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Validation of Kinetic Stem Cell (KSC) counting algorithms for rapid quantification of human hematopoietic stem cells

Specific quantification of therapeutic tissue stem cells (TSCs) is a major challenge. We recently described a computational simulation method for accurate and specific counting of TSCs. The method quantifies TSCs based on their unique asymmetric cell kinetics, which is rate-limiting for TSCs' production of transiently-amplifying lineage-committed cells and terminally arrested cells during serial cell culture. Because of this basis, the new method is called kinetic stem cell (KSC) counting. Here, we report further validations of the specificity and clinical utility of KSC counting. First, we demonstrate its quantification of the expected increase in the hematopoietic stem cell (HSC) fraction of CD34+-selected preparations of human-mobilized peripheral blood cells, an approved treatment product routinely used for HSC transplantation therapies. Previously, we also used the KSC counting technology to define new mathematical algorithms with the potential for rapid determination of TSC-specific fractions without the need for serial culture. A second important HSC transplantation treatment, CD34+-selected umbilical cord blood (UCB) cells, was used to investigate this prediction. We show that, with an input of only simple population doubling time (PDT) data, the KSC counting-derived "Rabbit algorithms" can be used to rapidly determine the specific HSC fraction of CD34+-selected UCB cell preparations with a high degree of statistical confidence. The algorithms define the stem cell fraction half-life (SCFHL), a new parameter that projects stem cell numbers during expansion culture. These findings further validate KSC counting's potential to meet the long-standing unmet need for a method to determine stem cell-specific dosage in stem cell medicine.

Retrospective Study **Published Date:-2022-09-29 17:46:13**

The outcome of autologous hematopoietic stem cell transplantation in patients with multiple myeloma. The experience of King Fahad Specialist Hospital in Dammam, Saudi Arabia

Background: Aautologous hematopoietic stem cell transplants (HSCT) is the standard of care for newly diagnosed patients with multiple myeloma (MM) who are eligible for autologous transplantation. Although cryopreservation is routinely employed, autologous HSCT can be performed using non-cryopreserved stem cells.
Methods and materials: A retrospective study of patients with MM who received autologous HSCT between the 10th of October 2010 and the 31st of January 2022 at King Fahad Specialist Hospital (KFSH) in Dammam, Saudi Arabia was performed.
Results: Over 11 years and 113 days, a total of 135 autologous HSCTs were performed for 119 patients with MM at our institution. Single autologous HSCTs were performed for 119 patients, while 16 of these patients received either planned tandem autologous transplants or second autografts due to either progression or relapse of their myeloma. The median age of patients with MM at autologous HSCT was 51.5 years. At presentation of their MM, the following high-risk (HR) features were encountered: stage III disease according to the revised international scoring system (RISS) in 12.3%; adverse cytogenetics in 31.93% of patients; advanced bone disease in 60.50%; and renal dysfunction or failure in 11.76% of patients.
A total of 104 autologous HSCTs (77.04%) were performed without cryopreservation while 31 autografts (22.96%) were performed using cryopreserved apheresis stem cell products. Additionally, 54 autologous HSCTs (40.00%) were done at outpatient while 81 autografts (60.00%) were performed in an inpatient setting. Survival for 100 days post-HSCT for all patients with MM who received autologous transplants including those done at outpatient was 100%. The 4 years overall survival (OS) an progression-free survival (PFS) for patients with MM who received non-cryopreserved or fresh autologous HSCTs were 82% and 68% respectively.
Conclusion: Autologous HSCT without cryopreservation is safe, and feasible and can lead to short-term as well as long-term outcomes that are comparable to autologous transplantation with cryopreservation. Non- cryopreserved autologous grafts allow the performance of autologous transplants in an outpatient setting to save beds and reduce costs.

Research Article **Published Date:-2022-08-30 10:30:14**

Use of collagenase to isolate adipose tissue-derived stem cells – substantial manipulation or not?

Background: Collagenase is commonly used to isolate the stromal vascular fraction (SVF) or adipose tissue-derived stem cells (ADSCs) from human adipose tissue. Enzymatic breakdowns may be a substantial manipulation according to the classifications of medical regulatory authorities. This study investigates the possible effects of human adipose tissue dissociation with collagenase on in vitro function and behavior of ADSCs.
Methods and results: Adipose tissue from nine donors was divided into two equal fractions. SVF was then isolated either mechanically or with collagenase, respectively. The resulting cells were analyzed for their surface markers directly after isolation and at passage five. Proliferation, tri-lineage differentiation, and secretome markers were measured after passage four.
Using collagenase compared to mechanical isolation did not alter the expression of typical surface markers of ADSCs. ADSCs isolated with collagenase showed a significantly shorter population doubling time ($p < 0.001$), a significantly higher mean specific GPDH-activity, a stronger intensity in perilipin staining ($p = 0.005$), and a significantly higher extracellular calcium deposition ($p = 0.006$) than mechanically isolated ADSCs. The expression of adipogenic and osteogenic marker genes was not different in mechanically versus enzymatically isolated ADSCs. There were no significant differences in proteoglcyan production ($p > 0.05$) and the concentration of type 2 collagen. Except for an increased CCL2 concentration in mechanically isolated ASDCs ($p = 0.01$), there were no significant differences in the concentration of secreted proteins between both isolation methods.
Conclusions: The use of collagenase does not substantially impair central in vitro characteristics and functions of human adipose tissue-derived stem cells.

Case Report **Published Date:-2022-06-10 09:42:36**

Allogeneic hematopoietic cell transplantation to treat two synchronous hematologic malignancies

Allogeneic hematopoietic cell transplantation often represents the only solution for several poor-prognosis hematologic malignancies. The curative strategy for patients with synchronous hematologic disorders is always difficult and, in most cases, ineffective. Herein, we report an unusual case of synchronous hematologic disorders successfully treated with an “ad-hoc” conditioning regimen followed by allogeneic hematopoietic cell transplantation.

Research Article **Published Date:-2022-04-01 17:37:58**

Age-related changes in cell yield and viability of feline Adipose Tissue-Derived Mesenchymal Stem (fAD-MSCs)

In the present study, omental adipose tissue was collected from, the animals that underwent ovariectomy and ovariohysterectomy, surgical procedures, at the age of seven months to 11/2 years of age groups. The sample was digested with 0.1% (W/V) collagenase type I and transferred to a beaker with a magnetic stirrer and kept in a stirrer with 600 rpm at 37 °C for 30 minutes. The viability of the cell was evaluated by the trypan blue exclusion method using a hemocytometer. Trypan blue had a high affinity to nuclear DNA, which traverse the member in a dead cell and dye it blue. In the present study, the cell yield of fAD-MSCs was 8.15 ± 0.68, 6.55 ± 0.26, 4.85 ± 0.42, 3.90 ± 0.34, and 3.51 ± 0.43 in different age groups viz., 7,8,9 month 1 and 1½ year respectively. In younger age groups, cell yield and viability percentage were more than in animals of higher age groups. In the younger age group, stem cells proliferation status is considered potent for therapeutic application.
