

ABSTRACT

AIM:

The aim of our study was to evaluate the geometrical design characteristics (lead angle of thread, pitch, depth, taper, number of threads, surface area, thread length, diameter, thread type) of 2 commercially available self drilling tapered miniscrew implants using scanning electron microscopy (SEM) and to evaluate the effects of each geometrical design parameters of MSI's on primary stability using insertion torque in different cortical bone thickness.

MATERIAL AND METHOD:

A total of 60 titanium miniscrew implants (MSI's) were used in this study, consisting of 30 MSI's each from two different manufacturers (Dentos Korea, SK Surgicals India). MSI's were grouped into small, medium and large according to their diameters as 1.3mm, 1.5mm and 1.8mm respectively. All MSI's had a standard length of 8mm. All the MSI's used in this study were tapered and self-drilling type. Precise measurement of all MSI geometric design parameters were evaluated using scanning electron microscopy (SEM) and Image J software. Mechanical evaluation of insertion torque was done to evaluate primary stability.

RESULTS:

Geometric design characteristics like decreasing the MSI pitch distance, increasing the number of threads, maintaining a uniform MSI taper and increasing the surface area of MSI's plays an important role to achieve optimal insertion torque and thereby enhancing primary stability. An increase in lead angle increases the cutting efficiency of MSI. Therefore MSI's with higher lead angles are recommended for easy insertion of MSI in thick cortical areas. Increase in MSI depth reduces the core diameter of the MSI and are more prone to fracture. An increase in the diameter of the MSI and cortical bone thickness which increases the insertion torque will enhance the primary stability

CONCLUSIONS:

A great variability in the geometric design characteristics of MSI was observed. On the basis of the present outcomes it is assumed that MSI design parameters could be strategically matched, in order to improve its performance, according to insertion site characteristics and clinical demands concerning the directions of the forces applied. So, the clinicians must know these geometric design characteristics of MSI's in order to increase the success rates of their procedures.

KEY WORDS: Miniscrew implant, Geometric design parameters, Insertion torque, Miniscrew implant stability, Scanning electron microscope, Cortical bone thickness.