

Guest editorial

The Gothenburg Osseointegrated Titanium (GOT) hip—a new addition to the orthopedic arsenal—whether osseointegrated or not

In this issue (pages 549–566) Lars Carlsson and co-workers publish their much awaited clinical reports on what they call the Gothenburg Osseointegrated Titanium (GOT) prosthesis. Using proven principles from the Brånemark dental implant technology, they have designed a novel hip prosthesis. The femoral component does not feature an intramedullary stem, but is inserted into the femoral metaphysis only. In a randomized controlled trial in which the GOT hip is compared to the Spectron/Trilogy cemented hip, they report no loosening in either group, and plain radiography showed no radiolucencies in either group. Using radiostereometric analysis (RSA), they found similar results in both groups with some migration that was well below the threshold shown to be predictive of future loosening (Kärrholm et al. 1994). They conclude that the design goals have been reached and that the GOT prosthesis is, indeed, osseointegrated. The authors are certainly to be congratulated for a long-term developmental effort which, despite difficulties and setbacks, has been brought to a successful conclusion. They have carefully avoided commercial exposure until a long trial period has been successfully completed. The new device is appealing in that it is conservative and preserves bone stock. This means that the orthopedic community has a new and possibly superior operative procedure added to its arsenal.

The report, however, brings into focus the elusive concept of osseointegration. Osseointegration was developed by the Brånemark group in their quest for definite dental implants. These implants are now a routine commodity on the dental market and are used globally. The concept rests on some fundamental principles: (1) c.p. titanium, (2)

correct surface treatment and texture, (3) optimal implant design, (4) optimized host bed, (5) exact and atraumatic surgical technique, and (6) postoperative healing under unloaded conditions (Albrektsson et al. 1981, Albrektsson and Albrektsson 1987). The last precondition means sequential operative procedures, where the unloaded implant is allowed to be “osseointegrated”. The aim of these dental implants was to have them attached to bone in an integrated, “ingrown” way. Conceptually, bone and implant were to be regarded as one biological unit. Considerable difficulties were encountered, however, in trying to prove the concept. Histological investigations always showed some “layer” between living bone and implant and the definition therefore came to rest on biomechanical grounds, the implant being “well fixed without migration” (Zarb and Albrektsson 1998). The phenomenal success of the dental implants has meant that the concept of “osseointegration” has become something of a “holy grail of implant fixation”, implying definite and everlasting secure fixation.

The GOT hip operative protocol deviates from the last of the 6 principles of osseointegration; the implant is loaded immediately. What the authors have shown are results similar to those of the cemented Spectron/Trilogy hip, which is not integrated—either conceptually or in actual histological studies. Cemented implants do regularly develop a soft tissue interface, despite sometimes excellent radiological appearance. Furthermore, both implants in their final study migrate. This migration is not large and it is not ominous, and (judging by the data shown) the GOT hip may indeed be very well bonded and may remain so

permanently. But does this mean that the GOT hip is osseointegrated?

“Osseointegrated” implants have never been assessed in terms of migration, i.e. by RSA. Ironically, however, osseointegration is a feature built into precisely that RSA technology used here to prove the concept. The tantalum beads used to mark implant and bone are supposedly osseointegrated (Alberius 1983), and they do not migrate in the short-term nor in the long-term (as tested over > 20 years). In fact, RSA assessment includes a thorough test of marker stability in each individual case. It would therefore appear reasonable to reserve the term “osseointegration” for implant fixation without migration, as is indeed done in the official definition. So with all due respect to Carlsson et al. for an otherwise excellent job, with an implant showing migration, albeit very small, the choice of name may appear somewhat pretentious.

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