There is increasing evidence to suggest patients want to be better informed about their own disease diagnosis [Chesson et al. 2002; Broadbent et al. 2004]. Based on ongoing collaborative work between the School of Media Arts & Imaging and Clinical Radiology, Ninewells Hospital, Dundee, a need has been identified for 3-D visualisation strategies to improve disease understanding among patient groups. Scientific imagery such as Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) allows clinicians to image ever deeper into our body spaces for the purpose of clinical diagnosis. However, interpretation is restricted to the eye of the trained medic within a clinical or scientific context. Captured as a series of 2-D slices (Figure 1), MRI imagery, while useful to a Radiologist, can cause confusion and misunderstanding when presented to patients and their families.

In this PhD research, computer visualisation techniques from the field of digital animation (storyboarding, 3-D modelling and rendering) were used to create a hybrid image: an image that uses MRI data and artistic imaginative vision to create a new aesthetic that supports communication of complex medical data to patients. The work involved the digital artist being embedded in the hospital and interacting with patients, physicists and clinicians. During this period of interaction, MRI renal angiogram data was utilised. Through a process of segmentation and thresholding, established for the generation of medical implants (http://www.materialise.be/MEDICAL/main_ENG.html), 3-D geometry was extracted in an STL format. This STL data was then imported into AutoDesk Maya allowing the computer artist to integrate animation, dynamics, texturing, lighting and rendering techniques (Figure 2).

Utilising this type of imagery a pilot study was undertaken to improve understanding among a group of outpatients with arterial disease in the Department of Clinical Radiology. This was based on the premise that present communication transactions (from clinician to patient) is primarily concerned with the imparting of functional, technical information. Eighteen patients (11 women and seven men) with an average age of 71 years, took part in semi-structured interviews incorporating the presentation of information in a range of formats (eg hard copy, 2-D images, resin desktop model and 3-D imagery on DVD video). The study found that this type of 3-D digital narrative provided a better understanding of disease to the majority of participants. The study also demonstrated that health care professions should not assume that (1) older patients are resistant to 3-D computer imagery; and that (2) that one model will be appropriate for all in information giving.

Ultimately this research is about understanding the ways in which patients visualise the invisible. This work has started to demonstrate that 3-D computer artists can enhance and interpret clinical scan data, providing tools for improved patient-clinician dialogue and understanding.

References