The vertebral column consists of 33 vertebrae: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 4 coccygeal segments.

The vertebral column usually contains three curves. The cervical and lumbar curves are convex anteriorly, and the thoracic curve is convex posteriorly.
Ligamentous elements provide structural support, and, together with supporting muscles, help to maintain the unique shape.

Ventrally, the vertebral bodies and intervertebral disks are connected and supported by the anterior and posterior longitudinal ligaments.

Dorsally, the ligamentum flavum, interspinous ligament, and supraspinous ligament provide additional stability.
The three membranes that protect the spinal cord are the dura mater, arachnoid mater, and pia mater.

Also there is three spaces

1 - **subarachnoid space**, spinal nerves run in this space, as does CSF.
2 – **subdural space** is generally a poorly demarcated.
3- **epidural space** is a better defined potential space within the spinal canal that is bounded by the dura and the ligamentum flavum.
Spinal Cord

gives 31 pairs of spinal nerve

Spinal cord extends from foramen magnum to L1 (in adult) L3 (in infant & children).

Duramater, Subarachnoid space & subdural space extend to S2 in (adults) S3 (in children).
Blood supply

The blood supply to the spinal cord and nerve roots is derived from:

1. Single anterior spinal artery (supplies the anterior two-thirds of the cord)

2. Paired posterior spinal arteries (supply the posterior one-third)
Regional Anesthesia

Regional Anesthesia: Is the use of local anesthetics to block sensations of pain from a large area of the body, such as; an arm or leg or the abdomen ... based on the dermatomes.

Neuraxial Anesthesia: refers to local anesthetics placed around the nerves of the CNS, such as; spinal anesthesia, epidural anesthesia, caudal anesthesia.
Neuraxial anesthesia were first used for surgical procedures at the turn of the twentieth century. These central blocks were widely used worldwide until reports of permanent neurological injury appeared.

Today, neuraxial blocks are routinely employed for labor analgesia, cesarian delivery, orthopedic surgery, perioperative analgesia, and chronic pain management.
Neuraxial anesthesia in many cases providing alternatives to general anesthesia or may be used simultaneously with general anesthesia or afterward for postoperative analgesia.

Neuraxial blocks can be performed as a single injection or with a catheter to allow intermittent boluses or continuous infusions.
Spinal anesthesia:
is the injection of small amounts of local anaesthetics
into the (CSF) at the level below (L2) where the
spinal cord ends, anaesthesia of the lower body part
below the umbilicus is achieved.
Neuraxial blocks may reduce the incidence of venous thrombosis and pulmonary embolism, cardiac complications in high-risk patients, bleeding and transfusion requirements, vascular graft occlusion, and pneumonia and respiratory depression following upper abdominal or thoracic surgery in patients with chronic lung disease. They may also allow earlier return of gastrointestinal function following surgery.
The Sick Elderly Patient: aspinal anesthetic with little or no intravenous sedation may reduce the likelihood of postoperative delirium or cognitive dysfunction, which is sometimes seen in the elderly.

The Obstetric Patient: Is associated with less maternal morbidity and mortality than is general anesthesia.
Mechanism of Action

The principal site of action for neuraxial blockade is believed to be the nerve root, at least during initial onset of block.

Local anesthetic is injected into CSF (spinal anesthesia) or the epidural space (epidural and caudal anesthesia).
Manifestations

Cardiovascular: produce variable decreases in blood pressure that may be accompanied by a decrease in heart rate.

Pulmonary: there is only a small decrease in vital capacity, which results from a loss of the abdominal muscles' contribution to forced expiration.

Gastrointestinal: Neuraxial block–induced sympathectomy allows vagal “dominance” with a small, contracted gut and active peristalsis.
Indications

1. lower abdomen.
2. Inguinal.
3. Urogenital.
4. Lower extremities.
5. Lower spine.

*Upper abdominal procedures (eg, gastrectomy) have been performed with spinal or epidural anesthesia, but because it can be difficult to safely achieve a sensory level adequate for patient comfort these techniques are less commonly used.
Patient Positioning

A. Sitting Position:
The anatomic midline is often easier to identify when the patient is sitting than when the patient is in the lateral decubitus position.

This is particularly true with obese patients.

maneuver:

Patients sit with their elbows resting on their thighs or a bedside table, or they can hug a pillow &
Flexion of the spine maximizes the “target” area between adjacent spinous processes and brings the spine closer to the skin surface.
B. Lateral Decubitus:
Many clinicians prefer the lateral position.

Patients lie on their side with their knees flexed and pulled high against the abdomen or chest, assuming a “fetal position.”
Anatomic approach

A. Midline Approach.
B. Paramedian Approach.
C. Assessing Level of Blockade:
   With knowledge of the sensory dermatomes, the extent of sensory block can be assessed by a blunted needle or a piece of ice.
D. Ultrasound-Guided Neuraxial Blockade.
Factors affecting the dermatomal spread of spinal anesthesia.

- Most important factors:
  1. Baricity of anesthetic solution.
  2. Position of the patient
     - During injection
     - Immediately after injection.
  3. Drug dosage.
  4. Site of injection.
## Spinal Anesthetic Agents

The best agent is the Bupivacaine.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Preparation</th>
<th>Dose (mg)</th>
<th>Procedures</th>
<th>Duration (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Plain</td>
</tr>
<tr>
<td>2-Chloroprocaine</td>
<td>1%, 2%, 3%</td>
<td>30–60</td>
<td>Ambulatory, T8</td>
<td>1–2</td>
</tr>
<tr>
<td>Lidocaine</td>
<td>2%</td>
<td>40–50</td>
<td>Ambulatory, T8</td>
<td>1–2</td>
</tr>
<tr>
<td>Mepivacaine</td>
<td>1.5%</td>
<td>30 (T9)</td>
<td>Ambulatory surgery, knee scope, TURP</td>
<td>1–2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45 (T6)</td>
<td></td>
<td>1.5–3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60 (T5)</td>
<td></td>
<td>2–3.5</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>0.5%</td>
<td>7.5</td>
<td>Ambulatory lower limb</td>
<td>1–2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>THA, TKA, femur ORIF</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Bupivacaine</td>
<td>0.75% in 8.25% dextrose</td>
<td>4–10</td>
<td>Perineum, lower limbs(^5)</td>
<td>1.5–2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12–14</td>
<td>Lower abdomen</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12–18</td>
<td>Upper abdomen</td>
<td>4</td>
</tr>
<tr>
<td>Ropivacaine</td>
<td>0.5%, 0.75%</td>
<td>15–17.5</td>
<td>T10 level</td>
<td>2–3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18–22.5</td>
<td>T8 level</td>
<td>3–4</td>
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<tr>
<td></td>
<td></td>
<td>18–22.5</td>
<td>T4 level</td>
<td>1.5–2</td>
</tr>
</tbody>
</table>

\(^3\)W girlfriend.  
\(^4\)I first.  
\(^5\)I second.
Thank you