

Straumann® Emdogain® in oral wound healing

Scientific and clinical evidence

2017

This list results from a PubMed search using the search terms (“Emdogain OR enamel matrix derivative”) and “wound healing”. Most abstracts are available via www.pubmed.com or dx.doi.org

The literature was hand selected into the following sub-categories, and listed by author in alphabetical order:

- General literature, preclinical literature in vitro (page 1-3)
- General literature, preclinical literature in vivo (page 3-5)
- Clinical literature specific to soft tissue wound healing (page 5-6)
- Clinical literature reporting wound healing in the context of periodontal wound healing (page 6-10)

General literature, preclinical in vitro

Amin HD, Olsen I, Knowles J, Dard M, Donos N. A tyrosine-rich amelogenin peptide promotes neovasculogenesis in vitro and ex vivo. *Acta Biomater.* 2014 May;10(5):1930-9. doi: 10.1016/j.actbio.2013.11.027.

Amin HD, Olsen I, Knowles JC, Donos N. Differential effect of amelogenin peptides on osteogenic differentiation in vitro: identification of possible new drugs for bone repair and regeneration. *Tissue Eng Part A.* 2012 Jun;18(11-12):1193-202. doi: 10.1089/ten.TEA.2011.0375.

Bertl K, An N, Bruckmann C, Dard M, Andrukhov O, Matejka M, Rausch-Fan X. Effects of enamel matrix derivative on proliferation/viability, migration, and expression of angiogenic factor and adhesion molecules in endothelial cells in vitro. *J Periodontol.* 2009 Oct;80(10):1622-30. doi: 10.1902/jop.2009.090157.

Chano L, Tenenbaum HC, Lekic PC, Sodek J, McCulloch CA. Emdogain regulation of cellular differentiation in wounded rat periodontium. *J Periodontal Res.* 2003 Apr;38(2):164-74.

Craig RG, Kallur SP, Inoue M, Rosenberg PA, LeGeros RZ. Effect of enamel matrix proteins on the periodontal connective tissue-material interface after wound healing. *J Biomed Mater Res A.* 2004 Apr 1;69(1):180-7. doi: 10.1002/jbm.a.20140.

Gassmann G, Schwenk B, Entschladen F, Grimm WD. Influence of enamel matrix derivative on primary CD4+ T-helper lymphocyte migration, CD25 activation, and apoptosis. *J Periodontol.* 2009 Sep;80(9):1524-33. doi: 10.1902/jop.2009.080612.

Goda S, Kaneshita Y, Inoue H, Domae E, Ikeo T, Iida J, Domae N. Enamel matrix derivative protein stimulated wound healing via phosphoinositide 3-kinase. *J Periodontol.* 2009 Oct;80(10):1631-7. doi: 10.1902/jop.2009.090127.

Grayson RE, Yamakoshi Y, Wood EJ, Agren MS. The effect of the amelogenin fraction of enamel matrix proteins on fibroblast-mediated collagen matrix reorganization. *Biomaterials.* 2006 May;27(15):2926-33. doi: 10.1016/j.biomaterials.2005.12.026.

Haase HR, Bartold PM. Enamel matrix derivative induces matrix synthesis by cultured human periodontal fibroblast cells. *J Periodontol.* 2001 Mar;72(3):341-8. doi: 10.1902/jop.2001.72.3.341.

Hoang AM, Oates TW, Cochran DL. In vitro wound healing responses to enamel matrix derivative. *J Periodontol.* 2000 Aug;71(8):1270-7. doi: 10.1902/jop.2000.71.8.1270.

Jonke E, Gemperli AC, Zhang T, Özdemir B, Dard M, Rausch-Fan X, Andrukhov O. Effect of tyrosine-rich amelogenin peptide on behavior and differentiation of endothelial cells. *Clin Oral Investig.* 2016 Feb 12. doi: 10.1007/s00784-016-1726-2.

- Kapferer I, Schmidt S, Gstir R, Durstberger G, Huber LA, Vietor I.** Gene-expression profiles of epithelial cells treated with EMD in vitro: analysis using complementary DNA arrays. *J Periodontal Res.* 2011 Feb;46(1):118-25. doi: 10.1111/j.1600-0765.2010.01321.x.
- Karima MM, Van Dyke TE.** Enamel matrix derivative promotes superoxide production and chemotaxis but reduces matrix metalloproteinase-8 expression by polymorphonuclear leukocytes. *J Periodontol.* 2012 Jun;83(6):780-6. doi: 10.1902/jop.2011.110397.
- Kasaj A, Meister J, Lehmann K, Stratul SI, Schlee M, Stein JM, Willershausen B, Schmidt M.** The influence of enamel matrix derivative on the angiogenic activity of primary endothelial cells. *J Periodontal Res.* 2012 Aug;47(4):479-87. doi: 10.1111/j.1600-0765.2011.01456.x.
- Kauvar AS, Thoma DS, Carnes DL, Cochran DL.** In vivo angiogenic activity of enamel matrix derivative. *J Periodontol.* 2010 Aug;81(8):1196-201. doi: 10.1902/jop.2010.090441.
- Kémoun P, Gronthos S, Snead ML, Rue J, Courtois B, Vaysse F, Salles JP, Brunel G.** The role of cell surface markers and enamel matrix derivatives on human periodontal ligament mesenchymal progenitor responses in vitro. *Biomaterials.* 2011 Oct;32(30):7375-88. doi: 10.1016/j.biomaterials.2011.06.043.
- Khedmat S, Hadjati J, Iravani A, Nourizadeh M.** Effects of enamel matrix derivative on the viability, cytokine secretion, and phagocytic activity of human monocytes. *J Endod.* 2010 Jun;36(6):1000-3. doi: 10.1016/j.joen.2010.02.032.
- Kuroda S, Wazen R, Sellin K, Tanaka E, Moffatt P, Nanci A.** Ameloblastin is not implicated in bone remodelling and repair. *Eur Cell Mater.* 2011 Jul 15;22:56-66; discussion 66-7.
- Miron RJ, Bosshardt DD, Gemperli AC, Dard M, Buser D, Gruber R, Sculean A.** In vitro characterization of a synthetic calcium phosphate bone graft on periodontal ligament cell and osteoblast behavior and its combination with an enamel matrix derivative. *Clin Oral Investig.* 2014;18(2):443-51. doi: 10.1007/s00784-013-0977-4.
- Miron RJ, Bosshardt DD, Hedbom E, Zhang Y, Haenni B, Buser D, Sculean A.** Adsorption of enamel matrix proteins to a bovine-derived bone grafting material and its regulation of cell adhesion, proliferation, and differentiation. *J Periodontol.* 2012 Jul;83(7):936-47. doi: 10.1902/jop.2011.110480.
- Miron RJ, Bosshardt DD, Laugisch O, Dard M, Gemperli AC, Buser D, Gruber R, Sculean A.** In vitro evaluation of demineralized freeze-dried bone allograft in combination with enamel matrix derivative. *J Periodontol.* 2013 Nov;84(11):1646-54. doi: 10.1902/jop.2013.120574.
- Narani N, Owen GR, Häkkinen L, Putnins E, Larjava H.** Enamel matrix proteins bind to wound matrix proteins and regulate their cell-adhesive properties. *Eur J Oral Sci.* 2007 Aug;115(4):288-95. doi: 10.1111/j.1600-0722.2007.00467.x.
- Nokhbehshaim M, Keser S, Nogueira AV, Cirelli JA, Jepsen S, Jäger A, Eick S, Deschner J.** Beneficial effects of adiponectin on periodontal ligament cells under normal and regenerative conditions. *J Diabetes Res.* 2014;2014:796565. doi: 10.1155/2014/796565.
- Nokhbehshaim M, Winter J, Rath B, Jäger A, Jepsen S, Deschner J.** Effects of enamel matrix derivative on periodontal wound healing in an inflammatory environment in vitro. *J Clin Periodontol.* 2011 May;38(5):479-90. doi: 10.1111/j.1600-051X.2010.01696.x.
- Parkar MH, Tonetti M.** Gene expression profiles of periodontal ligament cells treated with enamel matrix proteins in vitro: analysis using cDNA arrays. *J Periodontol.* 2004 Nov;75(11):1539-46. doi: 10.1902/jop.2004.75.11.1539.
- Rincon JC, Haase HR, Bartold PM.** Effect of Emdogain on human periodontal fibroblasts in an in vitro wound-healing model. *J Periodontal Res.* 2003 Jun;38(3):290-5.
- Rodrigues TL, Marchesan JT, Coletta RD, Novaes AB Jr, Grisi MF, Souza SL, Taba M Jr, Palioto DB.** Effects of enamel matrix derivative and transforming growth factor-beta1 on human periodontal ligament fibroblasts. *J Clin Periodontol.* 2007 Jun;34(6):514-22. doi: 10.1111/j.1600-051X.2007.01090.x.
- Sakoda K, Nakajima Y, Noguchi K.** Enamel matrix derivative induces production of vascular endothelial cell growth factor in human gingival fibroblasts. *Eur J Oral Sci.* 2012 Dec;120(6):513-9. doi: 10.1111/j.1600-0722.2012.00999.x.
- Sanders JE, Chuang A, Swiec GD, Bisch FC, Herold RW, Buxton TB, McPherson JC 3rd.** The effects of enamel matrix derivative and cyclic mechanical strain on human gingival fibroblasts in an in vitro defect healing model. *Int J Periodontics Restorative Dent.* 2011 Nov-Dec;31(6):671-8.

- Sculean A, Auschill TM, Donos N, Brex M, Arweiler NB.** Effect of an enamel matrix protein derivative (Emdogain) on ex vivo dental plaque vitality. *J Clin Periodontol.* 2001 Nov;28(11):1074-8.
- Shu R, Song AM, Wang HY, Zhang XL.** [Effects of enamel matrix proteins on the proliferation of human gingival epithelial cells in vitro]. *Shanghai Kou Qiang Yi Xue.* 2006 Feb;15(1):38-41. Chinese.
- Song AM, Shu R, Xie YF, Song ZC, Li HY, Liu XF, Zhang XL.** A study of enamel matrix proteins on differentiation of porcine bone marrow stromal cells into cementoblasts. *Cell Prolif.* 2007 Jun;40(3):381-96. doi: 10.1111/j.1365-2184.2007.00441.x.
- Spahr A, Lyngstadaas SP, Boeckh C, Andersson C, Podbielski A, Haller B.** Effect of the enamel matrix derivative Emdogain on the growth of periodontal pathogens in vitro. *J Clin Periodontol.* 2002 Jan;29(1):62-72.
- Villa O, Brookes SJ, Thiede B, Heijl L, Lyngstadaas SP, Reseland JE.** Subfractions of enamel matrix derivative differentially influence cytokine secretion from human oral fibroblasts. *J Tissue Eng.* 2015 Mar 19;6:2041731415575857. doi: 10.1177/2041731415575857.
- Yin YZ, Shen CJ, Song ZC, Zhang XL.** [Effect of enamel matrix protein on periodontal cells in an in vitro wound healing model]. *Shanghai Kou Qiang Yi Xue.* 2007 Jun;16(3):272-6. Chinese.
- Zilm PS, Bartold PM.** Proteomic identification of proteinase inhibitors in the porcine enamel matrix derivative, EMD(®). *J Periodontal Res.* 2011 Feb;46(1):111-7. doi: 10.1111/j.1600-0765.2010.01320.x.

General literature, preclinical in vivo

- Al-Hezaimi K, Al-Askar M, Al-Fahad H, Al-Rasheed A, Al-Sourani N, Griffin T, O'Neill R, Javed F.** Effect of enamel matrix derivative protein on the healing of standardized epithelial wounds: a histomorphometric analysis in vivo. *Int Wound J.* 2012 Aug;9(4):436-41. doi: 10.1111/j.1742-481X.2011.00904.x.
- Alhezaimi K, Al-Shalan T, O'Neill R, Shapurian T, Naghshbandi J, Levi P Jr, Griffin T.** Connective tissue-cementum regeneration: a new histologic regeneration following the use of enamel matrix derivative in dehiscence-type defects. A dog model. *Int J Periodontics Restorative Dent.* 2009 Aug;29(4):425-33.
- Araújo M, Hayacibara R, Sonohara M, Cardaropoli G, Lindhe J.** Effect of enamel matrix proteins (Emdogain®) on healing after re-implantation of "periodontally compromised" roots. An experimental study in the dog. *J Clin Periodontol.* 2003 Oct;30(10):855-61.
- Araújo MG, Lindhe J.** GTR treatment of degree III furcation defects following application of enamel matrix proteins. An experimental study in dogs. *J Clin Periodontol.* 1998 Jun;25(6):524-30.
- Bajić MP, Danilović V, Prokić B, Prokić BB, Manojlović M, Živković S.** Histological Effects of Enamel Matrix Derivative on Exposed Dental Pulp. *Srp Arh Celok Lek.* 2015 Jul-Aug;143(7-8):397-403.
- Cornelini R, Scarano A, Piattelli M, Andreana S, Covani U, Quaranta A, Piattelli A.** Effect of enamel matrix derivative (Emdogain) on bone defects in rabbit tibias. *J Oral Implantol.* 2004;30(2):69-73. doi: 10.1563/0.642.1.
- Corrêa MG, Gomes Campos ML, Marques MR, Casati MZ, Nociti FH Jr, Sallum EA.** Histometric analysis of the effect of enamel matrix derivative on the healing of periodontal defects in rats with diabetes. *J Periodontol.* 2013 Sep;84(9):1309-18. doi: 10.1902/jop.2012.120354.
- Craig RG, Kamer AR, Kallur SP, Inoue M, Tarnow DP.** Effects of periodontal cell grafts and enamel matrix proteins on the implant-connective tissue interface: a pilot study in the minipig. *J Oral Implantol.* 2006;32(5):228-36. doi: 10.1563/820.1.
- de Oliveira CA, Spolidório LC, Cirelli JA, Marcantonio RA.** Acellular dermal matrix allograft used alone and in combination with enamel matrix protein in gingival recession: histologic study in dogs. *Int J Periodontics Restorative Dent.* 2005 Dec;25(6):595-603.
- Harrison JW, Roda RS.** Intermediate cementum. Development, structure, composition, and potential functions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1995 May;79(5):624-33.
- Igarashi R, Sahara T, Shimizu-Ishiura M, Sasaki T.** Porcine enamel matrix derivative enhances the formation of reparative dentine and dentine bridges during wound healing of amputated rat molars. *J Electron Microsc (Tokyo).* 2003;52(2):227-36.

- Inaba H, Kawai S, Nakayama K, Okahashi N, Amano A.** Effect of enamel matrix derivative on periodontal ligament cells in vitro is diminished by *Porphyromonas gingivalis*. *J Periodontol*. 2004 Jun;75(6):858-65. doi: 10.1902/jop.2004.75.6.858.
- Inaba H, Tagashira M, Kanda T, Ohno T, Kawai S, Amano A.** Apple- and hop-polyphenols protect periodontal ligament cells stimulated with enamel matrix derivative from *Porphyromonas gingivalis*. *J Periodontol*. 2005 Dec;76(12):2223-9. doi: 10.1902/jop.2005.76.12.2223.
- Iqbal MK, Bamaas N.** Effect of enamel matrix derivative (EMDOGAIN) upon periodontal healing after replantation of permanent incisors in beagle dogs. *Dent Traumatol*. 2001 Feb;17(1):36-45.
- Kadonishi Y, Deie M, Takata T, Ochi M.** Acceleration of tendon-bone healing in anterior cruciate ligament reconstruction using an enamel matrix derivative in a rat model. *J Bone Joint Surg Br*. 2012 Feb;94(2):205-9. doi: 10.1302/0301-620X.94B2.26904.
- Kawana F, Sawae Y, Sahara T, Tanaka S, Debari K, Shimizu M, Sasaki T.** Porcine enamel matrix derivative enhances trabecular bone regeneration during wound healing of injured rat femur. *Anat Rec*. 2001 Dec 1;264(4):438-46.
- Kikuchi S.** [Experimental study of periodontal tissue regeneration after the application of enamel matrix derivative in rat periodontal defects]. *Kokubyo Gakkai Zasshi*. 2001 Mar;68(1):82-92. Japanese.
- Laaksonen M, Suojanen J, Nurmenniemi S, Läärä E, Sorsa T, Salo T.** The enamel matrix derivative (Emdogain) enhances human tongue carcinoma cells gelatinase production, migration and metastasis formation. *Oral Oncol*. 2008 Aug;44(8):733-42. doi: 10.1016/j.oraloncology.2007.09.008.
- Lam K, Sae-Lim V.** The effect of Emdogain gel on periodontal healing in replanted monkeys' teeth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2004 Jan;97(1):100-7. doi: 10.1016/S1079210403003184.
- Mardas N, Kraehenmann M, Dard M.** Regenerative wound healing in acute degree III mandibular defects in dogs. *Quintessence Int*. 2012 May;43(5):e48-59.
- Matsumoto N, Minakami M, Hatakeyama J, Haruna C, Morotomi T, Izumi T, Anan H.** Histologic evaluation of the effects of Emdogain gel on injured root apex in rats. *J Endod*. 2014 Dec;40(12):1989-94. doi: 10.1016/j.joen.2014.08.024.
- Maymon-Gil T, Weinberg E, Nemcovsky C, Weinreb M.** Enamel Matrix Derivative Promotes Healing of a Surgical Wound in the Rat Oral Mucosa. *J Periodontol*. 2016 Jan 16:1-16. doi: 10.1902/jop.2016.150567.
- Miron RJ, Wei L, Yang S, Caluseru OM, Sculean A, Zhang Y.** Effect of enamel matrix derivative on periodontal wound healing and regeneration in an osteoporotic model. *J Periodontol*. 2014 Nov;85(11):1603-11. doi: 10.1902/jop.2014.130745.
- Nakamura Y, Hammarström L, Lundberg E, Ekdahl H, Matsumoto K, Gestrelus S, Lyngstadaas SP.** Enamel matrix derivative promotes reparative processes in the dental pulp. *Adv Dent Res*. 2001 Aug;15:105-7. doi: 10.1177/08959374010150010201.
- Nakamura Y, Hammarström L, Matsumoto K, Lyngstadaas SP.** The induction of reparative dentine by enamel proteins. *Int Endod J*. 2002 May;35(5):407-17.
- Nakamura Y, Slaby I, Matsumoto K, Ritchie HH, Lyngstadaas SP.** Immunohistochemical characterization of rapid dentin formation induced by enamel matrix derivative. *Calcif Tissue Int*. 2004 Sep;75(3):243-52. doi: 10.1007/s00223-003-0153-y.
- Nemcovsky CE, Zahavi S, Moses O, Kebudi E, Artzi Z, Beny L, Weinreb M.** Effect of enamel matrix protein derivative on healing of surgical supra-infrabony periodontal defects in the rat molar: a histomorphometric study. *J Periodontol*. 2006 Jun;77(6):996-1002. doi: 10.1902/jop.2006.050317.
- Onodera H, Shibukawa Y, Sugito H, Ota M, Yamada S.** Periodontal regeneration in intrabony defects after application of enamel matrix proteins with guided tissue regeneration: an experimental study in dogs. *Biomed Res*. 2005 Apr;26(2):69-77.
- Pimentel SP, Sallum AW, Saldanha JB, Casati MZ, Nociti FH Jr, Sallum EA.** Enamel matrix derivative versus guided tissue regeneration in the presence of nicotine: a histomorphometric study in dogs. *J Clin Periodontol*. 2006 Dec;33(12):900-7. doi: 10.1111/j.1600-051X.2006.00989.x.
- Poi WR, Carvalho RM, Panzarini SR, Sonoda CK, Manfrin TM, Rodrigues Tda S.** Influence of enamel matrix derivative (Emdogain) and sodium fluoride on the healing process in delayed tooth replantation: histologic and histometric analysis in rats. *Dent Traumatol*. 2007 Feb;23(1):35-41. doi: 10.1111/j.1600-9657.2006.00481.x.

- Potijanyakul P, Sattayasansakul W, Pongpanich S, Leepong N, Kintarak S.** Effects of enamel matrix derivative on bioactive glass in rat calvarium defects. *J Oral Implantol.* 2010;36(3):195-204. doi: 10.1563/AAID-JOI-D-09-00042.
- Regazzini PF, Novaes AB Jr, de Oliveira PT, Palioto DB, Taba M Jr, de Souza SL, Grisi MF.** Comparative study of enamel matrix derivative with or without GTR in the treatment of class II furcation lesions in dogs. *Int J Periodontics Restorative Dent.* 2004 Oct;24(5):476-87.
- Sakallioğlu U, Açıkgöz G, Ayas B, Kirtiloğlu T, Sakallioğlu E.** Healing of periodontal defects treated with enamel matrix proteins and root surface conditioning--an experimental study in dogs. *Biomaterials.* 2004 May;25(10):1831-40.
- Sallum EA, Pimentel SP, Saldanha JB, Nogueira-Filho GR, Casati MZ, Nociti FH, Sallum AW.** Enamel matrix derivative and guided tissue regeneration in the treatment of dehiscence-type defects: a histomorphometric study in dogs. *J Periodontol.* 2004 Oct;75(10):1357-63. doi: 10.1902/jop.2004.75.10.1357.
- Sawae Y, Sahara T, Kawana F, Sasaki T.** Effects of enamel matrix derivative on mineralized tissue formation during bone wound healing in rat parietal bone defects. *J Electron Microsc (Tokyo).* 2002;51(6):413-23.
- Sculean A, Berakdar M, Donos N, Auschill TM, Arweiler NB.** The effect of postsurgical administration of a selective cyclo-oxygenase-2 inhibitor on the healing of intrabony defects following treatment with enamel matrix proteins. *Clin Oral Investig.* 2003 Jun;7(2):108-12. doi: 10.1007/s00784-003-0200-0.
- Sculean A, Donos N, Brex M, Karring T, Reich E.** Healing of fenestration-type defects following treatment with guided tissue regeneration or enamel matrix proteins. An experimental study in monkeys. *Clin Oral Investig.* 2000 Mar;4(1):50-6.
- Sculean A, Junker R, Donos N, Berakdar M, Brex M, Dünker N.** Immunohistochemical evaluation of matrix molecules associated with wound healing following regenerative periodontal treatment in monkeys. *Clin Oral Investig.* 2002 Sep;6(3):175-82. doi: 10.1007/s00784-002-0161-8.
- Shirakata Y, Eliezer M, Nemcovsky CE, Weinreb M, Dard M, Sculean A, Bosshardt DD, Moses O.** Periodontal healing after application of enamel matrix derivative in surgical supra/infrabony periodontal defects in rats with streptozotocin-induced diabetes. *J Periodontol Res.* 2014 Feb;49(1):93-101. doi: 10.1111/jre.12084.
- Shirakata Y, Yoshimoto T, Goto H, Yonamine Y, Kadomatsu H, Miyamoto M, Nakamura T, Hayashi C, Izumi Y.** Favorable periodontal healing of 1-wall infrabony defects after application of calcium phosphate cement wall alone or in combination with enamel matrix derivative: a pilot study with canine mandibles. *J Periodontol.* 2007 May;78(5):889-98. doi: 10.1902/jop.2007.060353.
- Shirakata Y, Yoshimoto T, Takeuchi N, Taniyama K, Noguchi K.** Effects of EMD in combination with bone swaging and calcium phosphate bone cement on periodontal regeneration in one-wall intrabony defects in dogs. *J Periodontol Res.* 2013 Feb;48(1):37-43. doi: 10.1111/j.1600-0765.2012.01499.x.
- Villa O, Wohlfahrt JC, Mdlá I, Petzold C, Reseland JE, Snead ML, Lyngstadaas SP.** Proline-Rich Peptide Mimics Effects of Enamel Matrix Derivative on Rat Oral Mucosa Incisional Wound Healing. *J Periodontol.* 2015 Dec;86(12):1386-95. doi: 10.1902/jop.2015.150207.
- Wang Y, Zhang Y, Jing D, Shuang Y, Miron RJ.** Enamel matrix derivative improves gingival fibroblast cell behavior cultured on titanium surfaces. *Clin Oral Investig.* 2015 Aug 14. doi: 10.1007/s00784-015-1558-5.
- Yuan K, Chen CL, Lin MT.** Enamel matrix derivative exhibits angiogenic effect in vitro and in a murine model. *J Clin Periodontol.* 2003 Aug;30(8):732-8.

Clinical literature specific to soft tissue wound healing

- Giannobile WV, Hollister SJ, Ma PX.** Future Prospects for Periodontal Bioengineering Using Growth Factors. *Clinic Adv Periodontics.* 2011 Aug 1;1(2):88-94. doi: 10.1902/cap.2011.110041.
- Guimarães GF, de Araújo VC, Nery JC, Peruzzo DC, Soares AB.** Microvessel Density Evaluation of the Effect of Enamel Matrix Derivative on Soft Tissue After Implant Placement: A Preliminary Study. *Int J Periodontics Restorative Dent.* 2015. Sep-Oct;35(5):733-8. doi: 10.11607/prd.2044.
- Lyngstadaas SP, Wohlfahrt JC, Brookes SJ, Paine ML, Snead ML, Reseland JE.** Enamel matrix proteins; old molecules for new applications. *Orthod Craniofac Res.* 2009 Aug;12(3):243-53. doi: 10.1111/j.1601-6343.2009.01459.x.

- Mirastschijski U, Konrad D, Lundberg E, Lyngstadaas SP, Jorgensen LN, Agren MS.** Effects of a topical enamel matrix derivative on skin wound healing. *Wound Repair Regen.* 2004 Jan-Feb;12(1):100-8. doi: 10.1111/j.1067-1927.2004.012117.x.
- Miron RJ, Dard M, Weinreb M.** Enamel matrix derivative, inflammation and soft tissue wound healing. *J Periodontal Res.* 2015 Oct;50(5):555-69. doi: 10.1111/jre.12245.
- Nevins ML, Camelo M, Schupbach P, Nevins M, Kim SW, Kim DM.** Human buccal plate extraction socket regeneration with recombinant human platelet-derived growth factor BB or enamel matrix derivative. *Int J Periodontics Restorative Dent.* 2011 Sep-Oct;31(5):481-92.
- Rebele SF, Zuhr O, Schneider D, Jung RE, Hürzeler MB.** Tunnel technique with connective tissue graft versus coronally advanced flap with enamel matrix derivative for root coverage: a RCT using 3D digital measuring methods. Part II. Volumetric studies on healing dynamics and gingival dimensions. *J Clin Periodontol.* 2014 Jun;41(6):593-603. doi: 10.1111/jcpe.12254.
- Villa O, Wohlfahrt JC, Koldslund OC, Brookes SJ, Lyngstadaas SP, Aass AM, Reseland JE.** EMD in periodontal regenerative surgery modulates cytokine profiles: A randomised controlled clinical trial. *Sci Rep.* 2016 Mar 15;6:23060. doi: 10.1038/srep23060.
- Wennström JL, Lindhe J.** Some effects of enamel matrix proteins on wound healing in the dento-gingival region. *J Clin Periodontol.* 2002 Jan;29(1):9-14.
- Zeren KJ.** Minimally invasive extraction and immediate implant placement: the preservation of esthetics. *Int J Periodontics Restorative Dent.* 2006 Apr;26(2):171-81.

Clinical literature reporting wound healing in the context of periodontal wound healing

- Al Machot E, Hoffmann T, Lorenz K, Khalili I, Noack B.** Clinical outcomes after treatment of periodontal intrabony defects with nanocrystalline hydroxyapatite (Ostim) or enamel matrix derivatives (Emdogain): a randomized controlled clinical trial. *Biomed Res Int.* 2014;2014:786353. doi: 10.1155/2014/786353.
- Andersen KM, Selvig KA, Leknes KN.** Altered healing following mucogingival surgery in a patient with Crohn's disease: a literature review and case report. *J Periodontol.* 2003 Apr;74(4):537-46. doi: 10.1902/jop.2003.74.4.537.
- Andrade PF, Grisi MF, Marcaccini AM, Fernandes PG, Reino DM, Souza SL, Taba M, Palioto DB, Novaes AB.** Comparison between micro- and macrosurgical techniques for the treatment of localized gingival recessions using coronally positioned flaps and enamel matrix derivative. *J Periodontol.* 2010 Nov;81(11):1572-9. doi: 10.1902/jop.2010.100155.
- Aroca S, Keglevich T, Nikolidakis D, Gera I, Nagy K, Azzi R, Etienne D.** Treatment of class III multiple gingival recessions: a randomized-clinical trial. *J Clin Periodontol.* 2010 Jan;37(1):88-97. doi: 10.1111/j.1600-051X.2009.01492.x.
- Berlucchi I, Francetti L, Del Fabbro M, Testori T, Weinstein RL.** Enamel matrix proteins (Emdogain) in combination with coronally advanced flap or subepithelial connective tissue graft in the treatment of shallow gingival recessions. *Int J Periodontics Restorative Dent.* 2002 Dec;22(6):583-93.
- Bosshardt DD, Stadlinger B, Terheyden H.** Cell-to-cell communication--periodontal regeneration. *Clin Oral Implants Res.* 2015 Mar;26(3):229-39. doi: 10.1111/clr.12543.
- Bosshardt DD.** Biological mediators and periodontal regeneration: a review of enamel matrix proteins at the cellular and molecular levels. *J Clin Periodontol.* 2008 Sep;35(8 Suppl):87-105. doi: 10.1111/j.1600-051X.2008.01264.x.
- Cardaropoli G, Leonhardt AS.** Enamel matrix proteins in the treatment of deep intrabony defects. *J Periodontol.* 2002 May;73(5):501-4. doi: 10.1902/jop.2002.73.5.501.
- Chen FM, Zhang J, Zhang M, An Y, Chen F, Wu ZF.** A review on endogenous regenerative technology in periodontal regenerative medicine. *Biomaterials.* 2010 Nov;31(31):7892-927. doi: 10.1016/j.biomaterials.2010.07.019.
- Chen L, Cha J, Guiha R, Bouwsma OJ.** Root coverage with enamel matrix derivatives. *Compend Contin Educ Dent.* 2002 Sep;23(9):797-800, 802, 804 passim; quiz 808.
- Cheng GL, Fu E, Tu YK, Shen EC, Chiu HC, Huang RY, Yuh DY, Chiang CY.** Root coverage by coronally advanced flap with connective tissue graft and/or enamel matrix derivative: a meta-analysis. *J Periodontal Res.* 2015 Apr;50(2):220-30. doi: 10.1111/jre.12199.

- Chitsazi MT, Mostofi Zadeh Farahani R, Pourabbas M, Bahaeddin N.** Efficacy of open flap debridement with and without enamel matrix derivatives in the treatment of mandibular degree II furcation involvement. *Clin Oral Investig.* 2007 Dec;11(4):385-9. doi: 10.1007/s00784-007-0134-z.
- Cortellini P, Pini Prato G.** Coronally advanced flap and combination therapy for root coverage. Clinical strategies based on scientific evidence and clinical experience. *Periodontol 2000.* 2012 Jun;59(1):158-84. doi: 10.1111/j.1600-0757.2011.00434.x.
- Cortellini P, Pini-Prato G, Nieri M, Tonetti MS.** Minimally invasive surgical technique and enamel matrix derivative in intrabony defects: 2. Factors associated with healing outcomes. *Int J Periodontics Restorative Dent.* 2009 Jun;29(3):257-65.
- Cortellini P, Tonetti MS.** A minimally invasive surgical technique with an enamel matrix derivative in the regenerative treatment of intra-bony defects: a novel approach to limit morbidity. *J Clin Periodontol.* 2007 Jan;34(1):87-93. doi: 10.1111/j.1600-051X.2006.01020.x.
- Cortellini P, Tonetti MS.** Clinical and radiographic outcomes of the modified minimally invasive surgical technique with and without regenerative materials: a randomized-controlled trial in intra-bony defects. *J Clin Periodontol.* 2011 Apr;38(4):365-73. doi: 10.1111/j.1600-051X.2011.01705.x.
- Cortellini P, Tonetti MS.** Improved wound stability with a modified minimally invasive surgical technique in the regenerative treatment of isolated interdental intrabony defects. *J Clin Periodontol.* 2009 Feb;36(2):157-63. doi: 10.1111/j.1600-051X.2008.01352.x.
- Deschner J, Nokhbehshaim M.** Regulatory effects of inflammatory and biomechanical signals on regenerative periodontal healing. *Int J Oral Maxillofac Implants.* 2013 Nov-Dec;28(6):e472-7. doi: 10.11607/jomi.te27.
- Donos N, Sculean A, Glavind L, Reich E, Karring T.** Wound healing of degree III furcation involvements following guided tissue regeneration and/or Emdogain. A histologic study. *J Clin Periodontol.* 2003 Dec;30(12):1061-8.
- Döri F, Arweiler N, Gera I, Sculean A.** Clinical evaluation of an enamel matrix protein derivative combined with either a natural bone mineral or beta-tricalcium phosphate. *J Periodontol.* 2005 Dec;76(12):2236-43. doi: 10.1902/jop.2005.76.12.2236.
- Döri F, Arweiler N, Húszár T, Gera I, Miron RJ, Sculean A.** Five-year results evaluating the effects of platelet-rich plasma on the healing of intrabony defects treated with enamel matrix derivative and natural bone mineral. *J Periodontol.* 2013 Nov;84(11):1546-55. doi: 10.1902/jop.2013.120501.
- Dori F.** [Effect of combined therapeutic methods on healing of periodontal vertical bone defects in regenerative surgery]. *Orv Hetil.* 2009 Mar 15;150(11):517-22. doi: 10.1556/OH.2009.28500. Hungarian.
- Farina R, Simonelli A, Rizzi A, Pramstraller M, Cucchi A, Trombelli L.** Early postoperative healing following buccal single flap approach to access intraosseous periodontal defects. *Clin Oral Investig.* 2013 Jul;17(6):1573-83. doi: 10.1007/s00784-012-0838-6.
- Fransson H.** On the repair of the dentine barrier. *Swed Dent J Suppl.* 2012;(226):9-84.
- Fridström M, Schollin J, Crossner CG.** Evaluating Emdogain and healing of replanted teeth using an intra-individual experimental-control study design. *Dent Traumatol.* 2008 Jun;24(3):299-304. doi: 10.1111/j.1600-9657.2008.00559.x.
- Fujishiro N, Anan H, Hamachi T, Maeda K.** The role of macrophages in the periodontal regeneration using Emdogain gel. *J Periodontol Res.* 2008 Apr;43(2):143-55. doi: 10.1111/j.1600-0765.2007.01004.x.
- Giannobile WV, Somerman MJ.** Growth and amelogenin-like factors in periodontal wound healing. A systematic review. *Ann Periodontol.* 2003 Dec;8(1):193-204. doi: 10.1902/annals.2003.8.1.193.
- Gilio DA.** Clinical efficacy of the Nd:YAG laser for combination therapy using EMD for periodontal reconstructive surgery: clinical case reports. *Dent Today.* 2001 Sep;20(9):106-11.
- Gkraniias ND, Graziani F, Sculean A, Donos N.** Wound healing following regenerative procedures in furcation degree III defects: histomorphometric outcomes. *Clin Oral Investig.* 2012 Feb;16(1):239-49. doi: 10.1007/s00784-010-0478-7.
- Gurinsky BS, Mills MP, Mellonig JT.** Clinical evaluation of demineralized freeze-dried bone allograft and enamel matrix derivative versus enamel matrix derivative alone for the treatment of periodontal osseous defects in humans. *J Periodontol.* 2004 Oct;75(10):1309-18. doi: 10.1902/jop.2004.75.10.1309.

Hagenaars S, Louwse PH, Timmerman MF, Van der Velden U, Van der Weijden GA. Soft-tissue wound healing following periodontal surgery and Emdogain application. *J Clin Periodontol.* 2004 Oct;31(10):850-6. doi: 10.1111/j.1600-051X.2004.00571.x.

Heard RH, Mellonig JT, Brunsvold MA, Lasho DJ, Meffert RM, Cochran DL. Clinical evaluation of wound healing following multiple exposures to enamel matrix protein derivative in the treatment of intrabony periodontal defects. *J Periodontol.* 2000 Nov;71(11):1715-21. doi: 10.1902/jop.2000.71.11.1715.

Heijl L. Periodontal regeneration with enamel matrix derivative in one human experimental defect. A case report. *J Clin Periodontol.* 1997 Sep;24(9 Pt 2):693-6.

Hoidal MJ, Grimard BA, Mills MP, Schoolfield JD, Mellonig JT, Mealey BL. Clinical evaluation of demineralized freeze-dried bone allograft with and without enamel matrix derivative for the treatment of periodontal osseous defects in humans. *J Periodontol.* 2008 Dec;79(12):2273-80. doi: 10.1902/jop.2008.080259.

Hovey LR, Jones AA, McGuire M, Mellonig JT, Schoolfield J, Cochran DL. Application of periodontal tissue engineering using enamel matrix derivative and a human fibroblast-derived dermal substitute to stimulate periodontal wound healing in Class III furcation defects. *J Periodontol.* 2006 May;77(5):790-9. doi: 10.1902/jop.2006.030264.

Ito K, Akutagawa H. Periosteal connective tissue grafting or root coverage with enamel matrix derivative: a case report. *J Esthet Restor Dent.* 2001;13(3):172-8.

Ito K, Ito K, Owa M. Connective tissue grafting for root coverage in multiple Class III gingival recessions with enamel matrix derivative: a case report. *Pract Periodontics Aesthet Dent.* 2000 Jun-Jul;12(5):441-6; quiz 448.

Jepsen S, Topoll H, Rengers H, Heinz B, Teich M, Hoffmann T, Al-Machot E, Meyle J, Jervøe-Storm PM. Clinical outcomes after treatment of intra-bony defects with an EMD/synthetic bone graft or EMD alone: a multicenter randomized-controlled clinical trial. *J Clin Periodontol.* 2008 May;35(5):420-8. doi: 10.1111/j.1600-051X.2008.01217.x.

Kaida H, Hamachi T, Anan H, Maeda K. Wound healing process of injured pulp tissues with emdogain gel. *J Endod.* 2008 Jan;34(1):26-30. doi: 10.1016/j.joen.2007.09.011.

Kaner D, Bernimoulin JP, Kleber BM, Friedmann A. Minimally invasive flap surgery and enamel matrix derivative in the treatment of localized aggressive periodontitis: case report. *Int J Periodontics Restorative Dent.* 2009 Feb;29(1):89-97.

Kao DW, Fiorellini JP. Regenerative periodontal therapy. *Front Oral Biol.* 2012;15:149-59. doi: 10.1159/000329677.

Karring T. Regenerative periodontal therapy. *J Int Acad Periodontol.* 2000 Oct;2(4):101-9.

Kenny DJ, Barrett EJ, Johnston DH, Sigal MJ, Tenenbaum HC. Clinical management of avulsed permanent incisors using Emdogain: initial report of an investigation. *J Can Dent Assoc.* 2000 Jan;66(1):21.

Kurhańska-Flisykowska A, Łojewski W, Wyganowska-Swiatkowska M. Effectiveness of Emdogain in the periodontal treatment. *Przegl Lek.* 2012;69(10):1046-8.

Lafzi A, Farahani RM, Tubbs RS, Roushangar L, Shoja MM. Enamel matrix derivative Emdogain as an adjuvant for a laterally-positioned flap in the treatment of gingival recession: an electron microscopic appraisal. *Folia Morphol (Warsz).* 2007 May;66(2):100-3.

Lekovic V, Camargo PM, Weinlaender M, Kenney EB, Vasilic N. Combination use of bovine porous bone mineral, enamel matrix proteins, and a bioabsorbable membrane in intrabony periodontal defects in humans. *J Periodontol.* 2001 May;72(5):583-9. doi: 10.1902/jop.2001.72.5.583.

Majzoub Z, Bobbo M, Atiyeh F, Cordioli G. Two patterns of histologic healing in an intrabony defect following treatment with enamel matrix derivative: a human case report. *Int J Periodontics Restorative Dent.* 2005 Jun;25(3):283-94.

Nokhbehshaim M, Deschner B, Bourauel C, Reimann S, Winter J, Rath B, Jäger A, Jepsen S, Deschner J. Interactions of enamel matrix derivative and biomechanical loading in periodontal regenerative healing. *J Periodontol.* 2011 Dec;82(12):1725-34. doi: 10.1902/jop.2011.100678.

Nokhbehshaim M, Keser S, Jäger A, Jepsen S, Deschner J. Regulation of regenerative periodontal healing by NAMPT. *Mediators Inflamm.* 2013;2013:202530. doi: 10.1155/2013/202530.

Nokhbehshaim M, Keser S, Nogueira AV, Cirelli JA, Jepsen S, Jäger A, Eick S, Deschner J. Beneficial effects of adiponectin on periodontal ligament cells under normal and regenerative conditions. *J Diabetes Res.* 2014;2014:796565. doi: 10.1155/2014/796565.

- Okuda K, Miyazaki A, Momose M, Murata M, Nomura T, Kubota T, Wolff LF, Yoshie H.** Levels of tissue inhibitor of metalloproteinases-1 and matrix metalloproteinases-1 and -8 in gingival crevicular fluid following treatment with enamel matrix derivative (EMDOGAIN). *J Periodontol Res.* 2001 Oct;36(5):309-16.
- Oortgiesen DA, Meijer GJ, Bronckers AL, Walboomers XF, Jansen JA.** Regeneration of the periodontium using enamel matrix derivative in combination with an injectable bone cement. *Clin Oral Investig.* 2013 Mar;17(2):411-21. doi: 10.1007/s00784-012-0743-z.
- Oringer RJ.** Biological mediators for periodontal and bone regeneration. *Compend Contin Educ Dent.* 2002 Jun;23(6):501-4, 506-10, 512 passim; quiz 518.
- Ozcelik O, Cenk Haytac M, Seydaoglu G.** Enamel matrix derivative and low-level laser therapy in the treatment of intra-bony defects: a randomized placebo-controlled clinical trial. *J Clin Periodontol.* 2008 Feb;35(2):147-56. doi: 10.1111/j.1600-051X.2007.01176.x.
- Parodi R, Liuzzo G, Patrucco P, Brunel G, Santarelli GA, Birardi V, Gasparetto B.** Use of Emdogain in the treatment of deep intrabony defects: 12-month clinical results. Histologic and radiographic evaluation. *Int J Periodontics Restorative Dent.* 2000 Dec;20(6):584-95.
- Rasperini G, Acunzo R, Barnett A, Pagni G.** The soft tissue wall technique for the regenerative treatment of non-contained infrabony defects: a case series. *Int J Periodontics Restorative Dent.* 2013 May-Jun;33(3):e79-87. doi: 10.11607/prd.1628.
- Rathva VJ.** Enamel matrix protein derivatives: role in periodontal regeneration. *Clin Cosmet Investig Dent.* 2011 Dec 1;3:79-92. doi: 10.2147/CCIDEN.S25347.
- Ribeiro FV, Casarin RC, Júnior FH, Sallum EA, Casati MZ.** The role of enamel matrix derivative protein in minimally invasive surgery in treating intrabony defects in single-rooted teeth: a randomized clinical trial. *J Periodontol.* 2011 Apr;82(4):522-32. doi: 10.1902/jop.2010.100454.
- Röllke L, Schacher B, Wohlfeil M, Kim TS, Kaltschmitt J, Krieger J, Krigar DM, Reitmeier P, Eickholz P.** Regenerative therapy of infrabony defects with or without systemic doxycycline. A randomized placebo-controlled trial. *J Clin Periodontol.* 2012 May;39(5):448-56. doi: 10.1111/j.1600-051X.2012.01861.x.
- Saito A, Hayakawa H, Ota K, Fujinami K, Nikaido M, Makiishi T.** Treatment of periodontal defects with enamel matrix derivative: clinical evaluation at early healing stages. *Bull Tokyo Dent Coll.* 2010;51(2):85-93.
- Sallum EA, Casati MZ, Caffesse RG, Funis LP, Nociti Júnior FH, Sallum AW.** Coronally positioned flap with or without enamel matrix protein derivative for the treatment of gingival recessions. *Am J Dent.* 2003 Oct;16(5):287-91.
- Sculean A, Barbé G, Chiantella GC, Arweiler NB, Berakdar M, Brex M.** Clinical evaluation of an enamel matrix protein derivative combined with a bioactive glass for the treatment of intrabony periodontal defects in humans. *J Periodontol.* 2002 Apr;73(4):401-8. doi: 10.1902/jop.2002.73.4.401.
- Sculean A, Blaes A, Arweiler N, Reich E, Donos N, Brex M.** The effect of postsurgical antibiotics on the healing of intrabony defects following treatment with enamel matrix proteins. *J Periodontol.* 2001 Feb;72(2):190-5. doi: 10.1902/jop.2001.72.2.190.
- Sculean A, Chiantella GC, Windisch P, Donos N.** Clinical and histologic evaluation of human intrabony defects treated with an enamel matrix protein derivative (Emdogain). *Int J Periodontics Restorative Dent.* 2000 Aug;20(4):374-81.
- Sculean A, Donos N, Windisch P, Brex M, Gera I, Reich E, Karring T.** Healing of human intrabony defects following treatment with enamel matrix proteins or guided tissue regeneration. *J Periodontol Res.* 1999 Aug;34(6):310-22.
- Sculean A, Junker R, Donos N, Windisch P, Brex M, Dünker N.** Immunohistochemical evaluation of matrix molecules associated with wound healing following treatment with an enamel matrix protein derivative in humans. *Clin Oral Investig.* 2003 Sep;7(3):167-74. doi: 10.1007/s00784-003-0212-9.
- Sculean A, Nikolidakis D, Nikou G, Ivanovic A, Chapple IL, Stavropoulos A.** Biomaterials for promoting periodontal regeneration in human intrabony defects: a systematic review. *Periodontol 2000.* 2015 Jun;68(1):182-216. doi: 10.1111/prd.12086.
- Sculean A, Pietruska M, Arweiler NB, Auschill TM, Nemcovsky C.** Four-year results of a prospective-controlled clinical study evaluating healing of intra-bony defects following treatment with an enamel matrix protein derivative alone or combined with a bioactive glass. *J Clin Periodontol.* 2007 Jun;34(6):507-13. doi: 10.1111/j.1600-051X.2007.01084.x.

- Sculean A, Pietruska M, Schwarz F, Willershäusen B, Arweiler NB, Auschill TM.** Healing of human intrabony defects following regenerative periodontal therapy with an enamel matrix protein derivative alone or combined with a bioactive glass. A controlled clinical study. *J Clin Periodontol.* 2005 Jan;32(1):111-7. doi: 10.1111/j.1600-051X.2004.00635.x.
- Sculean A, Rathe F, Junker R, Becker J, Schwarz F, Arweiler N.** [The use of Emdogain in periodontal and osseous regeneration]. *Schweiz Monatsschr Zahnmed.* 2007;117(6):598-606. German.
- Sculean A, Schwarz F, Becker J, Brex M.** The application of an enamel matrix protein derivative (Emdogain) in regenerative periodontal therapy: a review. *Med Princ Pract.* 2007;16(3):167-80. doi: 10.1159/000100386.
- Sculean A, Schwarz F, Berakdar M, Windisch P, Arweiler NB, Romanos GE.** Healing of intrabony defects following surgical treatment with or without an Er:YAG laser. *J Clin Periodontol.* 2004 Aug;31(8):604-8. doi: 10.1111/j.1600-051X.2004.00525.x.
- Sculean A, Windisch P, Döri F, Keglevich T, Molnár B, Gera I.** Emdogain in regenerative periodontal therapy. A review of the literature. *Fogorv Sz.* 2007 Oct;100(5):220-32, 211-9. English, Hungarian.
- Sculean A, Windisch P, Keglevich T, Chiantella GC, Gera I, Donos N.** Clinical and histologic evaluation of human intrabony defects treated with an enamel matrix protein derivative combined with a bovine-derived xenograft. *Int J Periodontics Restorative Dent.* 2003 Feb;23(1):47-55.
- Sculean A, Windisch P, Keglevich T, Fabi B, Lundgren E, Lyngstadaas PS.** Presence of an enamel matrix protein derivative on human teeth following periodontal surgery. *Clin Oral Investig.* 2002 Sep;6(3):183-7. doi: 10.1007/s00784-002-0171-6.
- Szatmári P, Gera I.** [Treatment of localized intrabony periodontal defects with enamel matrix derivative (Emdogain). Case series]. *Fogorv Sz.* 2014 Mar;107(1):15-28. Hungarian.
- Thalmair T, Fickl S, Bolz W, Wachtel H.** The double split flap: a surgical approach for regenerative treatment of interproximal defects. *J Clin Periodontol.* 2009 Oct;36(10):877-81. doi: 10.1111/j.1600-051X.2009.01461.x.
- Tobita M, Mizuno H.** Adipose-derived stem cells and periodontal tissue engineering. *Int J Oral Maxillofac Implants.* 2013 Nov-Dec;28(6):e487-93. doi: 10.11607/jomi.te29.
- Tonetti MS, Fourmoussis I, Suvan J, Cortellini P, Brägger U, Lang NP;** European Research Group on Periodontology (ERGOPERIO). Healing, post-operative morbidity and patient perception of outcomes following regenerative therapy of deep intrabony defects. *J Clin Periodontol.* 2004 Dec;31(12):1092-8. doi: 10.1111/j.1600-051X.2004.00615.x.
- Trabulsi M, Oh TJ, Eber R, Weber D, Wang HL.** Effect of enamel matrix derivative on collagen guided tissue regeneration-based root coverage procedure. *J Periodontol.* 2004 Nov;75(11):1446-57. doi: 10.1902/jop.2004.75.11.1446.
- Trombelli L, Bottega S, Zucchelli G.** Supracrestal soft tissue preservation with enamel matrix proteins in treatment of deep intrabony defects. *J Clin Periodontol.* 2002 May;29(5):433-9.
- Wachtel H, Schenk G, Böhm S, Weng D, Zuhr O, Hürzeler MB.** Microsurgical access flap and enamel matrix derivative for the treatment of periodontal intrabony defects: a controlled clinical study. *J Clin Periodontol.* 2003 Jun;30(6):496-504.
- Windisch P, Sculean A, Klein F, Tóth V, Eickholz P, István G.** [Comparative analysis of the sensitivity and accuracy of clinical, radiographic and histometric measurements in assessing periodontal attachment levels]. *Fogorv Sz.* 2002 Jun;95(3):93-8. Hungarian.
- Yilmaz S, Cakar G, Yildirim B, Sculean A.** Healing of two and three wall intrabony periodontal defects following treatment with an enamel matrix derivative combined with autogenous bone. *J Clin Periodontol.* 2010 Jun;37(6):544-50. doi: 10.1111/j.1600-051X.2010.01567.x.
- Yukna RA, Mellonig JT.** Histologic evaluation of periodontal healing in humans following regenerative therapy with enamel matrix derivative. A 10-case series. *J Periodontol.* 2000 May;71(5):752-9. doi: 10.1902/jop.2000.71.5.752.