

Treatment of Heart Diseases Using Stem Cell Therapy: Cell Types and Regeneration

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SUMMARY. Cardiovascular diseases are the significant determinants of morbidity. Apoptosis in cardiomyocytes impedes cardiac function, generates cardiac decompensation, and culminates in terminal cardiac arrest. Understanding the signaling networks that influence cardiac cell viability provides constructive therapeutic indications about their efficacy. The ability of cardiomyocytes to regenerate and recover itself is constrained. For the effective repair and regeneration of ischemic cardiomyocytes, stem cell treatment is employed. Stem cell therapy has demonstrated to be a potential treatment strategy for cardiovascular disorders in numerous clinical studies. Several stem cell types, notably BMC, CSC, and ESCs and their progenies, are employed in various studies. Although stem cells exhibit multipotency or pluripotency and are capable of regeneration, these processes are adversely affected by the overexpression of apoptosis pathways, which results in a marked reduction in survivability and differentiated signals in response to cardiovascular damage. Investigations that concentrate on preventing the extensive apoptosis following transplantation are extremely limited, despite the successful attempts to determine various cell types and their underlying molecular pathways that enhance heart regeneration of the cardiac tissues. This review outlines significant ongoing clinical trials on stem cells against cardiovascular diseases, and various stem cells employed in the treatment of cardiovascular diseases, their advantages, and limitations.

RESUMEN. Las enfermedades cardiovasculares son los determinantes significativos de la morbilidad. La apoptosis en los cardiomiocitos impide la función cardíaca, genera descompensación cardíaca y culmina en un paro cardíaco terminal. Comprender las redes de señalización que influyen en la viabilidad de las células cardíacas proporciona indicaciones terapéuticas constructivas sobre su eficacia. La capacidad de los cardiomiocitos para regenerarse y recuperarse está restringida. Para la reparación y regeneración eficaz de los cardiomiocitos isquémicos, se emplea el tratamiento con células madre. Se ha demostrado que la terapia con células madre es una posible estrategia de tratamiento para los trastornos cardiovasculares en numerosos estudios clínicos. Varios tipos de células madre, en particular BMC, CSC y ESC y sus progenies, se emplean en varios estudios. Aunque las células madre exhiben multipotencia o pluripotencia y son capaces de regenerarse, estos procesos se ven afectados negativamente por la sobreexpresión de las vías de apoptosis, lo que da como resultado una marcada reducción en la capacidad de supervivencia y señales diferenciadas en respuesta al daño cardiovascular. Las investigaciones que se concentran en prevenir la apoptosis extensa que sigue al trasplante son extremadamente limitadas, a pesar de los intentos exitosos de determinar varios tipos de células y sus vías moleculares subyacentes que mejoran la regeneración cardíaca de los tejidos cardíacos. Esta revisión describe importantes ensayos clínicos en curso sobre células madre contra enfermedades cardiovasculares y varias células madre empleadas en el tratamiento de enfermedades cardiovasculares, sus ventajas y limitaciones.

KEY WORDS: cardiac stem cells, cardiovascular diseases, embryonic stem cells, induced pluripotent stem cells, mesenchymal stem cells.

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