Deformasi slot beberapa produk braket stainless steel akibat gaya torque pada kawat stainless steel = slot deformation various stainless steel brackets products due to the torque force of stainless steel wire

Tambunan, Atika Zairina, author

Abstrak

Pendahuluan: Braket ortodonti merupakan komponen penting dalam piranti ortodonti cekat karena menghantarkan gaya dari kawat ke struktur gigi dan jaringan pendukungnya sehingga terjadi pergerakkan gigi. Komposisi logam dan proses manufaktur braket Stainless Steel mempengaruhi sifat fisik dan mekanis, salah satunya kekerasan dan kekuatan. Tetapi, beberapa pabrik mengurangi biaya produksi dengan mengabaikan proses manufaktur yang sesuai dengan standarisasi. Hal ini dapat menyebabkan deformasi slot braket khususnya saat diaplikasikan gaya torque. Deformasi slot braket dapat mengurangi besar gaya torque yang akan dihantarkan ke gigi dan jaringan pendukungnya sehingga hasil perawatan tidak efektif dan efisien. Beberapa braket Stainless Steel yang beredar dipasaran masih diragukan kualitasnya dalam perawatan ortodonti.
Tujuan: Untuk membandingkan besar gaya torque akibat sudut puntir 300dan 450 kawat Stainless Steel serta deformasi slot permanen akibat gaya torque tersebut antara kelompok merk braket (3M, Biom, Versadent, Ormco dan Shinye).
Metode Penelitiian: Lima puluh braket Stainless Steel edgewise dari 5 kelompok merk braket (n=10) di lem ke akrilik. Masing-masing braket dilakukan pengukuran tinggi slot dengan mikroskop stereoskopi, lalu diaplikasikan puntiran kawat melalui alat yang sudah dibuat pada penelitian ini sehingga diperoleh besar gaya torque. Setelah uji torque, dilakukan kembali pengukuran tinggi slot braket. Deformasi slot pemanen dihitung dari selisih dua tahapan pengukuran tinggi slot yaitu sebelum dan sesudah aplikasi gaya torque.
Hasil: Analisis statistik menunjukkan perbedaan bermakna besar gaya torque pada sudut puntir 300 dan 450 antara Biom dan Shinye dengan Omrco. Gaya torque paling besar yaitu pada merk braket 3M (300= 442,12 gmcm dan 450= 567,99 gmcm), sedangkan yang terkecil adalah Biom (300= 285,50 gmcm, 450=361,38 gmcm). Perbedaan deformasi slot braket terjadi hampir pada semua kelompok merk braket. Deformasi slot braket hanya terjadi pada merk braket Biom (2,82 µm) dan Shinye (2,52 µm).
Kesimpulan: Bentuk geometri slot, komposisi, proses manufaktur braket Stainless Steel dan sudut puntir kawat mempengaruhi besar gaya torque. Komposisi AISI 303 dan 17-4 PH serta proses manufaktur melalui MIM menghasilkan deformasi slot braket yang kecil dan secara klinis tidak signifikan.
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Introduction: Orthodontic bracket is an important component in fixed orthodontic appliances for distributing force to the structure of the tooth and its supporting tissues, causing tooth movement. Alloy composition and manufacturing process Stainless Steel bracket affects the physical and mechanical properties, one of which hardness and strength. However, some manufacturers reduce costs at the manufacturing process in accordance with standards. This can cause deformation of the bracket slot especially when applied torque force. In addition, slot deformation can reduce the torque force that will be transmitted to the tooth and its supporting tissues so that the treatment is ineffective and inefficient. Therefore, some Stainless Steel brackets quality in the market is still questionable for orthodontic treatments.

Objective: To determine the deformation of the bracket slot of five brands (3M, Biom, Versadent, Ormco and Shinye) due to the force Stainless Steel wire with torsional angle of 45° and the amount of torque force with torsional angle of 30° and 45°.
Methods: Fifty Stainless Steel Edgewise brackets from five bracket groups brands (n = 10) is attached onto an acrylic. Each bracket slot height was measured with a microscope stereoscopy, then applied torsion wire through torque apparatus that has been made for this study to obtain the amount of torque force. Once the torque test has been done, then the width of bracket slot is re-measured. Deformation slot calculated from measurements of height difference between before and after the torque test.
Results: Statistical analysis shows differences in slot bracket deformation in all group of bracket brands. But, clinically permanent slot deformation deformation occurs only on Biom (2.82 µm) and Shinye (2.52 µm). Repeated measure ANOVA comparison showed significant differences in the amount of torque at torsion angle of 300 and 450 between Biom and Shinye with Omrco. The 3M transmitted highest load (300 = 442,12 gmcm and 450 = 567,99 gmcm), while the lowest is Biom (300 = 285,50 gmcm and 450 = 361,38 gmcm).
Conclusion: Stainless Steel bracket slot deformation is influenced by several factors specifically geometry bracket slot, the composition of the metal, manufacture and torsional angle wire. Alloy composition of AISI 303 and 17-4 PH and manufacture by the method of metal injection molding (MIM) has the smallest deformation.