

# "Speescale: Intraoral Curve Of Spee Measuring Device"

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## **Abstract-**

*Molar distalization is an effective orthodontic approach for correcting class II malocclusion and managing space without extractions. It may involve distal movement of upper molars using intraoral appliances. While conventional methods may cause anchorage loss, skeletal anchorage has improved control and predictability. Right appliance selection are essential for achieving stable and efficient treatment outcomes.*

**Keywords-** *Molar distalization, Skeletal anchorage, Mini implants, Anchorage control*

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## **I. Introduction**

The curve of Spee, first described by Ferdinand Graf von Spee in 1890, refers to the anteroposterior curvature of the occlusal surfaces of the mandibular teeth<sup>1-2</sup>. It plays a crucial role in maintaining functional occlusion, balanced mastication, and overall dental arch harmony. In orthodontic diagnosis and treatment planning, evaluation of the curve of Spee is essential for identifying deep bites, determining occlusal plane levelling, and assessing treatment progress, especially in cases involving bite opening or levelling of the arch. Conventional methods for measuring the curve of Spee include cephalometric analysis, dental casts, and three-dimensional imaging. While these techniques are useful, they often require additional equipment, time, and indirect measurements, which may introduce variability and reduce chair side efficiency<sup>2-3</sup>. With the increasing demand for real-time, practical, and reproducible clinical tools, there is a need for a simple device that can directly measure the curve of Spee within the patient's oral cavity.

This article introduces a novel device specifically designed to address this gap in clinical orthodontics. It consists of a horizontal bite bar and a vertically movable scale calibrated to measure the depth of the curve of Spee at the second premolar region—a key site for assessing occlusal curvature. The device (SpeeScale) aims to provide an easy-to-use, direct, and cost-effective method to support accurate diagnosis, monitor treatment progression, and improve clinical documentation in orthodontic practice<sup>4</sup>.

## **II. Materials Required**

1. Biocompatible 3D Printing Resin
2. SLA or DLP 3D Printer
3. CAD Design Software
4. Isopropyl Alcohol (90% or higher)
5. UV Curing Station or UV Light Source
6. Calibrated Measuring Scale

In addition to 3D printing with biocompatible resin, this device can also be fabricated using conventional acrylic materials, making it accessible in clinical settings without advanced digital infrastructure. Heat-cured or cold-cure acrylic sheets with a thickness of 3 to 5 mm can be manually shaped to form the

horizontal bite bar. A vertical groove or slot can be created to accommodate a calibrated measuring scale made of plastic or stainless steel. The parts can be assembled using dental acrylic adhesive or cyanoacrylate glue, and the device can be finished with polishing and smoothing tools to ensure intraoral safety and patient comfort. This alternative method offers a cost-effective and easily reproducible option for practitioners in resource-limited environments.

### **Fabrication**

**1. Designing the Device (CAD Design)** - Use CAD software such as Autodesk Fusion 360, Blender, or Solid Works.

Design two main components:

- A horizontal bite bar wide enough for the patient to occlude stably.
- A vertical scale or a groove for inserting a calibrated vertical measuring arm, aligned to the second premolar region.

**2. Exporting the Design-** Export the final design in STL format (standard for 3D printing).

**3. Preparing for Printing (Slicing)** - Import the STL file into slicing software (e.g., Pre Form for Formlabs, Chitubox for Anycubic).

#### **Set the desired:**

- Layer height (recommended: 50–100 microns for precision),
- Print orientation (to minimize supports on functional surfaces),
- Support structures (light supports preferred).

**4. 3D Printing-** Load the **biocompatible resin** into the SLA/DLP printer.

### **5. Post-Processing**

**Washing:** Clean the printed parts in isopropyl alcohol ( $\geq 90\%$ ) to remove uncured resin.

**Drying:** Air-dry the parts thoroughly after washing.

**Curing:** Place the parts in a UV curing chamber to fully polymerize the resin, following manufacturer's recommendations (typically 10–20 minutes).

**6. Finishing-** Use **fine-grit sandpaper or rotary tools** (400–1000 grit) to smooth any sharp edges or rough surfaces for patient comfort. (Figure 1-6)

### **Advantages**

**1. Simple and Easy to Use** – Requires minimal clinical time and no advanced training to operate.

**2. Chair side Application** – Allows direct intraoral measurement without the need for dental casts or radiographs.

**3. Cost-Effective** – Can be fabricated using affordable materials like acrylic or 3D-printed resin, making it accessible in resource-limited settings.

**4. Customizable** – Dimensions and features can be modified based on patient arch size or clinical preference.

**5. Reproducible Measurements**– Provides consistent and repeatable readings when used with proper technique.

**6. Portable and Lightweight-** Easy to carry and store in clinical setups; ideal for use in private practices and teaching institutes.

**7. Supports Clinical Documentation-** Facilitates recording of baseline and progress measurements in deep bite or levelling cases.

**8. Biocompatible and Safe** – Fabricated from materials (resin/acrylic) that is safe for short intraoral use with proper finishing and sterilization.

**9. No Radiation Exposure**– Unlike cephalometric methods or CBCT, this tool does not involve radiation.

**10. Time-Saving-** Eliminates the need for indirect measurement methods such as plaster model analysis or digital scanning.

## **III. Discussion**

The curve of Spee is a critical parameter in orthodontic diagnosis and treatment planning, particularly in managing deep bites and leveling the occlusal plane. Traditional methods for measuring this curve—such as dental casts, cephalograms, and 3D scans—are often indirect, time-consuming, or require specialized

equipment<sup>3</sup>. The device presented (SpeeScale) in this article offers a simple, direct, and chairside alternative for measuring the curve of Spee at the second premolar region. Its design allows for quick, reproducible measurements without the need for radiographic imaging or laboratory processing. The device (SpeeScale) is versatile, as it can be fabricated using either 3D-printed biocompatible resin for high precision or conventional acrylic for cost-effective, low-resource applications. This makes it highly practical for both clinical and academic settings<sup>4</sup>. While initial use suggests clinical efficiency and ease, further validation studies comparing its accuracy to digital and radiographic methods would strengthen its applicability and support broader adoption.

#### IV. Limitation

- **Requires 3D printer for high-precision fabrication:** Not all clinics have access to 3D printing technology.
- **Limited validation:** Lacks comprehensive clinical studies comparing its accuracy with standard methods.
- **Operator sensitivity:** Accuracy may depend on clinician's technique and consistency.

#### V. Conclusion

The accurate assessment of the curve of Spee is a critical component of orthodontic diagnosis, treatment planning, and progress evaluation. The device presented in this article offers a simple, direct, and clinically practical method for measuring the depth of the curve of Spee at the second premolar region. Whether fabricated using advanced 3D printing with biocompatible resin or conventional acrylic materials, the device (SpeeScale) is easy to use, reproducible, and well-suited for chairside application. Its portability and cost-effectiveness make it especially valuable in settings where traditional measurement methods may be time-consuming or impractical. Incorporating this tool (SpeeScale) into routine orthodontic assessments can enhance clinical precision and improve treatment documentation. Further studies may validate its accuracy across diverse malocclusion types and expand its applicability in broader clinical contexts.

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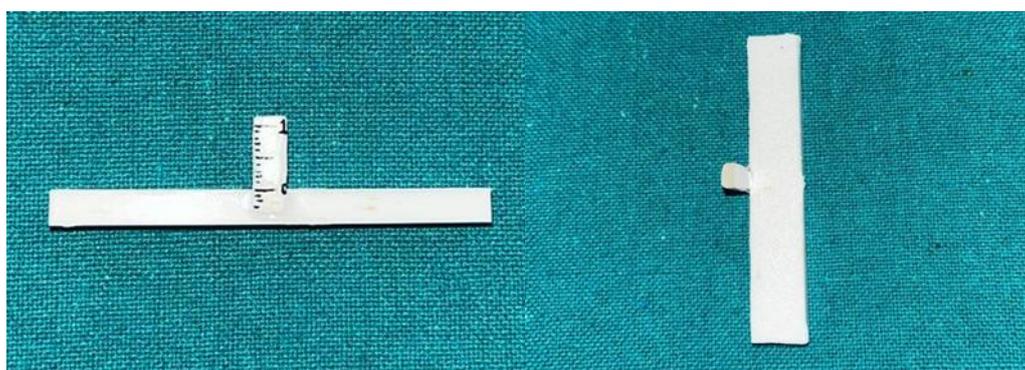


Figure 1- Top view of SpeeScale

figure 2 - Back view of SpeeScale

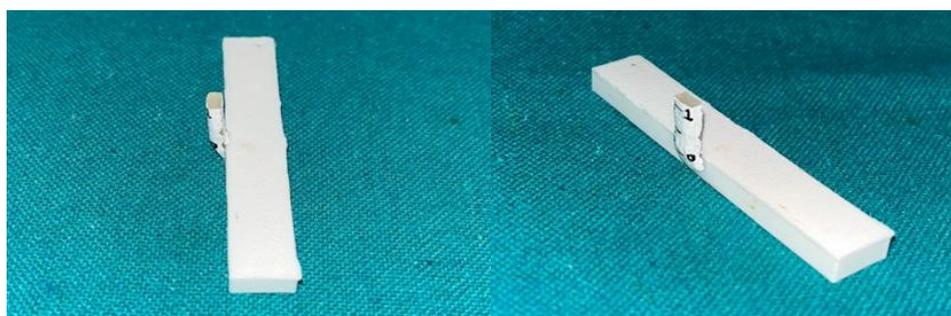
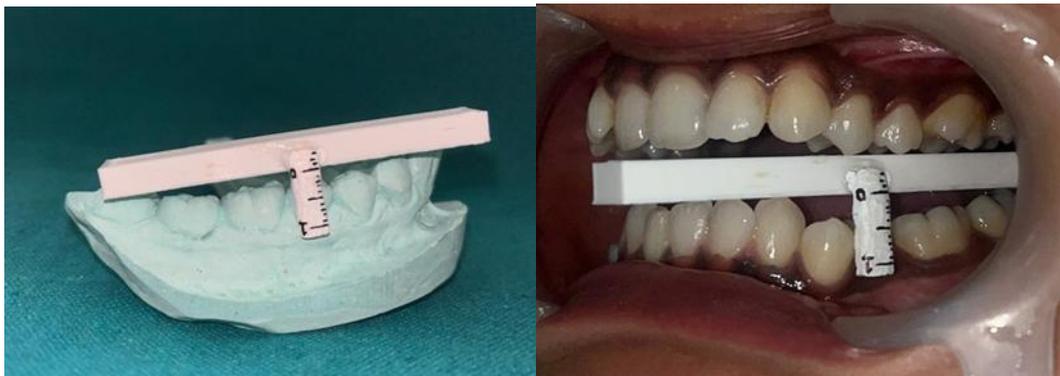


Figure 3 – Top vertical view of SpeeScale

figure 4- Side view of SpeeScale



**Figure 5 – Extra-oral view of SpeeScale**

**figure 6 – Intra-oral view**