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| Articles | Study design | Laser | Wavelength and power | Dose | Total energy | Pain measurement | Subject | Orthodontic treatment |
| Dominguez et al. (2013) | Single-blind RCT (split mouth) | GaAlAs laser | 830 nm  100 mW | 80 J/cm2, 2.2 J vestibular and palatal surface, for 22 sec each  Only one dose: T0 | 4.4 per tooth | VAS  after 2 h (T1), 6 h (T2), 24 h (T3), 2 days (T4), 3 days (T5), and 7 days(T6) | 59:  40 F - 19 M  AGE: 20-30 | mini brackets Equilibrium and self-ligating brackets  slot 0.022 inch |
| Wu et al. (2018) | Double-blinded RCT | GaAlAs diode laser | 810 nm  400 mW | 2 J/cm2  3 points/side, for 20 sec each  Multiple doses: 0h, 2 h, 24 h, 4 d, and 7 d | Not indicated | Quantitative sensory testing (QST)  at 0 h, 2 h, 24 h, 4 d, and 7 d | 40:  30 F – 10 M  Age: 12-33 | self-ligating brackets  slot 0.022 inch |
| Sobouti et al. (2015) | Single-blind RCT (split-mouth) placebo-controlled | He-Ne laser | 632.8 nm  10 mW | 6 J/cm2  buccal and palatal: radical apical for 80 sec and coronal for 40 sec  Only one dose: T0 | Not indicated | VAS  on the 1, 2, 4, and 7 days | 27:  11 F – 16 M  Age: 12-21 | metal pre-adjusted brackets  (Extractions) |
| Isola et al. (2019) | RCT (split mouth ) | Diode laser | 810 nm  1 W | 66.7 J/cm2,  3 points/side for 15 sec each  Multiple doses: 0d, 3d, 7d, 14d and every 15d | 8 J  (2 x 40 s x 100 mW) | VAS  at 3, 7, and 14 days | 41:  20 F – 21 M  Age: 10-18 | metal brackets slot 0.022–0.028 inch  (Extractions) |
| Qamruddin et al. (2017) | Single-blinded RCT (split-mouth) | GaAlAs diode laser | 940 nm  100 mW | 7.5 J/cm2,  5 points/side, 3 sec for each point  Multiple doses: T0, T1 and T2 | Not indicated | NRS  4h and 24h after each application | 20:  10 F – 10 M  Age: 12-25 | self-ligating MBT brackets slot 0.022-inch  (Extractions) |
| Celebi et al. (2019) | RCT (split-mouth) | GaAlAs diode laser | 820 nm  110.3 mW | 1.76 J/cm2, 3 points/side for 16 sec each.  Only one dose | Not indicated | VAS  2h, 6h, 24h, 2d, 3d and 7d | 60:  30 F – 30 M  Age: 11-23 | fixed orthodontic tratment, slot  0018x0.025 inch |
| Domiguez A. et al (2013) | RCT | Diode laser | 670 nm  200 mW | 6.37 W/cm2, 3 surface,  3 min on each surface  Multiple doses: 0, 1, 2, 3, 4, and 7 days | 108 J | VAS  day 0, 1, 2, 3, 4, 7, 30, and 45 | 10:  5 F – 5 M  Age: 12-16 | fixed orthodontic treatment  slot 0.018 inch  (Extractions) |
| Qamruddin et al. (2018) | single-blinded RCT (split mouth), placebo controlled | GaAlAs diode laser | 940- nm  100 mW | 7.5 J/cm2,  5 points/side for 3 sec.  Only one dose | 75 J per tooth | NRS.  at consecutive 12 h intervals for 7 days | 42:  26 F – 16 M  Age: 12-25 | fixed orthodontic treatment  slot 0.022-inch  (Extractions) |
| Doshi-Mehta et al (2012) | RCT (split mouth) | GaAlAs diode laser | 800 nm  0.7 mW | 8 J (2 x 40 sec x 100 mW).  5 points/side  Multiple doses: 0, 3, 7, and 14 days | 8 J  (2 x 40 s x 100 mW). | Visual pain scale  at 1, 3, 30 days | 20:  12 F – 8 M  Age: 12-23 | fixed orthodontic treatment  slot 0.022-inch  (Extraction) |
| Storniolo-Souza et al. (2020*)* | double-blind, placebo controlled RCT (split mouth) | ArGaA l-Twin Laser | 780 nm  40-70 mW | 10-35 J/cm2 5 points/side 10-20 sec each  Single monthly dose | 4 J for mandible  9 J for the maxilla | VAS  at12, 24, 48 and 72 hours | 11  Age: +14 | Fixed appliances  slot 0.022 × 0.028 inch  (Extraction) |
| Lo Giudice et al. (2019) | RCT | diode laser | 980 nm  1 W | 24-27 J/cm2  A total of 50 sec  Multiple doses: 3 times at intervals of 2 min | 150 J/cm2 for mandibular arch | NRS  at 2h, 6h, 24 h, from day 2 to 7 | 84:  43 F – 41 M  Age: 16.5+2.8 | self-ligating appliance  slot 0.022 inch |
| Alam MK. (2019) | Prospective clinical intervention | GaAlAs laser | 940 nm  100 mW | 7.5 J/cm2  5 points/side for 3 sec each  Only one dose | 75 J per tooth | NRS  At 4 h, 24 h, 3 d, and 7 d | 32  F>M  Age: 14-25 | Conventional backets and self-ligatin brackets slot 0.022 inch |
| AlSayed Hasan (2020) | single-blind, placebo-controlled, RCT | GaAlAs laser | 830 nm  150 mW | 4.25 J/cm2  2 point/side for 15 sec for each tooth  Only one dose | 2 J per point | VAS  At 1, 6, 24, 48, and 72 h | 26  Age 16-24 | fixed orthodontic treatment  (Extraction) |
| Guram et al. (2018) | RCT double-blind splint-mouth | Ga-Al-As laser | 810 nm  0.2 W | 5 J/cm2  8 spots for 10s  Multiple doses: each week for 21 days | Not indicated | Wong-Baker Faces Rating Scale  days 1 to 7 | 20  12 F – 8 M  Age: 17-24 | fixed orthodontic treatment  MBT bracket 0.022 inch  (Extraction) |

RCT: Randomized Clinical Trial; VAS: Visual Analogue Scale; QST: Quantitative Sensory Testing; NRS: Numerical Rating Scale

**Table 1: the different parameters of each study.**