ABSTRACT

Nickel titanium wires are the routinely using archwires in orthodontics. The two wires which are used in the initial and final stages are round and rectangular wires respectively. Biocompatibility of any dental material is now a fundamental requirement of successful clinical behavior in oral cavity. NiTi is a universal wire, Nickel in NiTi is capable of eliciting toxic and allergic responses and can produce more allergic reactions than any other metal elements. So, nickel titanium orthodontic arch wire with a good properties including corrosion resistance is essential to its biocompatibility. The metal ions leaching from orthodontic wires cannot be fully evaded; but it is possible to use materials with lower amounts of ions leaching in the mouth. It was proven that the amount of ions, leached from orthodontic wires in saliva was less than the toxic concentrations, which is below the critical value necessary to induce allergy and less than the daily dietary intake levels. The purpose of this study is to determine the amount of Ni and Ti ion release from NiTi wires of three different manufactures and to check whether the leached metal ions is lower than the daily dietary intake.

Methods

The study was performed by immersion of the samples in artificial saliva at various time intervals and Ni and Ti release was quantified with the use of an inductively coupled plasma mass spectrometry. In this study superelastic NiTi Archwires of three different manufactures which is in two shapes Round and Rectangular of commonly using dimensions 0.016 and 19x25 respectively of 7 inches long are used in this study. The testing solution used in the study is artificial saliva buffer solutions.

Procedure

Each wires separately dipped into 126 polypropylene beakers containing 50 ml of buffer solution. Then incubate and quantify the ions leached at T1=1 hour, T2=24 hour, T3=1 week, T4=3 week using the software Thermoscientific Qtegra^{TM} Intelligent Scientific Data Solution Software (ISDS) which is attached to the ICP MS instrument. This shared software approach provides control and data processing for a range of elemental and isotopic analysis technologies The output is numerical, and provided in counts per second i.e., how much Nickel and Titanium (mass-ion ratio) is released per second.

Results

From the findings of present study, revealed that Round wire shows least metal ion leaching than rectangular wire. This may differ according to the manufacturers choice. Least immersion time shows greatest release of metal ions and Group Ia is better than all other groups.

Conclusion

When comparing three manufactures, Group I shows least Ni and Ti ion leaching among other two groups. When comparing round and rectangular wires; round wires shows less ion release than rectangular wires. The least Ni and Ti ion release is shown by Group Ia at all time periods. The highest Ni and Ti ion release is shown by Group IIIb at all time periods .At each immersion time, T1 shows least Ni and Ti ion release than other time periods, which gradually increases with immersion period. The average amount of ions leached per day from round and rectangular of three manufactures was well below the tolerable daily dietary intake level.

Key words: Superelastic, Leaching, Artificial Saliva, Nickel Titanium Wire, Inductively coupled plasma mass spectrometry.