# *Clinical Evaluation of Transmucosal Flapless Implant Placement Using Osteotomes (Gauld's Technique)*

## *Thesis*

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BY

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This work is gratefully dedicated to:

My mother and my father

For their love, care, prayers and patient

My brother and my sisters

For their encouragement and motivation

My friends

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# ***Introduction and Review of literature***

Several factors contribute to partial and complete edentulism, where caries, periodontal disease and trauma are the most commonly blamed reasons among these factors. Attempts have been made since the beginning of history up to the present moment to restore missing teeth ranging from the most primitive ideas to much more sophisticated treatment modalities ***(Hobkirk et al 2003)***.

One of the most important significant scientific breakthroughs in clinical dentistry was undoubtedly the introduction of osseointegrated implants for anchorage of fixed bridges 40 years ago. Before the advent of implants, the only treatment alternative was to replace missing teeth with tooth supported crowns and bridges, or removable dentures, although fixed appliances may be well accepted, not all patients can adapt successfully to removable dentures and in many cases experience functional and / or psychological problems ***(Fischer 2008)***.

The idea of using dental implant to restore missing teeth evolved long time ago. The Mayan civilization has been shown to have used the earliest known examples of endosseous implants dating back over 1350 years before Per-Ingvar Brånemark started working with titanium. While excavating Mayan burial sites in Honduras in 1931, archaeologists found a fragment of mandible of Mayan origin, dating from about 600 AD. This mandible, which is considered to be of a woman in her twenties, had three tooth-shaped pieces of shell placed into the sockets of three missing lower incisor teeth. For forty years the archaeological world considered that these shells were placed after death in a manner also observed in the ancient Egyptians. However, in 1970 a Brazilian dental academic Professor Amadeo Bobbio studied the mandibular specimen and took a series of radiographs. He

noted compact bone formation around two of the implants which led him to conclude that the implants were placed during life ***(Stevens and Alexander 1971).***

In the 1950s research was being conducted at Cambridge University in England to study blood flow in vivo. These workers devised a method of constructing a chamber of titanium which was then embedded into the soft tissue of the ears of rabbits. In 1952 the Swedish orthopaedic surgeon, P I Brånemark, was interested in studying bone healing and regeneration, and adopted the Cambridge designed 'rabbit ear chamber' for use in the rabbit femur. Following several months of study he attempted to retrieve these expensive chambers from the rabbits and found that he was unable to remove them. Brånemark observed that bone had grown into such close proximity with the titanium that it effectively adhered to the metal. Brånemark carried out many further studies into this phenomenon, using both animal and human subjects, which all confirmed this unique property of titanium. Brånemark finally decided that the mouth was more accessible for continued clinical observations and the high rate of edentulism in the general population offered more subjects for widespread study. He termed the clinically observed adherence of bone with titanium as 'osseointegration' ***(Stevens and Alexander 1971).***

The use of osseointegrated implants for treatment of totally edentulous patients was first described by ***Brånemark et al 1969***. The term "osseointegration" was defined as a direct contact between the surface of an implant and the surrounding bone ***(Brånemark et al 1977)***. Schroeder et al used the term "functional ankylosis" for the same condition ***(Schroeder et al 1981)***. Later, osseointegration was defined as, 'a process whereby clinically asymptomatic rigid fixation of alloplastic materials is achieved, and maintained, in bone during functional loading" ***(Albrektsson and Zarb 1993)***.

Bone is a connective tissue consisting of cells and a mineralized extracellular matrix**.** It comprises about 65% mineral (mostly hydroxypatite), 25% organic matrix and 10% water. There are two macro architectural forms trabecular (cancellous or spongy) and cortical bone (compact or cortex), which are found in various proportions and structural patterns to form the individual bones of the body. In total, the skeleton consists of around 80 % cortical and 20 % trabecular bone. Bone has an outer dense compact layer (cortex), covered by periosteum. The interior of bone is a trabecular bone marrow. The trabeculae are oriented predominantly according to stress. Bone is constantly resorbed and formed by two processes known as modeling and remodeling. Bone modeling starts during fetal life and continues to the end of the second decade of life, while bone remodeling continues throughout life, replacing old bone with new, maintaining equilibrium between bone deposition and resorption. The bones are remodeled to an ideal shape that best withstands mechanical stress, thereby adapting to functional loading. Load on bone can affect bone quality and quantity and it seems that muscles exert influence on bone mineral content as well as on bone mineral density. The membrane covering the outer surface of the bone is the periosteum. It comprises an outer fibrous layer of dense irregular connective tissue with blood and lymphatic vessels and nerves. The periosteum is involved in bone growth and can form an extra callus during fracture healing ***(Fischer 2008)***.

Based on the initial concept of osseointegration, many new implant systems have been developed and variations in materials and treatment protocols have been introduced. The original treatment protocol for osseointegrated implants prescribed an unloaded healing period of 3 to 6 months before connection of the prosthetic