Scientific Review
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Marginal bone maintenance with Astra Tech Implant System®

The design features of a dental implant system are crucial for the long-term marginal bone maintenance. The Astra Tech Implant System is designed to maintain marginal bone support, a clinical reality that has been reported in a meta-analysis [1]. The standard norm for accepted marginal bone remodelling around implants allows for 1 mm bone loss during the first year of loading followed by an annual bone loss of less than 0.2 mm [2-4]. A meta-analysis concluded that the Astra Tech Implant System shows even better results than this standard norm for marginal bone remodeling [1].

A literature search for all published prospective studies reporting on radiographically measured (interproximal) mean marginal bone level changes around the Astra Tech Implant System resulted in 62 publications [5-66]. The articles had to report on ≥ 10 patients that were followed for ≥ 1 year with a complete patient cohort followed for the indicated period. Only articles reporting on studies using a standard implant treatment protocol utilizing implants with a moderately rough surface with MicroThread at the implant neck were included (extraction sockets and advanced grafting procedures were excluded). Data from these articles are presented in the table below.

In summary, small mean marginal bone level changes are reported after both short- and long-term follow-up periods. With focus on published data presenting changes from implant placement and up to 5 years of follow-up, an average reduction of 0.3 mm is reported.

It can be concluded that the scientific literature presenting bone level data around the Astra Tech Implant System, is extensive and shows remarkably well maintained marginal bone levels in the short and long-term perspective.

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First author	Mean MBL change* (mm)	Radiographic baseline (months from IP†)	Follow-up period (years)	No. of patients	Restaurations§	Implant survival (%)
One year follow-up						
Balleri et al. 2010 [6]	-0.36#	6	1	20	F	100
Bashutski 2013 [8]	-0.50#	0	1	24	S	92
Cooper et al. 2001 [15 h]	-0.40	1	1	52	S	96.2
Cooper et al. 2010 [16 c]	-0.40	0	1	60	S	98.3
D'Haese et al. 2013 [19]	-0.47	0	1	26	F	88.6
Donati et al. 2008 [20 d]	-0.31#	0	1	151	S	97.5
Galindo-Moreno et al. 2012 [22 f]	-0.07	0	1	69	S	95.9
Ghoveizi et al. 2013 [24]	-0.24#	no info	1	10	S	no info
Guljé et al. 2011 [28]	-0.10	0	1	12	OD	96
Guljé et al. 2013 [27]	0.04#	< 2	1	95	F	98.1
Guljé et al. 2014 [29]	-0.14	4	1	21	S	100
Kemppainen et al. 1997 [33]	-0.13	7	1	37	S	97.8
Kim et al. 2010 [34]	-0.06#	0	1	12	F	100
Koutouzis et al. 2011 [35]	-0.19	0	1	18	S	95
Lee et al. 2014 [38]	-0.09#	4 to 7	1	76	S	100
Liaje et al. 2012 [39]	-0.21	2	1	> 10	S, F	100
Marcelis et al. 2012 [42]	-0.13	0	1	29	S	no info
Noelken et al. 2014 [47]	-0.54	0	1	65	S	no info
Nordin et al. 1998 [48]	-0.05	3 to 5	1	10	F	100
Raes et al. 2013 [53 c]	0.05#	0	1	32	S	100
Rismanchian et al. 2011 [55]	-0.48	0	1	10	F	100
Slot et al. 2013 [58]	-0.24	3	1	25	OD	100
Slot et al. 2014 [57]	-0.22	3	1	25	OD	98
Stanford et al. 2014 [59]	-0.10	0	1	120	S, F	97
Toljanic et al. 2009 [61 g]	-0.50	0	1	51	F	96
Van de Velde et al. 2010 [62]	-0.70	0	1	10	F	100
Two and 3 years follow-up						
Barewal et al. 2012 [7]	-0.22	0	3	40	S	97.5
Cooper et al. 2007 [13 h]	-0.42	1	3	48	S	94,4
De Bruyn et al. 2013 [18 c]	-0.40	0	3	58	S	98.3
Geckili et al. 2011 [23]	-0.88	0	3	52	OD	100
Kahnberg et al. 2012 [31]	-0.35	< 1	3	10	F	100
Kutan-Misirlioglu et al. 2014 [36]	-0.89#	3	3	28	S	100
Lee et al. 2007 [37]	-0.24	4 to 7	3	17	F	100
Maiorana et al. 2013 [41 f]	-0.09	0	3	69	S	95.9
Palmer et al. 2005 [49]	-0.13	4 to 7	3	19	F	100
Thor et al. 2014 [60 g]	-0.60	0	3	51	F	97.7
Yi et al. 2001 [66]	-0.21	4 to 9	3	43	F	100
Bilhan et al. 2010 [10]	-0.66	6	2	> 10	F	100
Collaert et al. 2011 [12]	-0.11	0	2	25	F	100
Göcken-Röhlig et al. 2010 [30]	-1.17	4	2	10	OD	100
Karlsson et al. 1997 [32]	-0.31	5 to 9	2	47	S	100
Mumcu et al. 2012 [46]	-0.90#	2	2	48	OD	no info
Palmer et al. 1997 [51 e]	-0.01#	6	2	15	S	100
Pieri et al. 2012 [52]	-0.60	6	2	25	F	96.8
Vervaeke et al. 2013 [65]	-0.49#	0	2	50	F	100
Vervaeke et al. 2014 [64]	-0.90	no info	2	79	OD	no info

First author	Mean MBL change* (mm)	Radiographic baseline (months from IP†)	Follow-up period (years)	No. of patients	Restaurations§	Implant survival (%)
Five years follow-up						
Akoglu et al. 2011 [5]	-0.34	2	5	12	OD	100
Berberi 2014 [9]	-0.19	0	5	> 10	S	100
Cooper et al. 2008 [14]	0.09	3	5	59	OD	95.9
Cooper et al. 2014 [17 c]	0.09	0	5	58	S	98.3
Donati et al. 2013 [21 d]	-0.28#	0	5	151	S	95.6
Gotfredsen 2004 [26 a]	-0.26	6	5	10	S	100
Lops et al. 2013 [40]	-0.30#	5	5	85	S	100
Palmer et al. 2000 [50 e]	0.12#	6	5	15	S	100
Schliephake et al. 2012 [56]	-0.08	0	5	44	F	100
Wennström et al. 2005 [63]	-0.11	4 to 7	5	40	S	97.4
More than 5 years follow-up						
Renvert et al. 2012 [54]	-0.80	12	13	17	no info	no info
Mertens et al. 2012 [44]	-0.56	6	11	17	F	96.8
Cecchinato 2013 [11]	-0.36	> 12	10	133	S, F, OD	96
Gotfredsen et al. 2009 [25 a]	-0.86	6	10	10	S	100
Mertens et al. 2012 [43 b]	-0.30	3	10	14	F	100
Mertens et al. 2010 [45 b]	-0.30	6	8	17	F	99

Table text

* mean marginal bone level change reported: measured from radiographic baseline to the end of the follow-up period

† IP = implant placement (0 months is defined as < 48 hours since surgery)

the bone level change is presented for different subgroups and a new mean has been calculated, or, bone levels are presented over time and a change has been calculated

§ S= single tooth; F=fixed restoration; OD= overdenture

a, b, c, d ,e, f, g, h – articles report from the same patient material

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