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How Does a Pedicle Screw System Work in Spine Surgery

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Introduction

Spine surgeries have evolved significantly with advancements in medical technology, allowing for safer and more effective treatment of spinal disorders. One of the most widely used solutions for stabilizing the spine provides strong internal support and helps in proper alignment during the healing process. It is commonly used in procedures involving spinal fusion, trauma repair, and deformity correction.



Overview of Spine Anatomy

Understanding the basic structure of the spine is essential to grasp how spinal fixation systems function during surgery. The spine not only supports the body but also protects the spinal cord and enables flexible movement.

- The human spine consists of vertebrae stacked on top of each other
- Each vertebra has a strong section called the pedicle
- Pedicles connect the front and back parts of the vertebra
- The spinal cord runs through the central canal
- Stability of the spine is essential for movement and posture



What is a Pedicle Screw System

A Pedicle Screw System is a medical device used in spinal surgeries to stabilize and immobilize specific segments of the spine. It involves inserting screws into the pedicles of the vertebrae and connecting them with rods. This structure creates a rigid framework that supports the spine while bones fuse naturally over time.

These systems are designed to provide strong anchorage within the vertebra, ensuring that the affected spinal segment remains properly aligned during the healing process. By limiting unwanted movement, they help reduce pain and prevent further damage to the spine.

In modern spine surgery, such systems are widely preferred due to their ability to offer three-dimensional stability.



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Components of the System

A pedicle screw system is made up of multiple components that work together to provide stability and support to the spine. Each part plays a crucial role in ensuring proper alignment and secure fixation during and after the surgical procedure.

- Pedicle Screws – inserted into vertebrae for anchorage
- Rods – connect multiple screws to provide stability
- Connectors – link rods and screws securely
- Locking Mechanism – ensures the system stays fixed
- Instrumentation Tools – used for accurate placement



Spinal Fixation Screws



Working Mechanism

The system works by creating a stable internal structure within the spine. Screws are anchored into the pedicles of affected vertebrae, and rods are attached to connect them. This setup restricts movement in the targeted area, allowing bone grafts to heal and fuse the vertebrae together. By maintaining alignment and reducing stress on damaged segments, the system promotes long-term spinal stability.

Additionally, this mechanism helps distribute mechanical load evenly across the spine, reducing pressure on any single vertebra. This not only enhances the durability of the fixation but also supports a smoother recovery process, enabling the spine to regain strength and function over time.



Surgical Procedure

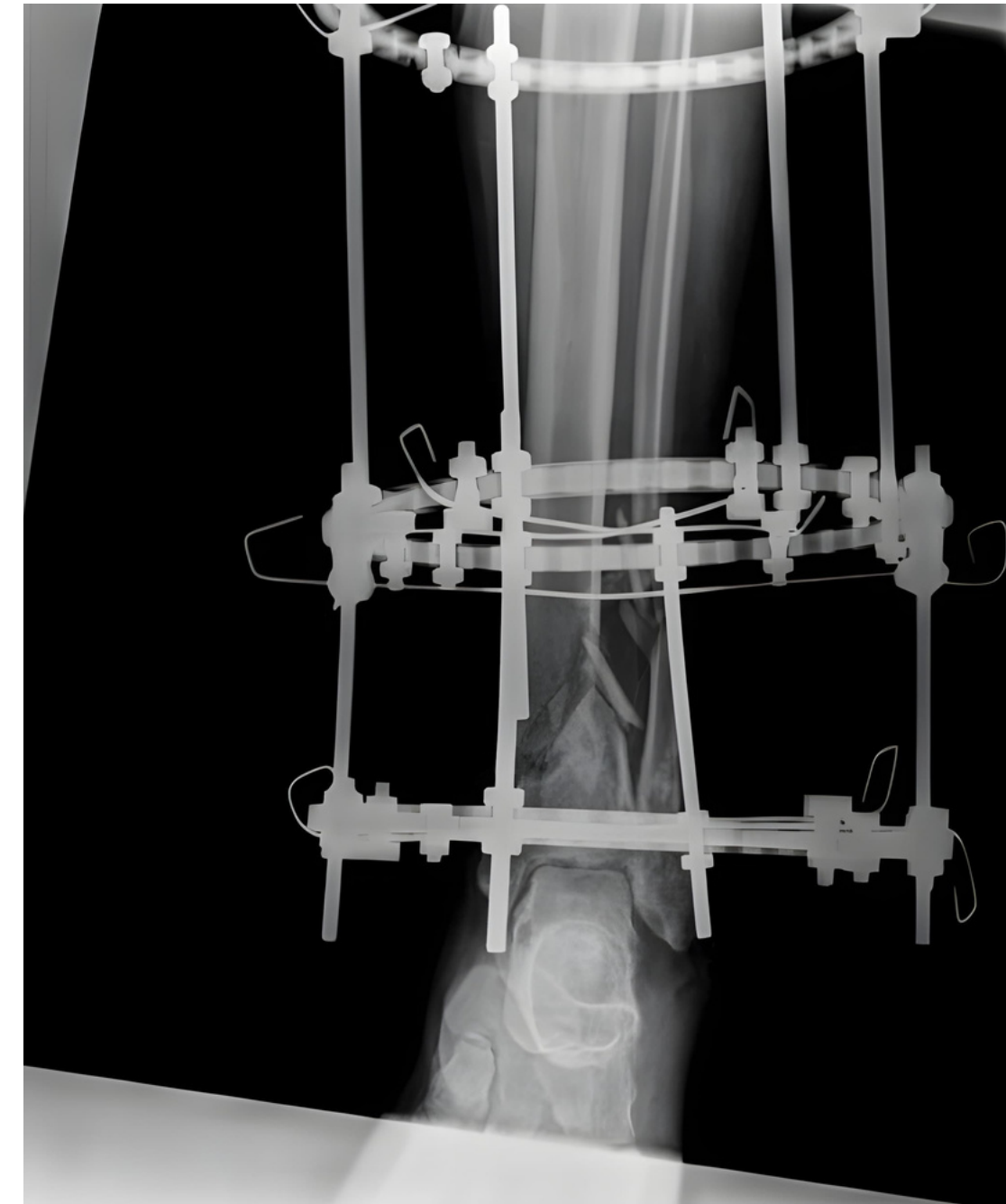
The surgical procedure involves a series of carefully planned steps to ensure accurate placement and effective stabilization of the spine. Surgeons use specialized instruments and imaging guidance to achieve precision and minimize risks during the operation.

- Patient is positioned and anesthesia is administered
- Surgeon makes an incision near the affected spinal area
- Pedicle screws are inserted using guided techniques
- Rods are attached to connect the screws
- System is tightened and secured
- Incision is closed after confirmation of placement



Benefits and Advantages

Spine surgeries have evolved significantly with advancements in medical technology, allowing for safer and more effective treatment of spinal disorders. One of the most widely used solutions for stabilizing the spine provides strong internal support and helps in proper alignment during the healing process. It is commonly used in procedures involving spinal fusion, trauma repair, and deformity correction.



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Conclusion

In conclusion, pedicle screw systems play a vital role in modern spinal treatments by offering reliable stabilization and support. Their ability to maintain alignment and promote bone fusion makes them an essential tool for surgeons. As technology continues to evolve, these systems are expected to become even more efficient, improving patient outcomes and recovery experiences.

Furthermore, advancements in design, materials, and surgical techniques continue to enhance their performance and safety. This ensures better precision during procedures and contributes to faster recovery, making them a cornerstone in advanced spine care solutions.





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Thank You !

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