

Voorstel MDO-opdracht

Opleiding Technische Geneeskunde

Universiteit Twente

A. Algemeen

1. Titel MDO-opdracht: **Can minimally invasive surgery be a viable option to deliver cell scaffold constructs to repair and treat bone defects?**
2. Gegevens instelling/indiener:
Naam indiener: Jan de Boer
Instelling/afdeling: Tissue Regeneration
Contactgegevens: j.deboer@tnw.utwente.nl
Medisch begeleider: : dr. Renard
Technologisch begeleider (UT): Jan de Boer
Anindita Chatterjea

B. Faciliteiten

1. Welke faciliteiten zijn nodig voor een adequate uitvoering van de vraagstelling?
Tissue culture lab facilities.
2. Wat zijn daarbij mogelijke risico's voor de voortgang van de opdracht?
None.

C. Overige opmerkingen

-

D. Inhoudelijke informatie MDO-opdracht

Omschrijving van de technisch geneeskundige vraagstelling:

Bone loss due to congenital defects, diseases, and injury is a major clinical problem. Reconstruction of the bone gap itself is currently undertaken with grafted autologous bone tissue. A tissue engineered bone graft substitute (TEBs) would alleviate the patient from the debilitating autograft.

Previous reports in literature have provided evidence that cells derived from some adult tissue like bone marrow, fat, periosteum et, when seeded on scaffolds, are capable of bone formation in humans. However, implanting the bone graft into the defect requires an invasive procedure and this leads to significant scarring and pain, which in turn delays the return of normal function. For this reason, many areas in the surgical field have resorted to the use of minimally invasive

surgical techniques such as laparoscopy, thoracoscopy, cystoscopy etc, which permit manipulations through less than 1 cm incisions. However placements of graft material is currently not amenable to such endoscopic techniques. Development of a minimally invasive method for placement of cell scaffold constructs for bone tissue engineering purposes could have significant clinical benefits.

During this assignment students will develop methods to introduce the TEBs into the defect site in a minimally invasive manner.

For this, firstly, they will do a literature study on current treatment options for bone defects and their drawbacks and the various types of TEBs available in the market. The following research questions should be answered.

- What are the current available alternatives to autologous bone grafts for implanting at the defect site?
- What are the drawbacks of these available methods?
- What are the available options and vehicles to introduce cells scaffold combinations in a defect site using minimal invasive surgery and least possible stress on the cells to ensure their viability?
- What experimental models can be used to test these options?

In addition to the literature study, the students will interview a number of clinicians and (if possible; discuss with clinicians) patients involved in clinical trials on this topic to get an overview of current treatment methods and their shortcomings. Based on these, students will come up with ideas on different vehicles and delivery methods to introduce TEBs without a large incision. Their hypothesis can be tested using in vitro cell culturing methods and experiments on dead animals. Eventual goal is to design a new clinical trial.