

# Cervical Medial Branch Block and Radiofrequency Ablation – Posterior Approach

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## Equipment and Monitoring

- Standard ASA monitoring
- Fluoroscopy
- Sterile prep, and drape
- Skin local anesthesia prior to any needle larger than 25G (unless sedation is used)
- Coaxial view is always used to advance needle, unless otherwise specified
- CPR equipment and medications available
- For diagnostic block
  - 22–25G 2 inch (50 mm) - 3.5 inch (90 mm) needle, tip curved to facilitate steering, 0.3 ml local anesthetic/level
  - Nonionic contrast (optional)
- For radiofrequency ablation (RFA)
  - 18–22G 100 mm radiofrequency cannula, 5-10 mm active tip
  - Grounding pad
  - RF generator with capacity for unipolar and bipolar lesions
  - Local anesthetic

## Anatomy

- Prevalence studies, physical exam, and pain referral maps can be utilized to choose levels. C2-3 and C5-6 levels are the most common causes of cervicogenic headache and neck pain, respectively
- At the C3 level, there is a superficial medial branch (third occipital nerve) that is located in close proximity to the C2/3 facet joint and serves to innervate that joint as well as the suboccipital area
- The deep medial branch of C3 (which is analogous to the medial branches of C4, C5, and C6) courses along the

waist of the corresponding articular pillars and supplies the adjacent vertebral segments (for instance, the C4 and C5 medial branches supply the zygapophyseal joint of C4/5)

- The C5 medial branch is located in the waist of the articular pillar of C5. The C3, C4, and C6 medial branches are located slightly above the waist of the corresponding articular pillars, variations exist
- The C7 vertebra has a prominent transverse process (TP), and the location of the medial branch at this level is variable. It can be found as far caudal as the TP/superior articular process (SAP) junction and as far rostral as the apex of the C7 SAP

The needle placement techniques for the diagnostic MBB and the Radiofrequency (RF) denervation are very similar:

For diagnostic block: the needle is placed to the center of the articular pillar in the lateral fluoroscopic view.

For RF denervation: the needle is placed to the anterior third of the articular pillar in the lateral fluoroscopic view.

## Pros of Posterior Approach

- Safer: no vital structures in trajectory
- It allows parallel placement of the RF cannula to the medial branch, which maximizes denervation success

## Cons of Posterior Approach

- Longer needle track and more patient discomfort than lateral approach for diagnostic blocks
- More difficult to overlap articular pillars from opposite sides than in the lateral approach with patient in lateral or supine position (for diagnostic MBB)

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## Structures to Keep in Mind and Possible Complications

- Ascending cervical artery → potential stroke through vertebral artery if particulate steroids administered
- Radicular artery occlusion → spinal cord ischemia, risk possibly higher if particulate steroids administered
- Cervical exiting nerve root → nerve injury
- Epidural, subdural, intrathecal space → death, paralysis, spinal cord injury, high spinal anesthesia, epidural anesthesia (more likely with lateral approach)
- Infection
- Bleeding
- Postprocedure pain
- Vasovagal reaction
- Allergic reaction

## Fluoroscopy Technique, Target Localization

- Patient in a prone position
- Start with Anteroposterior (AP) image, an open mouth view to identify the odontoid process (dens) and C1-2

facet joint space, count the articular pillars caudally starting from that level

- Identify the middle portion of the articular pillar at the target level in AP/slight ipsilateral oblique view
- Identify the narrowest portion of the vertebral body, the “waist” of the articular pillar
- *For diagnostic block:* The middle of the articular pillar is the entry point (Fig. 3.1b)
- *For RF ablation:* tilt the C-arm 20–30° caudal to identify skin entry (Fig. 3.3a–c)
  - If articular pillar is difficult to visualize with this caudad C-arm tilt, one can keep the less caudad C-arm tilt, but then needle is placed without coaxial view using a slightly caudal skin entry point

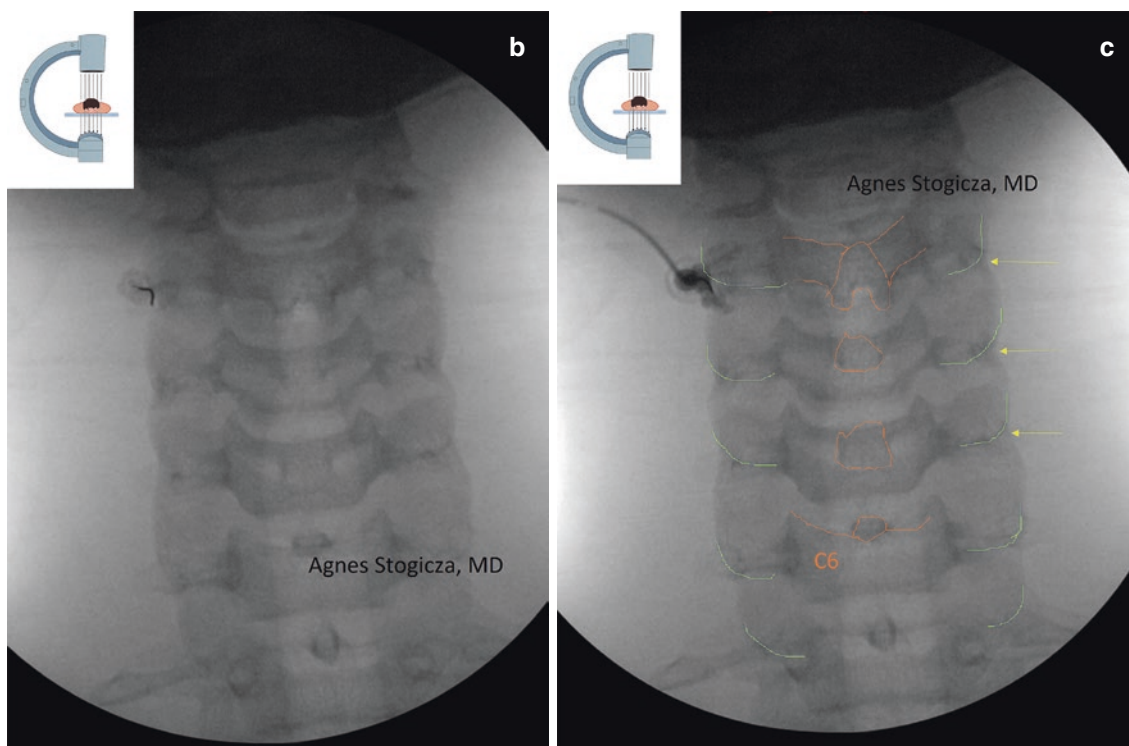
## Procedure Steps – Diagnostic Block

- Advance the needle until concavity (the “waist”) of the articular pillar is contacted; then, rotate the needle curve laterally and slide the needle more anteriorly over the lateral margin of articular pillar and then rotate the needle back again (Fig. 3.1b)



**Fig. 3.1** AP view of the cervical spine Complete Anatomy image (a). Diagnostic medial branch block. The target is the middle of the articular pillar. Needle is placed to the C4 Medial Branch (b). Contrast is

injected, and demonstrates no vascular uptake (c). Orange = spinous process, light green = inferior articular process; yellow arrows mark further target points for medial branch block



**Fig. 3.1** (continued)

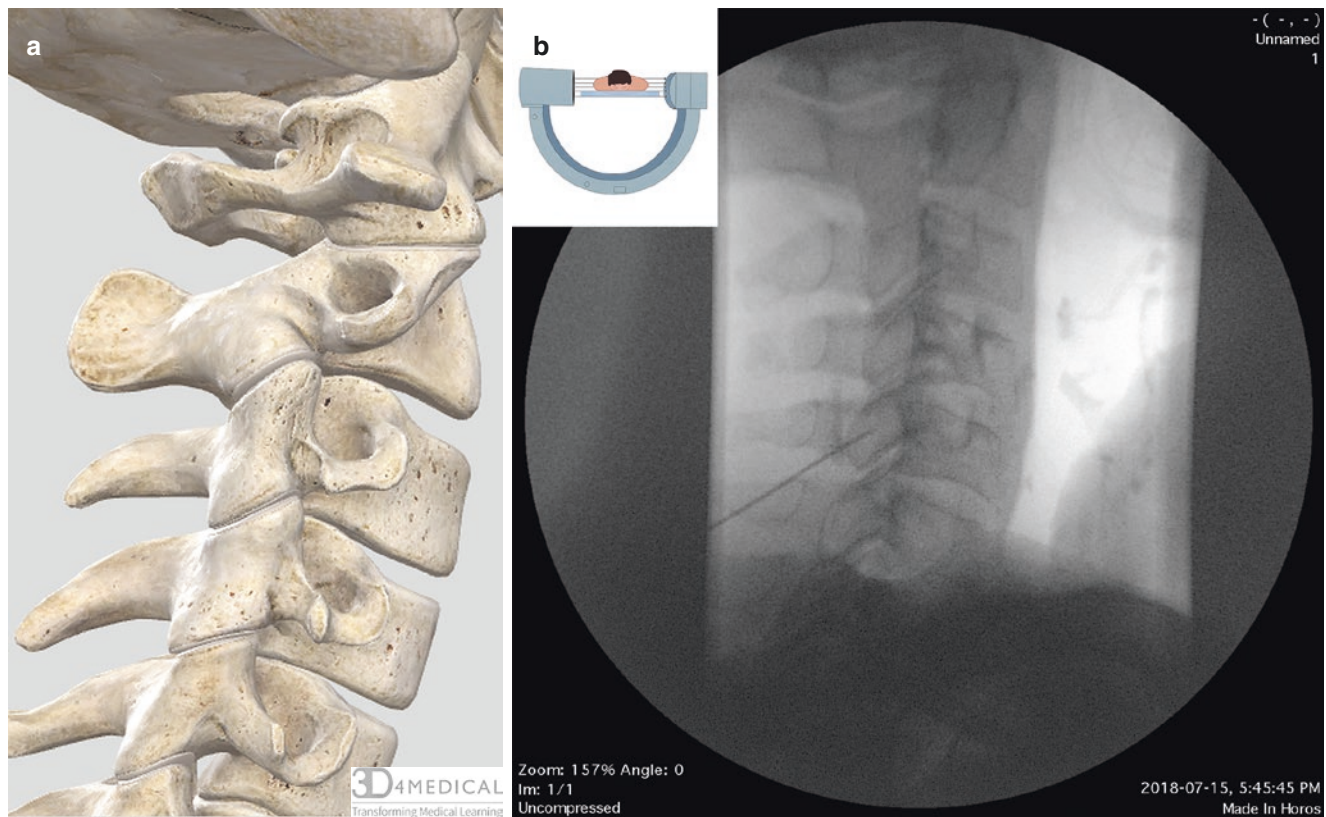
- Rotate the C-arm to the “true” lateral view
- In a true lateral, the articular pillars overlap and are clear and crisp. The facet joints above and below the level of interest must be crisp. The disc spaces must be clear. The anterior and posterior tubercles on each side should form a superimposed curvilinear line located in the superior posterior quadrant of the vertebral body shadow (Fig. 4.1 a and b – Chap. 4. “Cervical Medial Branch Block – Lateral Approach”)
- In the lateral view, advance the needle toward the center of the articular pillar while rotating the needle tip medially for the final position in the middle of the articular pillar (Fig. 3.2a, b)
- Contrast injection confirms lack of vascular uptake for diagnostic procedure (Fig. 3.1c)
- 0.3cc of local anesthetic is injected for diagnostic block
- Advance the cannula until the concavity (the “waist”) of the articular pillar is contacted, then rotate the cannula curve laterally, and slide the cannula more anteriorly over the lateral margin of articular pillar (Fig. 3.3d)
- Rotate the C-arm to the “true” lateral view, making sure that the articular pillars overlap from opposite sides
- In the lateral view, advance the cannula to the anterior margin of the articular pillar while rotating the curved cannula tip medially for the final position in the anterior third of the articular pillar (Fig. 3.4a, b)
- After appropriate sensory (0.4V reproduces patient’s pain) and motor (1.5V, muscle twitch only in the multifidus muscle, and none elsewhere) testing and local anesthetics administration, a lesion at 80°C for 90 seconds, twice should be performed

### Procedure Steps – RF Ablation Sagittal Pass

- The RF cannula should be inserted in cephalad direction, in order to be parallel to the plane of facet joints and medial branches. This cephalad angulation can be identified prior to skin entry by lateral view of the C-spine, identifying the angle of the joint lines (Fig. 3.2a, b)

### Clinical Pearls

- Make sure that in lateral fluoroscopic view articular pillars do overlap (so the opposite side is not mistaken for treated side). If not sure, “un-align,” and then again align the margins of proximal and distal articular pillar in the lateral view



**Fig. 3.2** Lateral view of the cervical spine, needle is placed to the middle of the articular pillar for diagnostic block. Complete Anatomy image (a) and native fluoroscopy image (b)

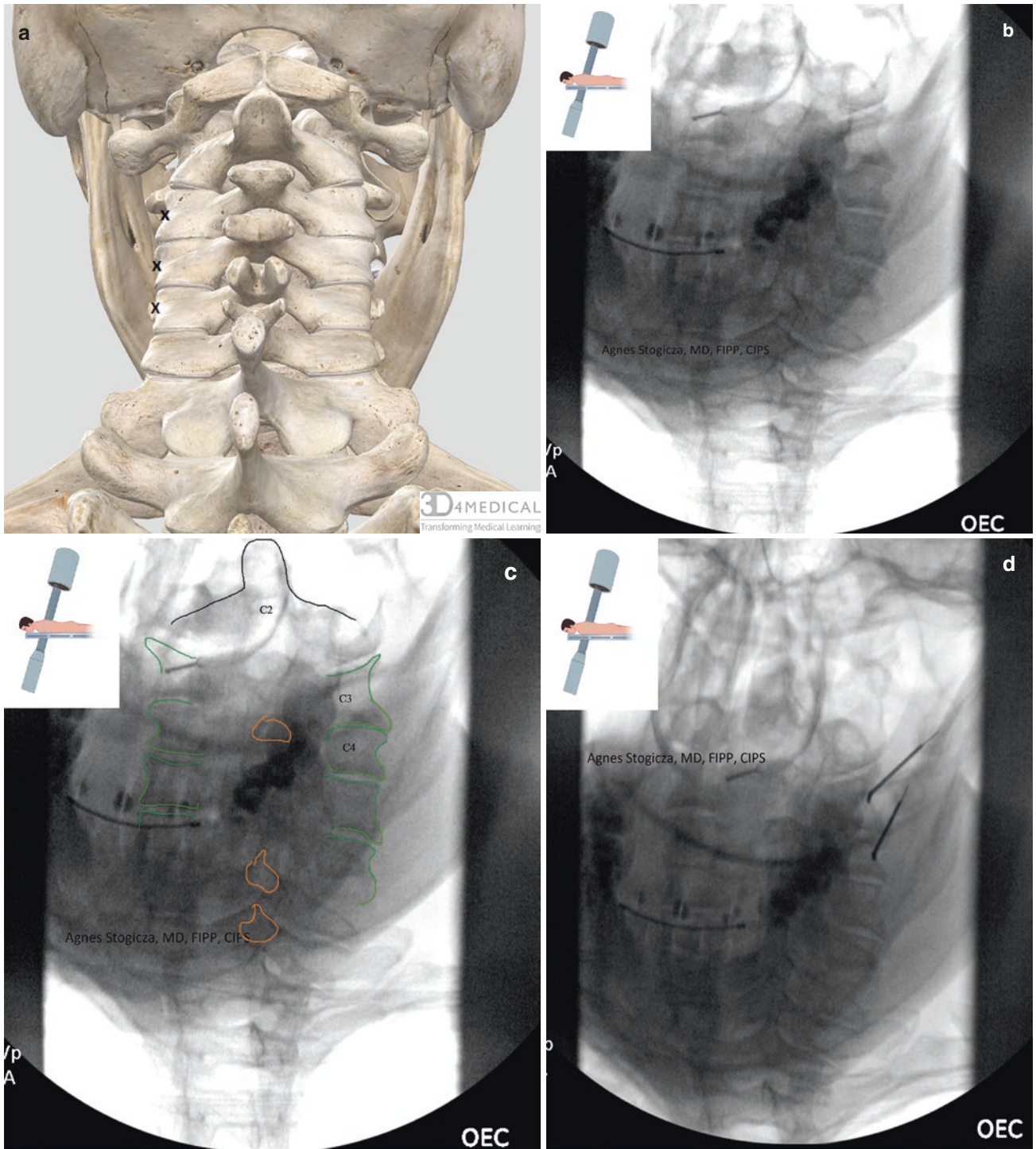
- Keep in mind that the location of medial branches varies at each level (C3 and C4 more cephalad, C5, 6, and 7 closer to the waist of articular pillar). Place the active tip of the RF cannula to target location, parallel and over the medial branch
- The procedure at the C7 level follows the same principles; however, it may be difficult to obtain clear lateral images due to image obstruction by the shoulders
- Keep the C-arm in the lateral view during lesioning to make sure that cannula is not inadvertently advanced further anteriorly
- Make sure that the curved cannula tip “hugs” the articular pillar for full contact with the medial branch
- Consideration to perform up to three lesions at each level (depending on the size of RF cannula used) should be taken in order to increase odds of success
- In addition to posterior (sagittal) approach, consider performing an additional lesion using an oblique, 30-degree

approach to capture the part of the medial branch positioned anterolateral to the articular pillar

- Avoid administration of particulate steroids through the cannula due to rare but possible chances of intravascular spread and possible embolization

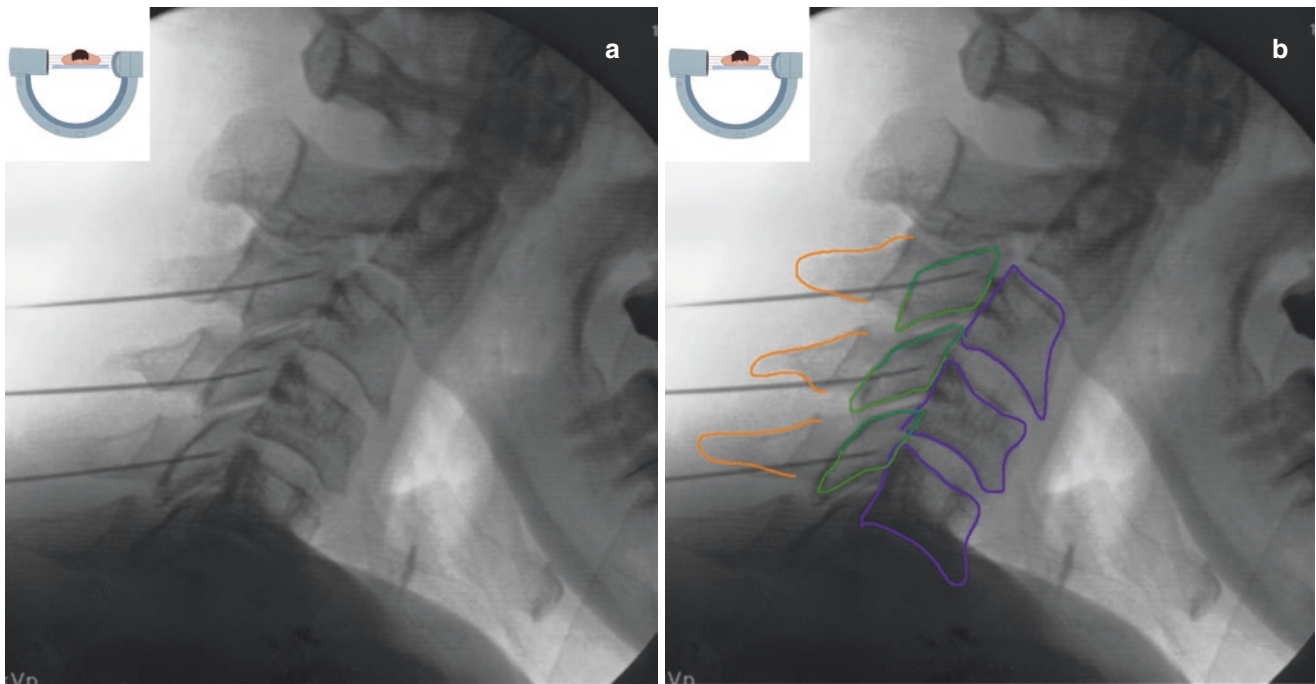
### Unacceptable, Potentially Harmful Needle Placement on Exam

- Not checking lateral view
- Needle through facet joint or compromised intraspinal space
- Needle tip too anterior
- Needle in foramen
- Any proof of lack of understanding of cervical spine anatomy, for example, the needle left far posterior between spinous processes and believing it is in the right place



**Fig. 3.3** Cervical medial branch denervation. AP view with the C-arm tilted caudally. Complete Anatomy image (a), native (b) and edited fluoroscopy images (c). Cannulas positioned at the C3, 4 levels (d).

Orange = spinous process; dark green = superior articular process; light green = inferior articular process; black = dens and vertebral body of axis



**Fig. 3.4** Cervical medial branch denervation, lateral view: Cannulas positioned at the C3, C4, C5 levels. Orange = spinous process; dark green = superior articular process; light green = inferior articular process; purple = vertebral body. Native (a) and edited (b) fluoroscopy image

### Unacceptable, But Not Harmful Placement on Exam

- Unnecessarily large bore needle
- Not obtaining an acceptable lateral view
- The examinee abandoned the procedure after unsuccessful attempts, but it was clear that the examinee was cognizant of the safety aspects of the procedure, the needle did not compromise vital structures, did not reach the epidural space, spinal cord, or vertebral artery

## Evidence

**Table 3.1** Level of evidence and recommendations by the Benelux section of the World Institute of Pain

These recommendations are based on both a review of the literature in 2015 by an independent third party (Kleijnen Systematic Reviews LTD) and the previous published guidelines published in Pain Practice. The recent literature, the potential risk for complications, and the grade of invasiveness were considered when deciding to upgrade or downgrade the recommendation.

Indication	Procedure	Recommendation 2009	Grade 2015 <sup>2</sup>	Recommendation 2018 <sup>3,4</sup>
Cervical facet joint pain <sup>1</sup>	Therapeutic (repetitive) injections with local anesthetic with or without corticosteroid of the medial branch (cervical ramus medialis of the ramus dorsalis)	2B+	Moderate	Weak
Cervical facet joint pain <sup>1</sup>	Radiofrequency treatment (ablation) of the medial branch (cervical ramus medialis of the ramus dorsalis)	2C+	Low	Weak
Cervicogenic headache <sup>5</sup>	Radiofrequency treatment (ablation) of the medial branch (cervical ramus medialis of the ramus dorsalis)	2C+/-	Very low	Very weak
Whiplash associated disorder <sup>6</sup>	Radiofrequency treatment (ablation) of the medial branch (cervical ramus medialis of the ramus dorsalis)	2B+	Low	Moderate

<sup>1</sup>van Eerd M, Patijn J, Lataster A, Rosenquist RW, van Kleef M, Mekhail N, et al. 5. Cervical facet pain. *Pain Pract.* 2010;10:113–23

<sup>2</sup>Kleijnen Systematic Reviews Ltd.: Search and evaluation of the literature. 2015

<sup>3</sup>Huygen F, Kallewaard JW, van Tulder M, Van Boxem K, Vissers K, van Kleef M, et al. “Evidence-based interventional pain medicine according to clinical diagnoses”: update 2018. *Pain Pract.* 2019;19:664–75

<sup>4</sup><https://www.anesthesiologie.nl/publicaties/praktische-richtlijnen-anesthesiologische-pijnbestrijding>

<sup>5</sup>van Suijlekom H, Van Zundert J, Narouze S, van Kleef M, Mekhail N. 6. Cervicogenic headache. *Pain Pract.* 10:124–30

<sup>6</sup>van Suijlekom H, Mekhail N, Patel N, Van Zundert J, van Kleef M, Patijn J. 7. Whiplash-associated disorders. *Pain Pract.* 10:131–6

**Table 3.2** Level of evidence based on the American Society of Interventional Pain Physicians (ASIPP) review of the literature

Cervical facet joint injections	Evidence
Diagnostic facet joint nerve blocks	Level II
Cervical facet joint nerve blocks	Level II
Cervical facet joint radiofrequency neurotomy	Level II

Manchikanti L, Schultz DM, Falco FJE, Singh V. Cervical facet joint interventions. In: Manchikanti L, Kaye AD, Falco FJE, Hirsch JA, editors. *Essentials of interventional techniques in managing chronic pain.* Springer International Publishing; 2018. p. 387–412.

## Suggested Reading

Bogduk N. Cervical medial branch thermal radiofrequency neurotomy. In: Bogduk N, editor. *Practice guidelines: spinal diagnostic and treatment procedures.* San Francisco: International Spine Intervention Society; 2013. p. 165–217.

Engel A, Rappard G, King W, Kennedy DJ, Standards Division of the International Spine Intervention Society. The effectiveness and risks of fluoroscopically-guided cervical medial branch thermal radiofre-

quency neurotomy: a systematic review with comprehensive analysis of the published data. *Pain Med.* 2016;17(4):658–69.

Lord SM, Barnsley L, Wallis BJ, McDonald GJ, Bogduk N. Percutaneous radio-frequency neurotomy for chronic cervical zygapophyseal-joint pain. *N Engl J Med.* 1996;335:1721–6.

Manchikanti L, Pampati V, Kaye AD, Hirsch JA. Cost utility analysis of cervical therapeutic medial branch blocks in managing chronic neck pain. *Int J Med Sci.* 2017;14(13):1307–16.

Engel A, King W, Schneider BJ, Duszynski B, Bogduk N. The effectiveness of cervical medial branch thermal radiofrequency neurotomy stratified by selection criteria: a systematic review of the literature. *Pain Med.*

van Eerd M, Patijn J, Lataster A, Rosenquist RW, van Kleef M, Mekhail N, et al. Cervical facet pain. *Pain Pract.* 2010;10(2):113–23.

Falco FJE, Erhart S, Wargo BW, Bryce DA, Atluri S, Datta S, et al. Systematic review of diagnostic utility and therapeutic effectiveness of cervical facet joint interventions. *Pain Physician.* 2009;12(2):323–44.

The Cervical Medial Branch chapter was reviewed by Andrea M. Trescot; Peter S. Staats; Agnes R. Stogicza; Andre M. Mansano; Sudhir Diwan; Standiform Helm, Jianguo Cheng; Charles Gauci