

OsseoSpeed™ – more bone more rapidly

OsseoSpeed™ was launched in the fall 2004 and is a further development of the moderately roughened (grit blasted with titanium dioxide particles) titanium surface TiOblast™. OsseoSpeed gains its additional surface characteristics via a chemical (fluoride) treatment and a slight topographic modification of the TiOblast surface^{1, 2}. Incorporation of small amounts of fluoride ions in the oxide layer, a slight increase on the micrometer scale in surface roughness and the appearance of a nanoscale topography have been reported for the OsseoSpeed surface³⁻⁹.

All but one¹⁰ *in vitro* and animal experiments indicate that the OsseoSpeed surface leads to increased bone formation and stronger bone-to-implant bonding^{2, 5, 11-25} at shorter healing times than TiOblast or machined titanium surfaces^{2, 17, 26, 27}. This has also been confirmed in a human histological study²⁸. The mechanisms for the faster osseointegration have been thoroughly investigated with emphasizes on the molecular level. Enhanced osteoblast differentiation^{3, 16, 29-34}, platelet activation and thrombogenic properties of the fluoride-treated surface have been reported^{11, 30, 35}.

The OsseoSpeed surface characteristics and properties have been reviewed in numerous published articles revealing positive bone response³⁶⁻⁴⁰. Results from the extensive OsseoSpeed clinical study program show good functionality⁴¹⁻⁴⁸, and predictable and maintained marginal bone levels with a mean marginal bone loss below 0.3 mm⁴⁹⁻⁵¹. The maintained marginal bone levels are also confirmed in prospective studies with three and five year results⁵⁰⁻⁵². There is no significant dip in Implant Stability Quotient values^{42, 44, 53} traditionally seen at implants 2-6 weeks after installation. This is interpreted as a continuous gain in osseointegration and stability. Published data shows that the OsseoSpeed implant can be safely used with a range reported for survival rate from 94.5% to 100%, including the use of immediate loading protocol⁵⁴⁻⁵⁷ even in the atrophic edentulous maxilla^{58, 59}, in sinus lifted maxillary posterior jaw sites^{42, 60-63}, immediate installation in extraction sockets^{41, 55, 64-69} and implants placed in atrophied mandibles close to the nerve⁷⁰.

1. Ellingsen JE. On the properties of surface-modified titanium. In: Davies JE, editor. Bone Engineering. Toronto: em squared inc, Toronto, Canada; 2000. p. 183-88. (ID No. 78360)
2. Ellingsen JE, Johansson CB, Wennerberg A, Holmén A. Improved retention and bone-to-implant contact with fluoride-modified titanium implants. *Int J Oral Maxillofac Implants* 2004;19(5):659-66. (ID No. 78245) [Abstract in PubMed](#)
3. Isa ZM, Schneider GB, Zaharias R, Seabold D, Stanford CM. Effects of fluoride-modified titanium surfaces on osteoblast proliferation and gene expression. *Int J Oral Maxillofac Implants* 2006;21(2):203-11. (ID No. 78731) [Abstract in PubMed](#)
4. Wennerberg A, Albrektsson T. Implant surfaces beyond micron roughness. Experimental and clinical knowledge of surface topography and surface chemistry. *Appl Osseointegration Res* 2006;5:40-44. (ID No. 78448-USX)
5. Johansson C, Wennerberg A, Junemo-Boström K, Holmén A, Hansson S. In vivo Comparison of TiO2 Blasted-and Fluoride Modified Implants in Rabbit Bone. Paper presented at: Biomaterials; May 17-21, 2004; Sydney 2004.
6. Fandridis J, Papadopoulos T. Surface characterization of three titanium dental implants. *Implant Dent* 2008;17(1):91-9. [Abstract in PubMed](#)
7. Jarmar T, Palmquist A, Branemark R, Hermansson L, Engqvist H, Thomsen P. Characterization of the surface properties of commercially available dental implants using scanning electron microscopy, focused ion beam, and high-resolution transmission electron microscopy. *Clin Impl Dent Rel Res* 2008;10(1):11-22. [Abstract in PubMed](#)
8. Kang BS, Sul YT, Oh SJ, Lee HJ, Albrektsson T. XPS, AES and SEM analysis of recent dental implants. *Acta Biomater* 2009;early online. [Abstract in PubMed](#)
9. Svanborg LM, Andersson M, Wennerberg A. Surface characterization of commercial oral implants on the nanometer level. *J Biomed Mater Res B Appl Biomater* 2010;92(2):462-9. [Abstract in PubMed](#)
10. de Sanctis M, Vignoletti F, Discepoli N, Zucchelli G, Sanz M. Immediate implants at fresh extraction sockets: bone healing in four different implant systems. *J Clin Periodontol* 2009;36(8):705-11. [Abstract in PubMed](#)
11. Thor A, Hong J, Zelling G, Sennerby L, Rasmusson L. Correlation of platelet growth factor release in jawbone defect repair - a study in the dog mandible. Article V in thesis. On platelet-rich plasma in reconstructive dental implant surgery. ISBN-10-91-628-7021-2 2006.
12. Ellingsen JE. Surface configurations of dental implants. *Periodontol* 2000 1998;17:36-46. [Abstract in PubMed](#)
13. Ellingsen JE. Pre-treatment of titanium implants with fluoride improves their retention in bone. *J Mater Sci: Mater Med* 1995;6:749-53. (ID No. 78327)
14. Ellingsen JE, Lyngstadaa SP. Increasing biocompatibility by chemical modification of titanium surfaces. In: Ellingsen JE, Lyngstadaa SP, editors. Bio-Implant Interface: Improving Biomaterials and Tissue Reactions. Boca Raton, Florida: CRC Press LLC; 2003. p. 323-40.
15. Ellingsen JE, Thomsen P, Lyngstadaa SP. Advances in dental implant materials and tissue regeneration. *Periodontol* 2000 2006;41:136-56. [Abstract in PubMed](#)
16. Cooper LE, Zhou Y, Takebe J, Guo J, Abron A, Holmen A, et al. Fluoride modification effects on osteoblast behavior and bone formation at TiO2 grit-blasted c.p. titanium endosseous implants. *Biomaterials* 2006;27(6):926-36. (ID No. 78750) [Abstract in PubMed](#)
17. Berglundh T, Abrahamsson I, Albojy JP, Lindhe J. Bone healing at implants with a fluoride-modified surface: an experimental study in dogs. *Clin Oral Implants Res* 2007;18(2):147-52. (ID No. 78775) [Abstract in PubMed](#)
18. Abrahamsson I, Albojy JP, Berglundh T. Healing at fluoride-modified implants placed in wide marginal defects: an experimental study in dogs. *Clin Oral Implants Res* 2008;19(2):153-59. [Abstract in PubMed](#)
19. Ellingsen J, Ronold H, Boström K, Holmen A, Hansson S. Enhanced Bone-to-Implant Attachment of Fluoride-modified Titanium Implants. abstract #2946. Paper presented at: IADR; June 25-28, 2003; Göteborg 2003.
20. Godarzi R, Rasmusson L, Dasmah A, Albrektsson T. Effects of implant design and surface on osseointegration. An experimental study in the dog mandible. *Appl Osseointegration Res* 2008;7:58-60. (ID No. 79034-USX)
21. Meirelles L, Currie F, Jacobsson M, Albrektsson T, Wennerberg A. The effect of chemical and nanotopographic modifications on the early stages of osseointegration. *Int J Oral Maxillofac Implants* 2008;23(4):641-7. [Abstract in PubMed](#)
22. Monjo M, Lamolle SF, Lyngstadaa SP, Ronold HJ, Ellingsen JE. In vivo expression of osteogenic markers and bone mineral density at the surface of fluoride-modified titanium implants. *Biomaterials* 2008;29(28):3771-80. [Abstract in PubMed](#)
23. Stanford CM. Surface modifications of dental implants. *Aust Dent J* 2008;53 Suppl 1:26-33. [Abstract in PubMed](#)
24. Welander M, Abrahamsson I, Berglundh T. Subcrestal placement of two-part implants. *Clin Oral Implants Res* 2009;20(3):226-31. [Abstract in PubMed](#)
25. Faria PE, Carvalho AL, de Torres EM, Rasmusson L, Salata LA. Effects of early functional loading on maintenance of free autogenous bone graft and implant osseointegration: an experimental study in dogs. *J Oral Maxillofac Surg* 2010;68(4):825-32. [Abstract in PubMed](#)
26. Ellingsen JE. The development of a bone regeneration promoting implant surface. *Appl Osseointegration Res* 2006;5:18-23. (ID No. 78448-USX)
27. Welander M, Abrahamsson I, Berglundh T. Placement of two-part implants in sites with different buccal and lingual bone heights. *J Periodontol* 2009;80(2):324-9. [Abstract in PubMed](#)
28. Rocci M, Rocci A, Martignoni M, Albrektsson T. A comparative study of TiOblast and OsseoSpeed implants retrieved from humans. *Appl Osseointegration Res* 2008;7:26-30. (ID No. 79034-USX)
29. Masaki C, Schneider GB, Zaharias R, Seabold D, Stanford C. Effects of implant surface microtopography on osteoblast gene expression. *Clin Oral Implants Res* 2005;16(6):650-56. [Abstract in PubMed](#)
30. Stanford C, Schneider GB, Masaki C, Zaharias R, Seabold D, Eckdahl J, et al. Effects of fluoride-modified titanium dioxide grit blasted implant surfaces on platelet activation and osteoblast differentiation. *Appl Osseointegration Res* 2006;5:24-30. (ID No. 78448-USX)
31. Mendonca G, Mendonca DB, Aragao FJ, Cooper LF. Advancing dental implant surface technology - From micron- to nanotopography. *Biomaterials* 2008;29(28):3822-35. [Abstract in PubMed](#)
32. Guo J, Padilla RJ, Ambrose W, De Kok IJ, Cooper LE. The effect of hydrofluoric acid treatment of TiO(2) grit blasted titanium implants on adherent osteoblast gene expression in vitro and in vivo. *Biomaterials* 2007;28(36):5418-25. [Abstract in PubMed](#)
33. Valencia S, Gretzer C, Cooper LF. Surface nanofeature effects on titanium-adherent human mesenchymal stem cells. *Int J Oral Maxillofac Implants* 2009;24(1):38-46. [Abstract in PubMed](#)
34. Lamolle SF, Monjo M, Rubert M, Haugen HJ, Lyngstadaa SP, Ellingsen JE. The effect of hydrofluoric acid treatment of titanium surface on nanostructural and chemical changes and the growth of MC3T3-E1 cells. *Biomaterials* 2009;30(5):736-42. [Abstract in PubMed](#)
35. Thor A, Rasmusson L, Wennerberg A, Thomsen P, Hirsch JM, Nilsson B, et al. The role of whole blood in thrombin generation in contact with various titanium surfaces. *Biomaterials* 2007;28(6):966-74. (ID No. 78908) [Abstract in PubMed](#)
36. Albrektsson T, Sennerby L, Wennerberg A. State of the art of oral implants. *Periodontol* 2000 2008;47:15-26. (ID No. 79205) [Abstract in PubMed](#)
37. Albrektsson T, Wennerberg A. Oral implant surfaces: Part 2-review focusing on clinical knowledge of different surfaces. *Int J Prosthodont* 2004;17(5):544-64. (ID No. 78477) [Abstract in PubMed](#)
38. Albrektsson T, Wennerberg A. Oral implant surfaces: Part 1-review focusing on topographic and chemical properties of different surfaces and in vivo responses to them. *Int J Prosthodont* 2004;17(5):536-43. (ID No. 78477) [Abstract in PubMed](#)
39. Carlsson LV, Albrektsson T, Jacobsson MC, Macdonald W. Osseointegration of a surface engineered orthopaedic implant. *Appl Osseointegration Res* 2006;5:45-49. (ID No. 78448-USX)
40. Wennerberg A, Albrektsson T. On implant surfaces: a review of current knowledge and opinions. *Int J Oral Maxillofac Implants* 2010;25(1):63-74. [Abstract in PubMed](#)
41. Oxyb G, Lindqvist J, Nilsson P. Early loading of Astra Tech OsseoSpeed implants placed in thin alveolar ridges and fresh extraction sockets. *Appl Osseointegration Res* 2006;5:68-72. (ID No. 78735)
42. Stanford C, Johnson G, Fakhry A, Gartton D, Melloni J, Wagner W. Outcomes of a fluoride modified implant one year after loading in the posterior-maxilla when placed with the osteotome surgical technique. *Appl Osseointegration Res* 2006;5:50-55. (ID No. 78448-USX)
43. Stanford CM, Åström M, Berglundh T, Wagner W, Baena R, Norton MR, et al. Evaluation of the effectiveness of dental implant therapy in a practice based network (FOCUS). *Int J Oral Maxillofac Implants* 2010;25(2):367-73.
44. Barewall RM, Stanford C. A randomized prospective clinical trial of the effect of three dental implant loading protocols on stability - an interim report. *Appl Osseointegration Res* 2006;5:62-67. (ID No. 78448-USX)
45. Creton M, Cune M, Verhoeven W, Muradin M, Wismeyer D, Meijer G. Implant treatment in patients with severe hypodontia: a retrospective evaluation. *J Oral Maxillofac Surg* 2010;68(3):530-8. [Abstract in PubMed](#)
46. Goshima K, Lexner MO, Thomsen CE, Miura H, Gofredsen K, Bakke M. Functional aspects of treatment with implant-supported single crowns: a quality control study in subjects with tooth agenesis. *Clin Oral Implants Res* 2010;21(1):108-14. [Abstract in PubMed](#)
47. Galindo-Moreno P, Moreno-Riestra I, Avila G, Fernandez-Barbero JE, Mesa F, Aguilar M, et al. Histomorphometric comparison of maxillary pristine bone and composite bone graft biopsies obtained after sinus augmentation. *Clin Oral Implants Res* 2009. [Abstract in PubMed](#)
48. Mesimäki K, Lindroos B, Tornwall J, Mauno J, Lindqvist C, Kontio R, et al. Novel maxillary reconstruction with ectopic bone formation by GMP adipose stem cells. *Int J Oral Maxillofac Surg* 2009;38(3):201-9. [Abstract in PubMed](#)
49. Schliephake H, Hüls A, Müller M. Early loading of surface modified titanium implants in the posterior mandible - preliminary results. *Appl Osseointegration Res* 2006;5:56-58. (ID No. 78448-USX)
50. Stanford C, Johnson G, Fakhry A, Aquilino S, Gratton D, Reinke M, et al. Three year post-loading outcomes with MicroThread OsseoSpeed dental implants placed in the posterior-maxilla. *Appl Osseointegration Res* 2008;7:49-57. (ID No. 79173)
51. Roediger M, Huels A, Schliephake H, McClumphy E, Phillips K. Early loading of fluoride modified implants in the posterior mandible. *J Dent Res* 2009;84(Spec Iss A):3385.
52. Steveling H, Mertens C, Merkle K. Bioactive implants: 5 years of experience with a fluoridized surface. # 603. *J Clin Periodontol* 2009;36(Suppl 9):197.
53. Geckili O, Bilhan H, Bilgin T. A 24-week prospective study comparing the stability of titanium dioxide grit-blasted dental implants with and without fluoride treatment. *Int J Oral Maxillofac Implants* 2009;24(4):684-88. (ID No. 79232) [Abstract in PubMed](#)
54. Donati M, La Scala V, Billi M, Di Dino B, Torrisi P, Berglundh T. Immediate functional loading of implants in single tooth replacement: a prospective clinical multicenter study. *Clin Oral Implants Res* 2008;19:740-48. (ID No. 79065) [Abstract in PubMed](#)
55. Harvey BV. Optimizing the esthetic potential of implant restorations through the use of immediate implants with immediate provisionals. *J Periodontol* 2007;78(4):770-6. [Abstract in PubMed](#)
56. D'Haese J, Van De Velde T, Elaut L, De Bruyn H. A prospective study on the accuracy of mucosally supported stereolithographic surgical guides in fully edentulous maxillae. *Clin Implant Dent Relat Res E-pub Nov 10*, DOI 10.1111/j.1708-8208.2009.00255.x 2009. [Abstract in PubMed](#)
57. Bilhan H, Sommez E, Mumcu E, Bilgin T. Immediate loading: three cases with up to 38 months of clinical follow-up. *J Oral Implantol* 2009;35(2):75-81. [Abstract in PubMed](#)
58. Toljanic JA, Baer RA, Ekstrand K, Thor A. Implant rehabilitation of the atrophic edentulous maxilla including immediate fixed provisional restoration without the use of bone grafting: a review of 1-year outcome data from a long-term prospective clinical trial. *Int J Oral Maxillofac Implants* 2009;24(3):518-26. [Abstract in PubMed](#)
59. Toljanic J, Thor A, Baer R, Ekstrand K. Immediate fixed restoration of implants in the atrophic edentulous maxilla. *Dent Today* 2008;June:56-63.
60. Thor A. TiOblast and OsseoSpeed implant in sinus lift surgery. *Appl Osseointegration Res* 2008;7:17-25. (ID No. 79034-USX)
61. Kahnberg KE, Wallstrom M, Rasmusson L. Local sinus lift for single-tooth implant. I. Clinical and radiographic follow-up. *Clin Implant Dent Relat Res* 2009;E-pub Sep 9, DOI: 10.1111/j.1708-8208.2009.00201.x. [Abstract in PubMed](#)
62. de Vicente C, Hernández-Vallejo G, Braña-Abascal P, Peña I. Maxillary sinus augmentation with autologous bone harvested from the lateral maxillary wall combined with bovine-derived hydroxyapatite: clinical and histologic observations. *Clin Oral Implants Res* 2010;21:430-38.
63. Trombelli L, Minenna P, Franceschetti G, Minenna L, Farina R. Transcrestal sinus floor elevation with a minimally invasive technique. *J Periodontol* 2010;81(1):158-66. [Abstract in PubMed](#)
64. Lops D, Chiapasco M, Rossi A, Bressan E, Romeo E. Incidence of inter-proximal papilla between a tooth and an adjacent immediate implant placed into a fresh extraction socket: 1-year prospective study. *Clin Oral Implants Res* 2008;19(11):335-40. [Abstract in PubMed](#)
65. Tomasi C, Sanz M, Cecchinato D, Pjetursson B, Ferrus J, Lang NP, et al. Bone dimensional variations at implants placed in fresh extraction sockets: a multilevel multivariate analysis. *Clin Oral Implants Res* 2010;21(1):30-6. [Abstract in PubMed](#)
66. Huynh-Ba G, Pjetursson BE, Sanz M, Cecchinato D, Ferrus J, Lindhe J, et al. Analysis of the socket bone wall dimensions in the upper maxilla in relation to immediate implant placement. *Clin Oral Implants Res* 2010;21(1):37-42. [Abstract in PubMed](#)
67. Sanz M, Cecchinato D, Ferrus J, Pjetursson EB, Lang NP, Lindhe J. A prospective, randomized-controlled clinical trial to evaluate bone preservation using implants with different geometry placed into extraction sockets in the maxilla. *Clin Oral Implants Res* 2010;21(1):13-21. (ID No. 79341) [Abstract in PubMed](#)
68. Ferrus J, Cecchinato D, Pjetursson EB, Lang NP, Sanz M, Lindhe J. Factors influencing ridge alterations following immediate implant placement into extraction sockets. *Clin Oral Implants Res* 2010;21(1):22-9. [Abstract in PubMed](#)
69. Gokcen-Rohlig B, Meric U, Keskin H. Clinical and radiographic outcomes of implants immediately placed in fresh extraction sockets. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109(4):e1-7. [Abstract in PubMed](#)
70. Pinholm EM. Surface engineered dental implant insertion in conjunction with bilateral inferior mandibular nerve transposition - a case report. *Appl Osseointegration Res* 2006;5:59-61. (ID No. 78448-USX)

