

Marginal bone maintenance and Astra Tech Implant System™

The maintenance of the marginal bone is crucial in implant dentistry, both from a functional and esthetic point of view. The design features of the implant system is one of several factors crucial to the long-term marginal bone stability. Interactions between an optimal biomechanical bone stimulation from the implant and the stable seal of the implant-abutment interface will help maintain the marginal bone, and thereby the function and esthetics of the implant.

The peer-reviewed published scientific documentation on the maintenance of the marginal bone supporting Astra Tech implants is extensive. Several thousand Astra Tech implants have been carefully evaluated by radiographs in clinical trials with a follow-up period of up to 10 years. Studies reporting on the frequency distribution of marginal bone level changes in periodontally compromised patients showed that 76-82% of the implants had ≤ 1.5 mm change in marginal bone after 3^{1,2} and 5^{3,4} years. The corresponding figure after 10 years was 64-69%^{3,4} and the reported implant survival rate was 97%. From studies evaluating mean values of marginal bone level changes, it can be concluded that only small bone level changes occur around Astra Tech implants during the first year in function, on average 0.3 mm. After 5 years, the mean bone level change is found to be stable at 0.3 mm, on average. Thus, the Astra Tech literature shows minimal marginal bone remodelling during the first year in function, and well maintained marginal bone levels thereafter.

The table below shows published articles reporting from a minimum of 10 patients on radiographically measured mean marginal bone level changes adjacent to Astra Tech implants after a minimum of 1 year in function. All studies have excellent results with regards to the current standard for success for radiographically evaluated implant outcomes⁵⁻⁷ (i.e. less than 1 mm bone loss during the first year and less than 0.2 mm annually thereafter).

| First author | Mean MBL ^a change (mm) | Follow-up period (years) | No. of patients | Restorations ^b | Implant survival (%) | Loading ^c |
|--|-----------------------------------|--------------------------|-----------------|---------------------------|----------------------|----------------------|
| <i>Prospective studies</i> | | | | | | |
| Rasmusson et al. 2005 ⁸ | 1.27 | 7 | 36 | F | 96.9 | 3 |
| Arvidsson et al. 1998 ^{9 i} | 0.26 | 5 | 107 | F | 98.7 | 3 |
| Cecchinato et al. 2008 ^{10 j} | 0.11 [#] | 5 | 84 | F | no info | 3 ▪ |
| Cooper et al. 2008 ¹¹ | + 0.09 | 5 | 59 | OD | 95.9 | 2 ▪ |
| Davis and Packer 1999 ¹² | 0.15 [#] | 5 | 25 | OD | 92 | 3 |
| Gotfredsen et al. 2000 ¹³ | 0.20 | 5 | 26 | OD | 100 | 3 |
| Gotfredsen et al. 2001 ¹⁴ | 0.37 [#] | 5 | 50 | F | 97.6 | 3 |
| Gotfredsen 2004 ¹⁵ | 0.30 [#] | 5 | 20 | S | 100 | 3 ▪ |
| Kahnberg et al. 2005 ¹⁶ | 1.60 ^{#*} | 5 | 22 | F | 97 | 3 |
| Makkonen et al. 1997 ¹⁷ | 0.48 | 5 | 33 | F, OD | 98.7 | 3 |
| Palmer et al. 2000 ^{18 h} | + 0.12 [#] | 5 | 15 | S | no info | 3 |
| Wennström et al. 2004 ¹⁹ | 0.41 | 5 | 51 | F | 94.1 | 3 |
| Wennström et al. 2005 ²⁰ | 0.11 | 5 | 40 | S | 97.4 | 3 |
| von Wowern and Gotfredsen 2001 ²¹ | 0.47 | 5 | 22 | OD | 100 | 3 |
| Åstrand et al. 2004 ^{22 d} | 0.26 [#] | 5 | 33 | F | 98.4 | 3 |
| Gotfredsen 1997 ²³ | 0.60 | up to 5 | 32 | OD | 98.5 | 3 |
| Stevelling et al. 2001 ²⁴ | 0.90 | up to 5 | 17 | F, S | 100 | 2 |
| Weibrich et al. 2001 ²⁵ | 1.50 [*] | up to 5 | 107 | F, OD | 95.9 | no info |
| Arvidsson et al. 1992 ^{26 m} | 0.01 [§] | 3 | 55 | F | 98.1 | 3 |
| Cooper et al. 2007 ^{27 f} | 0.42 | 3 | 54 | S | 94 | 2 ▪ |
| De Bruyn et al. 2008 ²⁸ | 1.20 | 3 | 25 | F | 100 | 1 ▪ |
| Engquist et al. 2002 ^{29 e} | 0.24 [#] | 3 | 33 | F | 98.9 | 3 |
| Lee et al. 2007 ³⁰ | 0.38 [#] | 3 | 17 | F | 100 | 3 |
| Palmer et al. 2005 ³¹ | 0.13 | 3 | 19 | F | no info | 3 |
| Yi et al. 2001 ³² | 0.21 | 3 | 43 | F | 100 | 3 |
| Norton et al. 2002 ³³ | 0.45 ^{#*} | 2-3 | 17 | S, F, OD | 88.6/96.8 | 3 |
| Gotfredsen et al. 1993 ³⁴ | 0.31 | 2 | 20 | OD | 97.5 | 3 |

| First author | Mean MBL ^a change (mm) | Follow-up period (years) | No. of patients | Restorations ^b | Implant survival (%) | Loading ^c |
|--|-----------------------------------|--------------------------|-----------------|---------------------------|----------------------|----------------------|
| Karlsson et al. 1998 ³⁵ | 0.24 | 2 | 50 | F | 97.7 | 3 |
| Karlsson et al. 1997 ³⁶ | 0.31 | 2 | 47 | S | 100 | 3 |
| Palmer et al. 1997 ^{37 h} | 0.00 | 2 | 15 | S | 100 | 3 |
| Cecchinato et al. 2004 ^{38 k} | 0.17 | 2 | 84 | F | no info | 3 ▪ |
| Collaert et al. 2002 ³⁹ | 0.70 | 1-2 | 25 | F | 100 | 2 ▪ |
| Cooper et al. 2001 ^{40 g} | 0.40 | 1 | 52 | S | 96.2 | 2 ▪ |
| Donati 2008 ⁴¹ | 0.31 [#] | 1 | 151 | S | 94.5 | 1 ▪ |
| Norton 2004 ⁴² | 0.40 | 1 | 25 | S | 96.4 | 1 ▪ |
| Kemppainen et al. 1997 ⁴³ | 0.13 | 1 | 37 | S | 97.8 | 3 |
| Nordin et al. 1998 ⁴⁴ | 0.05 | 1 | 10 | F | 100 | 3 |
| Thor et al. 2005 ⁴⁵ | 0.50* | 1 | 19 | F | 98.7 | 3 |
| Veltri et al. 2008 ⁴⁶ | 0.30 | 1 | 12 | F | 100 | 3 |
| Retrospective studies | | | | | | |
| Norton 2006 ⁴⁷ | 0.65 | up to 7 | 54 | S | 99.4 | 3 ▪ |
| Hallman et al. 2005 ⁴⁸ | 2.40* | 5 | 11 | F | 94.5 | 3 |
| Wennström et al. 2004 ⁴⁹ | 0.40 | 5 | 45 | F | no info | 3 |
| Koutouzis and Wennström 2007 ⁵⁰ | 0.45 [#] | 5 | 38 | F | no info | no info |
| Eliasson et al ⁵¹ | 0.09 | up to 5 | 16 | F | no info | 2&3 ▪ |
| Norton 2001 ⁵² | 0.63 [#] | 4-7 | 13 | S | no info | no info |
| Norton 1998 ⁵³ | 0.42 | 2 | 33 | S | no info | 3 |
| De Kok et al. 2006 ⁵⁴ | 0.31 [#] | 1-2 | 28 | S | no info | 1 ▪ |
| Warren et al. 2002 ⁵⁵ | 0.36 | 1-2 | 48 | F | no info | 3 |
| Fermgård and Åstrand 2008 ⁵⁶ | 0.40 | 1 | 36 | S, F | 96 | 4 |

^a Mean marginal bone level change reported; measured from baseline (implant placement or loading) to the end of the follow-up period; [#] the bone level change is presented for different subgroups and a new mean have been calculated;

* implants were placed in grafted or augmented bone or immediately placed in extraction sockets; [§] median is reported

^b S= single tooth; F= fixed restoration; OD= overdenture

^c 1= immediate load; 2= early load; 3= conventional load; ▪ = 1-stage surgery

^{d, e} Report on the same material

^{f, g} Report on the same material

^{h, i} Report on the same material

^{j, k} Report on the same material

^{l, m} Report on the same material

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