Platform-Switching: From History to Advantages

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Introduction and Objectives

The law of impenetrability, is the basis of successful platform-switching (PS): "Two distinct bodies can't occupy the same space at the same time." The implant rehabilitation following the PS protocol is widely used today and is based on biomechanical and biological theories. This study consists on a literature review, with the objective to describe the historical component of PS, as well as the theories that support it and it advantages.

Materials and Methods

Research was carried out in PubMed/Medline using the words "Platform-switching"; "Platform-switching history"; "Platform-switching theories" and "platform-switching advantages."
The articles that were included reported the history of PC, biomechanical and biological theories at its basis, as well as preservation of crestal bone and studies that evaluated the stress distribution in the prosthesis/implant system.
All articles published in other languages than English were excluded. It was selected 27 articles.

Literature revision

1- Historical Component

The first reference to PS is from 2005, where one upper central incisor was rehabilitated, and showed maintenance of bone crest level during the first year in function.[1] The concept was theorized later and defined as the horizontal displacement of the implant interface/abutment for a more medial position.[2] By serendipity, PS was discovered in 1991, implant Innovations (BIOMET 3i) marketed implants with 5.0/6.0 mm in diameter indicated for posterior areas and bone type IV. Due to the inexistence in the market of prosthetic components with suitable size for these new platforms, implants had to be rehabilitated with conventional abutments 4.1 mm in diameter. Radiographs 5-13 year follow-up found that the marginal bone loss was lower than typically observed in the implants rehabilitated with coincident diameter abutments. [2]

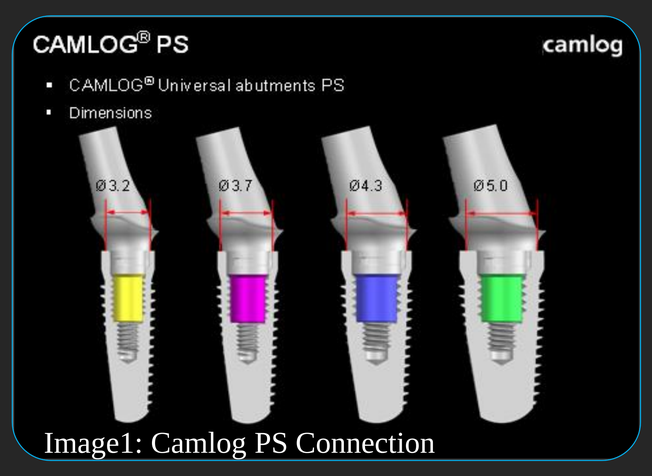

Image1: Camlog PS Connection

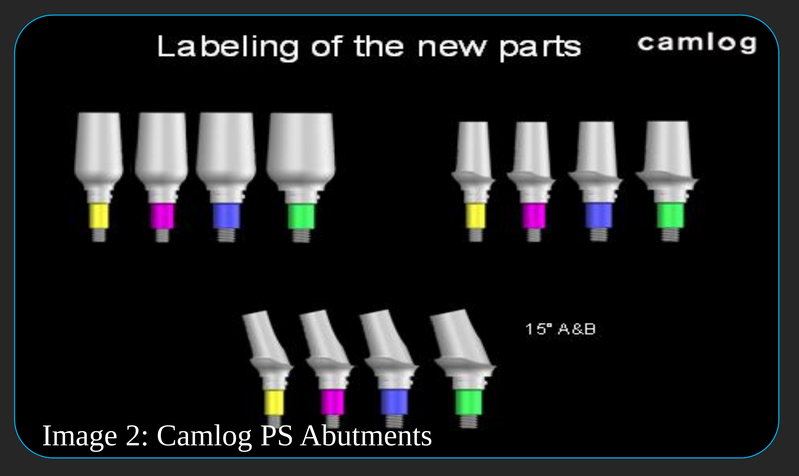

Image 2: Camlog PS Abutments

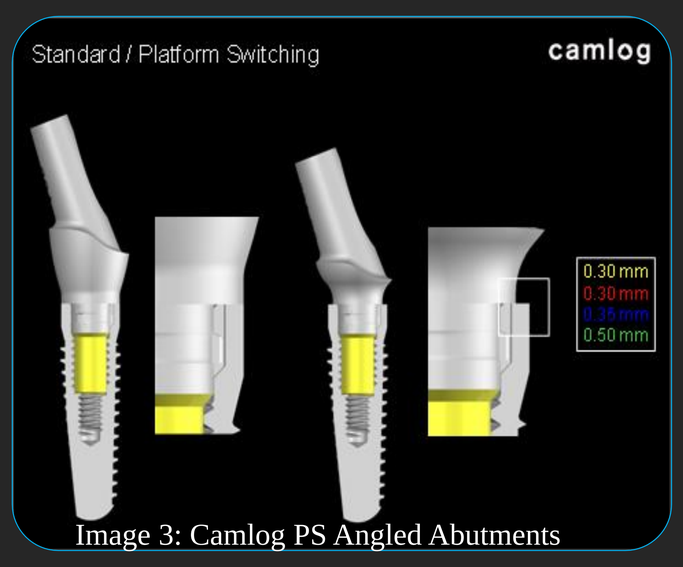

Image 3: Camlog PS Angled Abutments

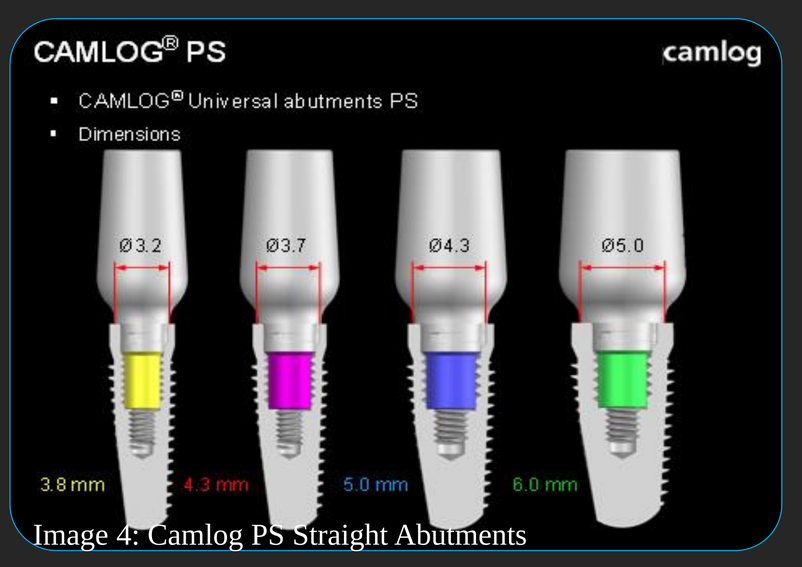

Image 4: Camlog PS Straight Abutments

2 - Biomechanics and Biological Theories

Biomechanical theory proposes that placing an abutment of smaller diameter than the implant platform can limit bone resorption by shifting the area subject to greater stress levels to the axis of the implant.[3] When PS is used, greater stress concentration is found in the prosthetic components.[4]
The biological width is smaller in implants with PS, due to the lower height, on average, of junctional epithelium and connective tissue covering the implant/abutment interface.[5, 6 ,7, 8, 9, 10, 11]
The presence of an inflammatory infiltrate associated with the contamination of the interface between the implant and the abutment.[12, 13] This was a reaction of the host to bacterial contamination of prosthetic components.[12, 13, 14] The displacement of the interface to an innermost position releases certain area of the implant platform to accommodate the peri-implant soft tissue. As a result there is a reduction of bone resorption and preservation of the soft tissue height. The discrepancy between the abutment and the implant platform stabilized the circular fibers of collagen in a more coronal position, preventing bone resorption.[15, 16] Bone loss after 1 year was lower (<0.25 mm) in rehabilitations with PS.[17]

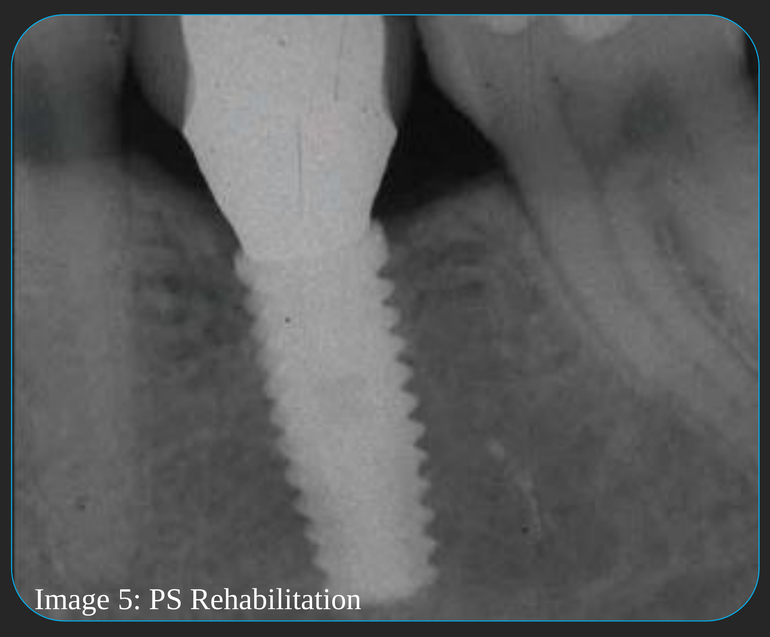
Image 5: PS Rehabilitation

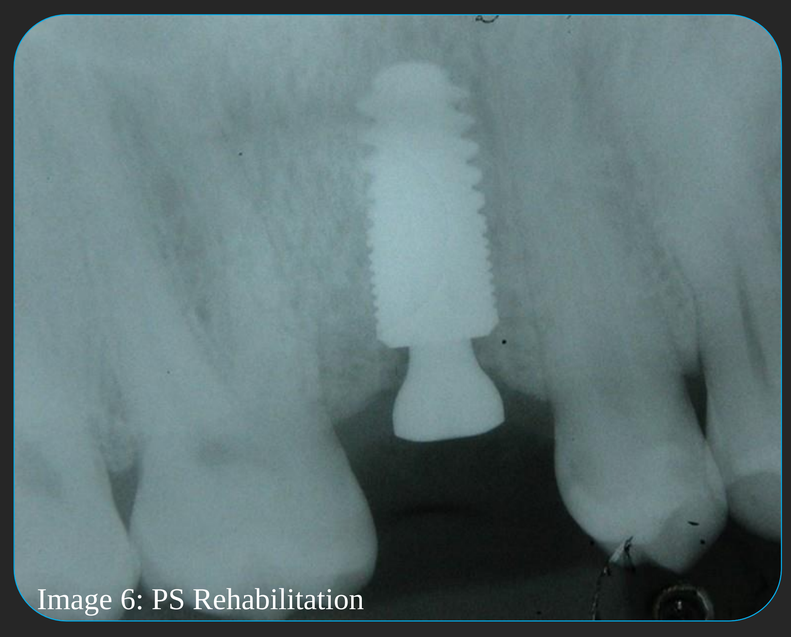
Image 6: PS Rehabilitation

3 - Advantages

In immediate loading, the PS implants showed better peri-implant stability, less bone loss and better preservation of the surrounding tissues.[18,19, 20]
Implants with external hexagon were more subject to fracture at the implant-abutment connection and greater stress on crestal bone.[20, 21]
Cumbo and colleagues found lower bone loss and better esthetics, using PS in the anterior region.[22]
González et al, 2012, observed differences between studies about the benefits of PS in the ratio of marginal bone loss and insertion depth of the implant. Changes on marginal bone level are not related to the use of PS.[24, 25] In immediate loading and graft procedures, success largely depends on the surgical technique rather than the use of PS.[26] On the other hand, the bone loss is multifactorial.[27]

Conclusions

The use of smaller diameter components in relation to the implant platform must begin at the time of exposure of the implant in the oral cavity, when the healing abutment or prosthetic abutment is screwed to the implant. It is from this moment that the peri-implant biological width begins to form.
The concept of PS presents well-structured basis regarding biomechanical and biological theories. Clinical studies evaluated, indicate a bone loss reduction peri-implant and gains on soft tissue levels.
Despite being a widespread concept with promising results, it appears that studies don't entire validate, with a consolidated basis the benefit of using PS. The paucity of sample, the absence of control groups, the absence of standardize implant loading and no repeated removal of abutments are factors that may be associated with the lack of scientific evidence in the current studies. It is clear the need for more randomized clinical trials in order to corroborate all the theories developed around the PS concept.

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