Exercise walk-through

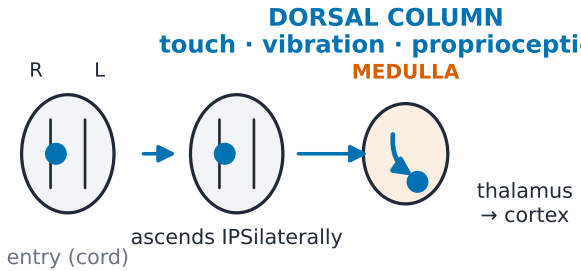
9.2 Somatosensory and pain pathways

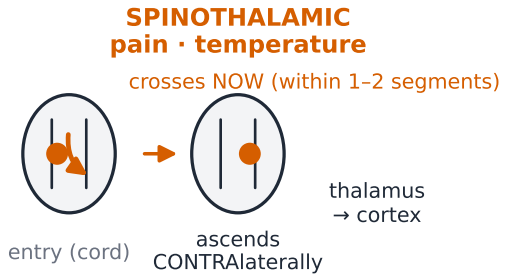
University Medicine

Somatosensory and pain pathways: two crossings

1. **Dorsal column** Fine touch, vibration, proprioception ascend IPSilaterally and cross in the MEDULLA - cord lesions hit them on the same side.
2. **Spinothalamic** Pain and temperature cross within 1-2 segments in the CORD - opposite-side loss below a lesion.
3. **Gate and referral** Aβ fibres close the gate on C-fibre pain; convergence refers diaphragm (C3-C5) to the shoulder and heart (T1-T5) to chest and arm.

The two ascending pathways and their crossing points





gate control

Aβ (touch) fibres inhibit the C-fibre pain gate in the dorsal horn — rubbing a knock closes it

referred pain = convergence

visceral + somatic afferents share segments: diaphragm (C3–C5) → shoulder; heart (T1–T5) → chest, arm

Dorsal column crosses in the medulla; spinothalamic crosses in the cord.

Exercises 2.1·2.3

2.1 Which tract crosses in the cord, and within how many segments? [3]

2.2 Why does rubbing a knock ease the pain? [3]

2.3 Diaphragm pain is felt at the shoulder tip – name the shared segments. [3]

Exercises 2.1·2.3

2.1 Which tract crosses in the cord, and within how many segments? [3]

2.1

- The spinothalamic tract – within 1–2 segments of entry ✓.

2.2 Why does rubbing a knock ease the pain? [3]

2.2

- Aβ touch traffic inhibits C-fibre pain in the dorsal horn – gate control ✓.

2.3 Diaphragm pain is felt at the shoulder tip – name the shared segments. [3]

2.3

- C3–C5, shared by diaphragm and shoulder skin ✓.

Exercise 3.1

3.1 A fictional patient stabs a pen into the LEFT side of the cord at T6.

Trace all four findings: (i) side and modality of fine-touch loss below, (ii) side and modality of pain loss below, (iii) which finding starts 1–2 segments lower, and why each follows its crossing. [8]

Exercise 3.1

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3.1

- (i) LEFT fine touch/vibration/proprioception loss below T6 – the dorsal column has not crossed ✓.
- (ii) RIGHT pain/temperature loss below – fibres already crossed in the cord ✓.
- (iii) The pain loss starts 1–2 segments BELOW the lesion – fibres ascend briefly before crossing ✓.
- Each finding follows its own crossing level; together they name a hemisection.

Exercise 3.2

3.2 A fictional patient has burning pain from both feet, length dependent.

Explain why this is NOT a cord hemisection pattern (no level, no crossed modalities). State the expected reflex findings of a length-dependent peripheral pattern (absent ankle jerks, normal plantars). [7]

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3.2

- Symmetric, length-dependent, no sensory LEVEL – not a cord pattern ✓.
- No crossed modality split (both modalities lost together in the feet).
- Peripheral pattern: distal LMN signs – absent ankle jerks with normal plantar responses ✓.