



## The Use of Osseointegrated Implants in Growing Jaws

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Edentulism is usually associated with the aging patient. However, total or partial tooth loss also affects young individuals, mainly as a result of trauma, decay, anodontia, or congenital and acquired jaw defects involving the alveolar processes. For elderly patients, the use of oral implants has become an accepted treatment modality for edentulism, and most of today's knowledge regarding implants is based on such practice. For patients who are still growing, there has been hesitation to perform implant therapy because so few children to date have been provided with implant-supported constructions. Consequently, little is known about the outcome of the osseointegration procedure in young patients, and until now only a limited number of case presentations have been reported (eg, Bergendal et al, *Int Dent J* 1991;41:149-156).

Which risks could be involved with the placement of osseointegrated implants (fixtures) in jaws that are still growing? Keeping in mind that the fixture may behave like an ankylotic tooth, ie, will not move together with the growing surrounding structures, there is an obvious risk that the fixture-supported prostheses could end up in infraocclusion if inserted too early in children. Furthermore, an osseointegrated construction could be anticipated to have a negative influence on the local and general growth and development of the dentoalveolar processes. Ankylotic teeth in infraocclusion often create malocclusions, a finding well known to orthodontists and pedodontists. In most instances, therefore, ankylotic teeth are in the end also extracted to facilitate the normal growth and development of the jaws. Consequently, osseointegrated constructions, if behaving like ankylotic teeth, may be at risk for similar problems when inserted in growing patients.

Still, some children are treated today with implants, and I am fully aware that there are those in whom the therapy may result in a better quality of life. However, the treatment can only be justified when the anticipated positive effects are greater than the drawbacks of the procedure. Furthermore, when utilizing techniques that are still not fully evaluated for purposes intended, I think we as clinicians and scientists have a responsibility to carefully follow and monitor the outcome. We should also publish our results with such treatment so that colleagues will have the opportunity to learn and benefit from our experience.

In the long run, however, our decisions regarding this type of treatment cannot be based only on personal opinions and assumptions that the therapy is possible to perform. Instead, more properly conducted and monitored research projects are necessary, which for obvious reasons cannot from the start be carried out in children. A few experimental studies have already also been performed in a collaborative

effort between the Brånemark Clinic in Gothenburg and the Department of Orthodontics, University of Göteborg, Sweden, headed by Professor Birgit Thilander. For many years Professor Thilander has been guiding research projects on the growth and development of the jaws. As our mutual belief is that inserted implants will not act like natural teeth during the growth of the jaws, our investigations started in animals. The aim was thereby to find some general principles for the way osseointegrated fixtures behave during dentoalveolar development.

The experiments have been performed as a PhD programme for Dr Jan Ödman, Sweden, and in short the project was carried out as follows: Five 12-week-old pigs of the Pigham strain and of both sexes were used for fixture insertion. The implants were placed in connection with erupted teeth, tooth germs, and edentulous areas (three in each mandible and one in each maxilla, respectively). A sixth animal was used as a control. All pigs were thereafter allowed to grow for 6 months, during which they increased in body weight by about 100 kg, ie, had their maximum growth period. After sacrificing the pigs, samples of the jaws including the implant areas were analyzed via clinical, radiographic, and biometric parameters to study the effect of the fixtures on the growth and development of the surrounding teeth and alveolar structures.

The outcome, which has thus far been published in three papers (Ödman et al, Eur J Orthod 1991;13:279-286; Thilander et al, Eur J Orthod 1992;14:99-109; Sennerby et al, Clin Oral Impl Res 1993;2, in press), showed that most of the inserted fixtures became osseointegrated in the growing jaws, but the integrated fixtures did not behave like normal teeth during the development of the jaws in the vertical, sagittal, and transversal dimensions. In mandibles the fixtures became displaced to stand lingually of the alveolar process, whereas in maxillae they ended up palatally to the alveolar crest because of the characteristic growth patterns of the jaws. Furthermore, the osseointegrated fixtures locally retarded the growth of the alveolar process and changed the eruption path of tooth germs located distally to the inserted implants.

The conclusions of the experiments were that the fixtures did not behave like natural teeth during the growth and development of the jaws, but rather like ankylotic teeth. Whether this would also be the result in children is not known. However, there is no reason to anticipate that it would not, as most of the jaw growth takes place during the puberty period. Consequently, it has been suggested that osseointegrated implants in general should not be inserted in children until after the growth maximum of the jaws has been reached, ie, at the age of 14 to 15 years for girls and about 1 year later for boys. The individual growth curve should, however, always be studied before any implants are placed.

In addition to the direct influence of fixtures on dentoalveolar growth, it is important to consider that when treating children with implants: (1) general

anesthesia will most likely be necessary during the surgical phase; (2) compromises in oral hygiene cooperation are likely; and (3) the patients themselves are not free to decide if they really want to have implants inserted (ie, to have this lifelong treatment). These conditions, together with the influences on jaw development, have led me personally to decide not to use osseointegrated implants in children who are still growing, at least not until more information has been obtained.

What can be done to reach a higher level of knowledge? For one, clinicians who have experience treating young patients can gather their data into some type of reference bank. Thereby, others would at least have a chance to get baseline information on expectations and possible problems. A controlled multicenter study of implants in children would also be appropriate. Only by joining forces can we hope to expand our knowledge within a reasonable time period so that the masticatory function of young oral invalids could be restored with osseointegrated implants under safe and predictable conditions in the future.