

The Role of Autologous Platelet Concentrates in Alveolar Socket Preservation: A Systematic Review

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Supplemental Material

Appendix 1. Excluded articles.

Study	Reason of exclusion
Albanese et al. Platelet-rich plasma (PRP) in dental and oral surgery: from the wound healing to bone regeneration. <i>Immun Ageing</i> . 2013 Jun 13;10(1):23.	Review
Al-Hamed et al. Efficacy of Platelet-Rich Fibrin After Mandibular Third Molar Extraction: A Systematic Review and Meta-Analysis. <i>J Oral Maxillofac Surg</i> . 2017 Jun;75(6):1124-1135.	Review
Al Nashar et al. Evaluation of the use of plasma rich in growth factors with immediate implant placement in periodontally compromised extraction sites: a controlled prospective study. <i>Int J Oral Maxillofac Surg</i> . 2015 Apr;44(4):507-12.	Not related to the clinical question.
Aloy-Prósper et al. Distal probing depth and attachment level of lower second molars following surgical extraction of lower third molars: a literature review. <i>Med Oral Patol Oral Cir Bucal</i> . 2010 Sep 1;15(5):e755-9. Review.	Not related to the clinical question, not related to the clinical question.
Amet M. Management of unscheduled anterior tooth or prosthesis loss with extraction and immediate implant placement: a clinical report. <i>J Oral Implantol</i> . 2010;36(3):209-17.	Not related to the clinical question.
Anitua et al. Efficacy of biologically guided implant site preparation to obtain adequate primary implant stability. <i>Ann Anat</i> . 2015 May;199:9-15.	Not related to the clinical question.
Anitua E. Plasma rich in growth factors: preliminary results of use in the preparation of future sites for implants. <i>Int J Oral Maxillofac Implants</i> . 1999 Jul-Aug;14(4):529-35.	Platelet concentrate used in combination with bone grafts or biomaterial.
Anitua E. The use of plasma-rich growth factors (PRGF) in oral surgery. <i>Pract Proced Aesthet Dent</i> . 2001 Aug;13(6):487-93; quiz 487-93.	Not related to the clinical question.

Antonello et al. Evaluation of the effects of the use of platelet-rich plasma (PRP) on alveolar bone repair following extraction of impacted third molars: prospective study. <i>J Craniomaxillofac Surg.</i> 2013 Jun;41(4): e70-5.	Impacted third molars.
Anwandter et al. Dimensional changes of the post extraction alveolar ridge, preserved with Leukocyte- and Platelet Rich Fibrin: A clinical pilot study. <i>J Dent.</i> 2016 Sep; 52:23-9.	Pilot-study
Arenaz-Búa et al. A comparative study of platelet-rich plasma, hydroxyapatite, demineralized bone matrix and autologous bone to promote bone regeneration after mandibular impacted third molar extraction. <i>Med Oral Patol Oral Cir Bucal.</i> 2010 May 1;15(3):e483-9.	Impacted third molars.
ArRejaie et al. Platelet-Rich Plasma Gel Combined with Bovine-Derived Xenograft for the Treatment of Dehiscence Around Immediately Placed Conventionally Loaded Dental Implants in Humans: Cone Beam Computed Tomography and Three-Dimensional Image Evaluation. <i>Int J Oral Maxillofac Implants.</i> 2016 Mar-Apr;31(2):431-8.	Platelet concentrate used in combination with bone grafts or biomaterial.
Asaka et al. Platelet-rich fibrin may reduce the risk of delayed recovery in tooth-extracted patients undergoing oral bisphosphonate therapy: a trial study. <i>Clin Oral Investig.</i> 2016 Nov 11.	Patients with systemic disease.
Baniasadi et al. Alveolar Ridge Preservation After Tooth Extraction with DFDBA and Platelet Concentrates: A Radiographic Retrospective Study. <i>Open Dent J.</i> 2017 Feb 14;11:99-108.	Platelet concentrate used in combination with bone grafts or biomaterial.
Barona-Dorado et al. Efficacy of platelet-rich plasma applied to post-extraction retained lower third molar alveoli. A systematic review. <i>Med Oral Patol Oral Cir Bucal.</i> 2014 Mar 1;19(2):e142-8.	Review
Barone et al. Buccal bone deficiency in fresh extraction sockets: a prospective single cohort study. <i>Clin Oral Implants Res.</i> 2015 Jul;26(7):823-30.	Platelet concentrate used in combination with bone grafts or biomaterial.
Baslarli et al. Evaluation of osteoblastic activity in extraction sockets treated with platelet-rich fibrin. <i>Med Oral Patol Oral Cir Bucal.</i> 2015 Jan 1;20(1):e111-6.	Impacted third molars.

Batstone et al. Platelet rich plasma for the prevention of osteoradionecrosis. A double blinded randomized cross over controlled trial. <i>Int J Oral Maxillofac Surg.</i> 2012 Jan;41(1):2-4.	Not related to the clinical question.
Baeyens et al. The use of platelet concentrates: platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) in bone reconstruction prior to dental implant surgery]. <i>Rev Med Brux.</i> 2010 Nov-Dec;31(6):521-7.	Review, not related to the clinical question.
Bilginaylar K. The Use of Platelet-Rich Fibrin for Immediate Closure of Acute Oroantral Communications: An Alternative Approach. <i>J Oral Maxillofac Surg.</i> 2017 Aug 3. pii: S0278-2391(17)31010-8.	Review, not related to the clinical question.
Bilginaylar et al. Evaluation of the effects of platelet-rich fibrin and piezosurgery on outcomes after removal of impacted mandibular third molars. <i>Br J Oral Maxillofac Surg.</i> 2016 Jul;54(6):629-33.	Impacted third molars.
Bléry et al. Development of mandibular osteoradionecrosis in rats: Importance of dental extraction. <i>J Craniomaxillofac Surg.</i> 2015 Nov;43(9):1829-36.	Not related to the clinical question.
Camarini et al. Use of biomaterials with or without platelet-rich plasma in postextraction sites: a microscopic study in dogs. <i>Int J Oral Maxillofac Implants.</i> 2009 May Jun;24(3):432-8.	Study in animals.
Célio-Mariano et al. Comparative radiographic evaluation of alveolar bone healing associated with autologous platelet-rich plasma after impacted mandibular third molar surgery. <i>J Oral Maxillofac Surg.</i> 2012 Jan;70(1):19-24.	Impacted third molars.
Chakravarthi S. Platelet rich fibrin in the management of established dry socket. <i>J Korean Assoc Oral Maxillofac Surg.</i> 2017 Jun;43(3):160-165.	Not related to the clinical question.
Cheah et al. Histologic, histomorphometric, and cone-beam computerized tomography analyses of calcium sulfate and platelet-rich plasma in socket preservation: a pilot study. <i>Implant Dent.</i> 2014 Oct;23(5):593-601.	Pilot study, platelet concentrate used in combination with bone grafts or biomaterial
Choukroun et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part IV: clinical effects on tissue healing. <i>Oral Surg</i>	Review

Oral Med Oral Pathol Oral Radiol Endod. 2006 Mar;101(3):e56-60.	
Cocero et al. Autologous plasma rich in growth factors in the prevention of severe bleeding after teeth extractions in patients with bleeding disorders: a controlled comparison with fibrin glue. Blood Transfus. 2015 Apr;13(2):287-94.	Patients with systemic disease.
Coviello et al. Platelet-rich plasma improves wound healing in multiple myeloma bisphosphonate-associated osteonecrosis of the jaw patients. J Biol Regul Homeost Agents. 2012 Jan-Mar;26(1):151-5.	Patients with systemic disease.
Curi et al. Treatment of avascular osteonecrosis of the mandible in cancer patients with a history of bisphosphonate therapy by combining bone resection and autologous platelet-rich plasma: Report of 3 cases. J Oral Maxillofac Surg. 2007 Feb;65(2):349-55.	Patients with systemic disease not related to clinical question.
Das et al. Socket preservation by beta-tri-calcium phosphate with collagen compared to platelet-rich fibrin: A clinico-radiographic study. Eur J Dent. 2016AprJun;10(2):264-76.	Platelet concentrate used in combination with bone grafts or biomaterial.
Del Corso et al. The use of leukocyte-and platelet-rich fibrin during immediate postextractive implantation and loading for the esthetic replacement of a fractured maxillary central incisor. J Oral Implantol. 2012 Apr;38(2):181-7.	Not related to the clinical question.
Del Fabbro et al. Immediate implant placement into fresh extraction sites with chronic periapical pathologic features combined with plasma rich in growth factors: preliminary results of single-cohort study. J Oral Maxillofac Surg. 2009 Nov;67(11):2476-84.	Not related to the clinical question.
Del Fabbro et al. Is autologous platelet concentrate beneficial for post-extraction socket healing? A systematic review. Int J Oral Maxillofac Surg. 2011 Sep;40(9):891-900.	Review
Del Fabbro et al. Healing of Postextraction Sockets Preserved With Autologous Platelet Concentrates. A Systematic Review and Meta-Analysis. J Oral Maxillofac Surg. 2017 Aug;75(8):1601-1615.	Review
Del Fabbro et al. Autologous platelet concentrate for post-extraction socket healing: a systematic review. Eur J Oral Implantol. 2014 Win-	Review

ter;7(4):333-44.	
Del Fabbro et al. Autologous platelet concentrates for bisphosphonate-related osteonecrosis of the jaw treatment and prevention. A systematic review of the literature. <i>Eur J Cancer</i> . 2015 Jan;51(1):62-74.	Review
Della Valle et al. Prevention of postoperative bleeding in anticoagulated patients undergoing oral surgery: use of platelet-rich plasma gel. <i>J Oral Maxillofac Surg</i> . 2003 Nov;61(11):1275-8.	Patients with systemic disease.
Durmuşlar et al. Clinical and radiographic evaluation of the efficacy of platelet-rich plasma combined with hydroxyapatite bone graft substitutes in the treatment of intra-bony defects in maxillofacial region. <i>Acta Odontol Scand</i> . 2014 Nov;72(8):948-53.	Not related to the clinical question.
Dutta et al. A randomized comparative prospective study of platelet-rich plasma, platelet-rich fibrin, and hydroxyapatite as a graft material for mandibular third molar extraction socket healing. <i>Natl J Maxillofac Surg</i> . 2016 Jan-Jun;7(1):45-51.	Platelet concentrate used in combination with bone grafts or biomaterial.
Dutta et al. Mandibular Third Molar Extraction Wound Healing With and Without Platelet Rich Plasma: A Comparative Prospective Study. <i>J Maxillofac Oral Surg</i> . 2015 Sep;14(3):808-15.	Extraction of impacted third molars.
Eshghpour et al. Effect of platelet-rich fibrin on frequency of alveolar osteitis following mandibular third molar surgery: a double-blinded randomized clinical trial. <i>J Oral Maxillofac Surg</i> . 2014 Aug;72(8):1463-7.	Not related to the clinical question.
Esposito et al. The efficacy of various bone augmentation procedures for dental implants: a Cochrane systematic review of randomized controlled clinical trials. <i>Int J Oral Maxillofac Implants</i> . 2006 Sep-Oct;21(5):696-710.	Review, not related to the clinical question.
Farina et al. Plasma rich in growth factors had limited effect on early bone formation in extraction sockets: Response to "Anitua, E., Alkhraisat, M.H. & Orive, G. (2013) Letter to the Editor: Rigorous methodology is the school of coherent conclusions in science. <i>European Journal of Oral Implantology</i> 6: 9-11. <i>Clin Oral Implants Res</i> . 2014	Letter to editor

Oct;25(10):1189-91.	
Gawai et al. Clinical evaluation of use of platelet rich plasma in bone healing. J Maxillofac Oral Surg. 2015 Mar;14(1):67-80. doi: 10.1007/s12663-013-0605-5. Epub 2014 Jan 9.	Extraction of impacted third molars.
Gawande et al. Efficacy of platelet rich plasma in bone regeneration after surgical removal of impacted bilateral mandibular third molars: pilot study. J Maxillofac Oral Surg. 2009 Dec;8(4):301-7.	Extraction of impacted third molars.
Geurs et al. Using growth factors in human extraction sockets: a histologic and histomorphometric evaluation of short-term healing. Int J Oral Maxillofac Implants. 2014 Mar Apr;29(2):485-96.	Platelet concentrate used in combination with bone grafts or biomaterial.
Girish et al. Bone regeneration in extraction sockets with autologous platelet rich fibrin gel. J Maxillofac Oral Surg. 2013 Mar;12(1):11-6.	Extraction of impacted third molars.
Gomes-Ferreira et al. Scientific evidence on the use of recombinant human bone morphogenetic protein-2 (rhBMP-2) in oral and maxillofacial surgery. Oral Maxillofac Surg. 2016 Sep;20(3):223-32.	Not related to the clinical question.
González-García et al. Cell therapy in bisphosphonate-related osteonecrosis of the jaw. J Craniofac Surg. 2013 May;24(3):e226-8.	Not related to the clinical question.
Gürbüz et al. Scintigraphic evaluation of osteoblastic activity in extraction sockets treated with platelet-rich fibrin. J Oral Maxillofac Surg. 2010 May;68(5):980-9.	Extraction of impacted third molars.
Gürbüz et al. Scintigraphic evaluation of early osteoblastic activity in extraction sockets treated with platelet-rich plasma. J Oral Maxillofac Surg. 2008 Dec;66(12):2454-60.	Extraction of impacted third molars.
Hao et al. Effect of umbilical cord mesenchymal stem cell in peri-implant bone defect after immediate implant: an experiment study in beagle dogs. Int J Clin Exp Med. 2014 Nov 15;7(11):4131-8.	Not related to the clinical question, study in animals.
Haraji et al. Effect of plasma rich in growth factors on alveolar osteitis. Natl J Maxillofac Surg. 2012 Jan;3(1):38-41.	Not related to the clinical question.
Hatakeyama et al. Effects of platelet-poor plasma, platelet-rich plasma, and platelet-rich fibrin on healing of extraction sockets with buccal	Study in animals.

dehiscence in dogs. <i>Tissue Eng Part A</i> . 2014 Feb;20(3-4):874-82.	
He et al. Local Application of Platelet-Rich Fibrin During Lower Third Molar Extraction Improves Treatment Outcomes. <i>J Oral Maxillofac Surg</i> . 2017 Jun 8. pii: S0278-2391(17)30611-0.	Review
Hoaglin et al. Prevention of localized osteitis in mandibular third-molar sites using platelet-rich fibrin. <i>Int J Dent</i> . 2013;2013:875380.	Not related to the clinical question.
Huang et al. Platelet-rich plasma for regeneration of neural feedback pathways around dental implants: a concise review and outlook on future possibilities. <i>Int J Oral Sci</i> . 2017 Mar;9(1):1-9.	Review
Ito et al. Osteogenic potential of effective bone engineering using dental pulp stem cells, bone marrow stem cells, and periosteal cells for osseointegration of dental implants. <i>Int J Oral Maxillofac Implants</i> . 2011 Sep-Oct;26(5):947-54.	Not related to the clinical question.
Ji et al. The combination use of platelet-rich fibrin and treated dentin matrix for tooth root regeneration by cell homing. <i>Tissue Eng Part A</i> . 2015 Jan;21(1-2):26-34.	Not related to the clinical question.
John et al. Implant treatment and the role of platelet rich plasma. <i>J Indiana Dent Assoc</i> . 2003 Summer;82(2):8-13.	Not related to the clinical question.
Kaur et al. Efficacy of platelet rich plasma and hydroxyapatite crystals in bone regeneration after surgical removal of mandibular third molars. <i>J Maxillofac Oral Surg</i> . 2013 Mar;12(1):51-9.	Extraction of impacted third molars, platelet concentrate used in combination with bone grafts or biomaterial.
Kfir et al. Immediate bone augmentation after infected tooth extraction using titanium membranes. <i>J Oral Implantol</i> . 2007;33(3):133-8.	Not related to the clinical question.
Khan et al. Evaluation of peri-implant tissues around nanopore surface implants with or without platelet rich fibrin: A clinico-radiographic study. <i>Biomed Mater</i> . 2017 Sep 28. doi: 10.1088/1748-605X/aa8fa3.	Not related to the clinical question.
Gonzalez-Ocasio et al. Autotransplantation of Third Molars With Plate-	Involving third molars.

let-Rich Plasma for Immediate Replacement of Extracted Non-Restorable Teeth: A Case Series. J Oral Maxillofac Surg. 2017 Sep;75(9):1833.e1-1833.e6.	
Kocyigit et al. Correction of postsurgical alveolar ridge defect with vertical alveolar distraction of the onlay block graft. J Craniofac Surg. 2012 Sep;23(5):1550-2.	Not related to the clinical question.
Kotsakis et al. Extraction Socket Management Utilizing Platelet Rich Fibrin: A Proof-of-Principle Study of the "Accelerated-Early Implant Placement" Concept. J Oral Implantol. 2016 Apr;42(2):164-8.	Not related to the clinical question.
Kumar et al. Evaluation of treatment outcome after impacted mandibular third molar surgery with the use of autologous platelet-rich fibrin: a randomized controlled clinical study. J Oral Maxillofac Surg. 2015 Jun;73(6):1042-9.	Extraction of impacted third molars.
Kutkut et al. Extraction socket preservation graft before implant placement with calcium sulfate hemihydrate and platelet-rich plasma: a clinical and histomorphometric study in humans. J Periodontol. 2012 Apr;83(4):401-9.	Platelet concentrate used in combination with bone grafts or biomaterial.
Kutkut et al. Clinical and radiographic evaluation of single-tooth dental implants placed in grafted extraction sites: a one-year report. J Int Acad Periodontol. 2013 Oct;15(4):113-24.	Case report, platelet concentrate used in combination with bone grafts or biomaterial.
Maney et al. Applications of plasma rich in growth factors (PRGF) in dental surgery: a review. J West Soc Periodontol Periodontal Abstr. 2013;61(4):99-104.	Review
Manimaran et al. Treatment of osteoradionecrosis of mandible with bone marrow concentrate and with dental pulp stem cells. Ann Maxillofac Surg. 2014 Jul-Dec;4(2):189-92.	Not related to the clinical question.
Martins et al. Association of laser phototherapy with PRP improves healing of bisphosphonate-related osteonecrosis of the jaws in cancer patients: a preliminary study. Oral Oncol. 2012 Jan;48(1):79-84.	Not related to the clinical question.
Martin et al. Histological findings of revascularized/revitalized immature permanent molar with apical periodontitis using platelet-rich	Not related to the clinical question.

plasma. J Endod. 2013 Jan;39(1):138-44.	
Melville et al. Regeneration of a Tooth in a Tissue-Engineered Mandible After Resection of a Central Giant Cell Tumor. Demonstrating Evidence of Functional Matrix Theory and Ectodermal Origin of Teeth in a Human Model-A Case Report. J Oral Maxillofac Surg. 2017 Apr;75(4):850-857.	Case-report
Miron et al. Use of platelet-rich fibrin in regenerative dentistry: a systematic review. Clin Oral Investig. 2017 Jul;21(6):1913-1927.	Review
Mogharehabet al. Socket preservation using demineralized freeze-dried bone allograft with and without plasma rich in growth factor: A canine study. Dent Res J (Isfahan). 2014 Jul;11(4):460-8.	Platelet concentrate used in combination with bone grafts or biomaterial, study in animals.
Moraschini et al. Effect of autologous platelet concentrates for alveolar socket preservation: a systematic review. Int J Oral Maxillofac Surg. 2015 May;44(5):632-41.	Review
Mozzati et al. A dental extraction protocol with plasma rich in growth factors (PRGF) in patients on intravenous bisphosphonate therapy: a case-control study. Joint Bone Spine. 2011 Dec;78(6):648-9.	Patients with systemic disease.
Mozzati et al. Tooth extraction in patients on zoledronic acid therapy. Oral Oncol. 2012 Sep;48(9):817-21.	Patients with systemic disease.
Mozzati et al. Efficacy of plasma-rich growth factor in the healing of postextraction sockets in patients affected by insulin-dependent diabetes mellitus. J Oral Maxillofac Surg. 2014 Mar;72(3):456-62.	Patients with systemic disease.
Mozzati et al. Can plasma rich in growth factors improve healing in patients who underwent radiotherapy for head and neck cancer? A split-mouth study. J Craniofac Surg. 2014 May; 25(3):938-43.	Patients with systemic disease.
Mozzati et al. The impact of plasma rich in growth factors on clinical and biological factors involved in healing processes after third molar extraction. J Biomed Mater Res A. 2010 Dec 1;95(3):741-6.	Extraction of impacted third molars.
Nandeesh et al. Treatment of AVN Using Autologous BM Stem Cells and Activated Platelet-Derived Growth Factor Concentrates. J Stem Cells. 2016;11(3):135-148.	Platelet concentrate used in combination with bone grafts or biomaterial, patients with sys-

	temic disease.
Nathani et al. Comparison of platelet rich plasma and synthetic graft material for bone regeneration after third molar extraction. <i>Ann Maxillofac Surg.</i> 2015 Jul-Dec;5(2):213-8.	Platelet concentrate used in combination with bone grafts or biomaterial.
Nazaroglou et al. Radiographic evaluation of bone regeneration after the application of plasma rich in growth factors in a lower third molar socket: a case report. <i>Cases J.</i> 2009 Dec 3;2:9134.	Case report
Neiva et al. The Synergistic Effect of Leukocyte Platelet-Rich Fibrin and Micrometer/Nanometer Surface Texturing on Bone Healing around Immediately Placed Implants: An Experimental Study in Dogs. <i>Biomed Res Int.</i> 2016;2016:9507342.	Study in animals.
Ntounis et al. Clinical assessment of bone quality of human extraction sockets after conversion with growth factors. <i>Int J Oral Maxillofac Implants.</i> 2015 Jan-Feb;30(1):196-201.	Platelet concentrate used in combination with bone grafts or biomaterial.
Nurden et al. Use of autologous platelet-rich clots for the prevention of local injury bleeding in patients with severe inherited mucocutaneous bleeding disorders. <i>Haemophilia.</i> 2011 Jul;17(4):620-4.	Not related to the clinical question.
Ogundipe et al. Can autologous platelet-rich plasma gel enhance healing after surgical extraction of mandibular third molars? <i>J Oral Maxillofac Surg.</i> 2011 Sep;69(9):2305-10.	Extraction of impacted third molars.
Öncü et al. The effect of platelet-rich fibrin on implant stability. <i>Int J Oral Maxillofac Implants.</i> 2015 May-Jun;30(3):578-82.	Not related to the clinical question.
Ozgul et al. Efficacy of platelet rich fibrin in the reduction of the pain and swelling after impacted third molar surgery: randomized multicenter split-mouth clinical trial. <i>Head Face Med.</i> 2015 Nov 26;11:37.	Extraction of impacted third molars.
Pal et al. Comparative evaluation of zinc oxide eugenol versus gelatin sponge soaked in plasma rich in growth factor in the treatment of dry socket: An initial study. <i>Contemp Clin Dent.</i> 2013 Jan;4(1):37-41.	Not reported
Peck et al. Alveolar ridge preservation using leukocyte and platelet-rich fibrin: a report of a case. <i>Case Rep Dent.</i> 2011;2011:345048.	Case report

Peck et al. The use of leukocyte- and platelet-rich fibrin (L-PRF) to facilitate implant placement in bone-deficient sites: a report of two cases. <i>SADJ</i> . 2012 Mar;67(2):54-6, 58-9.	Case report
Perkin et al. Report of two oral surgical cases using a new microfibrillar collagen preparation and EACA for hemostasis. <i>Oral Surg Oral Med Oral Pathol</i> . 1979 Jan;47(1):36-9.	Not related to the clinical question.
Pessoa et al. Effects of platelet-rich plasma on healing of alveolar socket: split-mouth histological and histometric evaluation in Cebus apella monkeys. <i>Indian J Dent Res</i> . 2009;20(4):442-7.	Study in animals.
Petrungaro PS. An update on implant placement and provisionalization in extraction, edentulous, and sinus-grafted sites. A clinical report on 3200 sites over 8 years. <i>Compend Contin Educ Dent</i> . 2008 Jun;29(5):288-94, 296, 298-300.	Not related to the clinical question.
Petrungaro PS. Immediate restoration of multiple tooth implants for aesthetic implant restorations. <i>Implant Dent</i> . 2002;11(2):118-27.	Not related to the clinical question.
Raj et al. Natural Tooth Pontic: An Instant Esthetic Option for Periodontally Compromised Teeth-A Case Series. <i>Case Rep Dent</i> . 2016;2016:8502927.	Case series
Rosano et al. Immediate postextraction implant placement using plasma rich in growth factors technology in maxillary premolar region: a new strategy for soft tissue management. <i>J Oral Implantol</i> . 2013Feb;39(1):98-102.	Not related to the clinical question.
Ruga et al. Platelet-rich fibrin and piezoelectric surgery: a safe technique for the prevention of periodontal complications in third molar surgery. <i>J Craniofac Surg</i> . 2011 Sep;22(5):1951-5.	Extraction of impacted third molars.
Rullo et al. Bone grafting with platelet-rich plasma in alveolar cleft. Case report. <i>Minerva Stomatol</i> . 2007 Jan-Feb;56(1-2):63-71.	Not related to the clinical question.
Rutkowski et al. Inhibition of alveolar osteitis in mandibular tooth extraction sites using platelet-rich plasma. <i>J Oral Implantol</i> . 2007;33(3):116-21.	Not related to the clinical question.
Rutkowski et al. Platelet rich plasma to facilitate wound healing follow-	Not reported

ing tooth extraction. J Oral Implantol. 2010;36(1):11-23.	
Samandari et al. Socket preservation using freeze-dried bone allograft with and without plasma rich in growth factors in dogs. Dent Res J (Isfahan). 2016 Sep;13(5):432-439.	Study in animals, platelet concentrate used in combination with bone grafts or biomaterial.
Sammartino et al. The usefulness of 111indium-oxine autologous platelet gel graft imaging to evaluate osteoinduction in patients undergoing surgery of jaw bone defects. Int J Immunopathol Pharmacol. 2008 Apr-Jun;21(2):393-9.	Not related to the clinical question.
Sammartino et al. Prevention of hemorrhagic complications after dental extractions into open heart surgery patients under anti-coagulant therapy: the use of leukocyte- and platelet-rich fibrin. J Oral Implantol. 2011 Dec;37(6):681-90.	Patients with systemic disease.
Sammartino et al. Platelet-rich plasma and resorbable membrane for prevention of periodontal defects after deeply impacted lower third molar extraction. J Oral Maxillofac Surg. 2009 Nov;67(11):2369-73.	Extraction of impacted third molars.
Sammartino et al. Use of autologous platelet-rich plasma (PRP) in periodontal defect treatment after extraction of impacted mandibular third molars. J Oral Maxillofac Surg. 2005 Jun;63(6):766-70.	Not related to the clinical question.
Schliephake H. Clinical efficacy of growth factors to enhance tissue repair in oral and maxillofacial reconstruction: a systematic review. Clin Implant Dent Relat Res. 2015 Apr;17(2):247-73.	Review
Scoletta et al. Tooth extractions in intravenous bisphosphonate-treated patients: a refined protocol. J Oral Maxillofac Surg. 2013 Jun;71(6):994-9.	Patients with systemic disease.
Scoletta et al. Initial experience on the outcome of teeth extractions in intravenous bisphosphonate-treated patients: a cautionary report. J Oral Maxillofac Surg. 2011 Feb;69(2):456-62.	Patients with systemic disease.
Shi et al. Alveolar ridge preservation prior to implant placement with surgical-grade calcium sulfate and platelet-rich plasma: a pilot study in a canine model. Int J Oral Maxillofac Implants. 2007 Jul-Aug;22(4):656-65.	Pilot study, study in animals, platelet concentrate used in combination with bone grafts or biomaterial.

Simon et al. Quantitative evaluation of extraction socket healing following the use of autologous platelet-rich fibrin matrix in humans. <i>Int J Periodontics Restorative Dent.</i> 2011 Jun;31(3):285-95.	No control group.
Simon et al. Potential for osseous regeneration of platelet-rich plasma--a comparative study in mandibular third molar sockets. <i>Indian J Dent Res.</i> 2004 Oct-Dec;15(4):133-6. Erratum in: <i>Indian J Dent Res.</i> 2005 Jan-Mar;16(1):18. Maneul, Suvy [corrected to Manuel, Suvy].	Not reported
Singh et al. Platelet rich fibrin: a novel approach for osseous regeneration. <i>J Maxillofac Oral Surg.</i> 2012 Dec;11(4):430-4.	Not reported
Strecha et al. Fusion of the 2nd maxillary molar with the impacted 3rd molar. <i>Bratisl Lek Listy.</i> 2012;113(9):569-71.	Not related to the clinical question
Suba et al. Alveolar bone regeneration stimulated by a combination of platelet-rich plasma and Cerasorb graft in Beagle dogs. Histological and histomorphometric studies. <i>Fogorv Sz.</i> 2004 Aug;97(4):143-9. Hungarian.	Platelet concentrate used in combination with bone grafts or biomaterial.
Taberner-Vallverdú et al. Efficacy of different methods used for dry socket management: A systematic review. <i>Med Oral Patol Oral Cir Bucal.</i> 2015 Sep 1;20(5):e633-9. Review.	Review
Takahashi H. Replacement therapy in platelet-type von Willebrand disease. <i>Am J Hematol.</i> 1985 Apr;18(4):351-62.	Not related to the clinical question.
Taner et al. Interdisciplinary treatment of an adult patient with old extraction sites. <i>Angle Orthod.</i> 2006 Nov;76(6):1066-73	Not related to the clinical question.
Tarakji et al. Systemic review of dry socket: aetiology, treatment, and prevention. <i>J Clin Diagn Res.</i> 2015 Apr;9(4):ZE10-3.	Review
Taschieri et al. Osteotome-Mediated Sinus Lift without Grafting Material: A Review of Literature and a Technique Proposal. <i>Int J Dent.</i> 2012;2012:849093.	Review, not related to the clinical question.
Taschieri et al. Surgical decision making in coronally located vertical root fracture. <i>Minerva Stomatol.</i> 2009 Sep;58(9):399-413. English, Italian.	Not related to the clinical question

Taschieri et al. Immediate post-extraction implants with or without pure platelet-rich plasma: a 5-year follow-up study. <i>Oral Maxillofac Surg.</i> 2017 Jun;21(2):147-157.	Platelet concentrate used in combination with immediate implant placement
Thakkar et al. A comparative evaluation of extraction socket preservation with demineralized freeze-dried bone allograft alone and along with platelet-rich fibrin: A clinical and radiographic study. <i>Contemp Clin Dent.</i> 2016 Jul-Sep;7(3):371-6.	Platelet concentrate used in combination with bone grafts or biomaterial.
Uyanık et al. Effects of platelet-rich fibrin and piezosurgery on impacted mandibular third molar surgery outcomes. <i>Head Face Med.</i> 2015 Jul 26;11:25.	Extraction of impacted third molars.
Vairaktaris et al. Bisphosphonate-induced avascular osteonecrosis of the mandible associated with a common thrombophilic mutation in the prothrombin gene. <i>J Oral Maxillofac Surg.</i> 2009 Sep;67(9):2009-12.	Not related to the clinical question
Varghese et al. Potential for Osseous Regeneration of Platelet-Rich Fibrin-A Comparative Study in Mandibular Third Molar Impaction Sockets. <i>J Oral Maxillofac Surg.</i> 2017 Jul;75(7):1322-1329.	Extraction of impacted third molars.
Vivek et al. Potential for osseous regeneration of platelet rich plasma: a comparative study in mandibular third molar sockets. <i>J Maxillofac Oral Surg.</i> 2009 Dec;8(4):308-11.	Not reported
Yamada et al. Tissue-engineered injectable bone regeneration for osseointegrated dental implants. <i>Clin Oral Implants Res.</i> 2004 Oct;15(5):589-97.	Not related to the clinical question.
Yerke et al. The Effect of Platelet-Rich Fibrin, Calcium Sulfate Hemihydrate, Platelet-Rich Plasma and Resorbable Collagen on Soft Tissue Closure of Extraction Sites. <i>J Funct Biomater.</i> 2017 May 25;8(2).	Platelet concentrate used in combination with bone grafts or biomaterial.
Wang et al. Preliminary clinical observation for platelet-rich fibrin in site preservation]. <i>Zhong Nan Da Xue Xue Bao Yi Xue Ban.</i> 2015 Jul;40(7):802-5.	Involving third molars.
Xu et al. Human osteoblasts attachment to guided tissue regeneration membranes which were coated either with platelet-rich plasma or platelet-poor plasma. <i>Zhonghua Kou Qiang Yi Xue Za Zhi.</i> 2007	Not related to the clinical question.

Aug;42(8):496-500. Chinese.	
No authors listed. Bone growth after tooth extractions examined. Br Dent J. 2010 May 8;208(9):384.	Not related to the clinical question.

Table 6. Main characteristics of selected studies: time, outcomes, methods of evaluation, parameters, effect of platelet concentrates.

Study	Time	Outcomes	Methods of evaluation	Parameters	Effect of platelet concentrate (statistical significance vs control)	Effect of platelet concentrate (adjunctive notes)	Conclusions
<i>Alissa et al., 2010</i> [15]	1w	Incidence of socket complications	Criteria of Cheung et al. [32]	Alveolar osteitis, acutely infected alveolus, acutely inflamed alveolus.	NS *	All complications (3/21 patients) were registered in the control group, although the difference was not statistically significant (P = 0.06).	PRP may have some additional benefits in reducing healing complications such as alveolar osteitis and improving healing of soft tissue of extraction sockets. It remains unclear whether the use of PRP in post-extractive sites can promote bone heal-
		Post-operative quality of life	VAS for pain evaluation; health-related quality of life questionnaire	Pain, analgesic consumption.	Sig.(*) in the first 3d NS after	In the PRP group the pain was significantly (P < 0.05) less intense in the first 3 days and patients needed less (P < 0.05) analgesic medication in the first two days with respect to the control group and no differences after.	

				Oral functions (ability to eat food, swallowing, mouth opening and speech), general activity and other symptoms such as presence of swelling, bruising, bleeding, bad taste or halitosis and food stagnation in surgical sites.	Sig. (*) only for bad taste or halitosis and food stagnation in surgical sites NS for other aspects	Patients treated with PRP reported less ($P < 0.05$) bad taste in the mouth, and a lower accumulation of food. However, global treatment satisfaction and other quality of life determinants, were not statistically different between the groups.	ing or improve the quality of life of patients. However, due to the small sample size achieved (23 patients) the power to detect statistically significant differences, if any, was reduced (60%).
		Soft tissue healing	Healing index of Landry et al. [33]	Colour of tissues, epithelialisation of wound margins, presence of bleeding on palpation, granulation and suppuration.	Sig.(*)		
	12w	Hard tissue healing	Standardized periapical radiographs (subjective evaluation)	Trabecular bone pattern classified into dense homogeneous, heterogeneous or sparse homogeneous according to Lindh et al. [34].	Sig. (*)		
			Standardized periapical	Trabecular bone volume	NS*	General trend (not statistically significant) for PRP-treated	

			radiographs (computer-aided analysis)	Trabecular number	NS	sockets to have more, longer, wider and closer trabeculae and a higher bone volume than the control sockets.	
				Trabecular length	NS		
				Trabecular width	NS		
				Trabecular separation	NS		
<i>Farina et al., 2013</i> [21]	4-8w	Hard tissue healing	Micro-CT analysis of bone biopsies	Bone volume	NS	The test group showed a higher number of CD68+ cells and a higher von Willebrand factor but the difference was not statistically significant.	Plasma rich in growth factors-treated group do not show any enhancement in early (4 and 8 weeks) bone deposition compared to the control group.
				Tissue mineral content	NS		
				Tissue mineral density	NS		
			Histomorphometric analysis of bone biopsies	Mean number of CD68+ stained cells (macrophages/giant multinucleated cells)	NS		
				Mean area of CD68+ staining	NS		
				Mean number of von Willebrand factor-positive stained cells (vascular and endothelial cells)	NS		
				Mean area of von Willebrand factor positive staining	NS		
				Mean osteocalcin staining score (osteoblast activity)	NS		

<i>Sut-tapreyasri and Leepong 2013</i> [17]	Up to 8w	Soft tissue healing	Periodontal probe	Dimensions of the socket orifice mesio-distally and buccolingually.	NS		The preliminary results demonstrated neither better alveolar ridge preservation nor enhanced bone formation of PRF in the extraction socket. The use of PRF revealed limited effectiveness by accelerated soft-tissue healing in the first 4 weeks.
		Alveolar ridge dimensions (soft and hard tissues)	Measurements on model casts (three different points of measurements in coronal-apical direction)	Bucco-lingual dimensions of the alveolar ridge	NS	A trend for the test group to enter in a steady state in terms of ridge contour changes 4-weeks post-extraction was pointed out, whereas ridge modifications progressively continued in the control group up to the 8-week time point. In the PRF group both buccal and lingual contractions were less than the control one at every level and time frame, although such a difference was never statistically significant (excepting for the difference at the most coronal point of the buccal ridge contour at the 1-week re-evaluation).	
		Alveolar bone dimensions	Standardized peri-apical radiographs	Alveolar bone height (M and D)	NS	No difference between test (M: 0.70 mm; D: 1.23 mm) and the control (M: 1.33 mm; D: 1.14 mm) groups at the 8 week-follow-up.	
<i>Hauser et al. 2013</i> [18]	8w	Soft tissue healing	Clinical evaluation	Integrity of the soft tissues, gingival biotype and presence/absence of	NR	Soft tissue healing occurred generally approximately 2 weeks. The amount of keratinized gingiva progressively increased at 5 and 8 weeks in	The use of PRF membranes to fill the socket after tooth extraction led to improved alveolar

				clinical symptoms		all patients and no sign of infection or delayed healing was registered. No difference among the experimental groups was reported.	bone healing with a better preservation of the alveolar crest width. The minimally traumatic procedure for extraction without mucosal flap appears to be appropriate to preserve the hard tissue, but these results should be confirmed by clinical studies in a larger patient population.
Hard tissue healing	Micro-CT analysis	Bone volume / total volume	PRF Sig.NR) PRF-flap NS				
		Trabecular number	PRF Sig. (*) PRF-flap NS				
		Trabecular thickness	PRF NS PRF-flap NS				
		Trabecular separation	PRF Sig. (*) PRF-flap NS				
	Nanoindentation test	Elastic modulus	PRF Sig. (*) PRF-flap NS				
		Working energy	PRF Sig. (*) PRF-flap NS				
		Tissue hardness	PRF NS* PRF-flap NS				
Alveolar bone dimensions	Calliper clamp	Alveolar bone width at 4 mm apical to the crest	PRF Sig. (*) PRF-flap NS		PRF showed significant (P < 0.05) lower mean loss of width (0.43 mm) compared with PRF-flap (0.06 mm) and control (0.42 mm) groups.		
	Standardized peri-apical radiographs	Alveolar bone height (mesial and distal)	PRF Sig. (*) PRF-flap Sig. (*)		Control group had a greater bone loss (P < 0.05) in the mesial (M: -0.77 ± 0.17 mm) and distal (D: -2.07 ± 0.81 mm) regions than the PRF (M: -1.21 ± 0.40 mm; D: -0.76 ± 0.25 mm) and PRF-flap (M: -0.86 ± 0.34 mm; D: -2.15 ± 1.05 mm) groups.		

Anitua et al. 2015 [16]	1-2w	Post-operative signs and symptoms	VAS scale	Pain	Sig. (*) 3d Sig. (**) 1w NS 2w	The use of PRGF is safe and it promotes bone and soft tissue healing as well as reduced post-operative pain and inflammation. More clinical trials, where tissue biopsy is harvested to contrast the clinical and radiographical outcomes will be still needed.	
			Inflammation score (0-3) [15]	Inflammation	Sig. (*) 3d Sig. (**) 1w NS		
	10-12w	Soft tissue healing	Healing index of Landry et al. [33]	Colour of tissues, epithelialisation of wound margins, presence of bleeding on palpation, granulation and suppuration.	Sig. (**)		
			Histomorphometric analysis	Keratinized gingival thickness (μm)	Sig. (*)		
	Hard tissue healing	CBCT analysis	Percentage of regenerated sockets ($\geq 75\%$ bone filling)		Sig. (**)		The rate of response to PRGF was 51.2% higher than the conventional treatment group (95 % CI 44.32–58.06; $P < 0.001$).
			% Regenerated volume		Sig. (**)		Almost 97 % in the PRGF group and almost 75 % in the control group.
			Bone density (HU)		Sig. (**)		The bone density was 131.82 (95 % CI 69.41–194.23; $P < 0.001$) units higher in the test than in the control group.
			Histomorphometric analysis	Percentage of new bone regeneration	Sig. (*)		27.52% more new bone in PRGF group than in the conventional treatment group (95 % CI 0.13–54.92; $P < 0.049$)

<i>Marenzi et al. 2015 [19]</i>	Up to 4 d	Post-operative symptoms	VAS scale	Pain	Sig. (***) (time point NR) NS 4 d	Patients reported a, that was significantly ($P < 0.0001$) lower mean value of the test sites of 3.2 ± 0.3 than the mean value of the control sites (4.5 ± 0.7) (but the time point was not reported in the article). Such a difference, and the pain itself, almost disappeared at day 4.	The use of L-PRF in post-extraction sockets filling is an efficient and useful procedure in order to manage the post-operative pain and to enhance the alveolar soft tissue healing process, especially in the first days after the extractions reducing the early adverse effects of the inflammation.
	3 w	Soft tissue healing	Modified Healing Index of Masse et al. [35]	Bleeding, suppuration, tissue color, and consistency of the healing tissue	NS	The authors reported a better healing and faster socket closure for the L-PRF sites, however, no correlation between this finding and the data reported in the relative table could be found. The differences at days 3 and 7 were statistically significant although the P -values reported in the published table were 0.197 and 0.05, respectively. At the opposite, no mention was made about the differences at the other time-points that were reported in the table as highly significant ($P=0.01$ and 0.0002 at 14 and 21 days, respectively)	
<i>Temmerman et al. 2016 [20]</i>	12w	Post-operative symptoms	Dutch version of the McGill Pain Questionnaire (MPQ-DLV) [36]	Pain	Sig. (*)	This questionnaire uses 100 mm VAS to evaluate the level of pain. The use of L-PRF resulted in less ($P < 0.01$) post-operative discomfort and pain for the patients, especially during the early phases of	The use of L-PRF as a socket filling material to achieve preservation of horizontal and vertical ridge dimension at three months after

						healing (up to 5 days).	tooth extraction is beneficial. The use of L-PRF results in less postoperative discomfort and pain for the patients, especially during the early phases of healing.
		Hard tissue healing	CBCT analysis	Socket fill	Sig. (***)	Statically significant differences (P = 0.0004) were found in the percentage of socket fill between test [94.7% (± 26.9)] and control sites [63.3% (± 31.9)].	
		Alveolar bone dimensions	CBCT analysis	Vertical resorption	Buccal Sig. (***) Lingual NS	Mean vertical height changes at the buccal side were -1.5 mm (± 1.3) for control sites and 0.5 mm (± 2.3) for test sites (P < 0.005); at the lingual side were -0.7 mm (± 0.8) for control sites and 0.4 mm (± 1.1) for test sites.	
				Horizontal resorption (1, 3 and 5 mm below the buccal bone crest)	1 mm buccal Sig. (**) 3 mm buccal Sig. (*) 5 mm buccal NS 1 mm lingual Sig. (**) 3 mm lingual NS* 5 mm lingual NS*	At the buccal side, control sites values were, respectively, -2.9 (± 2.7), -0.1 mm (± 1.1) and -0.5 mm (± 0.6), at 1, 3 and 5 mm below crest level, and test sites values were, respectively, -0.8 mm (± 2.5) (P < 0.003), -0.4 mm (± 1.5) (P < 0.04) and 0.4 mm (± 1.7). At the lingual side, control sites values were, respectively, -2.1 (± 2.5), -0.3 mm (± 0.3) and -0.1 mm (± 0.0), and test sites values were, respectively, -0.6 mm (± 2.2) (P < 0.004), -0.1 mm (± 0.3) and 0.0 mm (± 0.1).	
				Horizontal ridge width reduction (1, 3 and 5 mm below the buccal	1 mm Sig. (***) 3 mm Sig. (**) 5 mm Sig. (*)	Test sites values were, respectively, --22.84% (± 24.28), -5.42% (± 6.16), -2,91 (± 4.54) at 1, 3 and 5 mm below crest	

				bone crest)		level, and control sites values were, respectively, 51.92% (± 40.31) ($P = 0.0004$), -14.51% (± 19.6) ($P = 0.007$) and -4.47% (± 4.89) ($P = 0.02$).	
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PRP, platelet-rich plasma; PRGF, plasma rich in growth factors; PRF, platelet-rich fibrin; L-PRF, leukocyte enriched PRF; w, weeks; d, days; VAS, Visual Analogue Scale; HU, Hounsfield units CBCT, cone-beam computed tomography; M, mesial; D, distal; NS, not significant; NS* borderline not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; NR, not reported.