from back pain at some point in their lives. Back pain is the leading cause of disability globally, ahead of 290 other conditions. Over three quarters of a million people in the U.S. receive spine surgery annually. This study was conducted to find the rates at which spine surgery patients require revision operations following their primary procedures. Our map tracks the results of surgical procedures performed on lumbar intervertebral discs.

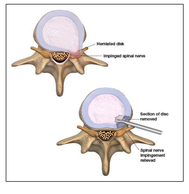


Laminectomy

An operation that relieves pressure by removing the dorsal section of the vertebra, the lamina.

Open Discectomy

An operation that removes the degenerated portion on an intervertebral disc.

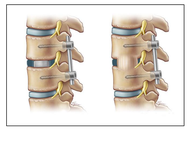


Microdiscectomy

An operation that removes the degenerated portion of an intervertebral disc through minimally invasive methods.

Spinal Fusion

An operation that utilizes bone grafts or metal plates to fuse two vertebra into one non-mobile unit.



Total Disc Replacement

An operation that replaces a degenerated intervertebral disc with an artificial biomaterial that mimics the purpose of the original disc.

RESULTS & DISCUSSION

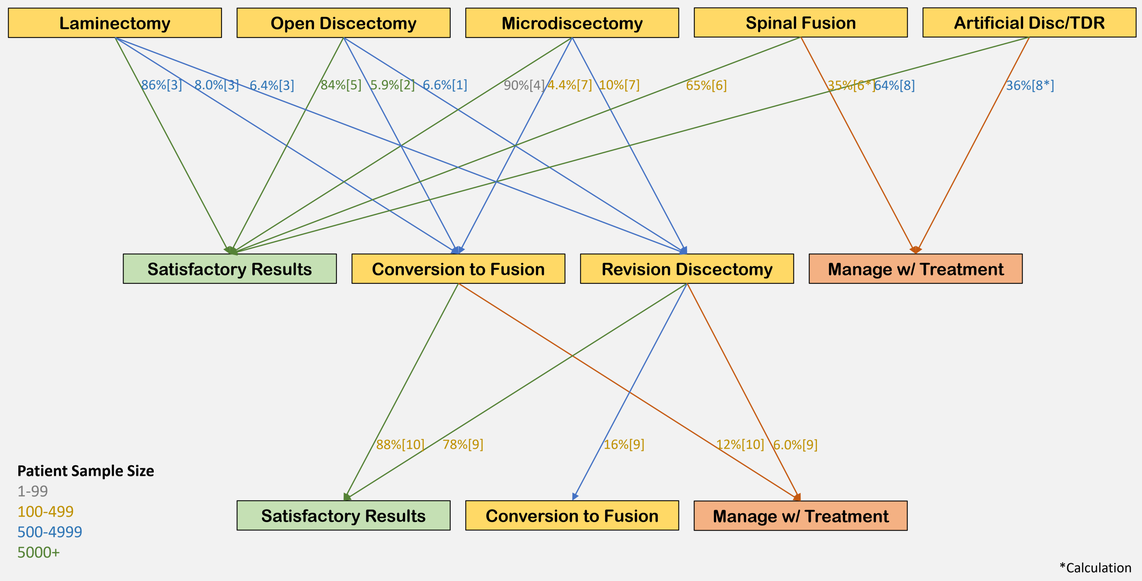


Figure 1 shows the relative outcomes of five different surgical procedures.

- Microdiscectomy has the highest rate of satisfactory results after surgery.
- An open discectomy has an 84% success rate among patients choosing to undergo the operation.
- A conversion to fusion results in a higher case of satisfactory results as a secondary procedure compared to a revision discectomy.

CONCLUSIONS & NEXT STEPS

- Next Steps:
  - Finding the success rates of a tertiary conversion to fusion
  - Factors that affect the lower success rates of primary fusion and total disc replacement

Research on the prevalence of different surgical procedures on lumbar intervertebral discs and their relative successes can help patients make an educated decision when it comes to the direction of treatment for back pain caused by intervertebral disc herniation and degeneration.

METHODS

A literature review was conducted to find the percentage of patients that have satisfactory results after surgery, manage the pain with other forms of treatment, or move on to a secondary procedure.

↓

Statistics were compiled on one spreadsheet that had the five primary operations included in our model. These include lumber laminectomy, open lumbar discectomy, lumbar microdiscectomy, lumbar spinal fusion and a total lumbar disc replacement.

↓

Pathways were drawn on Figure 1 based on common routes of treatment and surgical restrictions.

↓

Percentages were added to Figure 1 and numbers were divided by total number of patients observed in the study to find a percentage.

References
1. Patel et al. 2013. *Bone and Joint*.
2. Heindel et al. 2017. *Spine*.
3. Bydon et al. 2015. *Neurology International*.
4. Hubbe et al. 2016. *Neurosurgery Spine*.
5. Dohrmann et al. 2015. *Medical Principles and Practice*.
6. Hedlund et al. 2015. *Spine*.
7. McAnany et al. 2016. *Spine*.
8. Siepe et al. 2014. *Spine*.
9. Guo et al. 2005. *Zhonghua Wai Ke Za Zhi*.
10. Wong et al. 2002. *Chang Gung Medical*.

The OSU STEM Leaders Program is funded by NSF Award #1432810 and generous contributions from the OSU Research Office and the Colleges of Science, Agricultural Sciences, and Engineering.

Oregon State University

NSF