

## Marginal bone maintenance and Astra Tech Implant System™

The design features of a dental implant system are crucial to the long-term marginal bone stability. The Astra Tech Implant system™ is actually designed to maintain marginal bone support and this is proven clinically in several prospective long-term (i.e.  $\geq 5$  years) studies\*.

Studies reporting on the frequency distribution of marginal bone level changes in periodontally compromised patients, show that between 64–88% of the implants had  $\leq 1.5$  mm change after 3–10 years<sup>1-4</sup>.

From studies presenting mean values of marginal bone level changes, it can be concluded that very small bone level changes occur around Astra Tech implants during the first year in function, around 0.3 mm. On average, bone levels at 5 years follow-up are maintained at 0.3 mm. Figures from studies on 10 years or more of follow-up (10<sup>5</sup>, 12<sup>6</sup> and 16<sup>7</sup> years) also report bone level changes of on average 0.3 mm. Thus, the Astra Tech literature shows remarkably well maintained marginal bone levels in the long-term perspective.

The tables below shows published prospective studies reporting on radiographically measured mean marginal bone level changes adjacent to Astra Tech implants after a minimum of 1 year in function on a minimum of 10 patients. All studies have good results with regard to the current success criteria for radiographically evaluated implant outcomes<sup>8-10</sup> (i.e. less than 1 mm bone loss during the first year and less than 0.2 mm annually thereafter). Additionally, a meta analysis<sup>11</sup> concluded that Astra Tech implant system perform even much better than the presently accepted success criteria<sup>8-10</sup>.

\*Extended claims for Astra Tech Implant System™ cleared by FDA, September 2009.

First author	Mean MBL <sup>a</sup> change (mm)	Follow-up period (years)	No. of patients	Restora- tions <sup>b</sup>	Implant survival (%)	Loading <sup>c</sup>
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### More than 5-years follow-up

Jacobs et al. 2010 <sup>7 q</sup>	0.02	16	18	F	100	3
Vroom et al. 2009 <sup>6</sup>	0.20	12	20	OD	100	3
Gotfredsen 2009 <sup>5 n</sup>	0.75 <sup>#</sup>	10	20	S	100	3
Mertens et al. 2010 <sup>12</sup>	0.30	8	17	F	99	3
Rasmusson et al. 2005 <sup>13</sup>	1.07	7	36	F	96.9	3

### Five years follow-up

Akoglu et al. 2011 <sup>14</sup>	0.34	5	12	OD	100	2
Arvidsson et al. 1998 <sup>15 l</sup>	0.26	5	107	F	98.7	3
Cecchinato et al. 2008 <sup>16 i</sup>	0.07 <sup>#</sup>	5	84	F	no info	3 •
Chang et al. 2010 <sup>17</sup>	0.38	5	43	F	no info	3
Cooper et al. 2008 <sup>18</sup>	+ 0.09	5	59	OD	95.9	2 •
Davis et al. 1999 <sup>19</sup>	0.15 <sup>#</sup>	5	25	OD	92	3
Gotfredsen et al. 2000 <sup>20</sup>	0.20	5	26	OD	100	3
Gotfredsen et al. 2001 <sup>21</sup>	0.37 <sup>#</sup>	5	50	F	97.6	3
Gotfredsen 2004 <sup>22 o</sup>	0.30 <sup>#</sup>	5	20	S	100	3
Makkonen et al. 1997 <sup>23</sup>	0.48	5	33	F, OD	98.7	3
Palmer et al. 2000 <sup>24 h</sup>	+ 0.12 <sup>#</sup>	5	15	S	100	3
Roediger et al. 2011 <sup>25</sup>	0.05	5	44	F	100	2 •
Wennström et al. 2004 <sup>26</sup>	0.41	5	51	F	94.1	3
Wennström et al. 2005 <sup>27</sup>	0.11	5	40	S	97.4	3
von Wowern et al. 2001 <sup>28</sup>	0.24 <sup>#</sup>	5	22	OD	100	3
Åstrand et al. 2004 <sup>29 d</sup>	0.26 <sup>#</sup>	5	33	F	98.4	3
Gotfredsen 1997 <sup>30</sup>	0.60	up to 5	32	OD	98.5	3
Stevelling et al. 2001 <sup>31</sup>	0.90	up to 5	17	F, S	100	2

### Three years follow-up

Arvidsson et al. 1992 <sup>32 m</sup>	0.01 <sup>§</sup>	3	54	F	98.1	3
Cooper et al. 2007 <sup>33 f</sup>	0.42	3	48	S	94	2 •
Engquist et al. 2002 <sup>34 e</sup>	0.24 <sup>#</sup>	3	33	F	98.9	3
Lee et al. 2007 <sup>35</sup>	0.38 <sup>#</sup>	3	17	F	100	3
Palmer et al. 2005 <sup>36</sup>	0.13	3	19	F	no info	3
Yi et al. 2001 <sup>37</sup>	0.21	3	43	F	100	3

### Two years follow-up

Bilhan et al. 2010 <sup>38</sup>	0.66	2	no info	F	100	3
Cecchinato et al. 2004 <sup>39 k</sup>	0.10 <sup>#</sup>	2	84	F	no info	3 •
Gotfredsen et al. 1993 <sup>40</sup>	0.31	2	20	OD	97.5	3
Karlsson et al. 1998 <sup>41</sup>	0.24	2	50	F	97.7	3
Karlsson et al. 1997 <sup>42</sup>	0.31	2	47	S	100	3
Palmer et al. 1997 <sup>43 i</sup>	0.01	2	15	S	100	3
van Steenberghe et al. 2000 <sup>44 p</sup>	0.20	2	18	F	100	3
Collaert et al. 2002 <sup>45</sup>	0.70	1–2	25	F	100	2 •

First author	Mean MBL <sup>a</sup> change (mm)	Follow-up period (years)	No. of patients	Restora- tions <sup>b</sup>	Implant survival (%)	Loading <sup>c</sup>
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### One year follow-up

Balleri et al. 2010 <sup>46</sup>	0.36 <sup>#</sup>	1	20	F	100	3
Cooper et al. 2001 <sup>47 g</sup>	0.40	1	52	S	96.2	2 •
Kemppainen et al. 1997 <sup>48</sup>	0.13	1	37	S	97.8	3
Kim et al. 2010 <sup>49</sup>	0.06 <sup>#</sup>	1	12	F	100	3
Nordin et al. 1998 <sup>50</sup>	0.05	1	10	F	100	3
Piero et al. 2011 <sup>51</sup>	0.36	1	15	S, F	100	3
Veltri et al. 2008 <sup>52</sup>	0.30	1	12	F	100	3

### Advanced surgical techniques and immediately loading regimes at indicated follow-up periods

Mertens et al. 2011 <sup>53</sup>	0.10 <sup>*</sup>	5	17	S, F	97	1&2 •
Weibrich et al. 2001 <sup>54</sup>	1.50 <sup>*</sup>	up to 5	107	F	95.9	no info
Collaert et al. 2008 <sup>55</sup>	0.72	3	25	F	100	1 •
De Bruyn et al. 2008 <sup>56</sup>	1.20	3	25	F	100	1 •
Norton et al. 2002 <sup>57</sup>	0.45 <sup>**</sup>	2-3	17	S, F, OD	88.6/96.8	3
Gökcen-Röhlig et al. 2010 <sup>58</sup>	1.30 <sup>**</sup>	2	10	OD	100	3
Kahnberg 2009 <sup>59</sup>	0.56 <sup>**</sup>	2	26	S	100	3
Collaert et al. 2011 <sup>60</sup>	0.11	2	25	F	100	1 •
Cooper et al. 2010 <sup>61</sup>	+1.30 <sup>*</sup> 0.40	1 1	55 58	S S	94.5 98.3	1 • 1 •
Donati et al. 2008 <sup>62</sup>	0.31 <sup>#</sup>	1	151	S	97.5	1&3 •
Norton 2004 <sup>63</sup>	0.40	1	25	S	96.4	1 •
Thor et al. 2005 <sup>64</sup>	0.50 <sup>*</sup>	1	19	F	98.7	3
Toljanic et al. 2009 <sup>65</sup>	0.50	1	51	F	96	1 •
Van de Velde et al. 2009 <sup>66</sup>	0.75 <sup>#</sup>	1	25	F	100	1 •
Valentini et al. 2010 <sup>67</sup>	0.30 <sup>**</sup>	1	40	S	95.3	1 •

<sup>a</sup> Mean marginal bone level change reported: measured from baseline (implant placement or loading) to the end of the follow-up period;

<sup>#</sup> the bone level change is presented for different subgroups and a new mean have been calculated;

<sup>\*</sup> implants were placed in grafted or augmented bone or immediately placed in extraction sockets;

<sup>§</sup> median is reported

<sup>b</sup> S= single tooth; F= fixed restoration; OD= overdenture

<sup>c</sup> 1= immediate load; 2= early load; 3= conventional load; •= 1-stage surgery

<sup>d, e</sup> Report on the same material    <sup>h, i</sup> Report on the same material    <sup>l, m</sup> Report on the same material    <sup>p, q</sup> Report on the same material

<sup>f, g</sup> Report on the same material    <sup>i, k</sup> Report on the same material    <sup>n, o</sup> Report on the same material

Grey text indicate references based on incomplete study cohorts

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