Angiogenic modulation by umbilical cord serum and mesenchymal stem cells secretome

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BACKGROUND AND AIM

Umbilical cord (UC) is a medical waste and its collection is considered the cleanest, easiest and almost risk-free procedure to access one of earliest and primordial pool of mesenchymal stem cells (MSCs). MSCs presents immunomodulatory, non-immunogenic, secretory and paracrine, migratory, proliferative and multipotent properties providing us with MSC-based or MSC-derived biological therapeutics associated with standard homeostatic feedbacks [1]. In fact, there are several benefits of UCMSC in type 2 diabetes (T2D) including a raise in VEGF levels in diabetic ulcers, improving vascularization by increased micro vessel density and blood perfusion [2]. Although UCMSC effects are being widely studied, in some of T2D complications as diabetic cardiomyopathy, little is known. In T2D there is an impairment of the myocardial structure and the endothelial dysfunction is pointed out as a main cause [3]. Cord blood serum (CBS) also proved to be an efficient option in diabetic wound treatment and in stroke models, because of the physiological process enhance, at the injury site and through angiogenesis promotion [4]. Although some studies show that CBS and MSC may modulate endothelial cells behaviour, little is known about their effects in angiogenesis. In collaboration with Bebé Vida–Ciências para a Vida S.A, this work aimed to evaluate CBS and UCMSC effects on viability and proliferation of human microvascular EC (HMEC-1).

METHODOLOGY

UC were obtained from Bebé Vida–Ciências para a Vida S.A, after the informed consent obtain. In order to obtain UCSC primary culture, UC were processed as showed in figure 1. MSCs CD105, CD73, and CD90 markers were characterized by flow cytometry as well the non-expression of CD45 and CD34 markers. At Bebé Vida–Ciências para a Vida, CBS was collected from UC blood, and stored until be used in FMUP. For MSCs conditioned medium (CM) collection, MSCs were seeded and kept in culture until reach confluence, and CM was collected after 24h on serum-free medium incubation.

RESULTS

Viability and Proliferation assays: Cell viability was accessed through and MTT assay and cell proliferation by BrdU assay. For that, HMEC-1 were seeded and after 24h of culture, cells were treated with MSC CM at 10%, 25%, 50%, 75% and 100% concentrations for MTT assay and 10%, 50% and 100% concentrations for BrdU assay. For CBS treatment were used concentrations of 5%, 10%, 15%, 20%, and 25% for the MTT and 5% and 10% for BrdU.

Experimental design

Figure 1. Experimental procedure.

CONCLUSION

- The results demonstrate that both MSC secretome and CBS, in different concentrations, were able to significantly increase HMEC-1 viability and proliferation.
- This finding indicates that proangiogenic molecules and growth factors of MSC secretome and CBS modulate the behaviour endothelial cells.
- The effect of both UC-derivatives in endothelial cells might unravel novel applications on the re-establishment of angiogenesis homeostasis and related processes.

REFERENCES

1. Seid et al., A revealing review of mesenchymal stem cells therapy, clinical perspectives and Modification strategies. Stem cell investigation, 2016.8, p. 34-34.