Medical University of South Carolina (MUSC) Value Institute  
Evidence-Based Practice Summary  
Developed through the EBP for Health Care Professionals Course  

Tactile Acuity: What Can We Feel?

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**ASK THE QUESTION**

**Clinical Question:** Does the tactile acuity of dental students change over the length of their Doctoral program? What are we able to detect?

**Objective:** Two fold.  
First- what degree of change are we able to detect with tactile investigation?  
Second- can the tactile acuity of dental students be improved over the length of their doctoral program?

**Background:** The clinical practice of dentistry relies on the ability of the dentist to detect changes using only tactile examination. While the use of tactile skills is taught in the doctoral program, specific efforts to enhance or improve the students’ tactile acuity seem to be rare or nonexistent.

**SEARCH FOR EVIDENCE**

**Databases searched:** PubMed

**Search strategies:** used search terms consistent with the question including tactile, touch, detection, training, acuity

**Filters/limits (publication date, age, etc.):** no filters applied
CRITICALLY ANALYZE THE EVIDENCE

There is clearly a limit to what a human is able to detect by touch with the finger. The addition of a dental instrument for appropriate use with a patient allows for a range of surface changes to be detected. Comparing these basic, tactile techniques with newer, technology based techniques indicates a benefit to the technology-based techniques.

<table>
<thead>
<tr>
<th>Author/Date/ Journal</th>
<th>Purpose of Study</th>
<th>Study Design</th>
<th>Sample and Setting</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skedung, Arvidsson, Chung, Stafford, Berglund, Rutland</td>
<td>Determine what size of surface change we are able to feel with our fingers.</td>
<td>Manufactured test surfaces with different surface changes used to test subjects’ ability to feel a surface change.</td>
<td>20 blinded participants; determined using finger touch</td>
<td>Able to detect down to 10 nm surface change</td>
<td>Study Limitations = None. <em>RCT &amp; Quasi-Experimental Studies</em></td>
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<tr>
<td>Ekstrand, Ricketts, Longbottom, Pitts</td>
<td>Evaluate visual and tactile assessment of arrested decay</td>
<td>Evaluation of patient’s carious lesions (decay) either active or arrested by treatment</td>
<td>Clinical setting; human subjects</td>
<td>Dentists were unable to distinguish active and arrested carious lesions using visual and/or tactile methods</td>
<td>Study Limitations = None. <em>RCT &amp; Quasi-Experimental Studies</em></td>
</tr>
<tr>
<td>Kraye, Fiorica, Houston</td>
<td>Determine what size calculus</td>
<td>Blinded evaluation of extracted teeth</td>
<td>Extracted human teeth. Table</td>
<td>30 of first year and 40% of fourth year students reported feeling a</td>
<td>Study Limitations = None. <em>RCT &amp; Quasi-Experimental Studies</em></td>
</tr>
</tbody>
</table>
Dental students can feel. Also, do fourth-year students have more acute tactile sense than first-year students.

With calculus deposits of varying sizes, surface change when none was present. As the size of the deposit increased from 0.1 mm to 0.7 mm a greater percentage of first and fourth year students correctly identified the presence of the deposit.

Osborn, Lenton, Lunos, Blue

Live patients; treated for calculus removal facilitated with the periodontal endoscope vs. traditional detection methods.

26 patients evaluated by two dental hygiene faculty members. Adding the Perioscope led to greater calculus removal between two treatment visits (p<0.025) compared to tactile techniques only.

Shakibaie and Walsh

Extracted teeth set in a typodont with simulated soft tissues; evaluate for calculus presence then evaluate with visual examination under.

Single examiner; 15 samples. DR was more accurate than tactile techniques (79% vs. 60%); both better on single rooted teeth than multirooted teeth.

Publication Bias (e.g. pharmaceutical company sponsors study on effectiveness of drug)

Increase Quality Rating if:

- Large Effect

Level of evidence for studies as a whole:

- High
- Moderate
- Low
- Very Low
**APPLY THE EVIDENCE**

**Practice Recommendation:** Develop an instructional method to try to improve the tactile acuity of dentists and/or dental students to detect calculus deposits.

**Strength of Recommendation:** Strong

**Quality of Evidence:** Moderate

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**EVALUATE THE EVIDENCE**

**Outcome & Process Measures:**
The evidence suggests the level of tactile acuity among humans is highly variable. The evidence also suggests that technological replacements for the use of tactile skills might be considered though the cost of such replacements may be prohibitive.

**Implementation Plan:** Develop a training procedure to improve the tactile acuity of students and dentists using manufactured, standardized examples of surface changes of precise amounts. Begin the training in the first year of the dental curriculum, allow for periodic retraining and evaluate before the end of the fourth year of the doctoral program. Respond to subject remarks about the training and adapt if possible

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**REFERENCES**


Appendix A: GRADE criteria for rating a body of evidence on an intervention
Developed by the GRADE Working Group

Grades and interpretations:
High: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low: Any estimate of effect is very uncertain.

Type of evidence and starting level
Randomized trial—high
Observational study—low
Any other evidence—very low

Criteria for increasing or decreasing level

| Reductions |
|-----------------|-----------------|
| Study quality has serious (−1) or very serious (−2) problems |
| Important inconsistency in evidence (−1) |
| Directness is somewhat (−1) or seriously (−2) uncertain |
| Sparse or imprecise data (−1) |
| Reporting bias highly probable (−1) |

| Increases |
|-----------------|-----------------|
| Evidence of association† strong (+1) or very strong (+2) |
| Dose-response gradient evident (+1) |
| All plausible confounders would reduce the effect (+1) |

†Strong association defined as significant relative risk (factor of 2) based on consistent evidence from two or more studies with no plausible confounders. Very strong association defined as significant relative risk (factor of 5) based on direct evidence with no threats to validity.