

New generation titanium biologically fixed threaded implants in jawbone and hip joint

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Editorial

Some decades ago, implants of chromium, cobalt, vitale or ceramic have been tested with “Press Fit” or threaded fastening technique in the jawbone in order to replace worn teeth. From 1970 to date only screw – threaded dental titanium implants with osseointegrated surface have established because they showed very low mechanical loosening rates.¹⁻⁴ The Swedish orthopedic surgeon Per-Ingvar Brånemark (1929-2014), unknown in many orthopedic societies but very well known in all dentist societies, is the father of modern dental screwed titanium implants.^{1,2} Brånemark began observing rabbits in the 1950s without intention of studying either titanium or dentistry. He was instead interested in the anatomy of blood flow. In one study, in 1950, (a) Titanium screwed device was inserted into the rabbits’ legs, yet when researchers tried to remove the device they found that the titanium had bonded to the bone. Further blood-related studies with titanium instruments yielded similar outcomes, and Brånemark pivoted his research to focus on titanium’s impact on the body. As more research revealed that titanium bonded to human bone consistently and for the long term, Brånemark named the phenomenon osseointegration. He started applying the concept of screwed titanium implants to dentistry, intending to help the significant portion of the population who had missing teeth. The new generation screwed implants in jawbone (Figure 1) and in acetabulum of the hip joint (Figure 2) with a grit blasted roughness surface offer even more a very stable mechanical and biological primary fixation because they have larger contact area to the bone compared to other implants of the same diameter and simple shape design and surface. So, in the hip joint, the new generation threaded acetabular titanium implants Zweymuller type^{5,6,7} with thin fins (lamellae) and roughened osseointegrated surface showed excellent permanent results which were found also in our long series of more than two thousand total hip replacements. Between them many dysplasia or congenital dislocation cases and this is mainly due to the similarity in shape and bone stock of the destroyed acetabulum to that of the remaining area of the jawbone after removal of a damaged tooth. At first and up to the 80’s, the main type of hip screwed cups used internationally in many orthopedic centers were mainly those of Mittelmeiyer, Link or PCA type; because of their poor results due to their anelastic, smooth and non-osseointegrated surface, the use of new generation biologically fixed screwed-threaded titanium arthroplasty cups was not widely accepted, to the opposite of the excellent acceptance of screwed-threaded titanium teeth implants. These old unsuccessful cups had only primary mechanical stability but not permanent biological fixation; they were not accompanied by enough periprosthetic new bone formation and accompanied by very bad results and elevated rates of mechanical loosening. The difference between the old type and the new generation threaded hip cups is that the new generation titanium threaded cups of Zweymuller type are similar to the successful modern dental screwed implants are not so rigid as the old ones and have roughened titanium or hydroxyapatite surface and thin fins (lamellae) with excellent osseointegration

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possibility and permanent biological fixation Thanks to the famous professor of Vienna Karl Zweymuller many orthopedic surgeons including myself became aware of the considerable capabilities of these new threaded titanium acetabular implants. The Zweymuller cup with titanium roughened and osseointegrated surface has sharp-cutting thread blades able to improve bone penetration of the thread teeth into a subchondral sclerotic area and a different type of cutting thread blades for osteoporotic periprosthetic bone area. So, after several years of scientific erroneous assessment and in continuance to the excellent Zweymuller cup results, many other similar threaded titanium cups with osseointegrated surface are now introduced in the market for example Smith & Nephew, Zimmer, Implant Cast, Lima, Permedica, Aesculap, Depuy and many others. The screwed hip cups make unnecessary the use of acrylic cement or screws in acetabular site. The results of the new generation threaded-screwed cups in hip arthroplasties are excellent⁵⁻⁸ and perfectly comparable to those of highly successful modern press-fit cups and to the modern dental titanium screw implants not only in simple cases of osteoarthritic hips but in cases of osteoarthritis secondary to congenital dysplasia, low congenital hip dislocation or other diseases also.⁷ Especially in cases in which the threaded titanium acetabular implants are combined with rectangular Zweymuller type antirotation long femoral stems or new generation osseointegrated short antirotation femoral stems (Figure 3) the results are almost perfect. There are indications that the covered with new periprosthetic bone threaded titanium implant surfaces without necrotic area between implant and bone – as in cases in which acrylic cement is used - reduces the risk of infections maybe due to better periprosthetic blood supply and antibiotics circulation. Around the mandibular threaded titanium implants the infection is very rare although the mouth is not a sterile area. In our Orthopedic Department in Athens Medical Group/Iatriko Psychikou Clinic we have placed these implants (Figure 4) using in most cases a new modified ALMIS (Antero-Lateral Minimally Invasive Surgery) hip approach with minimal muscles injury and blood loss.⁸ The usually very laborious and complicated revision surgery to remove broken screws from the

iliac bone or acrylic cement in cases of a hip arthroplasty loosening is avoided. The absence of screws or acrylic cement in threaded titanium acetabular prostheses makes easy a review process in a very rare case of loosening and leaves enough healthy periprosthetic bone intact, not deeply infected, and the placement of a new one threaded titanium implant is usually a very easy process. New generation threaded titanium implants with osseointegrated surface in the jawbone and hip acetabulum seem to be the most ideal and permanent solution to these difficult and too loaded damaged bone areas! This is the future.

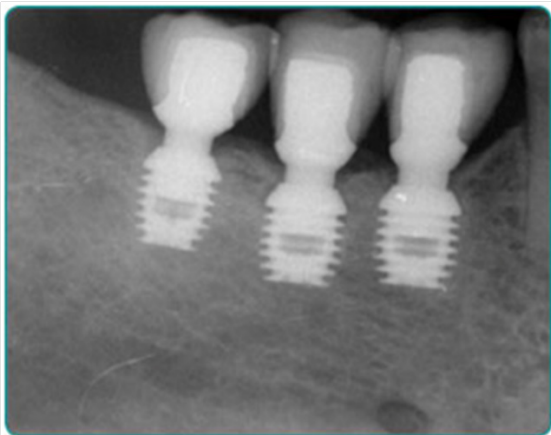


Figure 1 Modern short biologically fixed screwed-threaded titanium dental implants.



Figure 2 Zweymüller biologically fixed hip arthroplasty threaded cup.



Figure 3 New Lima type biologically fixed hip arthroplasty screwed cup.

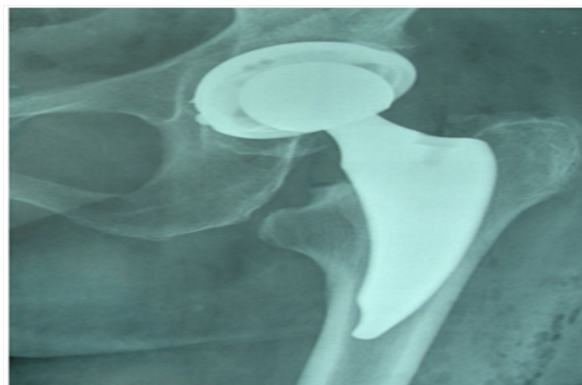


Figure 4 Xray of New Lima type biologically fixed screwed cup combined with a short antirotation stem.

Acknowledgments

None.

Conflicts of interest

None.

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