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Scriptwriter Name: Poornima G

Project Page Link: <https://review.jove.com/account/file-uploader?src=21281728>

Title: A Standardized Protocol for Functional Motor Mapping Using Navigated Transcranial Magnetic Stimulation

Authors and Affiliations:

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Author Questionnaire

- 1. Microscopy:** Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**
- 2. Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **Yes, all done**
- 3. Filming location:** Will the filming need to take place in multiple locations? **Yes**
If **Yes**, how far apart are the locations? **Different departments within the same hospital building**
- 4. Testimonials (optional):** Would you be open to filming two short testimonial statements **live during your JoVE shoot**? These will **not appear in your JoVE video** but may be used in JoVE's promotional materials. **Yes**

Current Protocol Length

Number of Steps: 26

Number of Shots: 54 (32 SC)

Introduction

Videographer: Obtain headshots for all authors available at the filming location.

Authors: Please note that the questions will not appear on screen. Please answer in **stand-alone full sentence with sufficient context.**

INTRODUCTION:

Videographer's NOTE: I shot everything in 4K. All of my footage is in 4K 25fps (I know I didn't need to)

~~REQUIRED:~~ Summarize your research focus and the main questions it aims to answer.

- 1.1. **Benjamin Bardel:** We present a standardized and reproducible protocol for motor mapping and corticospinal tract assessment using navigated TMS combined with DTI, for presurgical planning and neuroplasticity research.
 - 1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

~~Describe the research gap or limitation in existing methods and how this protocol addresses them.~~

- 1.2. **Suhan Senova:** Although intraoperative direct electrical stimulation is the gold standard, existing preoperative methods are limited. This protocol uses nTMS for accurate motor pathway mapping and improved surgical planning.
 - 1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

CONCLUSION:

~~What does this protocol allow researchers to study or measure?~~

- 1.3. **Gaia Fanella:** By combining neuronavigation with the subject's anatomical brain, this nTMS protocol enables precise identification and delineation of motor-eloquent cortical regions in under 90 minutes.
 - 1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

~~Describe the most important consideration or challenge when performing this protocol.~~

- 1.4. **Thibaut Mussigmann:** Careful selection of stimulation intensity is critical, as it affects MEP distribution and motor map interpretation; near-threshold levels provide conservative maps approximating direct electrical stimulation.

1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

~~How can future studies build on this work? Describe the questions or research directions that can be investigated next.~~

- 1.5. **Jean-Pascal Lefaucheur:** This technique provides clinically useful functional information for surgical planning and paves the way for longitudinal studies of motor plasticity in neurological and psychiatric diseases.

1.5.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

Videographer: Obtain headshots for all authors available at the filming location.

Testimonial Questions (OPTIONAL):

Videographer: Please capture all testimonial shots in a wide-angle format with sufficient headspace, as the final videos will be rendered in a 1:1 aspect ratio. Testimonial statements will be presented live by the authors, sharing their spontaneous perspectives.

- Testimonial statements will **not appear in the video** but may be featured in the journal's promotional materials.
- **Provide the full name and position** (e.g., Director of [Institute Name], Senior Researcher [University Name], etc.) of the author delivering the testimonial.
- Please **answer the testimonial question live during the shoot**, speaking naturally and in your own words in **complete sentences**.

What is the key takeaway you hope viewers remember after watching your video article?

- 1.6. **Benjamin Bardel, Assistant Professor**: (authors will present their testimonial statements live)

1.6.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

How does the video format of your article help you to share your work with the broader scientific community?

- 1.7. **Gaia Fanella, PhD Student**: (authors will present their testimonial statements live)

1.7.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

Ethics Title Card

This research has been approved by the Institutional Review Board (IRB) at the Henri Mondor Hospital, APHP

Protocol

2. Processing Neuroimaging Data for Neuronavigation and Subject Preparation

Demonstrators: Benjamin Bardel, Thibaut Mussigmann, Gaia Fanella

2.1. To begin, import high-resolution anatomical brain images of the subject [1] into the neuronavigation system to generate a three-dimensional brain reconstruction [2].

2.1.1. ~~Talent operating the MRI scanner while the subject lies inside, capturing the full cranial image.~~ **NOTE:** This was not filmed. *Video editor:* If there is any wide shot of talent working at the computer station or something like that, please use it. If you don't find anything, please contact me (Poornima)

2.1.2. SCREEN: 2.1.1-Import-Process.mp4 00:00-00:06-00:25-00:32

2.2. ~~Import the subject's images into the neuronavigation system to generate a three-dimensional brain reconstruction [1].~~ Mark the key anatomical points on the magnetic resonance imaging within the neuronavigation software by identifying the nasion, right ear, and left ear [2].

2.2.1. ~~SCREEN: Show the import process of the MRI file into the neuronavigation software and display the generated 3D brain model.~~

2.2.2. SCREEN: 2.1.2-Landmarks.mp4. 00:05-00:15 and 00:25-00:30

2.3. Now, position the subject on a comfortable armchair with a slight recline to reduce back tension [1]. Adjust the headrest to support the head and neck at theinion [2]. Place the head tracker on the subject's forehead [3].

2.3.1. Talent helping the subject sit in the reclined armchair and adjust position.

2.3.2. Talent adjusting the headrest to align with theinion for neck and head support.

2.3.3. Talent attaching the head tracker securely to the subject's forehead.

2.4. Using the digitizing pen, co-register the key anatomical points [1] on the subject with the imported image in the neuronavigation software [2] and refine the registration by digitizing additional scalp points for scalp-surface matching [3]. Validate the co-registration, ensuring a co-registration error below 3 millimeters [4].

2.4.1. Talent using the digitizing pen to tap the subject's nasion, right ear, and left ear.

2.4.2. SCREEN: 2.3.2-Coregistration.mp4. 00:05-00:17

- 2.4.3. Talent using the digitizing pen to tap various scalp points across the head.
- 2.4.4. SCREEN: 2.3.4-End-Coregistration.mp4.

3. Preparation of Mapped Muscles and Coarse Mapping

Demonstrators: Benjamin Bardel, Thibaut Mussigmann, Gaia Fanella

- 3.1. Next, give the subject a pair of earplugs and wear protective earmuffs during stimulation [1]. Then, prepare the skin over the target muscle by gently scraping it using alcohol pads and subsequently attach surface electrodes [2].
 - 3.1.1. Talent handing earplugs to the subject and placing earmuffs over their ears.
 - 3.1.2. Talent gently rubbing the skin on the upper limb (forearm) using an alcohol pad and attaching electrodes on the target muscle.
- 3.2. Place surface electrodes on the muscles of interest using a belly-tendon montage [1] and the ground electrode on a neutral site [2].
 - 3.2.1. Talent gently rubbing the skin on the lower limb (lower leg) and attaching surface electrodes on the subject's target muscle.
 - 3.2.2. Talent securing the ground electrode on a neutral part of the subject's body.
- 3.3. Connect all electrodes to the electromyography amplifier [1]. Start electromyography acquisition and verify that the muscles are at rest [2].
 - 3.3.1. Talent plugging in electrode wires to the corresponding ports on the electromyography amplifier.
 - 3.3.2. Talent looking at the electromyography acquisition software displaying baseline signals.
- 3.4. On the rendered brain volume within the neuronavigation software, adjust the peeling depth to between 15 and 25 millimeters from the scalp to optimally visualize the cortical anatomy, based on individual case characteristics [1]. Then, start the stimulator unit [2].
 - 3.4.1. SCREEN: 3.4.1-Peeling-ok.mp4.
 - 3.4.2. Talent powering on the stimulator unit and confirming readiness on the control

panel.

3.5. Position the stimulation coil tangentially to the scalp and stabilize it using one hand on the handle and the other on the coil surface to maintain firm contact during repositioning [1]. Stimulate at an intensity sufficient to elicit motor-evoked potentials within the amplitude range of 100 to 500 microvolts [2].

3.5.1. Talent holding the coil with both hands in a stabilized grip—one on the handle, one securing the top of the coil.

3.5.2. SCREEN: 3.5.2-Adjust-intensity.mp4. 00:15-00:30

3.6. Now, adjust the coil orientation based on the limb being mapped. For the upper limb and the face, maintain the coil perpendicular to the central sulcus to ensure a posterior-to-anterior induced current [1]. For the lower limb, orient the coil perpendicular to the sagittal midline to generate a mid-to-lateral current direction [2 and 3 side by side, split screen].

3.6.1. Talent orienting the coil perpendicularly to the central sulcus when mapping the upper limb or face. **Videographer's NOTE: 3.6.1 and 3.6.2 are very similar shots.**

3.6.2. Talent orienting the coil perpendicularly to the sagittal midline when mapping the lower limb.

3.6.3. SCREEN: 3.6.2-Miniature-Leg-Mapping-Perpendicular.mp4 00:20-00:30.

3.7. Perform stimulations across the target region [1]. Space the stimulation points 1 to 2 millimeters apart and sample three parallel lines along the gyrus. Space each stimulation by at least 1.5 seconds [2].

3.7.1. Talent pressing on the pedal to deliver stimulations sequentially . **Videographer's NOTE: 3.7.1 exact same type of shot as 3.6.1 and 3.6.2 so we took an extra shot changed the angle and filmed the talent manipulating the machine with his foot**

3.7.2. SCREEN: 3.7.2-Rough-Mapping-3-lines.mp4. *Video editor: Please speed up*

3.8. Stop the coarse mapping once 20 to 30 motor-evoked potentials per muscle have been recorded [1] and review all motor-evoked potentials [2].

3.8.1. SCREEN: 3.8.1-Finish-Rough-Mapping.mp4. 00:15-00:30

3.8.2. SCREEN: 3.8.2-Review-Meps.mp4. 00:10-00:20

3.9. Next display the recordings using a normalized color scale to identify the hotspot for each muscle, defined as the stimulation point that evokes the largest motor-evoked potential amplitude [1]. Locate the area containing the highest-amplitude responses [2] and select the single response with the largest amplitude within that region [3].

3.9.1. SCREEN: 3.9.1-Show-HeatMap-Normalized.mp4.

3.9.2. SCREEN: 3.9.2-Cluster-high-response-region.mp4.

3.9.3. SCREEN: 3.9.3-Select-Hotspot.mp4. 00:15-00:25

3.10. For each muscle, select the hotspot to determine the resting motor threshold to store the coil's position and orientation for consistent use during the threshold measurement [1] and determine the resting motor threshold for each muscle [2].

3.10.1. SCREEN: 3.10.1-RMT-determination.mp4.

Added 3.10.3: Talent holding the coil during the determination of RMT with the target tool shown on the computer screen.

4. Fine Mapping

Demonstrators: Benjamin Bardel, Thibaut Mussigmann, Gaia Fanella

4.1. Ensure that the subject remains fully relaxed without any involuntary muscle contractions [1].

4.1.1. Talent observing the subject and instructing the subject and the subject seated relaxed.

4.2. For each muscle, perform stimulation at 105 to 110 percent of its resting motor threshold [1]. Using the same coil orientation as during coarse mapping [2], reduce the spacing between stimulation points for higher resolution [3].

4.2.1. SCREEN: 4.2.1-Adjust-intensity-for-fine-mapping.mp4.

4.2.2. Talent aligning the coil and performing fine mapping.

4.2.3. SCREEN: 4.2.3-Fine-Mapping.mp4. 00:15-00:26

4.3. Delineate functional motor maps as cortical areas where navigated transcranial magnetic stimulation generates motor-evoked potentials of 50 microvolts or higher. Perform stimulation until the motor maps are bordered by one or two consecutive lines of negative sites that fail to elicit motor-evoked potentials [1].

4.3.1. SCREEN: 4.3.1-Show-Grey-around.mp4.

4.4. Ensure the motor maps are elliptic, with few negative sites inside [1]. For any negative stimulation points within the motor map, perform additional stimulations at different times to account for transient changes in motor cortex excitability [2].

4.4.1. SCREEN: 4.4.1-Show-elliptic-with-grey-point-inside.mp4.

4.4.2. Talent re-stimulating negative sites at different moments during evaluation.

5. Post-Processing Analysis of MEP Data and Motor Mapping

Demonstrators: Benjamin Bardel, Suhan Senova

5.1. Open the motor-evoked potential review panel or signal viewer in the neuronavigation software [1]. Inspect each recorded motor-evoked potential to correct amplitude and latency, and adjust markers if needed [2].

5.1.1. SCREEN: 5.1.1-Open-Mep-Review-Panel.mp4.

5.1.2. SCREEN: 5.1.2-Waveform-Adjustment.mp4.

5.2. Exclude artefactual or abnormal stimulation points from the dataset [1] and display the motor map for each muscle in a binary format[2].

5.2.1. SCREEN: 5.2.1-Mep-correction-artefact.mp4 00:04-00:20

5.2.2. SCREEN: 5.2.2-Show-Binary-Motor-Maps.mp4.

5.3. Export the positive stimulation points at 15, 20, and 25 millimeter depths in binarized DICOM format [1]. Use these files for fiber tracking, employing the positive stimulation points as seed points for corticospinal tract reconstruction [2].

5.3.1. SCREEN: 5.3.1-Export-depth.mp4. 00:04-00:20

5.3.2. SCREEN: 5.3.2-load-data.mp4.

5.4. For analysis of motor mapping, import the DICOM files of the motor maps into an image analysis software compatible with neurosurgical neuronavigation for brain tumor removal [1]. Register the anatomical T1-weighted image with the motor map DICOMs and diffusion-weighted imaging files [2-TXT].

5.4.1. SCREEN: 5.4.1-Import-DICOM.mp4. 00:08-00:18

5.4.2. SCREEN: 5.4.2-Fusion.mp4. 00:00-00:20 **TXT: Import and register additional images if required**

5.5. Generate objects from the motor map DICOMs and expand them by 1 to 2 millimeters to enhance sensitivity [1]. Crop the motor maps to exclude the ears and nasion in order to avoid incorrect fiber reconstruction during tractography [2].

5.5.1. SCREEN: 5.5.1-show-object-and-dilate.mp4. 00:10-00:15 and 00:35-00:44

5.5.2. SCREEN: 5.5.2-crop.mp4. 00:12-00:23

5.6. Manually draw an ending region of interest at the inferior pontine level on the same side as the mapped hemisphere [1].

5.6.1. SCREEN: 5.6.1-draw-pontine-object.mp4. 00:15-00:30

5.7. Perform fiber-tracking using the motor map regions of interest as seed points and the pontine region of interest as the endpoint [1]. Select a suitable tractography algorithm such as deterministic streamline tracking or probabilistic tractography and adjust tracking parameters according to the specific case [2].

5.7.1. SCREEN: 5.7.1-initiate-fibertracking.mp4. *Please speed up*

5.7.2. SCREEN: 5.7.2-algorithm-FT.mp4. *Please speed up*

5.8. Finally, segment the brain tumor and create a corresponding object within the analysis software [1,2]. Display the corticospinal tract either separated by limb part using different colors, or as a unified tract from the entire motor mapping [3, 4].

1- Added 5.8.1: Talent (surgeon) working at the computer station and showing the segmentation tools used to outline the tumor. **Author's NOTE: only the first 5 seconds should be used**

2- Added: SCREEN: 5.8.1.2-Create-object-tumor.mp4

3- Added 5.8.2: Talent (surgeon) showing the creation of CST reconstruction

4- SCREEN: 5.8.3-show-CST.mp4. 00:09-00:28

Results

6. Results

6.1. The resting motor threshold was determined at the hotspot of the First Interosseus Dorsalis muscle, identified through coarse mapping in a healthy subject [1], and the coil position and orientation were maintained at the same location during the procedure using a neuronavigation target [2].

6.1.1. LAB MEDIA: Figure 5. *Video editor: Highlight the lower left panel showing the hotspot with many dots.*

6.1.2. LAB MEDIA: Figure 5. *Video editor: Highlight the lower right panel showing the orange coils and graph traces on the right.*

6.2. Motor mapping of a healthy subject revealed cortical representations for the left lower limb, upper limb, and face, with positive stimulation sites color-coded by motor-evoked potential amplitude and negative sites shown in gray [1].

6.2.1. LAB MEDIA: Figure 6. *Video editor: Highlight the mapped dotted coloured regions*

6.3. Motor cortical mapping [1] and reconstruction of the corticospinal tracts [2] were performed in a patient with brain metastasis from lung cancer, involving the premotor gyrus with an upper-limb motor deficit. [3].

6.3.1. LAB MEDIA: Figure 7. *Video editor: Highlight the left panel .*

6.3.2. LAB MEDIA: Figure 7. *Video editor: Highlight the right panel.*

6.3.3. LAB MEDIA: Figure 7

1. Neuronavigation

Pronunciation link: <https://www.merriam-webster.com/dictionary/neuronavigation>

IPA: /ˌnɔr.ooˌnæv.əˈɡeɪʃən/

Phonetic Spelling: noor·oh·nav·uh·gay·shuhn

2. Anatomical

Pronunciation link: <https://www.merriam-webster.com/dictionary/anatomical>

IPA: /ˌæn.əˈtɑː.mɪ.kəl/

Phonetic Spelling: an·uh·taa·mi·kuhl

3. Reconstruction
Pronunciation link: <https://www.merriam-webster.com/dictionary/reconstruction>
IPA: /ˌriː.kənˈstrʌk.tʃən/
Phonetic Spelling: ree·kuhn·struk·shuhn
4. Cranial
Pronunciation link: <https://www.merriam-webster.com/dictionary/cranial>
IPA: /ˈkreɪ.ni.əl/
Phonetic Spelling: kray·nee·uhl
5. Magnetic
Pronunciation link: <https://www.merriam-webster.com/dictionary/magnetic>
IPA: /mægˈnet.ɪk/
Phonetic Spelling: mag·net·ik
6. Nasion
Pronunciation link: <https://www.merriam-webster.com/dictionary/nasion>
IPA: /ˈneɪ.zi.ən/
Phonetic Spelling: nay·zee·on
7. Inion
Pronunciation link: <https://www.merriam-webster.com/dictionary/inion>
IPA: /ˈm.i.ən/
Phonetic Spelling: in·ee·on
8. Coregister
Pronunciation link: <https://www.merriam-webster.com/dictionary/coregister>
IPA: /ˌkoʊ.rɪˈdʒɪs.tər/
Phonetic Spelling: koh·rih·jis·ter
9. Digitizing
Pronunciation link: <https://www.merriam-webster.com/dictionary/digitize>
IPA: /ˈdɪdʒ.ə.taɪz/
Phonetic Spelling: dij·uh·tyze
10. Electromyography
Pronunciation link: <https://www.merriam-webster.com/dictionary/electromyography>
IPA: /ɪˌlek.troʊ.məˈɑː.grə.fi/
Phonetic Spelling: ih·lek·troh·my·aa·gruh·fee
11. Amplifier
Pronunciation link: <https://www.merriam-webster.com/dictionary/amplifier>
IPA: /ˈæm.pləˌfaɪ.ər/
Phonetic Spelling: am·pluh·fy·er
12. Cortical
Pronunciation link: <https://www.merriam-webster.com/dictionary/cortical>
IPA: /ˈkɔːr.tɪ.kəl/
Phonetic Spelling: kor·tuh·kuhl
13. Stimulator
Pronunciation link: <https://www.merriam-webster.com/dictionary/stimulator>
IPA: /ˈstɪm.jəˌleɪ.tər/
Phonetic Spelling: stim·yuh·lay·ter

14. Tangentially
 Pronunciation link: <https://www.merriam-webster.com/dictionary/tangentially>
 IPA: /tæn'dʒen.jə.li/
 Phonetic Spelling: tan·jen·shuh·lee
15. Microvolts
 Pronunciation link: <https://www.merriam-webster.com/dictionary/microvolt>
 IPA: /'maɪ.kroʊ.vəʊlt/
 Phonetic Spelling: my·kroh·vohlt
16. Sulcus
 Pronunciation link: <https://www.merriam-webster.com/dictionary/sulcus>
 IPA: /'sʌl.kəs/
 Phonetic Spelling: sul·kuhs
17. Sagittal
 Pronunciation link: <https://www.merriam-webster.com/dictionary/sagittal>
 IPA: /'sædʒ.ə.təl/
 Phonetic Spelling: saj·uh·tuhl
18. Gyrus
 Pronunciation link: <https://www.merriam-webster.com/dictionary/gyrus>
 IPA: /'dʒaɪ.rəs/
 Phonetic Spelling: jy·ruhs
19. Normalized
 Pronunciation link: <https://www.merriam-webster.com/dictionary/normalize>
 IPA: /'nɔːr.məˌlaɪz/
 Phonetic Spelling: nor·muh·lyze
20. Amplitude
 Pronunciation link: <https://www.merriam-webster.com/dictionary/amplitude>
 IPA: /'æm.pləˌtuːd/
 Phonetic Spelling: am·pluh·tood
21. Delineate
 Pronunciation link: <https://www.merriam-webster.com/dictionary/delineate>
 IPA: /dɪˈlɪn.i.ət/
 Phonetic Spelling: dih·lin·ee·ayt
22. Transcranial
 Pronunciation link: <https://www.merriam-webster.com/dictionary/transcranial>
 IPA: /trænsˈkreɪ.ni.əl/
 Phonetic Spelling: trans·kray·nee·uhl
23. Excitability
 Pronunciation link: <https://www.merriam-webster.com/dictionary/excitability>
 IPA: /ɪkˌsaɪ.təˈbɪl.ə.ti/
 Phonetic Spelling: ik·sy·tuh·bil·uh·tee
24. Artefactual
 Pronunciation link: <https://www.merriam-webster.com/dictionary/artifactual>
 IPA: /,ɑːr.təˈfæktʃu.əl/
 Phonetic Spelling: ar·tuh·fak·choo·uhl

25. DICOM
 Pronunciation link: <https://www.howtopronounce.com/dicom>
 IPA: /'daɪ.kə:m/
 Phonetic Spelling: dye·kom
26. Diffusion
 Pronunciation link: <https://www.merriam-webster.com/dictionary/diffusion>
 IPA: /dɪ'fjuː.ʒən/
 Phonetic Spelling: dih·fyoo·zhuhn
27. Tractography
 Pronunciation link: <https://www.howtopronounce.com/tractography>
 IPA: /træk'tɑː.grə.fi/
 Phonetic Spelling: trak·taa·gruh·fee
28. Corticospinal
 Pronunciation link: <https://www.howtopronounce.com/corticospinal>
 IPA: /kə'r.tɪ.koo'spaɪ.nəl/
 Phonetic Spelling: kor·ti·koh·spy·nuhl
29. Pontine
 Pronunciation link: <https://www.merriam-webster.com/dictionary/pontine>
 IPA: /'pɑːn.tiːn/
 Phonetic Spelling: pon·teen
30. Probabilistic
 Pronunciation link: <https://www.merriam-webster.com/dictionary/probabilistic>
 IPA: /,prɑː.bəl.ə'stɪk/
 Phonetic Spelling: prob·uh·bil·uh·stik
31. Deterministic
 Pronunciation link: <https://www.merriam-webster.com/dictionary/deterministic>
 IPA: /dɪ.təː.mə.nɪ'stɪk/
 Phonetic Spelling: dih·ter·muh·nis·tik
32. Segmentation
 Pronunciation link: <https://www.merriam-webster.com/dictionary/segmentation>
 IPA: /,seg.mən'teɪ.fən/
 Phonetic Spelling: seg·muhn·tay·shuhn
33. Metastasis
 Pronunciation link: <https://www.merriam-webster.com/dictionary/metastasis>
 IPA: /mə'tæs.tə.sɪs/
 Phonetic Spelling: muh·tas·tuh·suhs
34. Premotor
 Pronunciation link: <https://www.merriam-webster.com/dictionary/premotor>
 IPA: /,pri:'moʊ.tər/
 Phonetic Spelling: pree·moh·ter
35. Interosseus
 Pronunciation link: <https://www.merriam-webster.com/dictionary/interosseous>
 IPA: /,ɪn.tə'ɑː.si.əs/
 Phonetic Spelling: in·ter·aa·see·uhs

36. Dorsalis

Pronunciation link: <https://www.howtopronounce.com/dorsalis>

IPA: /dɔːr'seɪ.lɪs/

Phonetic Spelling: dor·say·liss