Scientific Review
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Marginal bone maintenance with Astra Tech Implant System®

The Astra Tech Implant System is designed and proven to maintain marginal bone. A meta-analysis[1] concluded that the Astra Tech Implant System shows superior bone maintenance compared to the standard norm*. Another meta-analysis[2] shows that implants with the OsseoSpeed surface maintain the marginal bone better than competitor surfaces.

The features of the EV connection with the Conical Seal Design (internal conical implant-abutment connection) and MicroThread (minute thread on the implant neck) reduce peak stresses and transfer the load deeper into the bone, leading to positive biomechanical bone stimulation that maintains marginal bone levels long term.

Transparent systematic literature search

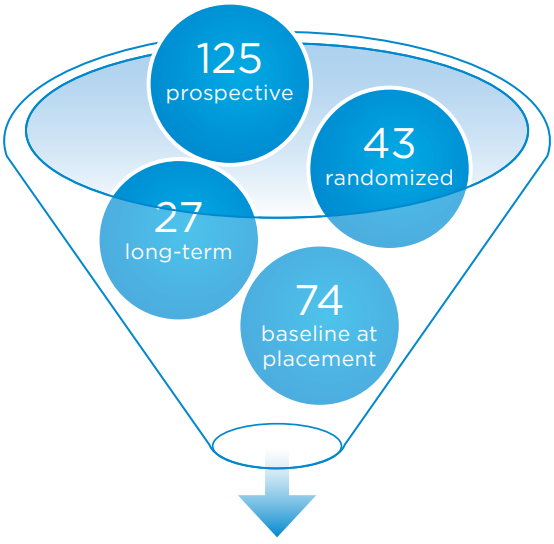
A systematic literature search of Astra Tech Implant System publications was conducted, applying the following inclusion criteria:

- Prospective studies with OsseoSpeed surface
- Bone level changes read from periapical intraoral radiographs
- ≥ 10 patients, followed for ≥ 1 year

In total, 125 publications—including 43 randomized studies, 27 long-term studies and 74 studies with radiographic baseline at implant placement—fulfilled the inclusion criteria, resulting in data from more than 5,600 patients with 11,500 implants. Any surgical approach was allowed; however, block augmentation or larger grafting were excluded from the analysis.

Overall, mean marginal bone level changes are small for the Astra Tech Implant System, averaging -0.3 mm after up to 10 years of follow-up.

Sampled features for publications included in the analysis



Conclusion

The scientific literature presenting bone level data on the Astra Tech Implant System is extensive and shows remarkably well-maintained marginal bone levels in both short and long-term perspective. Preserved bone levels is a key prerequisite for the predictability and longevity of the implant treatment and quality of life for the patient.

*Standard norm: 1 mm bone loss during the first year, and an annual bone loss of less than 0.2 mm thereafter, Albrektsson 1986[3]

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First author of publication	Mean MBLC[a] mm	Radiographic baseline[b] (months from IP)	Follow-up period (years)	No. of patients[c]	Restorations[d]	Implant survival rate (%)[e]
Five years or more follow-up						
Windael et al., 2018 [4]	-0.49	0	10	25	F	100
Windael et al., 2020 [5]	-0.97	0	10	121	F, S	86
Raes et al., 2018 [6]	-0.49 /+0.98	0	8-10	23 /16	S	100 /93.8
Trabovic et al., 2019 [7]	-1.29	0	8-11	25	F	81.9
Berberi et al., 2014 [8]	-0.19 /-0.21	0	5	36	S	100 /90.9
Boven et al., 2017 [9]	-0.23	3	5	25	OD	97
Boven et al., 2015 [10]	-0.37 #	3	5	26	OD	99.1
Cooper et al., 2014 [11]	+0.10 /+2.06	1 to 3	5	58 /55	S	98.3 /94.6
Cooper et al., 2014 [12]	-0.18 s	0	5	21	S	95.6
Donati et al., 2015 [13]	-0.28 #	3	5	149	S	97.5
Doornewaard et al., 2020 [14]	-0.36 #	0	5	26	OD	100
Galindo-Moreno et al., 2017 [15]	-0.15	0	5	69	S	95.9
Guljé et al., 2019 [16]	-0.14	0.5	5	21	S	100
Guljé et al., 2021 [17]	-0.06 #	1.5	5	95	F	97.5
Guljé et al., 2019 [18]	-0.13 #	4	5	38	S	97.5
Hosseini et al., 2019 [19]	-0.12 #	6	5	19	S	100
Ioannidis et al., 2019 [20]	-0.18	0.5	5	29	F, S	96.1
Laass et al., 2019 [21]	-0.09 #	No info	5	20	S	100
Lops et al., 2013 [22]	-0.30 #	5	5	85	S	100
Mertens et al., 2011 [23]	-0.09 #s	0 to 2	5	17	S, F	97
Matthys et al., 2019 [24]	-1.25 #	0	5	75	OD	100
Noelken et al., 2018 [25]	-0.70 #s	0	5	21	F, S	100
Salman et al., 2019 [26]	-0.55 #	0	5	30	OD	100
Schliephake et al., 2012 [27]	-0.08 #	0	5	44	F	100
Slot et al., 2016 [28]	-0.51 #	3	5	50	OD	99.6
Temmerman et al., 2019 [29]	-0.79	0	5	48	OD, F	96.5
Thoma et al., 2018 [30]	-0.40	0	5	101	S	99.3
Toljanic et al., 2016 [31]	-0.44	0	5	51	F	93.2

Table text

[a] MBLC, marginal bone level change in mm, from radiographic baseline to the end of the follow-up period (value for healed sites /extraction sockets).

[b] IP = implant placement (0 is defined as <48 hours since surgery).

[c] Number of patients at study start (patients having implants in healed sites /extraction sockets).

[d] Restoration, S = single tooth; F = fixed restoration; OD = overdenture.

[e] Cumulative implant survival rate (value for healed sites /extraction sockets).

Value has been presented for different or different time periods, and a *mean change* value has been calculated; or a mean change have been interpreted from tables or graphs.

s Value at implants placed in a mix of extraction sockets and healed sites.

First author of publication	Mean MBLC[a] mm	Radiographic baseline[b] (months from IP)	Follow-up period (years)	No. of patients[c]	Restorations[d]	Implant survival rate (%)[e]
Two to four years follow-up						
Güncü et al., 2016 [32]	-0.70	3 to 6	4	24	S	100
Arora et al., 2017 [33]	+0.26 #s	0	3	30	S	100
Barewal et al., 2012 [34]	-0.22	0	3	40	S	97.5
Basler et al., 2018 [35]	-0.04	4	3	23	S	no info
Berberi et al., 2014 [36]	-0.27 s	0	3	20	S	100
Bernard et al., 2019 [37]	-0.60 #	3	3	60	F, OD	100
Borges et al., 2021 [38]	-0.55 #	0	3	29	F	98.5
Clelland et al., 2016 [39]	+0.20 #	5	3	18	F	98.8
Cooper et al., 2019 [40]	-0.12	3	3	45	S	100
De Bruyn et al., 2013 [41]	-0.40 /+1.56	0	3	58 /55	S	98.3 /94.5
Doornewaard et al., 2019 [42]	-0.28 #	0	3	26	OD	100
Eisner et al., 2018 [43]	-0.24 #	No info	3	20	S	100
Galindo-Moreno et al., 2017 [44]	-0.33 s	0	3	59	S	100
Geckili et al., 2011 [45]	-0.88	0	3	52	OD	100
Guida et al., 2020 [46]	-0.04 #	3	3	30	F	100
Hadzik et al., 2018 [47]	-0.28 #	0	3	30	S	no info
Han et al., 2018 [48]	-0.04	0	3	45	S	95.8
Hosseini et al., 2013 [49]	-0.22	8	3	59	S	100
King et al., 2016 [50]	-0.23	0	3	38	S	96.8
Kraus et al., 2019 [51]	0.0 #	No info	3	44	S	97.2
Kutan et al., 2015 [52]	-0.89 #	3	3	28	S	100
Liu et al., 2019 [53]	+0.23	2	3	40	F	100
Maiorana et al., 2015 [54]	-0.09	0	3	69	S	95.9
Palmer et al., 2012 [55]	-0.10 #	4	3	29	S	96.6
Pieri et al., 2014 [56]	-0.22	6	3	50	S	100
Pohl et al., 2017 [57]	-0.44	0	3	101	S	100
Rossi et al., 2020 [58]	-0.16 #	3	3	10	S	100
Sanz et al., 2014 [59]	+0.25 #s	0	3	93	S	98.9
Tabrizi et al., 2013 [60]	-0.75	3	3	33	S	100
Tabrizi et al., 2016 [61]	-0.42 #	3	3	23	F	100
Temmerman et al., 2015 [62]	-0.18	4	3	28	S, F, OD	100
Thor et al., 2014 [63]	-0.57	0	3	51	F	95.7
Toija et al., 2021 [64]	-0.04 #	2	3	56	F	99.5
Zadeh et al., 2018 [65]	-0.19	0	3	95	F	97.6
Collaert et al., 2011 [66]	-0.11	0	2	25	F	100
Emami et al., 2016 [67]	-0.40 #	0	2	18	OD	91.7
Ettl et al., 2020 [68]	-0.81 #	No info	2	39	OD	92.3
Ferrari et al., 2015 [69]	-0.49 #	8	2	47	S	100
Göcken-Röhlig et al., 2010 [70]	-1.17 /-1.36	4	2	10	OD	100/100
Koutouzis et al., 2015 [71]	-0.31 #	0	2	29	S	100
Lee et al., 2016 [72]	+0.06	0	2	14	S	100
Mumcu et al., 2012 [73]	-0.43 #	6	2	48	OD	100
Noelken et al., 2020 [74]	+7.75 #s	0	2.5	50	S	98
Noelken et al., 2014 [75]	+0.89 #s	0	2	20	S, F	100
Pieri et al., 2012 [76]	-0.60	6	2	25	F	96.8
Raes et al., 2015 [77]	+0.06 #	2	2	85	S	96.5
Schiegnitz et al., 2017 [78]	-0.30	0	2	184	S	99.2
Toia et al., 2019 [79]	+0.02	3	2	40	OD	100
Vervaeke et al., 2013 [80]	-0.11	0	2	25	F	100
Vervaeke et al., 2018 [81]	-0.37 #	3 to 4	2	25	OD	100
Younes et al., 2019 [82]	-0.34	0	2	22	S	100

First author of publication	Mean MBLC[a] mm	Radiographic baseline[b] (months from IP)	Follow-up period (years)	No. of patients[c]	Restorations[d]	Implant survival rate (%)[e]
One year follow-up						
Barbier et al., 2019 [83]	-0.32	No info	1	10	F	90
Barbier et al., 2012 [84]	-0.21 s	6	1	20	F	100
Bashutski et al., 2013 [85]	-0.50 #s	0	1	24	S	92
Borges et al., 2018 [86]	-0.71	0	1	33	F	98.5
Cooper et al., 2010 [87]	-0.40 /+1.30	1 to 3	1	60 /55	S	98.3 /94.5
Cooper et al., 2015 [88]	-0.22	0	1	48	S	100
D'Haese et al., 2013 [89]	-0.47	0	1	26	F	88.6
Donati et al., 2008 [90]	-0.32 #	0	1	151	S	97.4
Ebler et al., 2016 [91]	-0.58 #	0	1	33	F, S	100
Galindo-Moreno et al., 2012 [92]	-0.07	0	1	69	S	95.9
Ghoveizi et al., 2013 [93]	-0.24 #	no info	1	10	S	no info
Guljé et al., 2011 [94]	-0.10	0	1	12	OD	96
Guljé et al., 2013 [95]	-0.13 #	0	1	95	F	98.6
Guljé et al., 2015 [96]	-0.14	4	1	21	S	100
Guljé et al., 2014 [97]	-0.10	4	1	41	S	100
Guljé et al., 2016 [98]	-0.13	< 1	1	37	S	100
Han et al., 2016 [99]	-0.13	0	1	45	S	95.8
Hosseini et al., 2011 [100]	-0.09 #	7	1	36	S	100
Ivanoff et al., 2021 [101]	-0.03 #	3	1	92	No info	99.4
Kim et al., 2010 [102]	-0.06 #	3 to 6	1	12	F	100
Koutouzis et al., 2011 [103]	-0.19	0	1	18	S	95
Lee et al., 2014 [104]	-0.09 #	3 to 6	1	76	S	100
Lyngstadaas et al., 2015 [105]	-0.65 #	0	1	37	F	98.6
Malmström et al., 2016 [106]	-0.13 #	3	1	30	S, F	98.8
Marcelis et al., 2012 [107]	-0.13	0	1	29	S	no info
Noelken et al., 2014 [108]	-0.54	0	1	65	S	100
Norton 2017 [109]	-0.13 s	3	1	22	S	100
Pieri et al., 2012 [110]	-0.37 #	0	1	40	F	98.7
Piero et al., 2012 [111]	-0.36	4	1	15	S, F	100
Raes et al., 2013 [112]	-0.18 /+0.66	0	1	23 /25	S	100 /96
Raes et al., 2011 [113]	-0.25 /+0.80 #	0	1	23 /16	S	100 /93.8
Rismanchian et al., 2011 [114]	-0.48	0	1	10	F	100
Schepke et al., 2017 [115]	+0.09 #	3	1	50	S	100
Schickaglia et al., 2015 [116]	-0.30 #	0	1	101	S	100
Schickaglia et al., 2016 [117]	-0.40 #	0	1	31	OD	96.5
Simmons et al., 2017 [118]	-0.21 #	0	1	27	S	93.3
Slot et al., 2013 [119]	-0.25 #	3	1	50	OD	99.7
Slot et al., 2014 [120]	-0.22	3	1	25	OD	98
Stanford et al., 2016 [121]	-0.07 #	0	1	120	S, F	96.9
Temmerman et al., 2017 [122]	-0.66	0	1	48	F	99.3
Toia et al., 2019 [123]	-0.17	0	1	50	F	100
Toljanic et al., 2009 [124]	-0.50	0	1	51	F	96
Tu et al., 2021 [125]	-0.50 #	0	1	19	No info	100
Tsuda et al., 2011 [126]	+0.10 s	0	1	10	S	100
Vercruyssen et al., 2014 [127]	-0.47 #	0	1	72	F, OD	100
Zhou et al., 2016 [128]	-0.14	0	1	45	F	100

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