Using of perfusion bioreactor for dynamic culture of Adipose Derived Stromal Cells on tubular scaffolds – an *in vitro* study

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INTRODUCTION

Bladder cancer is the 10th most common cancer worldwide. About 20% of bladder cancers are muscle-invasive and are indication for a radical cystectomy. The use of ileal segment is a standard method for urinary diversion after bladder removal. Use of this method extend surgical procedure and lead to numerous metabolic complications. To overcome these side effects, tissue engineering methods can be utilized to create an artificial urinary conduit.

AIM

The aim of this study was to develop a method of the tissue-engineered conduit construction for urinary diversion using dynamic bioreactor culture.

METHODS

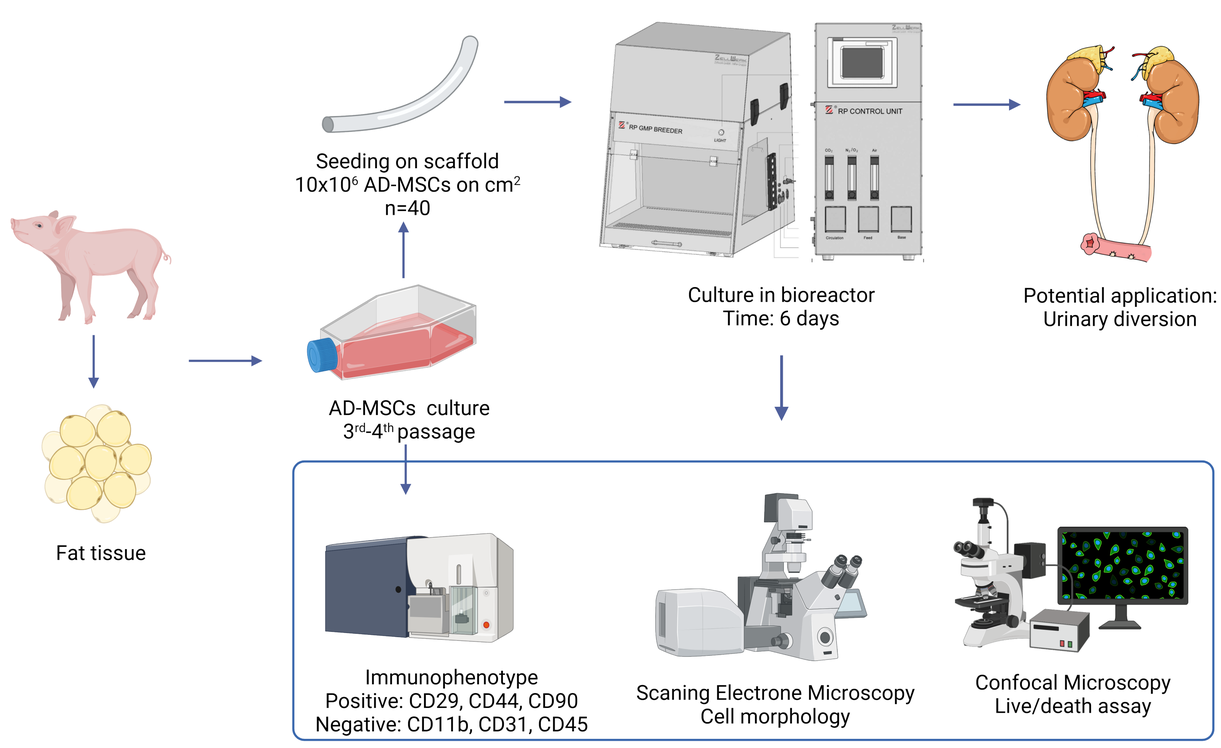
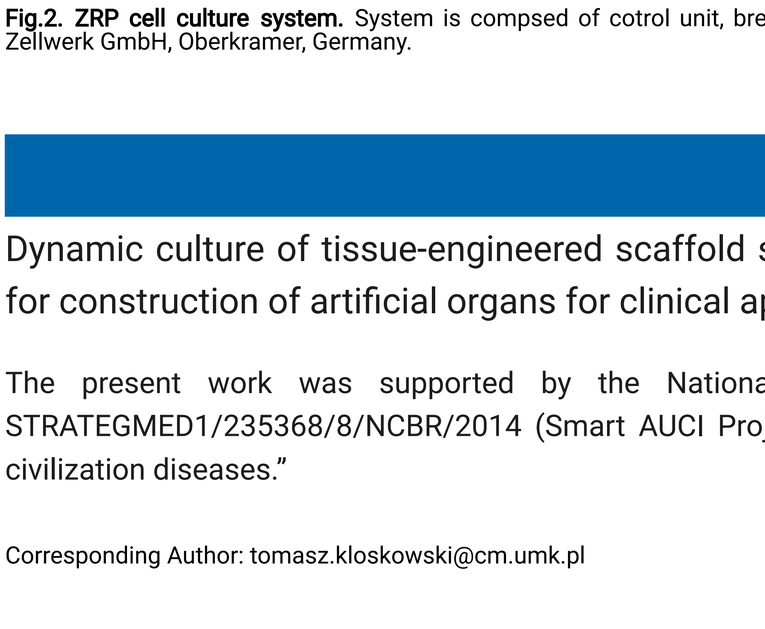


Fig.1. Schematic presentation of study design. AD-MSCs - Adipose Derived Mesenchymal Stromal Cells.



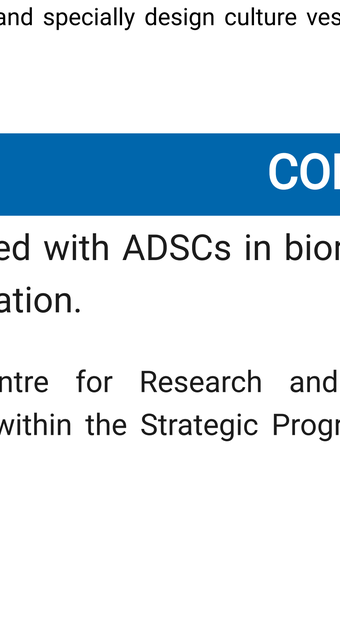


Fig.2. ZRP cell culture system. System is compsed of cotrol unit, breeader and specially design culture vessel. Zellwerk GmbH, Oberkramer, Germany.

RESULTS

Fig.3. Bioreactor culture of AD-MSCs seeded on tubular scaffold. A - ZRP system; B - bioreactor vessel connected inside the breeder; C - bioreactor vessel filled with culture medium.

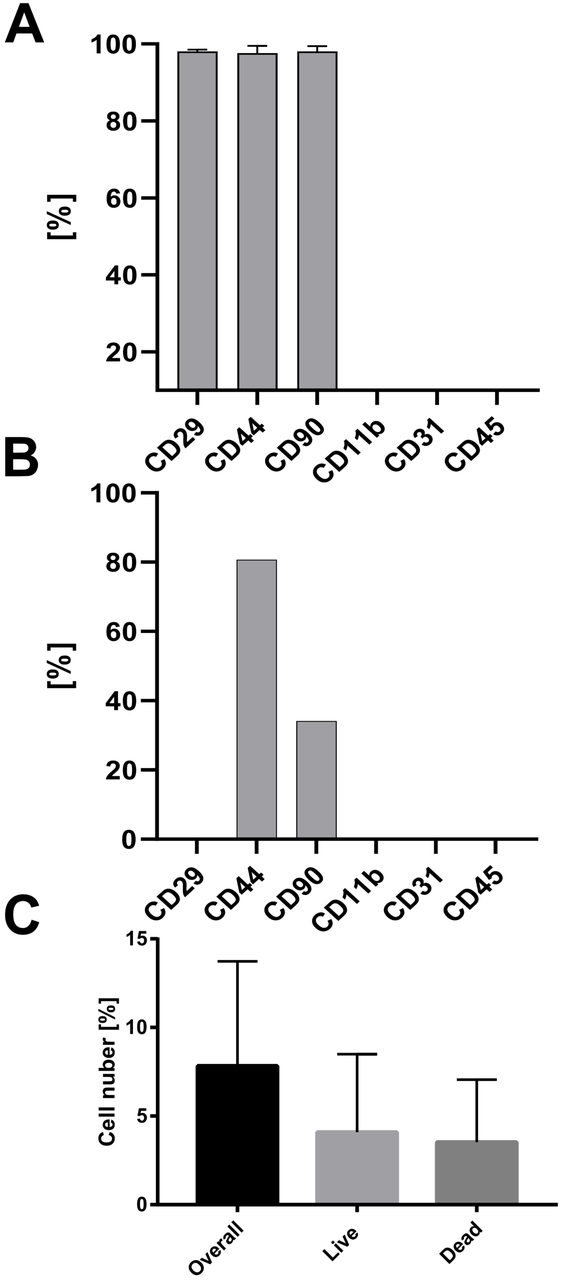


Fig.4. Cell analysis before and after bioreactor culture. A - AD-MSCs phenotype before seeding on scaffold (3rd passage); B - AD-MSCs phenotype after culture in bioreactor ; C - Number of cells deatached from scaffold after end of bioreactor culture.

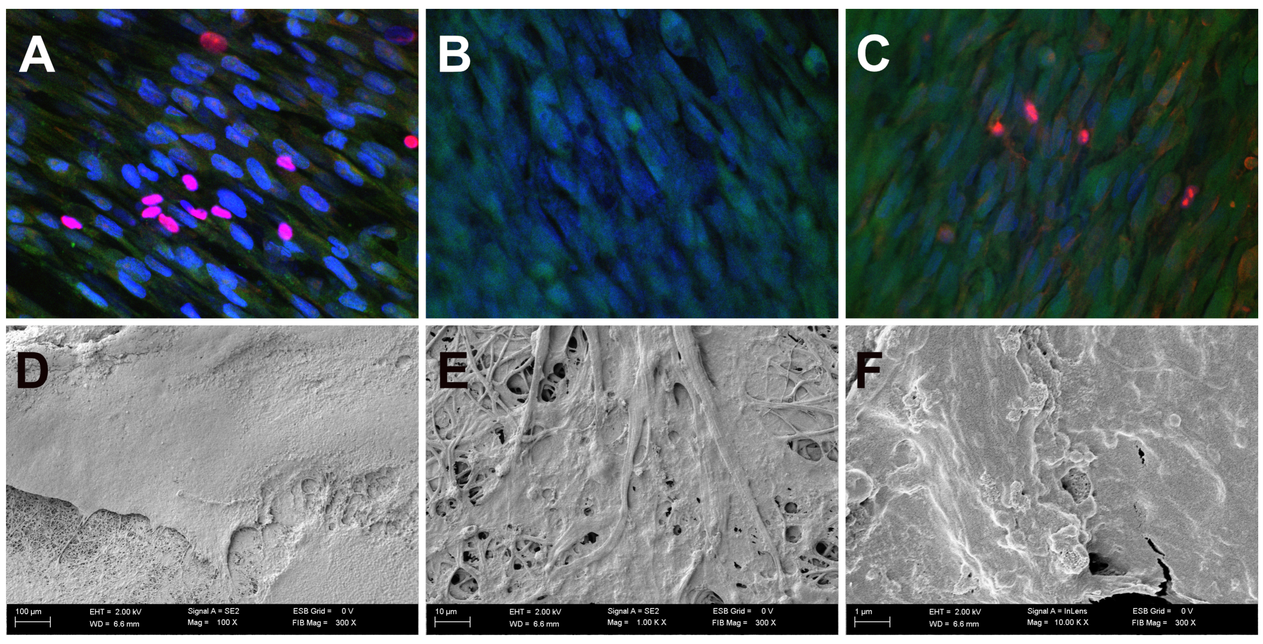


Fig.5. AD-MSCs condition on tubular scaffold cultured in bioreactor. Images of confocal microscopy (A-C) showed that majority of cells seeded on artificial urinary conduit after the end of 6-days culture were viable. Cells growth was directed after bioreactor culture. Green – live cells (calcein-AM), red – death cells (ethidium homodimer-1) , blue – nucleus (DAPI); magnification 20x. Scanning electron microscopy (D-E) revealed appropriate morphology of cells grew on artificial urinary conduit. Cells were elongated, spindle-shaped (E) with good condition confirmed by production of microvesicles (F).

CONCLUSION

Dynamic culture of tissue-engineered scaffold seeded with ADSCs in bioreactor enables their proper growth. Application of such culture method may allow for construction of artificial organs for clinical application.

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