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Stem cells and diabetes: Compassionate care with comfort, a humanized reflection

Células-tronco e diabetes: Cuidado compassivo com conforto, uma reflexão humanizada

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ABSTRACT

The objective of this study was to analyze the role of stem cells in Diabetes Mellitus, adopting the humanized perspective of Kolcaba's Comfort Theory. The methodology used a reflexive approach, reviewing literature on platforms such as Google Scholar and PubMed. The results highlighted the ability of stem cells to regenerate tissue in T1D, offering a promising insight. Scientific evidence has revealed the versatility of stem cells, not only in insulin replacement, but in differentiation into various cell lines, expanding the therapeutic spectrum. The discussion addressed challenges including heterogeneity in individual responses, optimization of cell differentiation, and ethical issues. The Comfort Theory enriched the analysis by highlighting the importance of compassionate care, promoting humanized practices and considering emotional dimensions. In stem cell transplantation, attention to the patient's emotional well-being, psychological support, and effective communication were crucial. Methodological limitations were recognized, suggesting more in-depth approaches in future research, and practical implications were highlighted, proposing the integration of the Comfort Theory in the therapeutic approach to optimize the care of patients with Diabetes Mellitus.

Keywords: Stem cells, Stem cell research, Diabetes mellitus, Nursing care, Therapeutics.

INTRODUCTION

The contextualization of this study is based on the urgent need for innovative therapeutic approaches in view of the significant prevalence and relevance of Diabetes Mellitus (DM) today.

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DM, a chronic metabolic disease characterized by dysfunctions in the production or use of insulin, significantly impacts the quality of life of affected individuals and is a growing challenge for health systems on a global scale1.

The prevalence of DM has reached epidemic proportions, becoming one of the main causes of morbidity and mortality in several regions of the world. The complexity of this pathology, combined with its systemic complications, imposes a substantial burden on both patients and health systems. In this context, the incessant search for effective and innovative therapeutic approaches becomes imperative1,2.

The in-depth understanding of the pathophysiological basis of DM and the search for interventions capable of reversing or modulating these processes represent constant challenges for the scientific community. Among the various strategies investigated, stem cell therapies emerge as a promising area, offering potential for the regeneration of damaged tissues and the restoration of metabolic homeostasis1-3.

The presentation of the relevance and prevalence of diabetes is based on the epidemiological magnitude and clinical impacts of this condition, demanding a comprehensive and innovative approach in the therapeutic field. Diabetes mellitus (DM) is a chronic disease that transcends its metabolic manifestations, representing a global concern due to its alarming prevalence and adverse implications for public health2,3.

The clinical relevance of DM is intrinsically associated with its exponential spread, and it is considered one of the main epidemics of the twenty-first century. The World Health Organization (WHO) estimates that more than 420 million people are affected by this condition, and projections indicate a substantial increase in this number in the coming decades. DM not only compromises the quality of life of individuals, but also exerts a significant burden on health systems, resulting in high costs associated with treatment and related complications3.

The complexity of MD transcends its metabolic nature, involving an intricate network of genetic, environmental, and behavioral factors. In addition to the challenge inherent in blood glucose management, diabetic patients face increased risks of developing macro and microvascular complications, impacting vital organs such as the heart, kidneys, eyes, and nervous system. In this context, the urgent need for innovative therapeutic strategies is evident, aiming not only at glycemic control, but also at the prevention and effective management of associated complications.

The emphasis on the search for new therapeutic approaches in diabetes reveals the continuous need for innovation in the face of the challenges inherent in the treatment of this

multifaceted condition. The traditional paradigm of interventions, although crucial, faces significant limitations, especially in the context of type 1 diabetes mellitus (DM1), where absolute insulin deficiency demands more comprehensive and long-lasting therapeutic strategies1.

The current scenario of scientific research highlights stem cells as promising protagonists in the field of tissue regeneration and repair. The intrinsic capacity of these cells to differentiate into several cell types, including insulin-producing cells, offers a unique perspective for the development of innovative therapies in T1D. This approach transcends simple insulin replacement, aiming at the effective restoration of compromised pancreatic functions4.

Given the above, the objective of this article is to critically analyze the role played by stem cells in the management of Diabetes Mellitus, adopting the perspective of Kolcaba's Comfort Theory. In this context, attention will be directed to the integration of the therapeutic properties of stem cells not only in the biomedical sphere, but also in the promotion of humanized care practices. Nursing's commitment to providing compassionate care and comfort to the patient is highlighted, considering not only the physiological aspects, but also the emotional and psychosocial dimensions involved in the treatment of diabetes.

METHODOLOGY

This study adopts a reflexive approach, characterized by its descriptive and critical nature, developed from a review of the updated scientific literature. The research is based on scientific journals indexed in the Google Scholar, PubMed and Virtual Health Library (VHL), using pertinent Health Sciences Descriptors (DeCS), such as "Stem Cells", "Stem Cell Research", "Diabetes Mellitus", "Nursing Care" and "Therapeutics". The search strategy involved the use of Boolean operators "*AND*" and "*OR*".

As inclusion criteria, studies were established in the format of scientific articles, published in 2023 in the pre-established indexing databases and in Portuguese and English languages. Exclusion criteria were studies that were not available free of charge and in full.

The process of searching, selecting, and analyzing the studies was carried out during the months of November and December 2023. Only one study, published in 2014, was selected and used outside the time frame established due to its extreme relevance when using the theory discussed here with the treatment of DM.

The analysis of the results follows a qualitative approach, identifying trends and patterns in the literature reviewed. Kolcaba's Comfort Theory was adopted as a theoretical foundation to

support critical reflection throughout the study, highlighting the importance of compassionate care and humanization in the use of stem cells in the treatment of diabetes.

The present methodology provides a solid basis for the reflexive analysis of the role of stem cells in the context of diabetes mellitus, integrating perspectives of stem cell research, nursing care and therapeutics.

RESULTS AND DISCUSSION

For a better understanding of the findings and critical discussion, the following categories were elaborated: Scientific Evidence, Critical Discussion on Advances and Challenges in Stem Cell Therapy in Diabetes Mellitus, Application of Comfort Theory in the Context of Stem Cell Treatment for Diabetes Mellitus, and Emphasis on Patient Well-Being in the Stem Cell Transplantation Process.

SCIENTIFIC EVIDENCE

By deepening the review of studies investigating the use of stem cells in the context of diabetes mellitus, an encouraging perspective emerges in the face of the converging results. The pathophysiological complexity of type 1 diabetes mellitus (DM1), characterized by an absolute insulin deficiency, has been the subject of intense research, and advances in this area point to promising therapeutic possibilities4,5.

Scientific evidence suggests that stem cells have a remarkable ability to modulate the pathophysiological processes associated with diabetes mellitus. They act not only in the replacement of insulin, but also in the regulation and restoration of compromised intrinsic mechanisms. This ability to intervene in different metabolic pathways and cell signaling makes stem cells a multifaceted tool in the management of DM14,6.

The regeneration of damaged tissues, with a special focus on the restoration of pancreatic functions, emerges as a focal point in the reviewed studies. Stem cells have the unique ability to differentiate into insulin-producing cells, providing an innovative approach to address the insulin deficiency characteristic of T1D. The functional restoration of the pancreas, which goes beyond the simple administration of exogenous insulin, represents a significant advance in the treatment of this condition[5,6].

In addition to differentiation into insulin-producing cells, the studies highlight the intrinsic versatility of stem cells. Their ability to differentiate into several cell types, such as osteoblasts, adipocytes, and endothelial cells, broadens the therapeutic spectrum. Understanding

this cellular plasticity opens the door to more comprehensive interventions, considering not only the restoration of pancreatic function, but also the attenuation of associated complications, such as vascular and bone changes5-7.

The broad therapeutic potential of stem cells is a promising strategy in the treatment of diabetes mellitus. Its ability to act on different fronts, ranging from the restoration of pancreatic function to the modulation of metabolic and vascular processes, stands out as a crucial point. Research points to an era of more personalized treatments, adapted to the specific needs of each patient4,7.

In summary, the in-depth analysis of the scientific evidence supports the optimistic position regarding the role of stem cells in the context of diabetes mellitus. However, it is imperative to recognize that challenges, such as standardization of protocols and full understanding of mechanisms of action, still require intensive investigation. The trajectory towards effective clinical implementation demands an ongoing commitment to translational research and an integrated approach across the various biomedical disciplines.

CRITICAL DISCUSSION ON ADVANCES AND CHALLENGES IN STEM CELL THERAPY IN DIABETES MELLITUS

Despite the promising advances outlined in the reviewed studies, it is imperative to conduct a critical analysis of the intrinsic challenges associated with stem cell therapy in the management of Diabetes Mellitus. The complexity of the pathophysiology of diabetes, combined with the diversity of individual responses, represents a substantial challenge in the clinical implementation of these innovative therapies.

Heterogeneity in individual responses to stem cell therapy emerges as a central challenge. Each patient has unique characteristics, including genetic variations, metabolic status, and overall health conditions. This diversity can significantly influence the efficacy of stem cell therapies, requiring a personalized approach to maximize clinical benefits5,8.

Optimizing cell differentiation conditions is a critical consideration in the efficacy of stem cell therapies. The ability to target stem cells to specific strains, such as insulin-producing strains, requires a deep understanding of the biochemical and molecular signals involved. The development of precise and standardized protocols is essential to ensure the consistency and efficacy of therapeutic interventions7-9.

The ethical issues linked to the source of the stem cells also demand critical attention. The choice of source, whether tissue or embryonic, raises ethical debates and considerations

about safety and social acceptance. It is imperative to establish clear and normative guidelines that guide the ethical use of stem cells, ensuring integrity and transparency in therapeutic procedures10.

Despite initial advances, the urgent need for long-term studies persists. Evaluating the long-term safety and efficacy of stem cell therapies is crucial to substantiate their clinical implementation in a robust manner. Monitoring patients over extended periods will allow for the identification of potential adverse effects and the assessment of the sustainability of therapeutic benefits.

An in-depth understanding of the mechanisms underlying the differentiation and integration of stem cells into tissues is a key element in the search for more effective and safer approaches. Investigating the complex interactions between stem cells and the local microenvironment is essential to optimize therapeutic efficacy and minimize potential risks4,8,10.

Given the above, stem cell therapy in diabetes mellitus presents promising advances, but the aforementioned challenges highlight the need for a cautious and multidisciplinary approach. Progress in this area requires not only scientific innovation, but also rigorous ethical and social consideration, ensuring that proposed therapies are safe, effective, and ethical.

APPLICATION OF COMFORT THEORY IN THE CONTEXT OF STEM CELL TREATMENT FOR DIABETES MELLITUS

By integrating Kolcaba's Comfort Theory into the context of stem cell treatment for diabetes mellitus, an approach that transcends the limits of the biomedical sphere is evidenced, incorporating essential elements for the promotion of humanized care practices[11].

The Comfort Theory underscores the importance of compassionate care, emphasizing the need to consider the emotional dimensions of patients during stem cell treatment. The journey of the patient with diabetes mellitus is intrinsically marked by emotional challenges, from diagnosis to the therapeutic process. Understanding and addressing patients' anxieties, fears and expectations contributes to the construction of a solid and patient-centered therapeutic relationship12.

The Comfort Theory highlights the importance of humanized practices, recognizing that effective care goes beyond purely clinical aspects. In the context of stem cell therapies, the humanization of care implies a therapeutic environment that respects the individuality of the

patient. This translates into open communication, detailed informed consent, and the creation of a space where the patient's concerns are heard and fully considered12.

Understanding patients' emotional needs is essential for a holistic and patient-centered approach. Diabetes Mellitus is not just a metabolic condition, but an experience that affects quality of life and emotional well-being. By applying the Comfort Theory, health professionals can tailor therapeutic interventions to provide not only physical relief but also significant emotional support12,13.

Creating an open dialogue about the therapeutic process, including potential benefits and challenges, contributes to managing patient expectations. Comfort Theory underscores the importance of transparent communication to build trust and reduce anxiety associated with the unknown. This not only enhances the patient experience, but also strengthens the partnership between healthcare professionals and individuals undergoing treatment13,14.

The Comfort Theory guides ethical decision-making, placing humanization at the center of clinical practices. The discussion about therapeutic options, including the use of stem cells, should incorporate an ethical approach that considers respect for patient autonomy, beneficence, and justice. The active involvement of patients in therapeutic decisions strengthens their autonomy and contributes to a more empowering experience13,14.

In summary, the application of the Comfort Theory in stem cell treatment for diabetes provides a humanized, patient-centered and ethical approach. This perspective enriches the therapeutic context, providing not only physical relief, but also emotional comfort and respect for the patient's individuality.

HIGHLIGHTING PATIENT WELL-BEING IN THE STEM CELL TRANSPLANT PROCESS

The stem cell transplantation process, although promising in therapeutic terms, presents intrinsic challenges that require special attention to the patient's well-being. The complexity of the intervention, associated with the chronic nature of diabetes mellitus, highlights the importance of strategies aimed not only at clinical efficacy, but also at the emotional comfort and quality of life of the individual throughout all phases of treatment5,9.

Psychological support during the stem cell transplant process is essential to mitigate the emotional impact that often accompanies complex medical procedures. The uncertainty associated with the outcome of the transplant, the expectations regarding clinical improvement, and the adaptation to lifestyle changes demand an interdisciplinary approach. Health professionals, especially specialized nurses, play a crucial role in providing emotional support,

educating patients about the steps of the procedure, and assisting in the construction of coping strategies12,13.

Effective communication is a key pillar for patient well-being during stem cell transplantation. Establishing an open, transparent, and understandable dialogue about the risks, benefits, and potential challenges of the procedure promotes patient empowerment. The ability to make informed decisions, combined with the continuous support of the health team, contributes to a more positive experience and to the construction of a solid partnership between patient and health professionals13,14.

Managing expectations is crucial for the patient's emotional balance. Frankish discussion of expected outcomes, possible complications, and realistic timelines contribute to a realistic understanding of the transplantation process. In addition, adaptive *coping* strategies are essential to help the patient cope with the stress and anxiety associated with treatment. Continuous support in the development and implementation of these strategies is an integral part of patient care12.

The role of nursing in this context is multifaceted. In addition to ensuring the technical effectiveness of the procedure, nurses have the responsibility to assess and address the patient's emotional needs. This involves the implementation of practices based on the Comfort Theory, promoting empathy, compassion and personalization of care to meet the specific demands of each patient during the transplantation process13,14.

By integrating the Comfort Theory with scientific evidence, the need for a comprehensive and humanized approach to stem cell treatment for diabetes is highlighted. Promising advances must be balanced with diligent attention to the psychosocial challenges faced by patients. Ongoing collaboration between the scientific community, healthcare professionals, and patients is imperative to optimize therapeutic benefits and promote the integral well-being of the individual throughout this challenging journey.

FINAL THOUGHTS

In the synthesis of the results, we highlight the promising perspective of stem cells in the management of Diabetes Mellitus, evidenced by their ability to modulate pathophysiological processes and regenerate compromised tissues. Heterogeneity in individual responses, optimization of differentiation conditions, and ethical issues associated with stem cell therapy emerge as crucial challenges that require personalized and thoughtful approaches. An in-depth

understanding of the underlying mechanisms and the search for standardized protocols are critical to effective advancements.

Kolcaba's Comfort Theory has significantly enriched our critical analysis, going beyond biomedical aspects and incorporating a humanized perspective. By applying the theory, we highlight the importance of compassionate care, transparent communication, and emotional support, contributing to a holistic therapeutic approach. The Comfort Theory guided ethical decisions, promoted the humanization of care, and strengthened the therapeutic relationship, recognizing the emotional and psychosocial dimensions of the patient.

We recognize some methodological limitations inherent to the reflexive nature of this research. The reliance on secondary sources and the absence of primary data may have impacted the depth of the analysis. In addition, variability in the methodologies of the reviewed studies may introduce bias in the synthesis of results. It is crucial to consider these limitations when interpreting the findings and suggest more in-depth approaches in future investigations.

To advance the understanding of the role of stem cells in MD, we recommend future research that adopts more standardized approaches, with uniform cell differentiation protocols. Long-term studies, considering the heterogeneity of patients, can offer valuable insights into long-term safety and efficacy. In addition, investigations on the specific interactions of stem cells with the local microenvironment can improve therapeutic strategies.

The results of this research have significant practical implications for the clinical approach to DM. The consideration of the Comfort Theory suggests that a humanized practice, with an emphasis on the emotional needs of patients, can improve the therapeutic experience. Transparent communication about therapeutic options, integrating the Comfort Theory, can strengthen the relationship between health professionals and patients. We suggest the integration of educational programs that address not only the biomedical aspects, but also the emotional dimensions of MD.

To optimize the application of the Comfort Theory in the therapeutic approach, we propose the incorporation of specific training for health professionals, highlighting the importance of empathy, effective communication, and emotional support. In addition, the creation of clinical protocols that consider the ethical guidelines of the Comfort Theory can provide a solid basis for humanized practices. Interdisciplinary collaboration among healthcare professionals, including specialized nurses, can enhance the effective application of theory in the clinical setting.

In conclusion, this research offers a comprehensive and critical view on the role of stem cells in the management of Diabetes Mellitus, enriched by the humanized perspective of the Comfort Theory. We recognize the limitations of the study and encourage future research that deepens our understanding, aiming for significant advances in stem cell therapy and quality of life for DM patients.

REFERENCES

Antar, S. A., Ashour, N. A., Sharaky, M., Khattab, M., Ashour, N. A., Zaid, R. T., Roh, E. J., Elkamhawy, A., & Al-Karmalawy. (2023). Diabetes mellitus: Classification, mediators, and complications; A gate to identify potential targets for the development of new effective treatments. *Biomedicine & Pharmacotherapy, 168*, 115734. https://doi.org/10.1016/j.biopha.2023.115734

Sasako, T., Yamauchi, T., & Ueki, K. (2023). Intensified Multifactorial Intervention in Patients with Type 2 Diabetes Mellitus. *Diabetes & Metabolism Journal, 47*(2), 185-197. https://doi.org/10.4093/dmj.2022.0325

Bloomgarden, Z. (2023). A diabetes update. *Journal of Diabetes, 15*(7), 542-544. https://doi.org/10.1111/1753-0407.13434

Hogrebe, N. J., Ishahak, M., & Millman, J. R. (2023). Developments in stem cell-derived islet replacement therapy for treating type 1 diabetes. *Cell Stem Cell, 30*(5), 530-548. https://doi.org/10.1016/j.stem.2023.04.002

Neumann, M., Arnould, T., & Su, B. L. (2023). Encapsulation of stem-cell derived β-cells: A promising approach for the treatment for type 1 diabetes mellitus. *Journal of Colloid and Interface Science, 636*, 90-102. https://doi.org/10.1016/j.jcis.2022.12.123

Hatipoglu, B. A., & Blanchette, J. (2023). Islet Cell Therapy and Stem Cell Therapy for Type 1 Diabetes: There Will Always Be a Hope. *Endocrinology and Metabolism Clinics of North America, 52*(1), 187-193. https://doi.org/10.1016/j.ecl.2022.07.001

Goyal, P., & Malviya, R. (2023). Stem Cell Therapy for the Management of Type 1 Diabetes: Advances and Perspectives. *Endocrine, Metabolic & Immune Disorders Drug Targets*. https://doi.org/10.2174/1871530325658223091909353 5

Tajali, R., Eidi, A., Tafti, H. A., Pazouki, A., Kamarul, T., & Sharifi, A. M. (2023). Transplantation of adipose derived stem cells in diabetes mellitus; limitations and achievements. *Journal of Diabetes & Metabolic Disorders, 22*(2), 1039-1052. https://doi.org/10.1007/s40200-023-01280-8

Çelik, S., Kaynar, L., Güven, Z. T., Begendi, N. K., Demir, F., Keklik, M., & Ünal, A. (2023). The impact of diabetes mellitus on hematopoietic stem cell mobilization, a single center cohort study. *Transfusion and Apheresis Science, 62*(6), 103838. https://doi.org/10.1016/j.transci.2023.103838

Ross, L. F., & Philipson, L. H. (2007). Ethics of hematopoietic stem cell transplantation in type 1 diabetes mellitus. *JAMA, 298*(3), 285-285. https://doi.org/10.1001/jama.298.3.285-a

Jones, I. (2024). Acquisition of Knowledge [Internet]. Bartlett Learning LLC. Recuperado em 2 de janeiro de 2024, de https://samples.jbpub.com/9781284053302/9781284048902_CH03_OnlineCat.pdf

Lin, Y., Zhou, Y., & Chen, C. (2023). Interventions and practices using Comfort Theory of Kolcaba to promote adults' comfort: an evidence and gap map protocol of international effectiveness studies. *Systematic Reviews, 12*(1), 33. https://doi.org/10.1186/s13643-023-02202-8

March, A., & McCormack, D. (2009). Nursing theory-directed healthcare: Modifying Kolcaba's comfort theory as an institution-wide approach. *Holistic Nursing Practice, 23*(2), 75-80. https://doi.org/10.1097/HNP.0b013e3181a1105b

Townsend, C. S., Bonham, E., Chase, L., Dunscomb, J., & McAlister, S. (2014). A comparison of still point induction to massage therapy in reducing pain and increasing comfort in chronic pain. *Holistic Nursing Practice, 28*(2), 78-84. https://doi.org/10.1097/HNP.0000000000000012