THE JOURNAL OF PROSTHETIC DENTISTRY

TIPS FROM OUR READERS

A straightforward method to record the peak torque value when using a cantilever spring mechanical torque limiting device

Chandur PK Wadhwani, BDS, MSD,[a] and Kwok Hung Chung, DDS, MS, PhD[b]

ABSTRACT

Implant cantilever beam torque limiting devices suffer from two prominant issues. 1. They do not record the peak torque applied. 2. They suffer from viewing angle parallax. A simple, inexpensive device, placed between the measurement reader arms of th instrument that can resolve these issues is described. (J Prosthet Dent xxxx;xxx:xxx-xxx)

Mechanical torque limiting devices (MTLDs) used in implant dentistry are typically available as either friction or cantilever spring types.[1] The friction type MTLD has 2 major disadvantages compared with the cantilever beam type: the need to carefully control the activation speed,[2,3] the higher maintenance demands.[3,4] However, when a calibrated friction type MTLD is used correctly, it has the ability to record the peak torque it delivers, which is preset on the instrument. Conversely, the cantilever beam MTLD cannot be preset and the peak torque it delivers is not recorded once the cantilever spring beam has been released. The cantilever beam MTLD is also affected by the viewing position of the operator because of the parallax effect, a result of the activating spring beam not being in the same plane as the marker arm's numerical etchings.[5,6] Measurement errors increase the consequences of premature screw joint failure from either under- or over-tightening the implant abutment or restoration screw.[7] Many cantilever beam MTLDs have separate dual marker arms through which the spring cantilever beam is activated, allowing torque measurement for both tightening and loosening the screw. The gap between the marker arms offers a site where a marker may be placed directly against the activation beam. As the beam is activated, the marker is pushed along the marker arms. Provided the marker can move and is not fixed, the torque delivered to the screwdriver is not affected. At the end of the activation when the activation beam is released, it will return to its start position and leave the marker in place. This can then be reviewed as it records the peak torque delivered. The marker material is a medical-grade polyolefin,[7] available in different colors, making it highly visible. Polyolefins are available in the form of heat shrink tubes (Ginsco Tubing Kit; Amazon) in various diameters and easily cut. When the tube is sectioned longitudinally one half can be placed between the marker arms. As this material has resilience, the section expands allowing it to be used with different cantilever beam MTLDs.

The marker is useful for checking the torque delivered to an implant restoration as well as when checking the cantilever beam MTLD to confirm accuracy and precision. Checking should be regularly undertaken[8] and accomplished by comparing the cantilever beam MTLD to an implant torque verification instrument (ITVS; ImplantWise).

The following describes a straightforward means of producing a maker to be placed in the measurement scale arms of most common spring cantilever MTLDs.

PROCEDURE

1. Cut a 12-mm length of Ø2.4-mm shrink tubing (Fig. 1) then proceed to cut it longitudinally into 2 halves.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: C.W. reports a relationship with Implantwisedental.com that includes: equity or stocks. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[a]Private practice (Prosthodontics), Bellevue, Wash; and Science Director, Foundation for Oral Rehabilitation, Luzern, Switzerland.
[b]Professor, Department of Restorative Dentistry, School of Dentistry, University of Washington, Seattle, Wash.

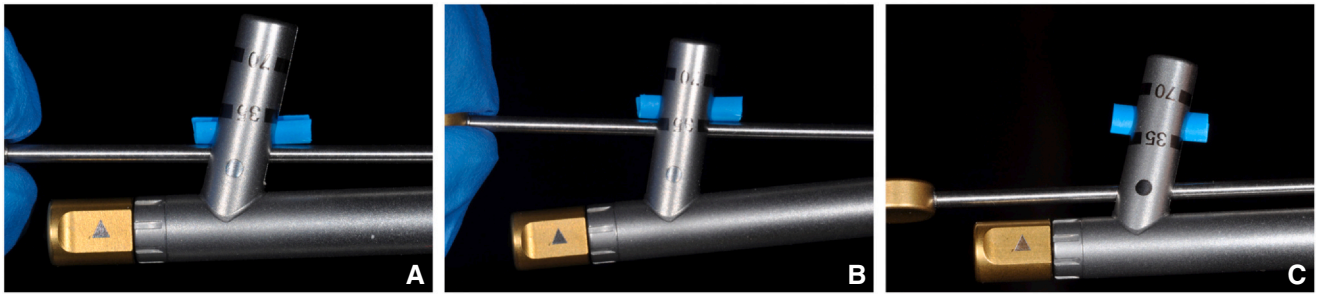

Figure 1. A, Marker shown contacting leading edge of cantilever beam. B, Beam activation concurrently moves marker. C, Releasing activation beam, marker remains in situ recording peak torque value.

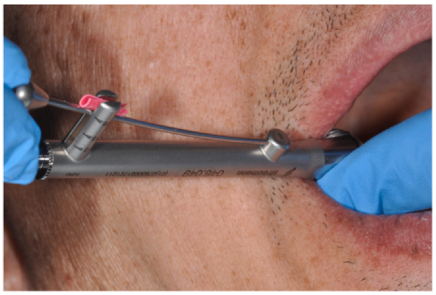

Figure 2. A, Marker clinically. B, Marker use with torque verifying

Figure 3. Marker being used when verifying torque device appropriately calibrated. Verification device held in one hand.

2. Use one of the halves and place it between the measurement arms of the cantilever beam MTLD. The cut side should face away from the beam. Disinfect with 70% alcohol if used clinically.
3. Slide the marker so it contacts the leading edge of the activation spring beam (Fig. 1A).
4. Activate the cantilever spring lever until the required torque is indicated on the scale marker arm (Fig. 1B).
5. On releasing the spring beam, it returns to the start location, leaving the marker at the peak location. Important note: The marker position reflects the leading-edge position of the beam, but not all cantilever beams use the leading edge of the activation beam as the site marking the torque value (Fig. 1C).
6. View the cantilever beam MTLD and confirm the marker reflects that the target torque reached the desired position on the graduated scale (Fig. 2). If not, repeat the procedures #3 to #5 by retightening or loosening the screw until it is achieved.
7. The marker can also be used when verifying the cantilever instrument provides the correct torque values. Place the marker against the leading edge, activate the MTLD while it is attached to the verification instrument. Once the peak value is achieved, remove the cantilever beam MTLD from the read the marker position. Compare the torque values of the cantilever and the verifying instrument (ITVS; ImplantWise) (Fig. 3).
8. Discard after use- do not heat.

SUMMARY

The cantilever beam MTLD marker device described is straightforward, inexpensive, made from a readily available material, and easy to fabricate. It provides a way of determining that the spring beam cantilever has delivered the required torque to the implant, abutment screw, or restoration screw. It can also be used as a check to reduce measurement read error associated with parallax that occurs when the operator does not have a good viewing angle when using a cantilever beam MTLD.

REFERENCES

1. Erdem MA, Karatasli B, Dinçer Kose O, et al. The accuracy of new and aged mechanical torque devices employed in five dental implant systems. *Biomed Res Int*. 2017;2017:8652720.
2. Wadhwani CPK, Frantz WT, Schoenbaum TR, Rosen PS, Nhan D, Chung KH. Effect of activation rate on output torque values from a dental implant toggle-style torque wrench. *J Prosthet Dent*. 2023;129:763–768.
3. McCracken MS, Mitchell L, Hegde R, Mavalli MD. Variability of mechanical torque-limiting devices in clinical service at a US dental school. *J Prosthodont*. 2010;19:20–24.
4. Gutierrez J, Nicholls JI, Libman WJ, Butson TJ. Accuracy of the implant torque wrench following time in clinical service. *Int J Prosthodont*. 1997;10:562–567.

5. Wadhwani CPK, O'Brien R, Rosen PS, Chung KH. Effect of viewing angles on measurement errors when using an implant cantilever beam torque-limiting device. *J Prosthet Dent*. 2023;130:597–601.
6. Shiba H, Sato Y, Furuya J, et al. Experimental study on the factors affecting torque of beam-type implant torque wrenches. *BMC Oral Health*. 2021;21:344–353.
7. Westlie AH, Chen EY, Holland CM, et al. Polyolefin innovations toward circularity and sustainable alternatives. *Macromol Rapid Commun*. 2022;43:e2200492.
8. Wadhwani CP, Rosen PS, Yang G, et al. Survey of dental clinicians for attitude and use of torque-limiting devices. *Int J Oral Maxillofac Implants*. 2021;36:538–545.

Corresponding author:
Dr Chandur Wadhwani
12715 Bel-Red Road, #201
Bellevue, WA 98005
Email: cpkw1@live.com

https://doi.org/10.1016/j.prosdent.2025.02.021