Professor Maria Siemionow, MD, PhD, led the multidisciplinary team that performed the first successful face transplant in the United States. The multidisciplinary team was able to achieve highly favorable aesthetic and functional outcomes for the patient, including “ability to chew and swallow solid foods as well as to drink liquid from a cup”. The patient was also able to “breathe through the nose, and her speech became intelligible”. These complex procedures are known as vascularized composite allotransplantation [VCA].

In the past decade more than 100 hand and 35 face transplants have been performed worldwide. The major limiting factors include the need for lifelong immunosuppressive therapy, the shortage of suitable donors, and the financial burden of the procedure. Could tissue engineering provide an alternative solution?

In her article in the December, 2015 issue, which is available for free access through December, Professor Siemionow describes the technical and procedural complexity of a successful VCA, and the current state of tissue engineering/stem cell technology as a potential alternative. Although we must recognize that the current state of tissue engineering is not yet mature enough to replace VCA, various anatomical components of the procedure, specifically tissue-engineered skin, muscle, bone, nerve, vasculature, tendons and ligaments, have reached some level of clinical applicability and validation. However, as the complexity of the anatomy and expected functionality increases, the composite behavior becomes more difficult to replicate. Currently we have a knowledge gap – how to combine the individual components into a functional structure perfectly rendering the anatomy and physiology of the targeted composite tissue replacement.

An analogy can be found in the genome – while we have mapped the human genome, we really do not understand the triggers, functions, and communication among various genes, as well as between genes and their external environment. Tissue engineering and stem cell technology are certainly experiencing significant strides, but we are still far from a functional tissue engineering composite such as the one supported by the VCA procedure. It appears that the spatial and chemical mechanisms of action confound us in the effort to develop a fully functional tissue ready for transplantation. However, current strides in bone grafting, valve and vascular replacements, tissue reinforcement, and even nerve conduit regeneration are gaining ground, sophistication, and initial clinical validation, thus justifying a degree of optimism.

Professor Siemionow and I, with the help of our colleagues from leading research groups throughout the world, will be compiling and curating a Special Issue for the Journal of Materials Science: Materials in Medicine to appear toward the end of 2016. The goal of the special issue is to raise awareness of both successes and barriers in the translation of biomaterials/tissue engineered solutions from bench to bedside. My October Editorial in JMSM entitled “A manifesto to action: trickle or trailblazing in translational research?” outlined some of the challenges and imperatives of developing viable solutions that encourage and drive adoption by the medical community. The problem we see in translating research to bedside is not specific to a field of application, but present in all clinical areas, from reconstructive surgery to cancer management to cardiovascular interventions, and, further, to diagnostic tools. This special issue will also provide joint clinician-scientist commentaries on the state of the presented technologies and their projected journey to the patient care setting.

To our readers: I am looking forward to your comments that can be sent to gabriela.voskerician@case.edu using the heading “Editors’ Choice”. We hope to develop this feature into a dynamic forum think-tank.