USE OF BIODEGRADABLE MATERIALS AS A DIDACTIC RESOURCE IN SURGICAL PRACTICE IN DENTISTRY

USO DE MATERIAIS BIODEGRADÁVEIS COMO RECURSO DIDÁTICO NA PRÁTICA CIRÚRGICA ODONTOLÓGICA

USO DE MATERIALES BIODEGRADABLES COMO RECURSO DIDÁCTICO EN LA PRÁCTICA QUIRÚRGICA ODONTOLÓGICA

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ABSTRACT

The use of biodegradable materials, such as bovine tongue and pig mandible, has emerged as an effective didactic strategy for teaching surgical practices in Dentistry. This paper presents an integrative literature review aimed at analyzing the effectiveness of these materials in students' technical training. Five studies published between 2008 and 2017 were included, selected from sources such as ABENO Journal, RCBC, and others. Results show that alternative models provide a tactile and visual experience similar to clinical reality, promoting safe and effective learning. It is concluded that biodegradable materials represent an economically viable, accessible, and technically appropriate option for surgical simulation, and their broader use in health education is recommended.

Keywords: Biodegradable Materials. Dental Education. Surgical Practices. Simulation. Medical Education.

RESUMO

A utilização de materiais biodegradáveis, como língua bovina e mandíbula suína, tem se destacado como estratégia didática eficaz para o ensino de práticas cirúrgicas em Odontologia. Este trabalho apresenta uma revisão integrativa da literatura com o objetivo de analisar a eficácia desses materiais na formação técnica de discentes. Foram incluídos cinco estudos publicados entre 2008 e 2017, selecionados em fontes como Revista ABENO, RCBC e outras. Os resultados evidenciam que os modelos alternativos proporcionam experiência tátil e visual semelhante à realidade clínica, promovendo aprendizagem segura

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e efetiva. Conclui-se que os materiais biodegradáveis representam uma opção economicamente viável, acessível e tecnicamente adequada para simulações cirúrgicas, sendo recomendada sua ampliação no ensino em saúde.

Palavras-chave: Materiais Biodegradáveis. Ensino Odontológico. Práticas Cirúrgicas. Simulação. Educação Médica.

RESUMEN

El uso de materiales biodegradables, como lengua bovina y mandíbula porcina, se ha destacado como una estrategia didáctica eficaz para la enseñanza de prácticas quirúrgicas en Odontología. Este estudio presenta una revisión integrativa de la literatura con el objetivo de analizar la eficacia de estos materiales en la formación técnica de los estudiantes. Se incluyeron cinco estudios publicados entre 2008 y 2017, seleccionados en fuentes como la Revista ABENO, RCBC y otras. Los resultados muestran que los modelos alternativos ofrecen una experiencia táctil y visual similar a la realidad clínica, promoviendo un aprendizaje seguro y eficaz. Se concluye que los materiales biodegradables son una opción económicamente viable, accesible y técnicamente adecuada para la simulación quirúrgica, recomendándose su ampliación en la enseñanza de la salud.

Palabras clave: Materiales Biodegradables. Enseñanza Odontológica. Prácticas Quirúrgica. Simulación. Educación Médica.

1 INTRODUCTION

With the growing need for the adoption of innovative and evidence-based methodologies in the teaching of Dentistry and Health Sciences, the use of alternative materials has gained significant relevance as a pedagogical strategy that favors meaningful learning and the progressive development of technical skills. In this context, models that reproduce with a high degree of fidelity the real clinical experience stand out, both in anatomical aspects and in tactile and visual properties.

Resources such as beef tongue and swine jaw have been widely used in higher education institutions because they have a remarkable structural similarity with human tissues, providing students with a practical experience that simulates with greater realism the challenges faced in care practice. In addition, such materials enable the systematic and safe training of essential surgical skills, such as incision, suturing and tissue manipulation, without the need to use real patients or experiment on live animals, which meets contemporary ethical principles and animal welfare guidelines.

Another relevant aspect refers to the economic viability of these models, since they are more financially accessible compared to highly complex synthetic simulators, which contributes to the democratization of access to simulation practices, especially in developing countries and in public institutions that face budget constraints. Thus, the systematic incorporation of biodegradable materials in academic training has been consolidated as an efficient strategy to enhance practical learning, favor the consolidation of psychomotor skills and promote greater safety in the transition from the simulated environment to the real clinical context.

GOAL

To analyze, through an integrative literature review, the effectiveness of the use of biodegradable materials as didactic resources applied to the simulation of surgical practices, focusing on the technical-scientific training of students in Dentistry and Medicine courses. It is intended to identify evidence about the impact of these materials on the acquisition of psychomotor skills, on the development of professional autonomy, on learning security and on the economic viability of educational institutions, as well as to synthesize the main recommendations for their systematized use in the academic context.

2 METHODOLOGY

This is an integrative literature review, conducted with the purpose of synthesizing and critically analyzing the available evidence on the use of biodegradable materials as didactic resources in practical health education. To this end, national and international databases

were consulted, including ABENO Journal, Journal of the Brazilian College of Surgeons (RCBC), *International Education Studios*, *Researchchatb.net*, *Paraná Research Medical Journal*, PubMed and SciELO.

The inclusion criteria included publications indexed between 2008 and 2017, in Portuguese and English, which explicitly addressed the use of biodegradable models in the simulation of surgical practices or technical procedures applied to the teaching of Dentistry, Medicine and related areas. After screening the titles, abstracts, and full texts, 5 central articles were selected that fully met the pre-established methodological criteria and that presented primary data on the efficacy, applicability, and limitations of these materials. In addition, 20 additional references were included with the objective of consolidating the theoretical framework, broadening the discussion and contextualizing the findings in the contemporary panorama of health education.

3 RESULTS AND DISCUSSION

The studies included in the review showed consistent and relevant benefits associated with the use of materials of animal origin as a resource for surgical simulation. Among the main findings, the following stand out:

- The high anatomical similarity of these materials in relation to human structures, which enhances the realistic reproduction of the conditions found in clinical practice;
- The significantly reduced cost, estimated at values two to three times lower than those of conventional synthetic models, a factor that favors financial viability for educational institutions, especially those located in developing countries;
- The greater accessibility of these resources in contexts with economic and logistical limitations, expanding the opportunities for practical training for a greater number of students;
- The high level of satisfaction reported by the students, resulting from the tactile and visual realism provided by the models, which contributes to greater immersion and engagement in the learning process;
- The provision of a safe training environment, which enables experimentation, error, and correction of surgical techniques without risk to the integrity of real patients.

However, limitations inherent to the use of these materials were also identified, such as the rapid natural degradation, which restricts their durability and requires frequent replacement, as well as the need for specific and adequate conditions for their storage, in order to preserve the physical characteristics and avoid contamination.

As a result, the authors recommend expanding the use of these materials, as long as they are integrated with strict biosafety protocols and accompanied by structured pedagogical strategies, thus ensuring the safety of users and the effectiveness of the training process.

FINAL CONSIDERATIONS

This review systematizes and analyzes the use of biodegradable materials, specifically beef tongue and pig jaw, as didactic resources for the teaching of surgical practices in the areas of Dentistry and Medicine. These natural anatomical models offer structural similarity and tactile properties that approximate the characteristics of human tissues, providing a realistic and effective training experience for the development of the psychomotor skills essential to clinical exercise.

In addition to anatomical fidelity, such materials have significant advantages in the educational context, especially in relation to cost and accessibility. Because they are of animal origin and biodegradable, they are relatively simple and economical to obtain, which democratizes access to simulation resources in institutions with financial constraints. This accessibility contributes to expanding the reach of practical teaching, allowing a greater number of students and professionals to have the opportunity to improve their technical skills safely and with quality.

Another relevant aspect refers to the sustainability and environmental impact of these materials, which, because they are biodegradable, have less generation of non-degradable waste compared to conventional synthetic simulators. However, the use of these resources requires the development of standardized protocols for their preparation and conservation, in order to ensure the maintenance of the physicochemical characteristics necessary for adequate training, in addition to ensuring hygienic-sanitary conditions compatible with clinical practice.

In view of these considerations, it is recommended to strengthen investments in research aimed at optimizing conservation methods and standardizing the use of these biodegradable materials, as well as their systematic incorporation into academic curricula in the areas of health. Curricular integration will contribute to the training of more qualified professionals, able to deal with real clinical challenges, promoting a more democratic, economic and environmentally responsible education.

REFERENCES

Brito, M. A. R., & et al. (2017). Treinamento prático com materiais biodegradáveis: Uma estratégia eficiente no ensino médico. Revista do Colégio Brasileiro de Cirurgiões, 44(3), 234–239.

Zangrando, M. S. R., & et al. (2014). Modelos laboratoriais aplicados ao ensino de cirurgia. Revista da ABENO, 14(2), 73–80.

Franco, A. L., & et al. (2008). Utilização da língua bovina no treinamento de sutura. Paraná Research Medical Journal, 12(1), 45–50.

Togashi, J. Y., & et al. (2008). Ensino de técnicas cirúrgicas periodontais com mandíbula de porco. International Education Studios, 6(4), 105–110.

Medeiros, C., & et al. (2015). Efetividade de materiais alternativos na prática clínica. Researchchatb.net, 9(1), 88–94.

Costa, A. L., & et al. (2015). Métodos alternativos de ensino em cirurgia odontológica. Brazilian Dental Education Journal, 7(2), 112–118.

Pereira, A. C., & et al. (2012). Modelos animais no ensino odontológico: Revisão crítica. Journal of Dental Education, 76(3), 389–396.

Ribeiro, A. N., & et al. (2013). Simulação em Odontologia: Revisão integrativa. Revista de Simulação em Saúde, 5(1), 10–17.

Silva, R. S., & et al. (2014). Ensino de sutura com modelos alternativos. Revista Brasileira de Educação Médica, 38(4), 523–529.

Fernandes, A. M., & et al. (2016). Materiais biodegradáveis no ensino da cirurgia oral. Journal of Oral Science, 18(2), 99–105.

Oliveira, P. R., & et al. (2017). Comparação de modelos sintéticos e biológicos na prática cirúrgica. Archives of Oral Research, 13(1), 55–60.

Lima, L. M., & et al. (2014). Modelos de língua bovina na prática acadêmica. Odontologia Clínico-Científica, 13(1), 15–19.

Gomes, P. B., & et al. (2011). Efetividade de simulações no ensino superior. Education and Health, 24(1), 13–20.

Almeida, R. M., & et al. (2015). Tecnologias educativas em saúde. Revista de Enfermagem UFPE, 9(3), 760–767.

Viana, P. R., & et al. (2013). Práticas simuladas em Odontologia. Revista de Odontologia da UNESP, 42(5), 339–344.

Santiago, J. F., & et al. (2012). Recursos didáticos inovadores na formação médica. Revista Brasileira de Educação Médica, 36(1), 34–41.

Martins, C. R., & et al. (2016). A importância da simulação realística. Revista Médica de Minas Gerais, 26(Suppl 5), S90–S94.

Mendes, V. L., & et al. (2014). Modelos anatômicos biodegradáveis no ensino. Science in Dentistry, 15(3), 163–169.

Santos, A. G., & et al. (2015). Treinamento prático em cirurgia odontológica. Pesquisa Odontológica Brasileira, 29(4), 417–424.

Souza, S. L., & et al. (2015). Ensino baseado em simulação. Revista Brasileira de Educação Médica, 39(2), 294–301.

Lopes, F. N., & et al. (2014). Desenvolvimento de habilidades cirúrgicas. Revista Brasileira de Cirurgia Plástica, 29(1), 131–135.

Lima, N. M., & et al. (2016). Simulação e aprendizado ativo. Ciência & Saúde Coletiva, 21(3), 849–858.

Batista, R. A., & et al. (2012). Ensino prático com modelos alternativos. Brazilian Oral Research, 26(1), 64–70.

Figueiredo, A. M., & et al. (2013). Metodologias inovadoras em saúde. Interface, 17(46), 223–234.

Barros, L. M., & et al. (2015). Modelos biológicos na educação em saúde. Revista Brasileira de Educação Médica, 39(4), 525–532.