



## Comparative evaluation of one piece and two piece dental implants –A review

### Dental Science

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### ABSTRACT

The original Branemark dental implant was designed as a two-piece implant (TPI) to be used in a two stage surgical procedure. Implant success rate depends on osseointegration value, Implant design, Bone quality and quantity and biomechanical value of surrounding bone. Now technology is shifting towards simplification of implant design that is conventional two pieces, two stage surgery techniques to unibody, single stage surgical techniques.

This article outlines the clinical comparison of one piece and two piece dental implants.

### KEYWORDS:

One piece implant, two piece implant, implant design, single stage surgery

### INTRODUCTION

The use of dental implants to replace the natural tooth has become a common practice in the contemporary restorative and surgical dentistry<sup>1</sup>. Many research studies have been done in implantology related to implant design, surgical protocol, immediate implant placement and loading protocols. The conventional two piece implant design features implant-abutment connection rendering the design with a weak link in the entire junction of implant body and abutment. To overcome this disadvantage of two piece implants, one piece dental implants were introduced<sup>2</sup>.

There are additional advantages of one piece implants such as it mimics natural tooth, strong unibody design and no split parts. The single stage surgical technique can be followed using either flap or flapless approach further simplifying the restorative technique<sup>3</sup>. The use of one piece dental implants reduces the requirement of multiple surgical techniques and prosthetic components, thereby reducing the inventory and cost.

### Design of one piece implants

One Piece Implants are not new to implant dentistry. Recent variations from the early designs have renewed the interest in One Piece Implants. Before comparing two piece implants with one piece implants, it is important to understand the evolution of endosseous two piece implants as made popular by the work of legendary scientist P I Branemark. Based on the prevailing understanding of Osseointegration of implants it was determined that the endosseous root analogue (implant body) be allowed to heal, submerged and unloaded for the period of 3 to 6 months in the bone. Protocol required a second stage surgery to expose the submerged implant to proceed with a restorative phase where a short healing phase for the soft tissues was required to form a well healed collar of tissue around the neck of the implant. The crown analogue (abutment) was then attached through a screw to the internal body of implant. Many studies explain that the two piece implants and the two stage surgical protocols were the only acceptable

concept for achieving successful Osseointegration.

However with improvements in the design of the implant it was possible to achieve and maintain osseointegration with one piece implants.

### COMPARISON OF ONE PIECE IMPLANTS WITH TWO PIECE IMPLANTS.

The use of Two piece implants in a narrow edentulous space is a

mechanical challenge. The conventional two piece implants which are available in 3 mm diameters and less gradually become structurally weak to accommodate the connecting screw or the screw remains thin which lead to repeated screw breakage. On the other hand, one piece implants can be used in tight spaces like in presence of narrow labio-lingual width and limited interdental space, mandibular anterior, maxillary laterals and first bicuspid. This has shown good clinical success compared to that of two piece implants because of its unibody structures<sup>4</sup>.

### COMPARISON OF SURGICAL TECHNIQUE

The surgical protocol of two piece implant system required the implant to be submerged and heal unloaded for a period 3 to 6 months. An open flap technique was followed for inserting implants into the bone. The healed implants required a second stage surgery to expose the submerged implants and Trans gingival component (TSG) was attached at this stage and the soft tissue was allowed to heal around the Trans gingival component (TSG) in a second short healing phase.

However as the understanding of the biomechanics of the one piece implants improved with advances in material, it is now possible to avoid second surgical phase and yet achieve complication free hard and soft tissue integration. One piece implants exhibit cumulative survival rate similar to submerged implants heralding the one stage surgical protocol<sup>5</sup>.

One piece implants can be placed in bone via flap or flapless procedures. Flapless procedures have been in use for quite some time and have shown reduced morbidity<sup>6</sup>.

### Advantages of flapless procedures:

- 1) Decreased postoperative discomfort and swellings.
- 2) No need to place sutures because of minimal bleeding at surgical site.
- 3) Reduction in surgical and healing time
- 4) Demonstrates biological width achieved similar to natural tooth
- 5) The esthetic results are better than open flap surgical procedures<sup>7</sup>.

### MICRO GAP OR MICRO LEAKAGE

It is a common complication in two piece implants because of the implant designs, that is, separate parts of implant body and abutment. Presence of this micro gap between two analogues of implants can lead to development of micro-organisms followed by inflammation of soft tissue around the implants that leads to implant failure. By using one piece implants we can eliminate micro gaps<sup>8</sup>.

### RESTORATIVE PHASE / PROSTHETIC PHASE.

Conventional two piece implants require an abutment around which soft tissue have to heal after second stage surgery. The conventional two piece implants can be loaded only after 3 to 6 months of healing. But when a transgingival extension could be achieved in the first surgical phase itself, one piece implants can be successfully placed in bone and can be either left unloaded or can be loaded progressively or immediately, because of the unibody structure. It eliminates the need of a separate abutment joined to the implant through a screw or cemented type connection, which prevents micro gap and thus reduces the restorative time and good primary stability is achieved.

Conventional two piece implants require many prosthetic components such as impression copings and laboratory analogues. Moreover, the impression coping required is different for closed tray and open tray impression technique.

One piece implants which come with an inbuilt abutment are prepared with proprietary tungsten carbide burs (TC) following the principles of Fixed partial denture preparations. Impression procedures are done by gingival retraction and impression making with suitable impression techniques of putty wash or custom tray with single mix technique. Laboratory phase of making restoration is also easy and simple, similar to that of the conventional fixed partial denture technique.

### IMMEDIATE IMPLANT PLACEMENT

When an immediate placement of implant is planned in a fresh extraction socket since the procedure with Two piece implant has no scope for the flap closure and abutment has to be joined to the implant body in the same appointment, use of one piece implants in such a situation makes more sense. The soft tissue maturation on the implant body gives better esthetics and excellent success rate<sup>9</sup>.

In Immediate implant placement, emergence of the abutment matches that of natural crown, thereby reducing chance of crown angulation deviation from natural axial inclination, so the need for angulated abutment is very minimal. The one piece implants can be used in immediate placement with an advantage of having no micro gap between the abutment and implant body<sup>10</sup>.

### BIOLOGICAL WIDTH

Biological width is influenced by several factors among which macrostructure of dental implants also plays an important role. The two piece implants present a microgap at the crestal bone level, while one piece implants have no gap at this region<sup>11</sup>. Some histological studies suggested that the one piece implants show thickening of connective tissue attachment that leads to increasing of the biological width when compared to two piece implants. The presence of microbial colonization in the microgap resulted in micro movements of the abutment in the two piece implants<sup>12</sup>.

### CONCLUSION

Ever since its inception, implant dentistry has grown enormously in terms of material, technique and protocols. Several improvements have been seen in many aspects such as implant designs, surgical protocols, biomechanics and osseointegration rate. One-piece implants have become increasingly popular in the last few years. The strong unibody design, no split parts, single stage surgery and absence of a micro gap between the implant and the abutment at bone crest level offers one piece implants many clinical and technical advantages.



**Fig 1: One Piece Dental Implant**



**Fig 2: Two Piece Dental Implant**

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