UK

Regional

Group

ADT : foundation

advancing digital technology in head & neck reconstruction ™

Workshop

Report

24th July, 2014

Image: Sean Peel

ADT UK Workshop

The first UK ADT Group workshop showcased current research and best practice in head and neck reconstruction and related fields. A mix of scientific presentations from fundamental research to surgical and prosthetic applications of technology was complemented with an afternoon forum. This stimulated the debate necessary to identify current best practice, limitations with existing technology-based approaches and identify future challenges for research and development.

The day was wall attended by vibrant mix of surgeons, prosthetic technologists, researchers, students and industry representatives. This helped to mediate the value of points that arose during the day and will help to ensure that the future research is balanced, prioritised and outcomes can be followed up appropriately.

This report highlights topics raised during the presentations and the discussions during the day. The outputs from the day will be presented on the world stage at the 5th ADT international conference in Beijing, September 2014 and made publicly available.

Links

1st UK Workshop Programme: http://www.adt-foundation.com/events_uk_regional_workshop.html

ADT Conference: http://www.adt-conference.com/

ADT Foundation: http://www.adt-foundation.com/

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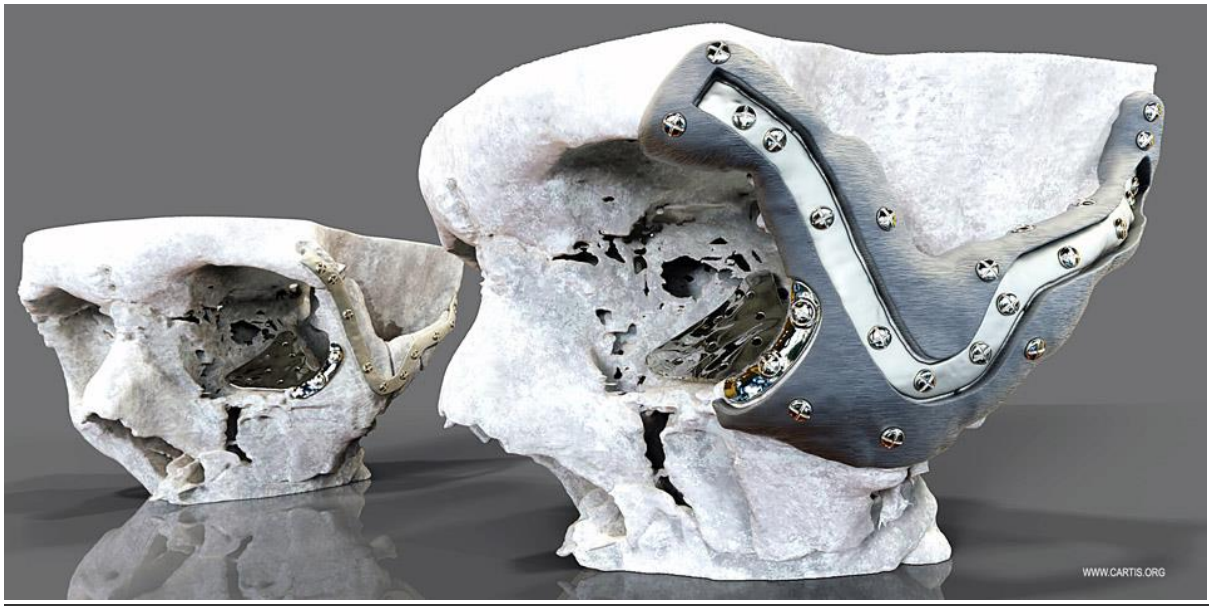

Image: Post-Traumatic Zygomatic Osteotomy and Orbital Floor Reconstruction Using Digital Design Tools and Additive Manufacturing. Sean Peel, PDR.

UK Workshop Organisations

The workshop was made free to attend due to the generosity of PDR at Cardiff Metropolitan University and Loughborough Design School at Loughborough University. RES Seminars and the wider support of the ADT Foundation also helped to make this first workshop possible.

The ADT Regional Group Director wishes to thank Sean Peel of the Surgical & Prosthetic Design team at PDR, for his assistance in organising the workshop. Thanks also to academic associate, Ffion O'Malley for her help in promoting the workshop. Thanks must also go to Dr. Richard Bibb and his colleagues, particularly Andrew Weeks for hosting the workshop venue at the prestigious Loughborough Design School. The input of Peter Evans of the Maxillofacial Unit, Morriston Hospital to helping promote the workshop is also appreciated.

pdr

Programme

09:30	**Registration**	
10:00	**Welcome**	Richard Bibb
10:15	Post-Traumatic Zygomatic Osteotomy and Orbital Floor Reconstruction Using Digital Design Tools and Additive Manufacturing	Sean Peel
10:35	Integration of digital technologies into the Maxillofacial laboratory, a review of developments	Lawrence Dovgalski & Peter Evans
10:55	Research to inform the improved accuracy of zygomatic implants placed using computer design & additive manufactured surgical guides	Ffion O'Malley
11:15	Case review of additive manufactured implants in head and neck surgery	Dr Dominic Eggbeer
11:30	The Role of Technology in Cranio-maxillofacial Surgery	Mr Satyajeet Bhatia
11:45	**Break**	
12:00	Rapid Manufacture of Indwelling Ocular Prosthesis	Liz Gill
12:20	Maturation of tissue engineered constructs for regenerative medicine	Dr Ilyas Khan
12:40	Determining normal and abnormal lip shapes during movement for use as a surgical outcome measure	Hashmat Popat
13:00	**Lunch / poster session**	
14:00	The use of zygomatic implants for the retention of nasal prosthesis following total rhinectomy	Mr Neil Scott
14:20	Tracking mandibular movement – auto-rotation for closing open bites	Prof. Stephen Richmond
14:40	Digital Technologies in Maxillofacial Prosthetics Training	Kelly Morris / Amy Myers
14:55	Discussion forum	Dominic Eggbeer
16:30	**Close**	

Digital Technologies in the UK

Awareness of the range of digital technologies was, unsurprisingly high amongst the attendees. This does not however mean that awareness of and access to advanced technologies is universal across the UK healthcare system. It was noted by many that even though they are active in research it remains very difficult stay aware of all developments across the broad spectrum of disciplines and research being undertaken in the UK.

Less than 3 years ago, only a very small number of large UK maxillofacial units or those with an academic research focus considered the concept of purchasing and running their own 3D planning software and 3D printers and instead relied on specialist vendors to produce models that supported clinical treatment. In recent years, UK National Health Service hospitals have increasingly been bringing technology such as 3D printing and computer aided design/surgical planning capability in-house as part of their routine services. There are numerous reasons for this trend, with factors including:

- reduction in technology purchase and maintenance costs;
- perception that having technology in-house can:
    - improve clinical outcomes;
    - reduce treatment times
    - reduce costs
- some technicians prefer to have full control of the process
- private finance initiatives (resulting in the building of new, high technology-equipped hospitals)

This trend was not discussed in detail at the UK ADT workshop, but provides useful background context to some of the themes identified during the day.

A number of software packages were noted as being used in clinical practice or for research by the attendees: Mimics, Simplant, Surgicase, InVesalius, 3D slicer, FreeForm and Autodesk software were mentioned. The growing trend in the use of freeware was noted. Some freeware now offers useful and powerful features that a few years ago would only have been seen in expensive software. However, whilst it may be appropriate for training and personal use, the risk of using it for medical applications was noted that some freeware is not certified to recognised standards (CE and or FDA).

Barriers to Using Digital Technologies

Barriers to technology adoption were noted as:

- high purchase prices
- high materials/running/maintenance costs
- high number of options usually tied to service vendor-specific solutions
- long term benefits of technology use is difficult to quantify (business case)
- in some cases (such as orbital floor repair, the speed of technology cannot match lab-based methods
- lack of training in the NHS Science Training Programmes (STP)

Although the cost of technology is falling, the price of purchasing and running equipment, such as 3D printers is still relatively high, especially for smaller units. There is clearly still a need for expert service providers to the NHS.

The huge range of software and hardware options on offer was also briefly discussed. It was noted that the majority of software for surgical/prosthetic planning were locked to service vendors, which provokes mixed viewpoints. Vendor-provided solutions are perceived as robust and safe, but expensive (probably necessarily so). They also offer limited freedom for the operator to provide expert input into a designed solution. In some cases the software restricts the output to physical production to the vendors services.

The need to understand the benefits of technology-based evidence of clinical efficacy over and above existing techniques was noted. There are a small number of UK university researchers looking specifically at this topic in relation to head and neck reconstruction, but there is currently limited literature that can quantify benefits. It was also noted that for cases such as custom orbital floor production, the use of CAD and AM increases the timescale and cannot yet be proven to offer a superior clinical outcome in the majority of cases. This provides a challenge to researchers, industry and technology vendors.

Lack of training and awareness was perceived as the largest barrier to effective technology adoption, especially for reconstructive scientists. Training is primarily focussed on lab-based techniques and access to digital technologies is dependent on the unit(s) where training is based. The introduction of dedicated CPD accredited courses and technology awareness workshops for trainees and professionals were highlighted as a key issue and a high priority.

How to Engage Other Specialists

There were some key disciplines missing from this first UK workshop, including:

- medical imaging experts
- ENT surgeons

- speech & language therapists

The busy nature of work was the most cited reason for not attending. Piggybacking ADT meetings and technology workshops on to larger specialist conferences was noted as a viable way of engaging specialists effectively. The Wales ENT meeting in October 2014 was suggested as the first suitable event. Further neurosurgery conferences were also suggested.

Promising Emerging Areas of Research

The presentations illustrated a range of valuable research being undertaken in the UK. The workshop programme provides abstracts for each presentation.

The field of regenerative medicine represents an area of particular interest where specific challenges, such as vascularity require addressing before the lab-based research becomes viable for clinical trial. Research presented by the Dental School, Cardiff University demonstrated more immediately applicable techniques that could improve the diagnosis of conditions and assessment of treatment efficacy. Research being undertaken in Manchester Metropolitan University demonstrated how 3D Printing technology could be used to automate and batch produce ocular units, which could reduce the cost to mass markets that currently cannot afford treatment, for example in the developing world. Research being undertaken between Cardiff Metropolitan University and Morriston Hospital is quantifying the accuracy of placing zygomatic implants and leading to improvements in the design of surgical guides.

Expanding ADT in the UK & Europe

The meeting agreed that it was important to continue these meetings and engage representatives and leading experts in the whole multidisciplinary team. It was agreed that efforts should be made to have meetings adjacent to larger events to overcome time pressures and travel costs associated with study leave funding and time away from frontline working. It was also agreed that efforts would be made to develop and offer CPD accredited training in advanced technologies on a regular basis and in particular into the STP programme such that all trainees could expect a minimum level of exposure and opportunity regardless of which unit they may be attached to.

CPD

Accredited Continuing Professional Development (CPD) points were viewed as a valuable method of encouraging attendance by enabling access to study leave and or funding from NHS Trusts. The leadership group will make efforts to engage with as many disciplines as possible to ensure future events offer accredited CPD to all relevant disciplines.

Conclusions

The workshop was well attended and there was significant enthusiasm to hold further ADT events in the UK. A number of offers for hosting future events were put forwards from attendees. The concept of piggybacking ADT events on other specialist surgical, science and industry events was encouraged. These suggestions will be followed up.

Using ADT as a mechanism to further education on the best practice use of technology was a strongly emerging theme. Industry representatives showed enthusiasm for supporting this.

Reference was also made to an EPSRC-funded workshop on the Future of Facial Prosthetics. The UK ADT Group may be an appropriate mechanism to develop outcomes from this event.

Clearly the ADT Foundation has a role to play in the UK. Engagement with other worldwide ADT Groups would also be welcomed.

Registered Delegates

Delegate	Affiliation
Sean Peel	Cardiff Met. University
Richard Bibb	Loughborough University
Satyajeet Bhatia	University Hospital of Wales
Dominic Eggbeer	Cardiff Met. University
Emily Bilbie	Cardiff Met. University
Sian Hayward	STP trainee, East Grinstead
Elizabeth Gruber	Worcestershire Royal Hospital
Mita Brahmbhatt	NIHR Brain Injury Healthcare Technology Cooperative, University of Cambridge
Thomas Stone	Addenbrookes Hospital
Tony Watson	Cavendish Implants
Holly Turner	New Cross hospital in Wolverhampton
Darren Collinson	Grantham Hospital
Steve Bailey	United Lancashire NHS
Liz Gill	Department of Healthcare Science, Manchester Metropolitan University
Neil Scott	Morriston Hospital, ABMU HB
Tony Simpson	East Lancashire Maxillofacial and Body Prosthetics Service
James (Jim) Diamond	University Hospital, Coventry
Ed Littlewood	Renishaw Plc
Kevin Brigden	Renishaw Plc
Ian Brooks	Renishaw Plc
Andrew Richmond	Nottingham University Hospitals Trust
Gareth Robinson	Worcestershire Royal Infirmary
Hashmat Popat	School of Dentistry, Cardiff University
Stephen Richmond	School of Dentistry, Cardiff University
Sian Morgan	Swansea University
Em Combellack	Swansea University
Ilyas Khan	Swansea University
Amy Myers	STP Student
Kelly Morris	STP student, Morriston Hospital, ABMU HB
Peter Evans	Morriston Hospital, ABMU HB
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