Short Communication

An Innovative Light Curing Unit With Multiple Portable Power Sources

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Abstract
The process of attaching brackets to the tooth surface has evolved from brackets being welded to bands to attaching them using light cure composite resin materials. Similarly, the curing lights have advanced from bulky Quartz-Tungsten-Halogen lights to light-emitting diode (LED) curing units. The LED curing units available now have advanced features like high intensity light, reduced curing time, and are very expensive and rely upon prior charging of the unit. The present article describes a curing light which is powered by an external power source like, laptop, smartphone, and power bank and is very compact compared to the present curing lights and is also less expensive.

Keywords
Light cure unit, bonding, LED light, shear bond strength

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Introduction
Orthodontic treatment involves brackets which are attached to the teeth surfaces to apply orthodontic force; this has been the tradition till the arrival of aligners into the armamentarium of an orthodontist. In the early 1980s, visible light-cured restorative materials were introduced which became increasingly popular for bonding orthodontic brackets, lingual retainers, and bands as they allowed unlimited work time. The catalyst used for these adhesives was camphorquinone, which cured in the visible light range (440-480 nm) with a Quartz-Tungsten-Halogen (QTH) light, making them safe for exposed eyes and skin.¹

The light sources for polymerization of composite resins available are QTH, Plasma Arc Curing, Argon laser, and light-emitting diode (LED). The light intensity of curing devices is defined by the International Organization for Standardization as the International Organization for Standardization (ISO) 4049 standard, which recommends an intensity of 300 mW/cm² with a wavelength bandwidth of 400 to 515 nm on the tip of the light curing device.² The present curing lights available in the market have intensity of more than 1,000 mW/cm² and have a curing time of less than 20 s. These curing lights are less cumbersome when compared to the original halogen curing lights but are still bulky to carry. The present day curing lights have supercapacitors which reduce the charging time of the curing light and are very expensive.

This article describes and evaluates an innovative light-curing unit that is less cumbersome, less expensive when compared to the present day curing lights, and uses laptop, smartphone, and power banks as power source (Figure 1).

Materials and Methods
SmartLite is a prototype light-curing unit housed in a rectangular 3D printed casing of 10 cm in length and 3 cm in width (Figure 2). The unit itself consists of LED bulb which emits blue light at an intensity of 525 mW/cm², 440 to 480 nm wavelength at the top of the casing (Figure 2A). At the base, there is a micro USB port used to attach the power sources (Figure 2B). On one side of the casing, there is an on/off switch (Figure 2C, D).

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The SmartLite prototype light-curing unit was tested on crowns of recently extracted 16 random human anterior and posterior teeth (Figure 3). All teeth were mounted in acrylic for testing. Preadjusted 0.022” metal brackets were bonded to all teeth using TransbondXT primer and adhesive. SmartLite unit was used to prime and cure the bracket for 20 s per teeth respectively. The power source used was laptop (Figure 4). After curing, the sample was assessed for shear bond strength using a universal testing machine at a crosshead speed of 1 mm per min, with a load of 1 kN (Figure 5).
available in market have intensity of more than 1,000 mW/cm², have a curing time of less than 20 s but require prior charging with electricity. Smartphones and power banks have become an inseparable part of a clinician’s armamentarium. SmartLite is powered by such external power sources like laptop, smartphone, or power bank which are carried by clinicians. SmartLite acts as a good curing light for bonding in case of failure of prior charging of the LED unit or in rural areas where there is problem of electricity. Lack of a battery source in the light unit also makes it easy to carry in the pocket and very compact. Though the advanced LED curing lights reduce the orthodontic bonding time, they are still expensive when compared to SmartLite.

**Conclusions**

SmartLite is a compact, portable, and less-expensive prototype of a curing light which can use smartphones, power banks, and laptops as a power source. The teeth cured with this light unit have mean shear bond strength of 8 MPa which makes it ideal to be used in orthodontic bonding procedures.

**Declaration of Conflicting Interests**

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**Statement of Informed Consent and Ethical Approval**

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