J Oral Res
research in oral sciences

ARTICLE

COMPARISON OF THE EFFECTIVENESS AND SAFETY BETWEEN AUTOLOGOUS BONE GRAFTS AND XENOGRAFTS FOR THE TREATMENT OF ALVEOLAR BONE DEFECTS: OVERVIEW OF SYSTEMATIC REVIEWS USING FRISBEE METHODOLOGY.

Comparación sobre la efectividad y seguridad entre los injertos óseos autólogos y xenoinjertos para el tratamiento de defectos óseos alveolares: Overview de revisiones sistemáticas con metodología FRISBEE

Kevin Cabrera-Navarrete.[1]
Esteban Hernández-Velasteguí.[1]
Camila Montesinos-Guevara.[2]

AFFILIATIONS:
[1]Facultad de Ciencias de la Salud Eugenio Espejo. Universidad UTE. Quito, Ecuador.
[2]Centro de Investigación de Salud Pública y Epidemiología Clínica (CISPEC). Facultad de Ciencias de la Salud Eugenio Espejo. Universidad UTE. Quito, Ecuador.

CORRESPONDING AUTHOR:
Camila Montesinos-Guevara.
Universidad UTE, Rumipamba y Bourgeois, Quito, Ecuador. Phone: (59-3) 979235467.
E-mail:camila.montesinos@ute.edu.ec

CITE AS:
Cabrera-Navarrete K, Hernández-Velasteguí E & Montesinos-Guevara C. Comparison of the effectiveness and safety between autologous bone grafts and xenografts for the treatment of alveolar bone defects: Overview of systematic reviews using FRISBEE methodology.
J Oral Res.2022;11(6):1-9.
doi:10.17126/joralres.2022.067

ABSTRACT:

Introduction: Due to the extensive number of studies developed on periodontal pathologies and the clinical need generated to correct bonvze defects, we have carried out an Overview of systematic reviews using the FRISBEE methodology.

Material and Methods: Through this study we expect to bridge the knowledge gap generated regarding the clinical question on the effectiveness of autologous bone substitutes and xenografts in maxillary and mandibular bone defects.

Results: For this study, we carried out a systematic search in Epistemonikos and PubMed, we included 3 systematic reviews and 5 primary studies included in these reviews to extract their data. We analyzed data using RevMan 5.4. and GRADEpro. Assessed outcomes included: bone gain [MD 0.06 mm lower (0.26 lower to 0.14 higher)] and bone resorption [MD 0.03 mm higher (0.12 lower to 0.18 higher)], where no significant differences were found between the study groups. The certainty of the evidence was moderate for both outcomes. Bone length and bone density outcomes were not measured or reported in the included studies.

Conclusion: We concluded that there are no significant clinical differences between the application of autologous bone grafts and xenografts for bone defects´correction for the assessed outcomes, therefore, these biomaterials should be applied at the discretion of the clinician and according to the needs and preferences of patients.

KEYWORDS:

Autografts; heterografts; allografts; bone regeneration, alveolar bone grafting; periodontal diseases

Received: March 28, 2021 | **Accepted:** November 02, 2022 | **Published online:** December 30, 2022.

RESUMEN:

Introducción: Debido al extenso número de estudios desarrollados sobre patologías periodontales y a la necesidad clínica generada para corregir defectos óseos, hemos realizado un Overview de revisiones sistemáticas tipo FRISBEE para acortar la brecha de conocimiento generada respecto a la pregunta clínica sobre la efectividad de sustitutos óseos tipo autólogo y xenoinjertos en defectos óseos a nivel maxilar y mandibular.

Material y Métodos: Para este estudio realizamos una búsqueda sistemática en *Epistemonikos* y *PubMed*, de los cuales incluimos 3 revisiones sistemáticas y 5 estudios primarios incluidos en estas revisiones para extraer sus datos. Los datos fueron analizados a través de RevMan 5.4. Y GRADEpro.

Resultados: Los estudios analizaron los desenlaces propuestos: ganancia ósea posterior a la aplicación del injerto óseo [MD 0.06 mm menos (0.26 menos a 0.14 más)] y reabsorción ósea posterior a la aplicación del injerto óseo [MD 0.03 mm más (0.12 menos a 0.18 más)], donde no se encontraron diferencias significativas entre los grupos de estudio. La certeza de la evidencia fue moderada para ambos desenlaces. Los desenlaces longitud ósea y densidad ósea no fueron medidos o reportados en los estudios incluidos.

Conclusión: Se concluyó que no hay diferencias que sean clínicamente significativas entre la aplicación de injertos óseos autólogos y xenoinjertos para la corrección de defectos óseos para los desenlaces analizados, por lo que, la aplicación de estos biomateriales queda a criterio del clínico, y de acuerdo a las necesidades y preferencias de los pacientes.

PALABRAS CLAVE:

Autoinjertos; xenoinjertos; aloinjertos; regeneración ósea; injerto de hueso alveolar; enfermedades periodontales.

INTRODUCTION.

To achieve a favorable long-term function and a better aesthetic result in case of bone loss, it is essential to carry out bone regeneration before placing dental implants.[1] Autogenous bone grafts are the preferred choice when performing regeneration procedures.[2] However, there are extrinsic and intrinsic characteristics of patients that limit bone substitute's adaptation, such as donor site morbidity, microorganisms' transmission, bone resorption, limited availability of bone graft and the need to include additional surgical sites.[3]

For this reason, more effective alternatives have been sought for bone regeneration, including xenografts, allografts, among others.[4]

Procedures for alveolar cortical augmentation fall into two main categories:

1) Horizontal bone augmentation to increase the recipient's bone in the Vestibular-Palatine/ Lingual direction for prosthetic rehabilitation and to obtain an adequate diameter.[5,2]

2) Vertical bone augmentation to increase the length of basal bone for implants' reception.[6] On the other hand, the most common techniques for bone augmentation in both directions include: guided bone regeneration (GBR), ridge splitting/ expansion, autogenous block graft, and barrier membranes combined with different grafting materials.[7,8]

Due to scientific advances in the use of various biomaterials, osseointegration of the recipient area using GBR technique has been relatively successful.[9] The four main characteristics for a successful GBR to occur are: Primary wound closure, space maintenance, clot stability, and angiogenesis, all of which provide access to nutrients

and oxygen needed for bone tissue regeneration and to facilitate new osteo-forming cells.[10]

Currently in daily clinical practice, bone augmentation procedures and the preservation of the alveolar ridge involve the application of bone substitutes such as xenografts, which are used in addition to autologous grafts or to replace them.[11]

The use of xenografts has shown more benefits than autologous grafts in terms of implant survival, as well as long-term gains in bone levels.[12] However, in the maxillary sinus, evidence shows that bone graft maturation is faster with autologous substitutes than with xenografts.[13]

Regarding the recipient's rehabilitation (implants, prostheses), it has been demonstrated that using bone grafts improves the anatomy of the recipient's site.[14] These reconstructive procedures can be performed prior to implant placement (two-stage procedure/stage approach) or simultaneously with the device to be implanted (one-stage procedure/simultaneous approach).[15]

Considering the divergence in the conclusions of the benefits between these bone substitution materials, this study aims to summarize the available evidence through an Overview of systematic reviews using the FRISBEE methodology (Friendly Summary of The Body of Evidence), to analyze the effectiveness and safety between autologous bone grafts and xenografts for the treatment of alveolar bone defects.

MATERIALS AND METHODS.

This study is an Overview of systematic reviews, following a FRISBEE methodology (Friendly Summaries of Body of Evidence using Epistemonikos), which synthesizes the best available evidence to answer the following PICO question:

(P) Patients with bone defects in the maxilla and mandible;

(I) Autologous bone;

(C) Xenograft bone;

(O) Bone gain and bone resorption.

A main systematic search was performed in the EPISTEMONIKOS electronic database to find systematic reviews answering the PICO question established in this study. In addition, a further search in MEDLINE/PubMed was performed (Appendix 1). No language restrictions were applied, but we filtered the searches to include only systematic reviews. Articles were included until December 14th, 2021.

Two authors (EH-V and KC-N) independently assessed the title and abstract for each identified study, the same process applied for full-text screening and for data extraction. In case of disagreement, the two authors resolved by discussion and consensus, with arbitration by a third author when necessary (CM-G).

Data collection was carried out in a XLSX template using the Microsoft EXCEL program, which included: search strategies, systematic reviews' characteristics, the risk of bias for primary studies, the (dichotomous or continuous) outcomes proposed in the PICO question. If supplementary information were missing, the corresponding author was contacted. Data analysis was performed using RevMan 5.4 program and GRADE pro online was used for assessing the certainty of the evidence, data presentation for each outcome was done through Summary of Findings tables.

RESULTS.

A total of 1596 reviews were identified from the systematic search performed in *Epistemonikos* and *Pubmed*, 117 were excluded because they were duplicates. A total of 1,479 studies were screened by title and abstract and 1,428 reviews were finally excluded. A total of 51 reviews were retrieved to screen for full-text; 48 studies did not meet the inclusion criteria, 5 of them because they used animal models, 15 were surgical procedures in trauma and maxillary orthopedics, 13 used platelet concentrates and 15 used calcium phosphate in their intervention.

As a final result, only three systematic reviews were included,[12,15,16] which had five primary studies[2-5,8] (Figure 1). The population included in the systematic reviews were adults (older than

ISSN Print 0719-2460 - ISSN Online 0719-2479.

18 years), non-smokers, partially edentulous (single missing tooth) and with a Class V maxilla atrophy according to the Cawood and Howell 1988 classification characterized by residual bone thickness (1mm to 3 mm), in which sinus floor augmentation is desirable for prosthetic reasons with single or multiple implants.[21]

The outcomes measured in the included studies were:

- Bone gain - five clinical trials measured bone gain (413 patients).

- Bone resorption - four clinical trials assessed bone resorption (127 patients).[3-5,8] (Table 1).

Although the studies measured other outcomes such as: attachment level, implant follicle, etc., they were not included in our PICO question. The summary of the main findings of this overview are:

- Regarding bone gain, a slight increase was shown in favor of the comparison (xenograft) *versus* the intervention (autologous). With a mean difference of 0.06 (moderate certainty of the evidence).

- Regarding bone resorption, a slight increase in resorption was shown in favor of the intervention (autologous) compared to the comparison group (xenograft). With a mean difference of 0.03 (moderate certainty of the evidence).

- The bone length outcome was not measured or reported in the included studies.

- The bone density outcome.

Figure 1. PRISMA flowchart of the systematic reviews' selection and inclusion process after database search.

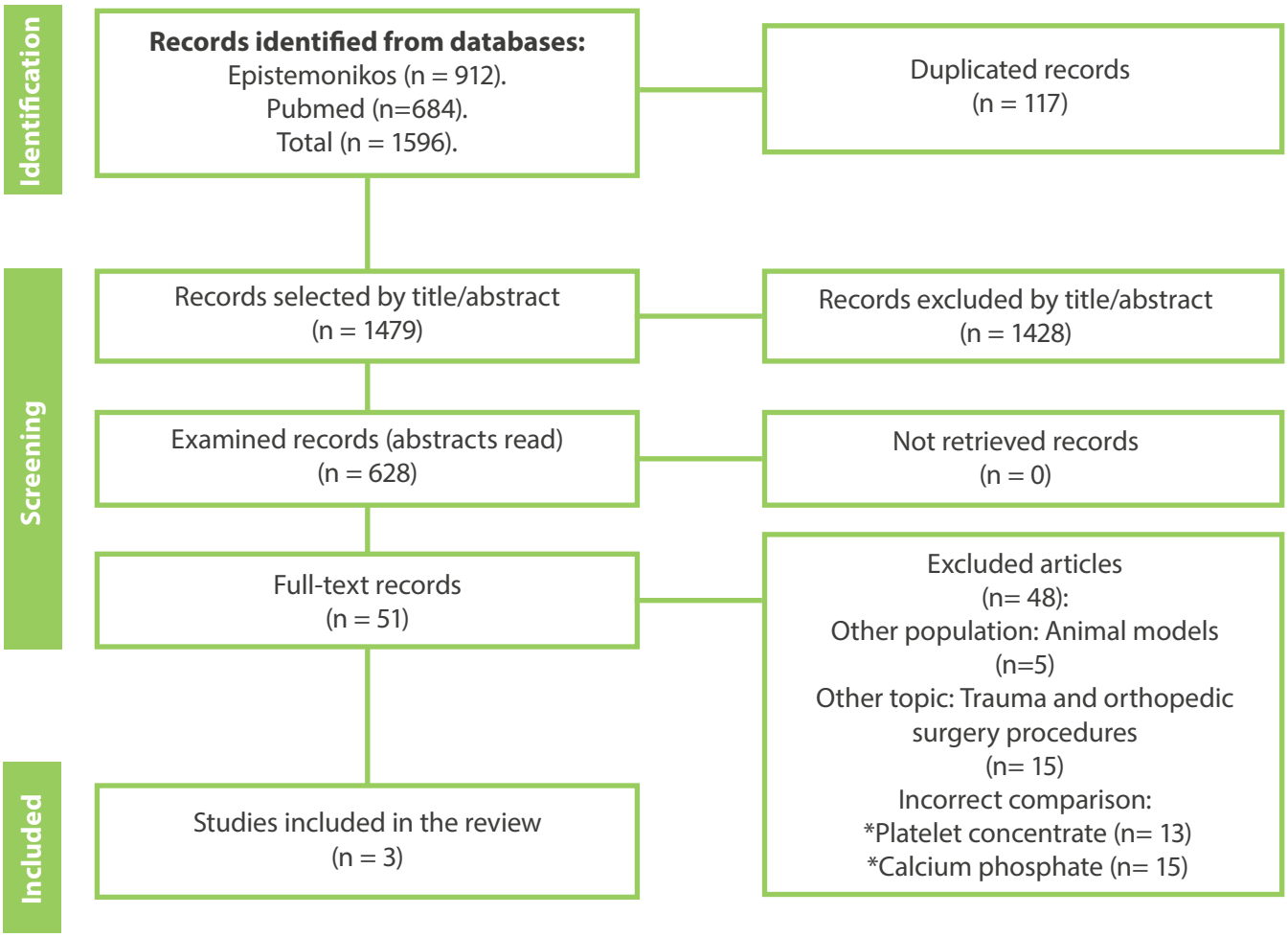

Table 1. Autologous bone compared to xenograft bone for maxillary and mandibular bone defects.

Population: Bone defects in the maxilla and mandible.
Intervention: Autologous bone.
Comparison: Xenograft Bone.

Outcomes	Anticipated absolute effects * (95% CI) Risk with Xenograft Bone	Risk with Autologous Bone	Relative effect (95% CI)	Certainty of the evidence (GRADE) **
Bone gain	2.00mm	1.94mm	--- --- ---	⨁⨁⨁◯
	MD 0.06 mm lower (0.26 lower to 0.14 higher)			Moderate [to]
Bone resorption	0.96mm	0.99mm		⨁⨁⨁◯
	MD 0.03 mm higher (0.12 lower to 0.18 higher)		--- --- ---	Moderate [to]
Bone length	It was not measured or reported in the included studies.			
Bone density	It was not measured or reported in the included studies.			

* **The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% confidence interval).
Margin of error: 95% confidence interval (95% CI).
MD: Mean difference.
a: One level of certainty of evidence was lowered down due to imprecision, for not having a non-representative sample size and it may not be sufficient to detect differences between the study groups.

****:** GRADE Working Group evidence grades

High certainty: We are very confident that the true effect is close to that of the effect estimate.
Moderate certainty: We are moderately confident in the effect estimate: the true effect is likely to be close to the effect estimate, but there is a possibility that it is substantially different.
Low certainty: Our confidence in the effect estimate is limited: the true effect may be substantially different from the effect estimate.
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the effect estimate.

DISCUSSION.

Bone defects result from a physiological process mainly caused by dental extraction and periodontitis.[3] In this study, we analyzed the application of autologous graft compared to xenograft for this condition that compromises patient's stability, function and aesthetics.

The evidence on the application of these biomaterials in bone defects is very limited, since most systematic reviews compare bone substitutes and other membranes (*e.g.* collagen, connective tissue, acellular dermal matrix, among other materials) that work as adjuvants to achieve better osseointegration with the recipient.[16,17]

In terms of bone gain outcome, there is no significant difference between the intervention group (autologous graft, Mean: 1.94 mm) and the comparison group (xenograft, Mean: 2.0 mm). The mean difference was 0.06, however, this value is not relevant from the clinical point of view. We concluded that, with any of the two grafts used for bone defect's regeneration, the gain will oscillate around 0.06 with a 95% CI (0.26-0.14).

For bone resorption outcome there was no significant difference between the intervention group (autologous graft; Mean: 0.93 mm) and the comparison group (xenograft; Mean: 0.96 mm). The mean difference was 0.03; for any of the two

ISSN Print 0719-2460 - ISSN Online 0719-2479.

grafts selected for bone defect's regeneration, resorption will be around 0.03 with a 95% CI (0.12-0.18).

The outcomes selected in this analysis are critical for decision-making in clinical practice, since they support the assessment of bone gain and resorption after the application of the two biomaterials in the mesio-distal and vestibule-lingual/palatal directions.[11] These outcomes also facilitate the evaluation of the best treatment plan that adjusts to the biological characteristics of the patient and the assessment of a long-term prognosis according to the treatment.[12]

However, outcomes such as length and bone density were not measured in the included reviews, thus they were not part of the analysis. We recommend that future studies should consider measuring these outcomes, since they allow dentists to make a better decision when selecting the most appropriate bone substitute for rehabilitation.

It is likely that these results will change in future studies due to the combination of these grafts with other biomaterials that increase the efficacy of the treatment, as we have found in several registries of clinical trials and systematic reviews that are currently under development. In *http:///www.clinicaltrials.gov* registry, we found two ongoing randomized clinical trials,[17,18] in which guided bone regeneration is analyzed in atrophic maxillary ridges,[17] or autologous bone and xenograft are applied for bone dehiscences around dental implants.[18] In both clinical trials, bone gain, bone resorption, length and bone density are assessed to determine the survival of implant placement.

On the other hand, in the International Clinical Trials Registry Platform of the World Health Organization (WHO), we identified an ongoing randomized trial,[19] where bone regeneration is applied in vestibular defects using autologous and xenograft bone substitutes. In this case, bone gain and loss are evaluated. Similarly, in the International prospective register of systematic reviews (PROSPERO), two ongoing systematic reviews were identified.[20,21] The first review[20] aims to investigate the efficacy of alveolar preservation techniques in the adult population, using bone substitutes, while the second study[21] analyzes the application of bone substitutes *versus* autologous grafts in the regeneration of maxillary alveolar with vertical bone resorption. Both studies evaluated bone gain and loss in the mesio-distal and vestibule-lingual/palatal directions.

CONCLUSION.

Our study does not show that there are clinically significant differences between the application of autologous bone grafts and xenografts for the regeneration of bone defects. Since both outcomes show similar results, the application of any of these biomaterials supposes the same levels of bone gain and loss.

Therefore, graft selection should be based on suitability of the biological needs of the patient; autologous or xenograft selection could be left to the judgment and discretion of the clinician.

Conflict of interests:

The authors declare that they have no conflict of interest in relation to the subject of study and have.

Ethics approval:

This study is a secondary study, which does not require ethical approval.

Funding:

Self-Financed.

Authors' contributions:

Cabrera-Navarrete K: Worked on the design, analysis, results, and writing of the manuscript.

Hernández E, Worked on the design, data extraction, results, and writing of the manuscript.

Camila Montesinos-Guevara C: Worked on the design, analysis and writing of the manuscript. All authors reviewed the latest version of the submission.

Acknowledgements:

The authors would like to thank Paula Zambrano-Achig for her support and recommendations in the application of the FRISBEE methodology.

ISSN Print 0719-2460 - ISSN Online 0719-2479.

REFERENCES.

1. Starch-Jensen T, Deluiz D, Vitenson J, Bruun NH, Tinoco EM. Maxillary Sinus Floor Augmentation with Autogenous Bone Graft Compared with a Composite Grafting Material or Bone Substitute Alone: A Systematic Review and Meta-Analysis Assessing Volumetric Stability of the Grafting Material. Journal of Oral and Maxillofacial Research [Internet]. 2021;12(1). doi.org/10.5037/jomr.2021.12101
2. Merli M, Moscatelli M, Mariotti G, Pagliaro U, Merli M, Nieri M. Use of autogenous bone versus deproteinised bovine bone matrix in one-stage lateral sinus floor elevation in severely atrophied maxillae: A 7-year randomised controlled trial. Int J Oral Implantol (Berl). 2021;14(1):101-112. PMID: 34006075.
3. Felice P, Marchetti C, Iezzi G, Piattelli A, Worthington H, Pellegrino G, Esposito M. Vertical ridge augmentation of the atrophic posterior mandible with interpositional bloc grafts: bone from the iliac crest vs. bovine anorganic bone. Clinical and histological results up to one year after loading from a randomized-controlled clinical trial. Clin Oral Implants Res. 2009;20(12):1386-93. doi: 10.1111/j.1600-0501.2009.01765.x. Epub 2009 Aug 4. PMID: 19681966.
4. Urban IA, Nagy K, Werner S, Meyer M. Evaluation of the Combination of Strip Gingival Grafts and a Xenogeneic Collagen Matrix for the Treatment of Severe Mucogingival Defects: A Human Histologic Study. Int J Periodontics Restorative Dent. 2019;39(1):9-14. doi: 10.11607/prd.3921. PMID: 30543721.
5. Si MS, Zhuang LF, Gu YX, Mo JJ, Qiao SC, Lai HC. Osteotome sinus floor elevation with or without grafting: a 3-year randomized controlled clinical trial. J Clin Periodontol. 2013;40(4):396-403. doi: 10.1111/jcpe.12066. Epub 2013 Feb 21. PMID: 23425152.
6. Plonka AB, Urban IA, Wang HL. Decision Tree for Vertical Ridge Augmentation. Int J Periodontics Restorative Dent. 2018;38(2):269-275. doi: 10.11607/prd.3280. PMID: 29447321.
7. Ye M, Liu W, Cheng S, Yan L. Outcomes of implants placed after osteotome sinus floor elevation without bone grafts: a systematic review and meta-analysis of single-arm studies. Int J Implant Dent. 2021;7(1):72. doi: 10.1186/s40729-021-00358-3. PMID: 34368916; PMCID: PMC8349946.
8. Urban IA, Monje A, Lozada J, Wang HL. Principles for Vertical Ridge Augmentation in the Atrophic Posterior Mandible: A Technical Review. Int J Periodontics Restorative Dent. 2017;37(5):639-645. doi: 10.11607/prd.3200. PMID: 28817126.
9. Urban IA, Monje A. Guided Bone Regeneration in Alveolar Bone Reconstruction. Oral Maxillofac Surg Clin North Am. 2019;31(2):331-338. doi: 10.1016/j.coms.2019.01.003. PMID: 30947850.
10. Naenni N, Lim HC, Papageorgiou SN, Hämmerle CHF. Efficacy of lateral bone augmentation prior to implant placement: A systematic review and meta-analysis. J Clin Periodontol. 2019;46 Suppl 21:287-306. doi: 10.1111/jcpe.13052. PMID: 30624791.
11. Al-Moraissi EA, Alkhutari AS, Abotaleb B, Altairi NH, Del Fabbro M. Do osteoconductive bone substitutes result in similar bone regeneration for maxillary sinus augmentation when compared to osteogenic and osteoinductive bone grafts? A systematic review and frequentist network meta-analysis. Int J Oral Maxillofac Surg. 2020;49(1):107-120. doi: 10.1016/j.ijom.2019.05.004. Epub 2019 Jun 21. PMID: 31230768.
12. Monje A, Monje F, Galindo-Moreno P, Montanero-Fernandez J, Suarez F, Wang HL. Microstructural and densiometric analysis of extra oral bone block grafts for maxillary horizontal bone augmentation: a comparison between calvarial bone and iliac crest. Clinical Oral Implants Research [Internet]. 2013; 25(6):659-64. doi.org/10.1111/clr.12159
13. Al-Nawas B, Schiegnitz E. Augmentation procedures using bone substitute materials or autogenous bone - a systematic review and meta-analysis. Eur J Oral Implantol. 2014 Summer;7 Suppl 2:S219-34. PMID: 24977257.
14. Vincent-Bugnas S, Laurent J, Naman E, Charbit M, Borie G. Treatment of multiple gingival recessions with xenogeneic acellular dermal matrix compared to connective tissue graft: a randomized split-mouth clinical trial. J Periodontal Implant Sci. 2021;51(2):77-87. doi: 10.5051/jpis.2002400120. PMID: 33913631; PMCID: PMC8090794.
15. Koudale SB, Charde PA, Bhongade ML. A comparative clinical evaluation of acellular dermal matrix allograft and sub-epithelial connective tissue graft for the treatment of multiple gingival recessions. J Indian Soc Periodontol. 2012;16(3):411-6. doi: 10.4103/0972-124X.100921. PMID: 23162338; PMCID: PMC3498713.
16. Temmerman A, Cortellini S, Van Dessel J, De Greef A, Jacobs R, Dhondt R, Teughels W, Quirynen M. Bovine-derived xenograft in combination with autogenous bone chips versus xenograft alone for the augmentation of bony dehiscences around oral implants: A randomized, controlled, split-mouth clinical trial. J Clin Periodontol. 2020;47(1):110-119. doi: 10.1111/jcpe.13209. Epub 2019 Nov 5. PMID: 31602699
17. Meloni SM, Jovanovic SA, Urban I, Canullo L, Pisano M, Tallarico M. Horizontal Ridge Augmentation using GBR with a Native Collagen Membrane and 1:1 Ratio of Particulated Xenograft and Autologous Bone: A 1-Year Prospective Clinical Study. Clin Implant Dent Relat Res. 2017;19(1):38-45. doi: 10.1111/cid.12429. Epub 2016 Jun 9. PMID: 27283920.
18. Hamada Hamed MM. Vestibular Socket Therapy in Immediate Implants with Grafting Materials. 2021. Available at: https://clinicaltrials.gov/ct2/show/NCT04957654
19. Kiruthiga P, Sabarigirinathan S, Rupkumar P, Prasanakumar D. Una revisión sistemática para determinar la eficacia de las técnicas de preservación del zócalo en la población adulta en ensayos controlados aleatorios de boca dividida. 2020. PROSPERO CRD4 2020177085 NIHR.2020.

20. Victor C, Mariela P, Eliana A, Maria G, Miguel R, Izabel F, Heitor H, Elcia V, Helio T, Simone S. Sustitutos óseos versus injerto óseo autógeno en la regeneración de procesos alveolares maxilares con resorción ósea vertical: una revisión sistemática y metanálisis. Parte 2. PROSPERO 2017 CRD42017071628. NIHR. 2022.

21. Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac Surg. 1988;17(4):232-6. doi: 10.1016/s0901-5027(88)80047-x. PMID: 3139793.

Appendix 1. Systematic search in databases.

Database	Search strategy
Epistemonikos	(title:((title:(((((((((periodontal intraosseous defect) OR (periodontal bone loss) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft) OR (xenologous bone grafts)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft)) OR (autograft)) OR abstract:((((((((((periodontal intraosseous defect) OR (periodontal bone loss)) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft) OR (xenologous bone grafts)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft) OR (autograft)))) OR abstract: ((title:((((((((((periodontal intraosseous defect) OR (periodontal bone loss) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft) OR (xenologous bone grafts)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft)) OR (autograft)) OR abstract:((((((((((periodontal intraosseous defect) OR (pe rodontal bone loss)) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft) OR (xenologous bone grafts)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft) OR (autograft)))))
PubMed/Medline	(((((((((periodontal intraosseous defect) OR (periodontal bone loss)) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft)) OR abstract:((((((((((periodontal intraosseous defect) OR (periodontal bone loss)) OR (periodontal Supraosseous defects)) AND (xenografts)) OR (Bone xenograft)) OR (bone substitute xenograft)) AND (autologous bone graft)) OR (autologous bone)) OR (autologous graft)))

ISSN Print 0719-2460 - ISSN Online 0719-2479.