

Submission ID #: 70415

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Title: Instructional Videos Demonstrating Periodontal Instrumentation on a Typodont with Simulated Calculus

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

✓ Correct

2. Interview statements: Which interview statement filming option is the most appropriate for your group? **Please select one.**



Interview Statements are read by JoVE's voiceover talent.

Current Protocol Length

Number of Steps: 34

Number of Shots: 54

Interviews

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

INTRODUCTION:

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

- 1.1. This protocol demonstrates periodontal instrumentation on a on a Typodont with simulated calculus for teaching purposes.

1.1.1. B roll: 2.3.1

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

- 1.2. Existing videos often lack realism, close visualization, and complete coverage of instrumentation techniques and common errors.

1.2.1. B roll: 3.3.1

CONCLUSION:

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

- 1.3. This protocol allows educators to standardize demonstrations and study learner engagement, usability, and skill development.

1.3.1. B roll: 4.2.1

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

- 1.4. The main challenge is demonstrating with close, clear views while preserving correct ergonomics and instrumentation technique.

1.4.1. B roll: 6.4.1

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

- 1.5. Future studies can record live patient and advanced typodont scenarios, including crowding, malposition, and challenging access.

1.5.1. *B roll: 7.4.1*

Protocol

2. Strokes for Calculus Detection with an 11/12 Periodontal Explorer

Demonstrators: Manti Lehn and Amy DeStaffany

NOTE: The authors provided timestamps in seconds: milliseconds. Hence, all the timestamps follow the same pattern (00:23-11:20 means 0 seconds to 11 seconds)

2.1. To begin, select the working end by aligning the terminal shank parallel to the distal surface of the tooth. Confirm that the lower 1/3 (*1 third*) of the tip contacts the surface upon insertion [1-TXT].

2.1.1. LAB MEDIA: Video 1, 00:23–11:20

2.2. Insert at 0 to 10 degrees and advance to the base of the sulcus while maintaining continuous tip contact. Use feather-light lateral pressure and short, overlapping strokes to assess deposits [1].

2.2.1. LAB MEDIA: Video 1, 11:20–25:00

2.3. For the posterior teeth, explore the facial surface in sequence from the distal line angle to the distal surface [1]. Continue along the mid-facial path [2], and then explore from the line angle to the mesial surface [3].

2.3.1. LAB MEDIA: Video 1, 11:29–22:05

2.3.2. LAB MEDIA: Video 1, 25:02–34:30

2.3.3. LAB MEDIA: Video 1, 40:00–50:15

2.4. For the anterior teeth, explore the lingual surface in sequence along the mid-path, around the mesiolingual line angle, and from the line angle to the mesial surface. Then, confirm the quality control endpoints [1].

2.4.1. LAB MEDIA: Video 4, 02:14–10:06; Video 4, 15:00–30:10

3. Periodontal Instrument Sharpening Using a Moving Sharpening Stone

Demonstrator: Manti Lehn

- 3.1. To sharpen a Gracey curette, keep the instrument stationary with the face parallel to the floor. Position the moving stone at approximately [1] 110 degrees to the cutting edge [2].
 - 3.1.1. LAB MEDIA: Video 5, 00:00–13:06
 - 3.1.2. LAB MEDIA: Figure 3C
- 3.2. Use short, controlled downward strokes from heel to toe. Maintain continuous contact with the lateral surface [1]. Lighten pressure when reaching the toe and preserve its rounded contour [2].
 - 3.2.1. LAB MEDIA: Video 5, 15:05–18:12
 - 3.2.2. LAB MEDIA: Video 5, 18:13–25:01
- 3.3. Avoid creating a bevel. Preserve the blade width and the rounded toe shape for curettes [1].
 - 3.3.1. LAB MEDIA: Figure 3B; Figure 3H
- 3.4. For universal curettes and sickle scalers, follow the same moving-stone technique described for the Gracey curette, maintaining an approximately 110-degree stone-to-cutting-edge angle on the lateral surface [1]. Preserve the rounded toe contour for the universal curettes [2].
 - 3.4.1. LAB MEDIA: Video 6, 00:05–13:00 and Video 7, 01:05–14:26 *Video editor: Please play side by side, label the video 6 as “Universal curette” and the video 7 as “Sickle scaler”*
 - 3.4.2. LAB MEDIA: Video 6 13:00–14:26
- 3.5. Under raking light, confirm that a sharp edge does not reflect light [1]. Identify any continuous reflective line along the cutting edge as dullness [2].
 - 3.5.1. LAB MEDIA: Video 8, 04:11–09:09; Video 9, 00:01–08:27 *Video editor: Use split screen to show both*
 - 3.5.2. LAB MEDIA: Video 10, 00:01–22:11

3.6. Avoid sharpening in the incorrect direction [1] and over-angulation of the stone [2].

3.6.1. LAB MEDIA: Video 11, 03:27–11:07 *Video editor: Show wrong (x) sign in red for both these shots*

3.6.2. LAB MEDIA: Video 12, 00:01–07:06 *Video editor: Show the wrong (x) sign in red for both these shots*

4. Magnetostrictive Instrumentation on Posterior Teeth

Demonstrators: Manti Lehn and Amy DeStaffany

4.1. Ensure that the unit is connected to a water supply. Set an adequate flow rate for cooling and lavage [1].

4.1.1. LAB MEDIA: Video 13, 31:05–46:19

4.2. Maintain active water coolant and a low angulation. Align the shank to the tooth surface at approximately 0 to 15 degrees, then advance from the line angle to the base of the sulcus [1].

4.2.1. LAB MEDIA: Video 14, 00:07–14:04

4.3. Roll the handle at the line angle [1] and use overlapping vertical or oblique strokes in the proximal areas while maintaining a low angulation [2].

4.3.1. LAB MEDIA: Video 14, 14:26–16:13

4.3.2. LAB MEDIA: Video 14, 19:12–22:10

4.4. Apply short, 1-to-4-millimeter sweeping strokes with the active surfaces of the insert tip along the cervical and root thirds. Maintain light pressure, continuous movement and irrigation [1].

4.4.1. LAB MEDIA: Video 15, 09:01–27:09

4.5. Avoid positioning the instrument tip perpendicular to the tooth surface [1].

- 4.5.1. LAB MEDIA: Video 16, 03:28–20:26 *Video editor: Show the wrong (x) sign in red for both these shots*

5. Piezoelectric Instrumentation on Posterior Teeth

- 5.1. For linear-motion tips, align the lateral side with the tooth surface at an angulation of approximately 0 to 15 degrees. Insert at the line angle and advance to the base of the sulcus [1].

- 5.1.1. LAB MEDIA: Video 17, 07:00–14:04

- 5.2. Adjust the handle minimally, as the piezoelectric motion is linear [1]. Maintain the lateral surface contact through vertical or oblique passes in the proximal areas with low angulation [2].

- 5.2.1. LAB MEDIA: Video 17, 13:24–14:23

- 5.2.2. LAB MEDIA: Video 17, 22:05–30:02

- 5.3. Maintain light pressure with a continuous movement [1] and ensure that the tip of the instrument is not pointed perpendicular to the tooth surface [2].

- 5.3.1. LAB MEDIA: Video 18, 05:07–39:25

- 5.3.2. LAB MEDIA: Video 19 30:00–39:22 *Video editor: Show wrong (x) sign in red*

6. Universal Curette Instrumentation on Posterior Teeth

Demonstrator: Manti Lehn

- 6.1. Insert the universal curette blade at a closed angle [1].

- 6.1.1. LAB MEDIA: Video 20, 15:15–20:16

- 6.2. After insertion, open the blade angulation for calculus removal and perform distal removal strokes [1].

- 6.2.1. LAB MEDIA: Video 21, 15:10–20:01

- 6.3. Continue onto the facial surface while maintaining lower-third cutting-edge adaptation [1].

6.3.1. LAB MEDIA: Video 21, 21:06–29:12

- 6.4. Roll the handle around the line angle toward the mesial surface [1]. Ensure the lower 1/3 of the cutting edge remains in contact [2] and avoid the use of the incorrect end [3].

6.4.1. LAB MEDIA: Video 20, 39:05–45:10;

6.4.2. LAB MEDIA: Video 21, 29:13–36:22

6.4.3. LAB MEDIA: Video 22, 02:02–10:22 *Video editor: Show wrong (x) sign in red*

7. Subgingival Debridement Using Gracey 11/12 and 13/14 Curettes

- 7.1. Align the terminal shank parallel to the target surface to confirm that the lower cutting edge is in use. [1].

7.1.1. LAB MEDIA: Video 23, 00:00–02:13 and Video 24, 02:06

- 7.2. Use Gracey 11/12 (11-12) for mesial and facial or lingual surfaces. Roll the handle around the line angle to maintain adaptation [1]. Use short vertical, horizontal, and oblique pull strokes with the lower 1/3 of the cutting edge adapted [2].

7.2.1. LAB MEDIA: Video 23, 02:13–08:04

7.2.2. LAB MEDIA: Video 23, 09:04–17:00

- 7.3. Switch to the Gracey 13/14 (13-14) curette for distal surfaces. Use short vertical or oblique pull strokes from the base coronally and maintain firm lateral pressure as deposits are released. Keep the terminal shank parallel and the lower 1/3 of the cutting edge adapted to the surface [1].

7.3.1. LAB MEDIA: Video 24, 00:00–20:09

7.4. Do not use the incorrect end of the instrument [1].

7.4.1. LAB MEDIA: Video 25, 01:25–14:18 *Video editor: Show wrong (x) sign in red*

8. Supragingival Calculus Removal with a Sickle Scaler

8.1. Maintain an angulation of 45 to 90 degrees during deposit removal [1]. Do not insert the pointed tip subgingivally [2].

8.1.1. LAB MEDIA: Video 26, 07:23–11:20

8.1.2. LAB MEDIA: Video 26, 21:27–26:21 *Video editor: Show wrong (x) sign in red*

8.2. For the anterior facial surfaces, begin at the midline of the anterior tooth and move toward the proximal end using short vertical or oblique pull strokes. Roll the handle at the line angle to maintain continuous adaptation into the proximal [1].

8.2.1. LAB MEDIA: Video 27, 05:12–09:00 *Video editor: Play in loop*

8.3. Use a controlled pull stroke from the contact toward the incisal edge to remove the deposit at the contact point and repeat the sequence for the other proximal end of the tooth [1].

8.3.1. LAB MEDIA: Video 27, 09:00–20:10

8.4. Then, proceed tooth by tooth across the arch [1]. Flip the instrument and repeat the sequence for the remaining facial surfaces [2].

8.4.1. LAB MEDIA: Video 27, 21:00–26:10

8.4.2. LAB MEDIA: Video 27, 28:15–47:24

8.5. Next, scale the posterior facial surfaces using the same sequence described for the anterior facial surfaces [1], but begin at the distal line angle rather than the midline surface [2].

8.5.1. LAB MEDIA: Video 28, 09:06–18:23

8.5.2. LAB MEDIA: Video 28, 35:16–44:26

- 8.6. Finally, for the lingual surfaces, repeat the midline-to-line-angle-to-contact sequence, maintaining an angulation of 45 to 90 degrees and lower 1/3 cutting-edge engagement. Repeat the sequence for the remaining lingual surfaces [1].

8.6.1. LAB MEDIA: Video 29, 00:01–22:21

1. Periodontal
Pronunciation link: <https://www.merriam-webster.com/dictionary/periodontal>
IPA: /ˌpɛr.i.ooʊˈdɑːntəl/
Phonetic Spelling: peh·ree·oh·DAH·nuhl
2. Calculus
Pronunciation link: <https://www.merriam-webster.com/dictionary/calculus>
IPA: /ˈkælkjələs/
Phonetic Spelling: KAL·kyuh·luhs
3. Sulcus
Pronunciation link: <https://www.merriam-webster.com/dictionary/sulcus>
IPA: /ˈsʌlkəs/
Phonetic Spelling: SUL·kuhs
4. Mesiolingual
Pronunciation link: No confirmed link found
IPA: /ˌmiːzi.ooʊˈlɪŋgwəl/
Phonetic Spelling: mee·zee·oh·LING·gwuhl
5. Lingual
Pronunciation link: <https://www.merriam-webster.com/dictionary/lingual>
IPA: /ˈlɪŋgwəl/, /ˈlɪŋɡjuəl/
Phonetic Spelling: LING·gwuhl; LING·gyoo·uhl
6. Mesial
Pronunciation link: <https://www.merriam-webster.com/dictionary/mesial>
IPA: /ˈmiːziəl/, /ˈmiːsiəl/
Phonetic Spelling: MEE·zee·uhl; MEE·see·uhl
7. Gracey
Pronunciation link: No confirmed link found
IPA: /ˈɡreɪsi/
Phonetic Spelling: GRAY·see
8. Curette
Pronunciation link: <https://www.merriam-webster.com/dictionary/curette>
IPA: /kjoʊˈret/
Phonetic Spelling: kyoo·RET
9. Bevel
Pronunciation link: <https://www.merriam-webster.com/dictionary/bevel>

- IPA: /'bɛvəl/
Phonetic Spelling: BEV·uhl
10. Magnetostrictive
Pronunciation link: <https://www.merriam-webster.com/dictionary/magnetostrictive>
IPA: /mæg,niːtoʊ'strɪktɪv/, /mæg,nɛtoʊ'strɪktɪv/
Phonetic Spelling: mag·NEE·toh·STRIK·tiv; mag·NEH·toh·STRIK·tiv
11. Lavage
Pronunciation link: <https://www.merriam-webster.com/dictionary/lavage>
IPA: /lə'vɑːʒ/
Phonetic Spelling: luh·VAHZH
12. Angulation
Pronunciation link: <https://www.merriam-webster.com/dictionary/angulation>
IPA: /,æŋɡjə'leɪʃən/
Phonetic Spelling: ang·gyuh·LAY·shuhn
13. Oblique
Pronunciation link: <https://www.merriam-webster.com/dictionary/oblique>
IPA: /oʊ'bliːk/, /ə'bliːk/, /oʊ'blaɪk/
Phonetic Spelling: oh·BLEEK; uh·BLEEK; oh·BLYKE
14. Cervical
Pronunciation link: <https://www.merriam-webster.com/dictionary/cervical>
IPA: /'sɜːvɪkəl/
Phonetic Spelling: SUR·vih·kuhl
15. Piezoelectric
Pronunciation link: <https://www.merriam-webster.com/dictionary/piezoelectric>
IPA: /piː,ɪzəʊə'lektrɪk/, /piː,ɑːtsəʊə'lektrɪk/
Phonetic Spelling: pee·AY·zoh·uh·LEK·trik; pee·AHT·soh·uh·LEK·trik
16. Subgingival
Pronunciation link: <https://www.merriam-webster.com/medical/subgingival>
IPA: /,sʌb'dʒɪŋdʒɪvəl/
Phonetic Spelling: sub·JIN·jih·vuhl
17. Debridement
Pronunciation link: <https://www.merriam-webster.com/dictionary/debridement>
IPA: /dɪ'briːdmənt/, /deɪ'briːdmənt/
Phonetic Spelling: dih·BREED·muhnt; day·BREED·muhnt
18. Supragingival
Pronunciation link: <https://www.merriam-webster.com/medical/supragingival>
IPA: /,suːprə'dʒɪŋdʒɪvəl/
Phonetic Spelling: soo·pruh·JIN·jih·vuhl
19. Subgingivally
Pronunciation link: <https://www.merriam-webster.com/medical/subgingival>
IPA: /,sʌb'dʒɪŋdʒɪvəli/
Phonetic Spelling: sub·JIN·jih·vuh·lee
20. Incisal
Pronunciation link: <https://www.merriam-webster.com/dictionary/incisal>

IPA: /ɪnˈsaɪzəl/, /ɪnˈsaɪsəl/

Phonetic Spelling: in·SYE·zuhl; in·SYE·suhl