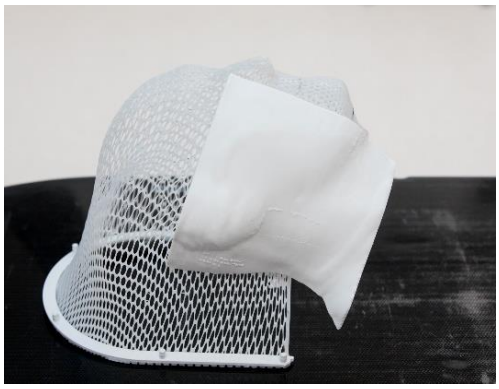
Client Profile

Calvary Mater Newcastle (CMN) is a public hospital in The Hunter Region of New South Wales, Australia. The Largest radiation therapy centre in regional NSW, the Radiation Oncology Department has five Varian Linear Accelerators, including a Varian Truebeam STx2, kV Therapy and a HDR brachytherapy treatment unit treating gynae and skin brachytherapy. They use Varian Eclipse Planning system for external beam planning, and an Elekta Oncentra planning system for Brachytherapy.

Introduction

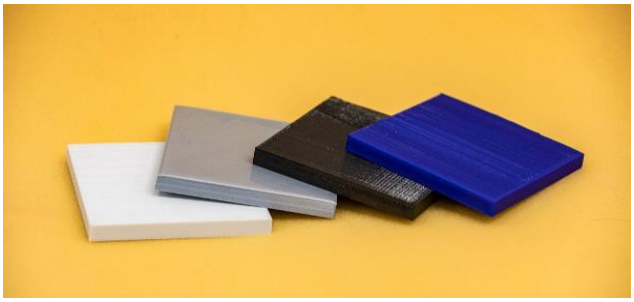
For more than 20 years, CMN has had an interest in the accuracy of electron plans and methods of improving electron treatment. Notable accomplishments include a publication in 1994 on electron parotid treatments involving modulated electron bolus, and in 2004 they developed modulated electron bolus for the internal mammary chain using a commercially printed bolus. They routinely treat a wide range of electron plans including complex-junctioned electron fields.



3D Bolus Software

The availability of 3D printers and the importance of streamlining the patient simulation process prompted CMN to investigate 3D printing of bolus on-site. The Centre recently replaced one of their CT simulators for an MRI, so efficient use of their remaining CT simulator has been paramount. Complicated anatomy can make even simple bolus a difficult prospect and modulated electron bolus is currently created by experienced guesswork during simulation, so the prospect of software which could

simplify the 3D bolus process, and design better single thickness or modulated electron bolus, was of great interest.



3D Printer

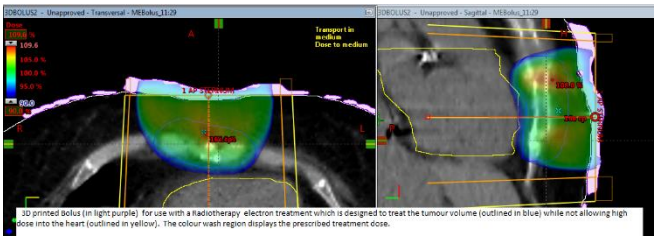
CMN has two Ultimaker 3 Extended FDM printers. Four Filaments (Polylactic Acid (PLA), Copolyester (CPE), Thermoplastic Polyurethane (TPU), Polycarbonate (PC) were tested for clinical bolus suitability, with Ultimaker TPU 95A identified as the preferred option due to its flexibility and durability. All four materials had relative electron densities of ~1.09, physical densities of ~1.2 g/cm3 and ~1% of dose enhancement compared to the same thickness of solid water.

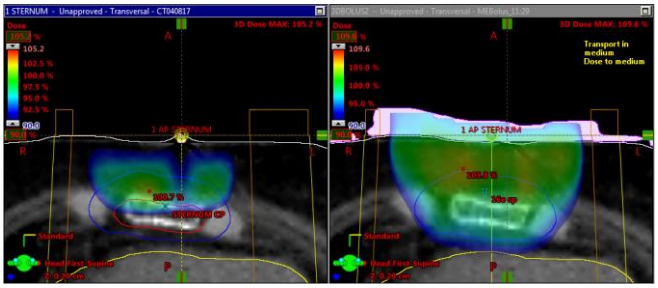
Trial Program

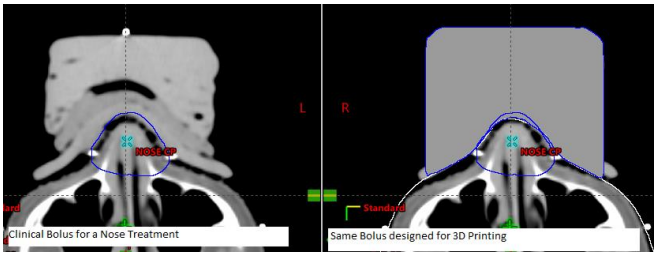
During the Trial program, CMN successfully produced a uniform thickness bolus for a parotid/side of face, and a modulated electron bolus for a palliative treatment to the sternum. The test bolus prints worked very well and they have designed a QA process for clinical use. The 3D Bolus software fits very well in the 3D-Printing workflow for producing clinical bolus.

Future Focus

CMN looks forward to further developing their 3D printed bolus program and are eager to improve electron treatments offered in their clinic, in the same way IMRT and VMAT has improved photon treatments.







Calvary

trish.ostwald@calvarymater.org.au