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• 中文關鍵字	牙科植體；應力分析；有限元素分析；最佳化設計
• 英文關鍵字	Dental implant；Stress analysis；Finite element analysis；Optimal design
• 中文摘要	在齒槽骨的有限空間中，找到一最佳的人工牙根內壁尺寸，使其既能提供足夠的承力強度又要能給與連接體螺桿(Retaining screw)足夠的體積以容納其外徑，是本研究的主要目的。本研究首先利用最佳化設計技巧，利用參數變化建立一可改變內壁厚度的人工牙根三維有限元模型，模型本身包含有精確的內外螺紋。將 150 N 的力量均勻作用於人工牙根的上螺帽處，以模擬水平咬合力量。並在不同的邊界骨高度下，計算不同人工牙根壁厚時人工牙根內的應力集中情形。研究結果顯示，應力集中多發生在人工牙根與邊界束縛位置，而具有 0.97mm 壁厚的人工牙根則在邊界高度下降時，有最小的應力增加率，亦即人工牙根的壁厚與邊界高度均是影響人工牙根內應力分布的重要因素。
• 英文摘要	It is critical to achieve an ideal relationship among major components of an implant system in the limited width of alveolar bone. The aim of the present work was to develop implant fixture models to predict maximum stress concentration sites and distribution contours after loading. Three-dimensional finite element models of a standard Branemark fixture with different wall thicknesses were developed and the geometric details, such as threads of inner and outer screws were realistically modeled. A maximum lateral force of 150 N was applied to simulate horizontal occlusal forces to predict stress distribution contours within the implant system using an optimal design technique (APDL, ANSYS Parametric Design Language). The effects of different wall thicknesses and boundary levels of the fixtures were then evaluated to help design a better implant system. When the fixtures were directly constrained to simulate different boundary levels, the maximum equivalent stress (max EQV) was always located at the implant-bone interface. Max EQV increased when the wall thickness or boundary level was reduced to a certain extent. The fixture with a wall thickness of 0.97 mm demonstrated the smallest stress increase ratio when the boundary level was lowered. The relationship between wall thickness of the fixture and the boundary level played an important role in

maintaining a well-distributed stress level within the fixture.