

DELEGATE

# SWANSEA

## 2019

# IMPT



29th Scientific  
Congress of the **IMPT**

4<sup>th</sup> — 6<sup>th</sup> September 2019

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# IMPT Chairman's Welcome

As the outgoing IMPT Chairman I would like to take this opportunity to warmly welcome all delegates to our Conference this year in Swansea. This is our first conference in Wales since we started in 1963 and our profession has come a long way as you will see from the 3D technology theme this year, but still alongside many other fine and varied lectures in the programme.

Also on offer is a social programme and hands on workshops and if you can tear yourself away Swansea is a beautiful seaside town which I have been looking forward to properly visiting. There will also be morning runs organised for all those who fancy starting the day limbering up along the beachfront, it worked well at the IASPE conference in Austria last year; that naturally brings me onto issuing a personal welcome to our two German guests, Joern and Phillipe, together with all other speakers and delegates from around the world.

As always please remember to visit the many varied trade stands that generously support our Conference. In addition, please remember to fill out feedback forms, as these are genuinely useful in improving future events.

The IMPT has endeavoured to bring you one of the best conferences around, the costs are kept low by our volunteer organisers so a hearty thanks to conference lead Steven Hollisey, Lawrence Dovgalski - programme Editor, Alba Gonzalez-Alvarez and Jason Ingham – social programme organisers and Peter Evans – sponsorship and lecture coordinator. Not forgetting our off site team including Sian Campbell, Richard Eggleton and student volunteers. Organising a conference is a huge responsibility the team have risen to the task magnificently, super effort all round, excellent work.



# The Institute of Maxillofacial Prosthetists and Technologists 2019

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## Croeso i Abertawe!

We're delighted to welcome you to Swansea (Abertawe = the "mouth of the Tawe"). During the Congress you'll see some of the city and its coastline; there's a lot more to enjoy. We wish you could stay for longer!

### A Welsh Primer

The Welsh language is taught in every Welsh school and appears on every sign. It's not famously widely-spoken in Swansea, so you probably won't have any language difficulty. Test your hosts to see if they know what you're talking about:

Bore Da (good morning) / Prynhawn Da (good evening)

Shw'mae? (how are you?)

[Name] ydw'i. (I am [Name].)

### Your whistle-stop tour of Swansea...

Once the hub of industrial Swansea, the South Dock got a glamorous makeover in the 1980s and became the Maritime Quarter – filled with modern flats and restaurants, plus Wales' tallest building (the Meridian Quay Tower; there's a restaurant at the top). It's also home to Wales' best Chinese Restaurant, as you've already discovered. If you're interested in the industrial history of Swansea, the National Waterfront Museum sits right on the marina with an old light ship ('Helwick') moored alongside.

You'll see the expansive sweep of Swansea Bay on your journey to our Banquet: the view reaches across to Devon. It's now a Blue Flag beach, but it wasn't always that safe to surf in... just ask some of the Swansea old-timers.

For the Banquet, Mumbles Pier provides a relaxed and picturesque setting. The Mumbles Lifeboat Station has been operative for 180 years, saving countless lives, and is entirely dependent on volunteers. The Station has recently been rebuilt, with a viewing platform for visitors to get really close to the boat (and try on some of the gear... take an IMPT Selfie).

### Swansea culture

Dylan Thomas may be Swansea's most famous person (he vies with Catherine Zeta Jones, who has a house near Mumbles). And while he said some terrible things about his home town, he wrote some beautiful lines about life and death.

Do not go gentle into that good night,  
Old age should burn and rave at close of day;  
Rage, rage against the dying of the light.

Dylan Thomas was born in Uplands, spent a lot of time in Gower with his friend Vernon Watkins, and ended up in Laugharne, where his waterside writing hut has been preserved. The Dylan Thomas centre is located a stone's throw from the Congress hotels, if you fancy a cultural trip before heading home.

Lead Organiser

**Steve Hollisley-McLean**



# IMPT Congress Awards

## **The Wim de Ruiter Delft Plate**

Awarded for significant research contribution. Mr. Wim de Ruiter from Ridderkirk near Rotterdam provided a maxillofacial prosthetics service for the Rotterdam area and donated this award in 1985

## **The Mount Vernon Award**

Awarded for outstanding clinical or technical practice. Designed and fabricated by Chief Maxillofacial Prosthetist Mr. John Hayward at Mount Vernon Hospital, this award was first presented at the 1981 IMPT congress (Brunel University, London)

## **The President's Award**

Awarded for the best poster display. This award was inaugurated at the 1983 IMPT congress (Royal College of Surgeons, London)

## **The Kidd Award**

Awarded for innovation. Donated by Mr. Norman Kidd, who began making subperiosteal implants in 1956. He instigated the Kidd award plaque upon his retirement in 1997

## **The Ian MacLeod Alumno Award**

Awarded to the most outstanding contribution from a student or junior/associate member of the IMPT. Dedicated in honour of Ian MacLeod, a member of the IMPT who had a positive influence on many young prosthetists

## **Technovent First Time Lecturer Award**

Awarded to the best first time lecture delivered at congress

## **The IMPT Travel Fellowship**

£1000 is awarded to the successful applicant to provide the means for study and research. The award is assessed by the fellows of the IMPT and must be applied for prior to Congress by contacting the Chairman

## **The Brian Conroy Award**

Awarded for outstanding service to maxillofacial prosthetics. Donated by Brian Conroy MBE FIMPT (Hon) in 1969, the award was commissioned- "for those who have given significant service for advancement in technology, prosthetics, surgery and other activities that relate to maxillofacial prosthetics and technology"

# Lecture Programme – Wednesday 4<sup>th</sup> September

11.00

Opening & Delegates Seated

11.10

Morrison Orpheus Choir

11.30

Barry Edwards

Chairman's Welcome

11.40

Presidential Handover

Formal Handover of Presidential Office

## Session 1: Digital Horizons

11.50

Adrian Sugar

Surgical Implant Planning

12.20

Madhav Kittur

Post Rhinectomy Rehabilitation: The Morrison Experience

12.40

Phillipe Federspil

Topographic bone thickness maps for the evaluation of the placement of titanium miniplates for nasal prostheses

12.55

Questions and Discussion

13.05 – 14.00

Lunch and Trade Exhibits

## Session 2: Facial Prosthetics

14.00

Rosemary Seelaus

Understanding Colour

14.25

Jiri Rosický

Application of Digital Technologies In Anaplastology

14.45

Angela Ridwan

The Face Print Study

15.00

Kirsty Galt

Making Connections - A Case Study

15.15

Joern Brom

Partial Nasal Prostheses

15.30

Questions and Discussion

15.45 – 16.15

Exhibitor Break



## Session 3: Facial Prosthetics

16.15

Gillian Duncan

Revisiting Anatomical, Surgical and  
Demitological Models

16.45

Stefan Edmondson

Patient Management for Placement of Extra-  
Oral Implants – Team Approach

17.00

Peter Evans

Early Nasal Prosthetic  
Rehabilitation following Surgery

17.15

Questions and Discussion

17.25

Justin McCarthy

Implications of the New  
Medical Devices Regulations

17.25

Session Adjourns

19.30 – 21.00

Reunion Dinner at Gigi Gao's Favourite Authentic Chinese Restaurant

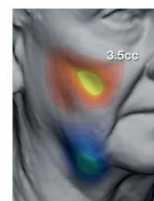
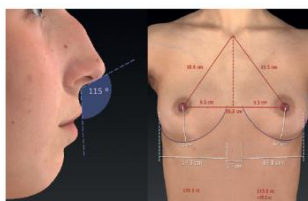


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## Session 4: Surgical Planning

09.00	Fraser Walker	Orthognathic Surgery Planning: “Not an Open and Shut Case”
09.35	Jacqueline Froman	The Digital Contribution in Maxillofacial Prosthetics
09.55	Jordan Abbasi	A Novel Approach to Improve Access and Visualisation in Skull Base Surgery
10.10	Jessica Smith	A Novel Approach to Permanently Treat Sleep Apnoea with Distraction Osteogenesis
10.25	Catherine Turner	An Evidence Based Method of Titanium Cranioplasty Construction
10.40	Questions and Discussion	

10.55 – 11.25 Exhibitor Break

## Session 5: Body Prosthetics

11.25	Dominic Eggbeer	Two decades of design engineering in maxillofacial reconstruction and what's next
11.45	David Morrison	When Analogue Technology Enables Modern Digital Technology: Making a Penile Impression for a New Treatment of Non-Invasive Penile Brachytherapy
12.00	Amy Davey	Alternative Digit Prosthesis with 3D Printed Joints
12.15	Holly Dimond	Troubleshooting: Multi-Disciplinary Team (MDT) Working
12.30	Matt Pilley	3D Printed Pelvic Reconstruction: A Multi-Disciplinary Approach
12.45	Jeannine Linha	Education, Education, Education
13.00	Questions and Discussion	

13.15 Conference Lunch; Jason Watson GIRFT (Getting it Right First Time)

14.00 – Workshops



Tellin Room



Port Eynon Room



Caswell Room



Oyster Room

15.30 – Workshops



Tellin Room



Port Eynon Room



Caswell Room



Oyster Room

17.00

Poster Presentations and at the Rhossili Bar Area

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# Lecture Programme – Friday 6<sup>th</sup> September

## Session 6: Splinting and Therapeutic Appliances

08.45	Announcements	
09.00	Tom Potokar	Facial Burns: History, Treatment & Problems
09.30	Paramjit Kaur	Facial Burns from House Fire: 5 Years On
09.50	Maxim Schuerer	Nasal Septum Epithesis – The Ultimate Technical Solution
10.05	Colin Gravenor	Auricular Keloid Splinting- Treatment Planning and Splint Design
10.20	Caroline Reed	Nasal obturators for speech: a non-surgical treatment for velopharyngeal dysfunction in the cleft palate and non-cleft population
10.35	Questions and Discussion	

10.50 – Exhibitor Break

## Session 7: Ocular and Orbital Prosthetics

11.20	Malene Grip	Team Approach in Contracted Eye Sockets
11.40	Emma Worrell	Nationwide Artificial Eye Study
11.55	Anne Marie Riedinger	Designing facial prostheses in the 3D world and orbital issues



12.10

Hitesh Koria

Rehabilitation: From the battlefield to the streets of Birmingham

12.25

Alba Gonzalez Alvarez

Design process and Clinical Application of a 3- Dimensional Printed Titanium Implant to Personalise the Vector of Mandibular Distraction

12.40

Questions and Discussion

12.55

“Old Mans’ Lunch”

### Session 8: Problem Solving

13.55

Steve Worrollo

Thinking Outside the Laboratory Box

14.20

Panel Discussion – Problem Solving with Rosie Seelaus, Steve Worrollo, Kerstin Bergstrom and Ann-Marie Riedinger

15.15

Summary of Congress

15.30

IMPT Business Meeting

16.00

Close of Congress



## Conference Entertainment



**Morriston Orpheus Choir** was born in 1935. Its membership mainly comprised manual workers, most probably in the steel or allied industries, living in or in close proximity to Morriston. More than 90% were Welsh-speaking and came from chapel backgrounds with experience of choral singing.

During the 75 years of the Choir's existence, not only has its members and musical staff changed but also the town of Morriston and its environs. The heavy industries so important at the time of the Choir's birth have long gone, being replaced with more modern manufacturing and service industries. Felindre steelworks has been replaced by the DVLA and the Enterprise Park, leisure facilities are far more numerous and available, the Welsh language and chapel attendances have declined and musical tastes have changed. These changes have been mirrored with the Orpheus. Its membership is now largely English-speaking living in an area ranging from Haverfordwest in Pembrokeshire to Bridgend and beyond in the East.

Today, often called the unofficial ambassadors for Wales, the Choir is internationally-acclaimed as a leading exponent of male choral singing. Within the United Kingdom the Choir is in constant demand with around 25 engagements a year, including concerts, TV and after-dinner performances. Much of its work is devoted to assisting local and national good causes, at home and overseas.

The aims and values of the Choir remain unchanged. During the whole of its existence it has striven to follow the advice, attributed to Sir Walford Davies in a speech in Swansea on that same April week in 1935 when the Choir was formed, to "make music joyously". Long may it continue to do so.



**Elin Lloyd** BA (Hons) CT ABRSM is a 'harpist with a difference', specialising in modern and popular music. Her repertoire also features a full range of classical and traditional Welsh music. As well as performing professionally, Elin teaches harp at Trinity College, Carmarthen



## Keynote and Invited Speakers

**Mr Adrian Sugar** FDSRCS(Eng/Ed)  
FDSRCPS MDhc(Riga Stradins Univ) Hon  
Fellow (Cardiff Met Univ)



After training in Leeds, Teesside, Manchester, South Wales, Washington DC, Basel, Arnhem and Lucknow, Adrian Sugar was from 1985 Consultant Cleft and Maxillofacial Surgeon at St Lawrence Hospital, Chepstow and then, on transfer of the Burns, Plastic and Maxillofacial Unit, at Morriston Hospital Swansea and Senior Lecturer at Swansea University Medical School. With main surgical interests in Cleft, Craniofacial Deformity and Trauma, he was clinical director of the Wales Centre for Cleft Lip and Palate for 11 years. He has a major interest in 3D imaging and planning for facial reconstruction and remains Chair of the Centre for Applied Reconstructive Technologies in Surgery (CARTIS), a collaboration between Morriston Hospital and the design engineers at Cardiff Met Univ. He co-founded the ADT Foundation with Prof John Wolfaardt from Edmonton, Alberta and Prof Rainer Schmelzeisen from Freiburg.

He chaired NHS England's Clinical Reference Group for Cleft Lip and Palate from its inception and the UK Cleft Development Group for six years. He is an elected trustee of the AO Foundation internationally having sat on its Academic Council, the International Board for Craniomaxillofacial (CMF) surgery, chaired AO's international Research Fund for all specialties and its research committee for CMF surgery. He has been President of the Craniofacial Society of Great Britain and Ireland and is now an honorary fellow for life. He has been training programme director for OMFS in Wales and chair of its Specialty Training Committee. He chaired his health board's Paediatric Surgery Cttee and Morriston Hospital's Medical Staff. He has more than 80 peer reviewed publications in the literature as well as 10 book chapters and more than 180 lectures by invitation.

He has particularly enjoyed a close working relationship with his excellent colleagues in Maxillofacial Technology and through that relationship much innovation has been developed. In particular the unit was pre-eminent in developing the use of craniofacial implants for facial prostheses in the UK and applied the use of distraction osteogenesis especially for children with congenital craniofacial deformities such as hemifacial microsomia. He has been awarded the international Tjellstrom Award for excellence in rehabilitation of the head and neck, the Down Surgical Prize of the British Association of Oral and Maxillofacial Surgeons, the BAOMS President's Prize twice and the BAOMS Norman Rowe Clinical Prize. He is now an honorary consultant at Morriston Hospital.

**Mr Madhav Kittur** BDS, MDS (OMFS), FDSRCS,  
MBBCh, MRCS, FRCS (OMFS)



Mr Kittur is dually qualified in Dentistry and Medicine. Having completed his primary dental qualification he came to the UK for further training. He completed his medical qualification from Cardiff University and completed basic surgical and specialist training in Oral and Maxillofacial Surgery in South Wales. He has also completed an Interface fellowship in "Therapeutic use of Lasers". Towards the end of his training he spent time at The Ninth People's Hospital in



Shanghai to gain further experience in advanced head and neck surgery and microvascular reconstruction.

On completion of his training, ABMU Health Board appointed him as a consultant in Oral and Maxillofacial Surgery. He practices the entire range of Oral and Maxillofacial Surgery but has a special interest in oral cancer and microvascular reconstruction. Mr. Kittur is the author and co-author of numerous publications in specialist journals, and has presented papers at national and international meetings. Mr. Kittur is committed to teaching and has been actively involved in teaching dental and medical practitioners.

## **Gillian Duncan MS, CMI, CCA**

Gillian has a dual career and boards certifications in medical illustration and clinical anaplastology. For almost 40 years, Gillian has used her knowledge of surgery, anatomy and pathology to create medical, scientific images and models and fit life-like prostheses for patients missing part of their face.



Duncan received a Bachelor of Fine Arts degree from Tulane University, New Orleans, LA in 1973. In 1977 she received a Master of Science degree in Medical Illustration from the Medical College of Georgia, Augusta, Georgia. Upon receiving her degree, Gillian did her clinical training in facial epithetics (prosthetics) in the department of Mund-, Kiefer-, Gesichtschirurgie at the Universitaetsklinikum in Homburg, Germany. Her ability to combine art, science, medicine and technology lead her to establish Graphica Medica Institute for Medical Illustrations and Facial Epitheses in Homburg Germany in 1981. In 1991 she moved Graphica Medica, LLC to Rochester, Minnesota - continuing to train interns in craniofacial prosthetics and providing facial and somatic prostheses for patients -nationally and internationally. Gillian has been active on the Board, as conference chairwoman and committee chair of the International Anaplastology Association. In 2016 Gillian sold Graphica Medica and established Artificials, LLC to reimagine 3D anatomy for the fine arts.

## **PD Dr. med. Philippe A. Federspil**

Philippe received his medical training at the Medical School of the University of Saarland in Homburg/Saar, Germany, as well as at the University College Dublin in Ireland and at the University Louis Pasteur in Strasbourg, France within a scholarship of the ERASMUS Program by the European Community.



In 2004, he received the qualification “plastic surgery” as well as “special oto-rhino-laryngological surgery”. Since October 2004, he is Attending Surgeon at the Department of Oto-Rhino-Laryngology at the University Hospital Heidelberg, Germany under the chairmanship of Prof. Dr. P.K. Plinkert. In 2008, he received the qualification „medical tumor therapy“.

Since 2010 Dr. Federspil is Assistant Professor (Habilitation) in Oto-Rhino-Laryngology. In 2017, he was appointed the director of the Division of Oncological ORL Surgery at the University Hospital Heidelberg.

Dr. Federspil's main interest is head & neck tumor surgery as well as reconstructive plastic surgery including microvascular free tissue transfer. A special focus is in the facial area including implantation for bone-anchored craniofacial prostheses. Since 2012, he was elected President of the International Association for Surgical Prosthetics and Epithetics (IASPE). In 2013, he received the J.N. Kidd-Award for the best achievement in prosthetic implantology, and in 2015 the Mount Vermont Award for the best clinical practice by the IMPT. In 2018, Dr. Federspil was given honorary membership of the IMPT.

## Rosemary Seelaus

Rosemary is a senior Anaplastologist at The Craniofacial Center, Department of Surgery at the University of Illinois at Chicago (UIC), Illinois. She has been practicing clinically for nearly 20 years.

Ms. Seelaus is a researcher, instructor and developer of advanced digital technology processes in anaplastology with interest toward improving

reconstructive outcomes globally through improved clinical protocols, outcomes, efficiencies and access to care. Her clinical focus is on the use of osseointegrated implants and technology in facial prosthetic rehabilitation.

She has served and serves on boards and committees including: International Society of Maxillofacial Rehabilitation (ISMR); SIG for Facial Prosthetic Rehabilitation (SIGFPR); ADT Foundation: Advanced Digital Technology in Head & Neck Reconstruction; International Anaplastology Association (IAA); Board for Certification in Clinical Anaplastology (BCCA); Journal of Prosthetic Dentistry; International Journal of Maxillofacial Rehabilitation; and is an Honorary Member and Vocal de la sociedad latinoamericana de rehabilitación bucomaxilofacial Por Estados Unidos.



## Prof Tom Potokar OBE

MBChB, FRCS (Ed), FRCS (Plast), DA (UK), DTM&H

Tom is a Professor of Global Burn Injury Policy & Research at Swansea University, an honorary consultant Burns and Plastic Surgeon at the Welsh Centre for Burns and Plastic Surgery, and the Director of Interburns.



He contributed to the WHO 5 Year Plan for Burn Care and Prevention, and is Co- Chair of the WHO-EMT Technical Working Group on Burns that is developing recommendations for management of burn mass casualty events. He led the development of Interburns comprehensive integrated approach to quality improvement and capacity building in burn care

and prevention. The Centre for Global Burn Injury Policy & Research has recently received an NIHR grant to establish a Global Health Research Group on Burn Trauma. He has over 40 publications including several book chapters, has presented at numerous national and international meetings and is a regular reviewer for a number of burns journals.

He was awarded an OBE in the 2016/7 New Year's Honors list for services to global burn care and prevention

### **Fraser Walker** Msc FIMPT

Fraser started his career as an apprentice dental technician in the R.B.Wilson dental laboratory in 1973. On completion of the City and Guilds dental technicians final certificate in 1977 he gained employment in the Glasgow Dental Hospitals prosthodontic laboratory with the aim of gaining further training and advanced qualifications. During his time at the Dental Hospital a job became available at the renowned Canniesburn Hospital and with it the opportunity to start a career in Maxillofacial Prosthetics which was his ultimate goal.



He was employed in Canniesburn in 1979 and has remained in this employment until the present day. He was in the fortunate position of being able to progress his career without leaving this service and found himself as the head of service for the regional Maxillofacial Prosthetics and Technology service for the West of Scotland, a post he has held for the last 26 years.

He was mentored by Professor Kurshied Moos OBE who was to shape his career in the specialty. Prof Moos was a pioneer in many aspects of Maxillofacial surgery and it was as a result of his interest in craniofacial deformity correction the Fraser's interest in surgery planning was established, an interest which he finds as engaging today as it was then. Research in the area of craniofacial deformity has always been an area of keen interest to Fraser and in 2005 he graduated with an MSc (Med Sci) by research from the University of Glasgow with the research and development of an orthognathic face bow and articulator. He holds Honorary Lecturer status with the University of Glasgow, Licencientship of the City and Guilds of London Institute and Fellowship of the Institute of Maxillofacial Prosthetist and Technologists.

### **Paramjit Kaur** MIMPT

From 2003, Paramjit was, a trainee Maxillofacial Prosthetist at Northern General Hospital in Sheffield, then worked as a Maxillofacial Prosthetist for 6 years in a deputy manager role at King's College Hospital, London. Paramjit is currently based at St George's Hospital in London and is part of the 3D Prosthetic rehabilitation team, manufacturing appliances including surgical stents/orthognathic wafers and maxillofacial prostheses



Paramjit Kaur has professional diploma in Learning and Teaching in Professional Practice (2014) and has been involved in teaching maxillofacial prosthetics in clinical practise, IAA and IMPT conferences and in-house training in London Hospitals.

## Anna Malene Grip MSc

Anna Malene has completed a Cand.mag (BA) in psychology and marketing, as well as a MSc in Maxillofacial Prosthetic Rehabilitation at Kings College, London



She has worked for Maine Grip AS since 2003. Anna Malene and Maine work with Oslo University Hospital, Ullevål at the Ophthalmological Department and with the section of Head, Neck and Reconstructive surgery.

Anna Malene's work primarily consists of producing individual eye prostheses and scleral shells. She also makes orbital, auricular and nasal prostheses, working closely with the hospital as part of the Ophthalmological and Maxillofacial team.

## Steve Worrollo FIMPT

Prior to retirement, Steve was Consultant Maxillofacial Prosthetist and Laboratory Services Manager at Queen Elizabeth Hospital, Birmingham

His main interests are surgical / prosthetic planning and the rehabilitation of patients undergoing ablative surgery in the management of head and neck cancer



Steve is a founder member of the Birmingham Osseointegrated extra-oral implant programme and a regular lecturer at scientific conferences. He is an instructor on numerous national and international head and neck courses.

Steve has authored and contributed to many scientific papers, as well as chapters on maxillofacial prosthetics in surgical text books, including Stell & Maran's Textbook of Head and Neck Surgery and Oncology and Scott-Brown's Otorhinolaryngology, Head and Neck Surgery Vol. I.

Steve is also an advisor and contributor to syllabus content for reconstructive science qualifications



## Applications of 3D Planning in Maxillofacial Surgery

*Adrian Sugar, Morriston Hospital, Swansea, UK*

This presentation will trace the history of 3D Imaging especially related to the head and neck and its application to 3D Planning in Maxillofacial Surgery. It will track the way in which this has driven the use of 3D Virtual models using user friendly computer software to create and trial surgical options and then make guides and implants. The various modalities of 3D Printing both Subtractive and Additive will be described and the way in which they can be used to enable better, more accurate and time saving surgery with crucially better outcomes for patients. Applications of these digital technologies to Maxillofacial to Trauma both primary and secondary, Tumour surgery for ablation and reconstruction, and facial deformity especially congenital deformity will be shown through case studies.

## Nasal Rehabilitation Following Rhinectomy – The Morriston Experience

*Madhav Kittur, Morriston Hospital, Swansea, UK*

The history of Nasal reconstruction dates back 2000 years to the days of Sushruta, the famous Indian Surgeon. Reconstruction and rehabilitation following Rhinectomy remains controversial and a complex problem. Although reconstruction with local and microvascular flaps is a valid option, the aesthetic and functional outcomes may not always be satisfactory. The results achieved with a nasal prosthesis are far superior, but patient acceptance relies on a secure method of retention and psychological acceptance of a prosthesis. We present our experience with the use of zygomatic implant for retention of nasal prosthesis including implant planning, surgical considerations and post surgical rehabilitation.

## Session I: Facial Prosthetics

### Topographic Bone Thickness Maps for the Evaluation of the Placement of Titanium Miniplates for Nasal Prostheses

*Philippe A. Federspil (1), Alexander Jung (1), Wilhelm Wimmer (2), Karim Zaoui (1)*

*1 Heidelberg University Hospital, Dept. of Oto-Rhino-Laryngology, Germany*

*2 ARTORG Center for Biomedical Engineering Research, Bern University, Switzerland*

#### Background

How well does the intuitive implantation method for titanium miniplates meet optimal bone stock?

#### Material and Methods

We studied 20 patients with titanium miniplates. A colour-coded topographic bone thickness map (TBTM) was created in Amira (Thermo Fisher Scientific). The implant plate virtually transposed into a position with higher bone thickness. Bone thickness was measured by a point score: 0-1mm: 1 point, 1-2mm: 2 points, 2-3mm: 3 points, 4-5mm: 4 points, and >4mm: 5 points. The points at each bone screw were summed up to give the Bone Thickness Score (BTS). The BTS was divided by this number to give the Bone Thickness Index (BTI).

#### Results

None of the plates lost osseointegration. The BTI for t- and u-plates could not be improved. The BTI for y-plates could be raised from a median of 3.1 mm to 4.1 mm ( $p < 0.0005$ ). The change was considered substantial ( $\geq 0.5$  points in BTI) in nine (56%) out of 16 y-plates. The median vector was 2.4 mm.

#### Conclusions

Approximately half the y-plates could have been inserted at areas with higher bone thickness if this information was available during surgery. However, the ideal position is located only a few millimeters from the actual placement.



## Understanding Colour

*R Seelaus, Craniofacial Centre, Dept. Of Surgery, University of Illinois, Chicago, USA*

Colour application in facial prosthetic rehabilitation remains a substantial challenge for many practitioners worldwide. To achieve a natural appearance of colour appearance in silicone, it is important to appreciate both the scientific and artistic aspects of colour that contribute to the overall perception of a good colour match. The successful facial prosthetist considers both the fundamentals of subjective colour matching with an evaluation like an artist, but also appreciates and respects the objective evaluation and matching of colour like a scientist or technologist.

This lecture will review the fundamentals and science of colour perception & application; and will explore technical considerations when selecting and employing colour technology in the colour-matching process for facial prosthetics.

The exciting prospects of technology's evolution provides commentary for discussion, as we witness the convergence of colour technology with other digital technologies that represent innovative opportunities for defining new global solutions in facial prosthetic reconstruction for the future.

## Application of Digital Technologies in Anaplastology

*J Rosický, A Grygar, M Paravan, P Chapcak, ING Corporation, Invent Medical Group, Czech Republic*

Assessment, treatment planning, design and manufacturing of custom-made facial silicone prostheses, all that could be realized with the use of digital technology. The purpose of this abstract is to describe the way we use digital methods in anaplastology in our clinical practise.

**Digital Data Acquisition:** Data acquisition could be obtained from CT, MRI or 3D surface scanning. We use different scanners (FCS-100, Artec EVA and ATOS Triple Scan) and software (SurgiCase, ZBrush) to process CT/MRI data.

**Treatment Planning:** Virtual 3D models could be used for treatment planning – an optimal placement of osseointegrated implants and a design of surgical guides, that could be manufactured by 3D printing.

**Computational modelling:** We create virtual mirror 3D models of missing body parts, we can virtually sculpt facial prostheses from scratch or modify existing digital models in ZBrush software. There is a possibility to design manufacturing moulds for prostheses as well.

**Manufacturing:** The combination of manual process and different 3D printing technologies (SLA, HP MJF, FDM) is used during manufacturing

Application of digital methods and technologies represents an alternative to traditional ways of fabrication of custom-made facial silicone prostheses. Nevertheless, this approach requires financial investment into equipment and also professionals working with digital technologies.

## The Faceprint Service

*A Ridwan, T Forouzanfar, W Mueller, N Ostergaard, Amsterdam University Medical Centre, Amsterdam, Netherlands*

In Europe and the US there are annually ~32,000 auricular and nasal prostheses needed due to facial defects that are the result from surgical ablation of cancer, severe trauma, or congenital craniofacial anomalies. Patients with these aesthetic defects experience psychological problems and reduced quality of life (QoL), as most of the defects cannot be corrected surgically. Facial prostheses can restore the function of facial organs, appearance, and improve social, emotional status, and overall QoL.

However worldwide there is a lack of anaplastologist and a lot of patients don't have access to treatment for this big impairment. That is why we are developing the access to treatment for this big impairment. That is why we are developing the FacePrint project, a market-ready, rapid, and low-cost 3D printing service for facial prosthetics. The faceprint consortium exists of several international partners, a multidisciplinary team, which each have their own contribution. Our goal is to develop in 3 years a 72-hour service for maxillofacial clinicians from all of the world to design and fabricate auricular and nasal prostheses based on imaging data. We will show where we stand at this moment and which challenges we are facing.



## Partial Nasal Prosthetics: Problems and Solutions

Jörn Brom, Brom Epithetik, Heidelberg, Germany

With an aging population there is an increase in the incidence of partial nasal defects. These defects due to their location and anatomy are very difficult to prophetically rehabilitate successfully.

We present several cases and discuss the various options to create the optimum result. These include several implant systems, spectacles and adhesives that are available. The size of the prosthesis in relation to the defect various 'tips and tricks' will be presented In the conclusion we discuss the advice that can be given pre-surgically.

## Making Connections – A Case Study

Kirsty Galt MIMPT, University Hospital Crosshouse, Kilmarnock, UK

The prosthetic rehabilitation of maxillofacial patients can prove challenging at the best of times. Good aesthetic results can be achieved but secure methods of retention and function are important for patient acceptance. The advent of osseo-integrated implants has greatly improved anchorage, however, placement of fixtures in the nasal region still provides challenges due to the quantity and quality of the bone available. When implants have been placed and failed this not only compromises retention but increases the challenge to find a stable and secure method of fixation for a prosthesis.

A multi-disciplinary approach is essential to obtain the best possible prosthetic outcome for the patient.

This presentation describes the prosthetic rehabilitation of a rhinectomy and maxillectomy patient, where osseo-integrated retention is very limited. Traditional methods combined with digital technology are employed to restore aesthetics and provide functional prostheses. I I

## Session 3: Facial Prosthetics

### Revisiting Anatomical, Surgical and Dermatological Models from Then and Now

G Duncan, Artificials Ltd, Rochester, Minnesota, USA

While the best model for investigating human anatomy has always been the human cadaver, for centuries, the use of three-dimensional anatomical models has been ubiquitous in medical, surgical and public/patient education of the human body. This discussion of anatomical models is divided into three areas of enquiry. First, to describe the quest to determine the age, origin and maker of a group of paper mâché and plaster life size anatomical models in the Greenblatt Library at Augusta College of the Medical College of Georgia, Augusta, GA. USA. Secondly, to discuss the value and usage of these antique models and other anatomical, surgical and dermatological models in the 21st century. Thirdly, to demonstrate the step-by-step design and fabrication of anatomical display models of craniofacial prostheses used to educate patients and health care providers.

Presently, there are seven life-size paper mâché and plaster anatomical models to research in the Georgia collection. It has been suggested that some of these models could be examples of the anatomical casts of the French team of Nicolas-Augier-Roux, who produced and sold, internationally the last important collection of artificial anatomical models produced between 1919 and 1939. This leads us into the second area of enquiry as to the repair and maintenance of wax, paper mâché and plaster models and whether collections of anatomical, surgical and dermatological models are still displayed, appreciated and used. The third part discusses the genesis and fabrication of display models of craniofacial prostheses for educational and archival purposes.

## Patient Management for Placement of Extra-Oral Implants – Team Approach

*S. Edmondson FIMPT, Queen Elizabeth Hospital, Birmingham, UK*

We are often called upon to help facilitate with patient management for placement of extra-oral implants.

We look at some cases for orbital, nasal and auricular sites for patient management of extra oral prostheses and the importance of a team approach

## Early Nasal Prosthetic Rehabilitation Following Surgery

*P Evans, K Shah, M Kittur, A Gonzalez-Alvarez, Morriston Hospital, Swansea, UK*

Cancer ablative rhinectomies are extremely disfiguring surgery. Craniofacial implants for prosthetic retention can be placed at time of surgery or at a secondary procedure but the patient will still wait at least 6 weeks without a prosthesis.

### Method

We have developed a protocol for patients undergoing a rhinectomy to ensure that they have a silicone prosthetic immediately following surgery and through the dressing stages until their final implant retained prosthesis is fitted.

The initial nasal shape is acquired from the pre operative planning CT and modified using Freeform Plus Software (Geomagics US). This allows the tumour distorted tissues to be modified into a symmetrical form. The form surface is used to create a high consistency silicone prosthesis that can be surgically stitched into place over the post operative dressings. At later dressing changes the prosthesis can be spectacle mounted.

### Results

The technique was developed in response to patient feedback that their appearance profile was so dramatically altered it was difficult to face family and friends. The protocol has been well received and helps to rehabilitate patients prior to surgery.

The techniques have been applied in other instances such as partial rhinectomies where surgical reconstruction is planned following the biopsy results with positive results and is a useful adjunct to treatment.

## The new Medical Devices Regulation and the Potential Impact on Services

*J. McCarthy, Consultant Clinical Engineer, Clinical Scientist, Clin Eng Consulting Ltd, Cardiff, UK*

The new Medical Devices Regulation came into force on 25th May 2017 and becomes fully applicable on 26th May 2020. It replaces the Medical Devices Directive and the UK regulations made under that Directive.

The basic structure and arrangements are similar but more detailed and stricter. Of particular relevance to a health institution (HI) is that medical devices manufactured and used only within the same HI are now regulated (all be it with an exemption from full conformity assessment) provided certain conditions are met: the so called Health Institution Exemption in Article 5.5. Such devices were unregulated under the MDD.

The key requirements that must be met are:

All General Safety and Performance Requirements must be considered and relevant ones addressed. Devices must not be transferred to another legal entity. Manufacture and use must occur under appropriate quality management systems. Technical documentation must be drawn up such that the intended purpose, design, performance and manufacturing process can be examined by the competent authority (MHRA). Experience gained from clinical use is reviewed and necessary corrective action taken. Various information is made publicly available. This presentation will consider these requirements and discuss their implications.

### Orthognathic Model Surgery Planning: Not an open and Shut Case

*Fraser Walker FIMPT, Queen Elizabeth University Hospital, Glasgow, UK*

Orthognathic model surgery planning is a crucial step in the treatment of patients with dento-facial and craniofacial deformities. In today's healthcare environment evidence based practice has become an essential requirement in patient care and treatment, orthognathic model surgery is no exception to this principle. Over many years it has become obvious that many methods being used are outdated and have been passed down from generation to generation by word of mouth with little regard to accuracy. Much of the work undertaken by the reconstructive scientist can be repeated if the result is compromised however orthognathic surgery is one area where such safety nets do not exist. The trust placed in us as a team to alter the appearance of a patient's face for life is a responsibility which cannot and must not be taken lightly.

In this presentation I will share the work I and my team have done to provide an evidence based method of orthognathic model surgery prediction. As a member of several teams I am involved with traditional methods of prediction planning and more recently a clinic which is purely digital using only computer software for prediction and 3D printed intraoperative wafers. I am grateful for the opportunity to share my observations in this exciting area of our practice.

### The digital contribution in maxillofacial prosthesis

*Jacqueline Frohman, Frohman Care, Metz, France*

Surgical reconstruction after a total maxillectomy remains challenging. This presentation will cover one of the approaches based on a very anatomical design suitable to mini invasive surgery that leads to good functional and anatomical outcomes thanks to 3D printing.

It constitutes a new therapeutic alternative for the reconstruction of large defects after total maxillectomy

### A Novel Approach to Improve Access and Visualisation of Skull Base Tumours

*J Abbasi, D Srinivasan, N Ahmed, J Watson, Queens Medical Centre, Nottingham University Hospitals, Nottingham, UK*

Tumours of the skull base by their nature are difficult to access. Current surgical approaches include endonasal access assisted with an endoscope for visualisation of the internalised structures and zygomatic osteotomy for lateral access. These approaches are limited in terms of visualisation of the site and access to more complex and internalised tumours.

Traditional frontal craniotomies offer wide asymmetrical exposure of the cranial skull base, however the visualisation of extensive internalised tumours is poor without excessive retraction of the brain. This introduces the risk of post-operative tissue oedema and as a result, cerebral spinal fluid (CSF) discharge.

We present a novel surgical technique adopted at Queens Medical Centre, Nottingham, to treat skull base tumours. The technique involves two craniotomy sites. The first a traditional frontal craniotomy and a second frontal bar osteotomy (FBO). An extended craniotomy is performed, to include the orbital roofs and ethmoid sinuses. This provides additional exposure of the anterior, middle and posterior cranial fossae.

The FBO has currently been performed on a total of 4 patients. The reconstructive science role is explained, and the findings of the short case series is analysed. I

## A Novel Approach to Permanently Treat Sleep Apnoea with Distraction Osteogenesis

*J Smith, D Srinivasan, J Watson, Queens Medical Centre, Nottingham University Hospitals, Nottingham, UK*

Obstructive Sleep Apnoea (OSA) occurs when a patients' airway collapses during sleep resulting in cessation of breathing and a dip in blood oxygen saturation. These apnoeic events are linked to serious health conditions so effective treatment is required. Repositioning the mandible in protrusion has been shown to permanently eliminate OSA symptoms. However this is a fixed movement of 10mm to allow the maxilla to be moved to maintain the patients occlusion. What if the patient needs more protrusion to successfully eliminate the OSA symptoms?

### Case

A patient was treated with a degree of success with a removable MAD for three years. The OSA was diagnosed tongue related obstruction. A permanent solution was sought.

### Method

The mandible was bilaterally distracted (1mm per day) to control the amount of protrusion. Symptoms were monitored by several sleep studies. The distraction was stopped when the patients' symptoms ceased. Distraction was coupled with a genioplasty to maximise protrusion.

### Result.

The patients AHI reduced from 26.3 (moderate) to 3.8 (normal). He has a class 3 occlusion that is to be corrected at a later stage.

### Conclusion

Distraction osteogenesis is a predictable tool in the reduction of OSA.

## An Evidence Based Method of Titanium Cranioplasty Construction

*C Turner, E Baird, M Cardona, Queen Elizabeth University Hospital, Glasgow, UK*

Cranioplasty fabrication within maxillofacial laboratories varies radically from unit to unit within the UK. There is little proven evidence to suggest an ideal method of construction of these implants. I will present the results of an evidence based study which was undertaken in association with Strathclyde University Department of Biomedical Engineering, concluding with an evidence based manufacturing process for titanium cranial implants.

## Session 5: Body Prosthetics

## Two Decades of Design Engineering in Maxillofacial Reconstruction and What's Next

*Prof. D. Eggbeer, Cardiff Metropolitan University, Cardiff, UK*

Global healthcare systems face numerous challenges around delivering the best value for money whilst achieving the best possible outcomes. An aging society, disease, variations in surgical outcomes and tightening regulations all contribute to the need for better products and services. Personalised devices, such as implants and prostheses, improve the accuracy, safety and predictability of complex surgical and prosthetic procedures; they embrace prudent healthcare principles of reducing inappropriate variation using evidence-based practice and make it more likely to a get it right first time.

Precision design engineering technologies, such as 3D computer aided surgical planning, Computer Aided Design (CAD), Additive Manufacture (AM) and 3D printing are used to design better personalised devices. They have been used for over two decades, playing an important role to improve healthcare efficiency and patient outcomes. However, safe and efficient adoption of these technologies into healthcare is challenging; it requires the adoption of new skills into the NHS, rigorous research and development to ensure regulatory compliance, and close collaboration between industry, the HEI and NHS to provide on-going training. This presentation reviews key developments and applications of design engineering technologies and considers the next important steps required to enable more efficient use in the future.

## **When Analogue Technology Enables Modern Digital Technology: Making a Penile Impression for a New Treatment of Non-Invasive Penile Brachytherapy**

*D. Morrison, Dept. of Dentistry, Craniofacial Prosthetic Unit Sunnybrook Hospital, Toronto, Canada*

This presentation offers the unusual challenge posed when obtaining an optimal digital scan of a patient's penis was unable to be made by another department and was thus stalling the start of a new treatment protocol being developed at Sunnybrook Hospital. When the Craniofacial Prosthetic Unit was approached for advice and presented with their technical problem, the matter of making an analogue impression and obtaining a digital scan of the resulting cast model with the CPU's equipment instead became the work-around solution. As most anaplastology presentations are generally head and neck, somato and breast case studies, this unusual case demonstrates the impression technique of a more unusual body part, offers insights into the relatively rare and potentially devastating issue of penile cancer and also demonstrates the new non-invasive brachytherapy service at Sunnybrook Hospital, resulting in the successful outcome post-treatment.

## **Alternative Digit Prosthesis with 3D-printed Moveable Joints**

*A Davey, Southmead Hospital, North Bristol NHS Trust, Bristol, UK*

This case presentation is of an alternative digit prosthesis that was designed and created jointly with a proactive patient, to improve its form and function. After initial consultation appointments with the patient, describing what we were able to offer him following his recent ring-finger amputation, it was agreed to start with simple silicone prosthesis with a potential hinge section. The patient requires use of his hand in a fist-shaped position for his type of work, pulling loads and was struggling with grip and the practicalities of a static bent-shaped finger prosthesis was not ideal. During a planning appointment, together we decided with use of 3D planning, we would be able to create an ideal joint for the proximal interphalangeal (PIP) joint movement. Over time, with a prototype and further planning appointments, we found the ideal arrangement and were able to use joints for both the PIP and distal interphalangeal (DIP) joints. With use in a glove (and attachment between the prosthetic finger and the adjacent middle glove finger), grip was restored and a moveable prosthesis proved successful. Joint design is continuing to be perfected and the future development of a similar prosthesis with attachment via an implant is underway.

## Troubleshooting: Multi-disciplinary Team (MDT) Working

*H Dimond, Royal Worcester Hospital, Worcester, UK*

NHS England defines Multi-disciplinary working as ‘*appropriately utilising knowledge, skills and best practice from multiple disciplines and across service provider boundaries eg. Health, social care or voluntary and private sector providers to redefine, re-scope and reframe health and social care delivery issues and reach solutions based on an improved collective understanding of complex patient needs*’.

As members of MDTs, we should be more than familiar with the concept. Many of us will be fortunate enough to work within extremely successful MDTs. Drawing on my own experiences of working within successful, and not so successful MDTs, in combination with shining a spotlight on guidelines for MDT working as set out by NHS England, I would encourage the question *how well is my MDT working?*

## 3D Printed Pelvic Reconstruction, a Multi Disciplinary Approach

*M Pilley, B Rollett, R Ashford, G Offer, University Hospitals of Leicester NHS Trust, Leicester, UK*

We present an article which describes the UK's first partial pelvic titanium reconstruction using Computer Aided Design & Manufacture. We describe the patient pathway and operative management of performing a 3D printed pelvic reconstruction.

CT scans of the pelvis were performed to aid reconstructive planning with the use of a 3D printed pelvis. A titanium bar was then custom made to fit the 3D pelvis. Reconstructive surgery was then performed using the sterilized titanium bar.

The patient remained an inpatient for 6 days and underwent surgery with a combined team of plastic and orthopaedic surgeons. No significant complications arose in the perioperative or post-operative phase.

We hope this article gives other surgeons a guide of how this procedure was performed and the hurdles that were needed to overcome to plan and perform successful surgery.

## Education, Education, Education

*J Linha, Linha Zahnlabor, Vienna, Austria*

Associate membership of the IMPT has opened so many new doors for me, to broaden my education, my training and meeting new colleagues. Winning the IMPT travel scholarship gave me the opportunity to explore more training experiences to help make me a better Prosthetist and ultimately to help my patients. I was able to obtain a valuable clinical placement in the UK at 2 different regional centres. This experience would have been hard to obtain without the IMPT membership support. I will present some of my experiences in the UK and Europe on my studies and how these opportunities have given me renewed confidence. I hope it will inspire others to apply for the IMPT membership and the travel scholarship so they may benefit from this organisations support.

## GIRFT: Getting It Right First Time

*J Watson, Queens Medical Centre, Nottingham University Hospitals, Nottingham, UK*

Getting It Right First Time (GIRFT) is a national review of NHS surgical and medical hospital specialities that began in 2012. The review was commissioned to look at key areas, to examine ‘best practice’ and try to improve patient outcomes within the resources of a modern NHS. The NHS faces unprecedented financial challenges so we need to examine the provision of all NHS services and procurement.

The other GIRFT reports across multiple specialities have focused on developing networks regionally to make savings and provide less duplication, centralising services to improve outcomes for patients by developing and focusing on what individual specialist units are good at, and do more of it.



The provisional review into Maxillofacial surgery was published in November 2018. Laboratory services are briefly mentioned in the revue, but the GIRFT Team contacted the IMPT as they were keen to get a focused, profession-supported view on services. The initial GIRFT report recognised variation in laboratory services across the country (large gaps in specialist coverage) and type of services provided (variation) and investment in the laboratories (new technology). The key questions the initial report and subsequent discussions raised were; What is a maxillofacial laboratory? What does it look like now? What should look like in 10 years? Geographically where do we need them to maximise service provision for patients and surgical specialities? The IMPT steering group developed a pilot questionnaire to collect data in the 6 units to better understand the 3 key themes of Data Collection, Improved Networks and Procurement. The results will be discussed and there will be an opportunity to ask questions of the team.

## Session 6: Splinting and Therapeutic Appliances

### Facial Burns: History, Treatment and Problems

*T Potokar, Morriston Hospital, Swansea, UK*

In terms of surface area, the face itself only accounts for about three percent from forehead to chin and ear to ear, yet within this small space we can read emotions, ascertain age, recognise friends and family and define beauty. No two faces are the same and no one face stays the same over a lifetime. Psychological and physical trauma can both leave their marks, some subtle some brutally obvious. The challenge to reconstruction is not just surgical but must be considered holistically and individually. Beauty may be in the eye of the beholder, but the beholder is both without and within, and the quality of beauty goes beyond the pure aesthetic.

### Facial Burns from House Fire: 5 Years On

*P Kaur, St. George's University Hospitals NHS Foundation Trust*

#### Background

We describe burns pressure therapy splinting for a 21 year old patient who sustained facial burns aged 16. The patient indicated mature hypertrophic scars resulting from burns and a z-plasty scar release after healing. Challenges arose due to mature, thick scarring. We had not dealt with pressure therapy on such mature scars before but the referring consultant felt pressure splinting would be beneficial.

#### Method

Early splint therapy was not possible at the time due to skull fractures. Hypertrophic scarring from burns injuries have demonstrated an improvement when utilising a monitored pressure splint therapy treatment allowing for consistent evaluation and adjustment. Two custom made facial pressure splints were utilised in this case, 1. Facial pressure splint with silicone gel sheet applied to areas where needed and most recently, 2. A silicone lined facial pressure splint.

#### Results

A compliant patient is crucial to a successful outcome. The pressure splint therapy treatment took 3 years due to additional surgeries/treatments whilst undergoing pressure splint treatment. The hypertrophic scars are now soft and flattened.

#### Conclusion

Mature hypertrophic burns scars can be treated successfully with compliance, careful monitoring and adjustment. Due to the maturity of the scars a two splint approach is preferable.

## Nasal Septum Epithesis – The Ultimate Technical Solution

*M Schürer, L Schürer, I Schürer, Werkstatt für Epithesen Iris Schürer, Iffeldorf, Germany*

We describe an elegant technique for manufacturing the perfect nasal septum epithesis: Separate impressions through each nostril are taken to define the septum defect. The overspill is removed, thereafter both impressions are merged and glued together.

The edges of the merged impression facing towards the septum are fortified with a thin layer of an extra hard wax. This maneuver guarantees, that the feather-edges of the epithesis apply a soft pressure to the tissue adjacent to the defect. Using Technovent elastic Occu-Form a new impression of the edited original is taken. After removing the edited original from the Occu-Form, the resulting negative is filled with a hard sculpturing wax. Cool the form and harden it in the freezer. The wax model is taken out of the Occu-Form. It can now be trimmed with the "Waxlectric" instrument.

The trimmed wax model is now molded in three parts, the usual way. Finally the silicone epithesis can be manufactured. Colour markings on the silicone ensure easy handling.

The septum epithesis can be inserted without anesthesia. We always produce two epitheses, since they should be exchanged every six months for hygienical reasons.

## Auricular Keloid Splinting-The Pressure of Compliance

*C Gravenor, Morriston Hospital, Swansea, UK*

Helical and lobe Keloids are traditionally difficult to treat conventionally. Surgical excision requires effective compression of the operative scar to prevent recurrence while retaining the contour and elasticity of the helix. There are numerous published designs for post operative keloid splints but the key is making an effective splint that is minimally visually obtrusive, easy to place and comfortable to wear. This gives the maximum possibility for patient compliance and success.

We detail the post surgery timings and protocols and describe the design and manufacture developed over the past 15 years with illustrated results.

## Nasal Obturators for Speech: a Non-Surgical Treatment for Velopharyngeal Dysfunction in the Cleft Palate and Non-Cleft Population

*C Reed, Guys and St. Thomas NHS Foundation Trust, London, UK*

Velopharyngeal dysfunction has many causes including cleft, traumatic brain injury, 22q11 deletion syndrome and nasopharyngeal cancer. Treatment traditionally consists of surgery and speech therapy, however where surgical intervention is not indicated the Cleft team approached the maxillofacial prosthetic service to see if we could provide a prosthetic alternative.

After gaining approval through the Trust Risk and Quality Committee for new device fabrication, 36 patients have been referred to the department. 27 patients have been fitted with devices, 5 are in progress and 4 declined further treatment.

Early results show a decrease in nasal emission scores, nasal turbulence scores and number of passive cleft speech characteristics with the use of nasal obturators. Patient satisfaction with comfort, appearance and breathing has improved with design adaptation.

The presentation will include an overview of gaining Trust approval for new devices, fabrication of the devices, how the design has developed over time and patient results and comments.

## Session 7: Orbital and Ocular Prostheses

### Team Approach in Contracted Eye Sockets. A Presentation of Two Cases.

*K Eidal, K Bergström, S Hegg-Lofstad, AM Grip, Oslo University Hospital, Oslo, Norway*

#### Case 1.

Patient with Acute Myeloid Leukemia (AML) suffered from severe side-effects from the treatment such as soft tissue necrosis around the patient's right eye and cheek. The lower eyelid severely contracted, and the eye had to be eviscerated. Due to the lack of a lower fornix and lower eyelid for retention of the prosthetic eye, a special prosthesis was fabricated consisting of a regular indwelling prosthetic eye sutured under the upper eyelid. The lower eyelid was made in silicone with magnetic retention.

#### Case 2.

Patient with right sided Congenital Anophthalmia. The primary treatment was conformers for expanding the eye socket. This proved very challenging due to the lack of a lower fornix. To ensure orbital growth, an implant was placed in the eye socket. After several attempts to reconstruct the lower eyelid, a method of suturing the prosthetic eye was preformed and today the patient can wear an regular indwelling eye prosthesis.

### Nationwide Artificial Eye Study

*E Worrell, Queen Victoria Hospital NHS Trust, East Grinstead, UK*

People who wear an ocular prosthesis often suffer with dry eye symptoms. Up to 90% will also complain of socket discharge, many of whom on a daily basis. Psychometric questions from the National Eye Institute Visual Functioning Questionnaire, was used to investigate the patient's quality of life, how the loss of an eye has impacted on their well-being.

Participants completed a questionnaire covering aetiology, length of prosthetic eye use, length of eye wear, age of prosthesis, cleaning regime, lubricant use, inflammation, comfort and discharge. Lower scores relate to a better tolerated prosthesis. The association between deposit build up, frequency of ocular polish, to socket discharge and dry eye symptoms were evaluated. In addition to a series of quality of life questions to probe the effects of monocular vision on day-to-day activities, hobbies, driving and how each patient regards their own general health after the loss of an eye. This presentation will report the results from 40 nationwide sites.

### Designing Facial Prostheses in the 3D World and Orbital Issues

*AM Riedinger, P Hémard, M Maechling, Centre d'Epithèses Faciales, Strasbourg, France*

The Centre for Facial Epithetics in Strasbourg, France, works since 30 years + in collaboration with a team of surgeons from the University Hospital Center as well as the University of Strasbourg. A review of 30 years collaboration between surgeons and anaplastologists for bone anchored prostheses shows the tremendous changes in the evolution and new possibilities offered by 3D tools. It opened doors for reconstructive solutions of complex patient cases which were barely possible before.

The surface scanner enables virtual design of the prosthesis, and 3D printing of the patients model and mould.

For an orbital prosthesis for example, it also captures the eye orientation so that the ocular piece is then perfectly positioned into the future prosthesis with the precise details of the skin texture and folds.

Nevertheless, the scan is a one shot one moment, one expression of the patient which needs to be adjusted to the patient's real character and ideal cases are rare. Cavity is rarely ideal, patients are not symmetrical, optical illusions disturb reality. How do we deal with those issues?

## Rehabilitation: From the Battlefield to the Streets of Birmingham

*H Koria, Queen Elizabeth Hospital, Birmingham, UK*

Gun violence is on the rise in the UK; however most of the literature on gunshot injuries relates to military weaponry and is difficult to apply to civilians due to variations in wound contamination/injury.

The difference in military and civilian injuries is often the outcome of a penetrating bullet. In combat situations the majority of penetrating missile wounds are from either explosives (IEDs/grenades) producing low-velocity fragmentation or high-velocity fragmentation resulting from close-range shotgun/handguns which inflict considerable damage.

Management of facial gunshot wounds has evolved and varies from conservative delayed operative repair to an early aggressive single stage approach. This has been largely due to the increased use of free tissue transfer which allows the transfer of well vascularized bone and soft tissue into the wound. Early transfer of vascularized tissue helps restore the bony and soft tissue framework while minimizing scar contracture.

We look at the variation of treatment for these complex cases from conventional procedures to modern day techniques.

## Design process and Clinical Application of a 3- Dimensional Printed Titanium Implant to Personalise the Vector of Mandibular Distraction

*A Gonzalez Alvarez, S Key, A Sugar, P Evans, L Dovgalski, Morriston Hospital, Swansea, UK*

The success of surgical distraction procedures for the treatment of congenital mandible anomalies relies on the trajectory of the distraction device.

Digital technologies have been used to predict the optimal distraction and deliver the plan into surgery with the design of customise cutting and drilling guides. We describe a complex paediatric case where the optimal vector of distraction could not be achieved with “off-the-shelf” distractors despite using digital planning. Consequently, the distractor was personalised by adding a novel component used as a spacer in between the mandible and the distractor. The assembly in between the spacer and the distractor delivered an optimal vector of distraction. The spacer as well as the cutting and drilling guides were additive manufactured by powder bed fusion technology in titanium alloy and successfully used in theatre.

The presentation will describe the design process of the patient specific guides and implant, their application during surgery, the post-operative results and the challenges encountered during the whole process.

## Session 8: Problem Solving

### Thinking Outside the Laboratory Box

*S Worrollo Queen Elizabeth Hospital, Birmingham, UK*

We live in time of change and rapid developments both from within our own profession and externally . Change requires the ability to adapt existing established practices with developing technologies and medical advances that impact on our role. Surgical techniques available today have changed dramatically over recent years which allow more options for reconstruction and improvement patient outcomes

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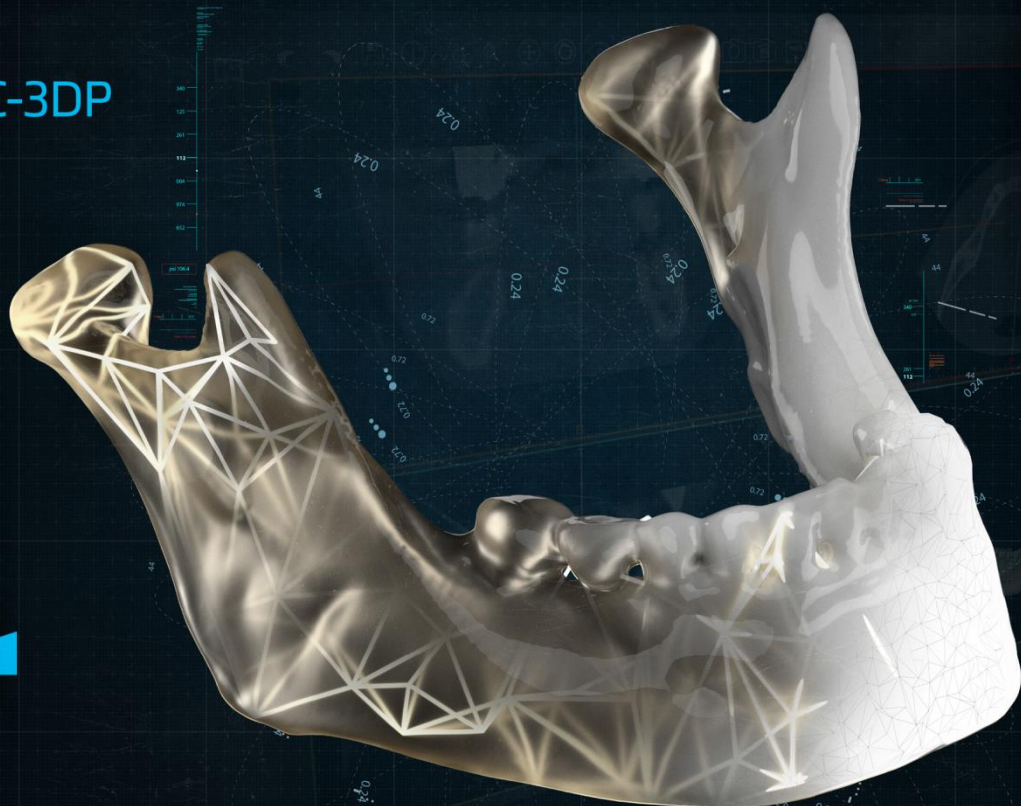
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## Poster Presentations

### Regenerative Medicine, 3D Printing and Biofabrication and their Influence on Maxillofacial Prosthetics

*S Guerrero, E Worrell, Queen Victoria Hospital, East Grinstead, UK*

Regenerative Medicine (RM) is an exciting field that holds much promise for generating innovative therapies for a wide variety of diseases and disorders. RM focuses on harnessing the body's own repair mechanisms to replace or heal damaged tissues and organs, with the hope that rejection of transplanted donor organs may be solved in the future.

The convergence of science, technology and medicine in Utrecht are highlighted in this poster presentation, through a combination of patient interaction, hands-on bench work, and practical demonstrations.

Additive manufacturing (3D printing) uses a layer-by-layer principle for fabrication. Utrecht demonstrated the opportunities of additive manufacturing technologies and 3D (bio)printing in biomedical applications.

This poster illustrates an overview of how regenerative medicine, 3D printing and biofabrication may have the ability to transfer tissue engineering therapy ideas from the lab to the clinic.

### Autotransplantation of a Canine Using a Customised 3D-Printed Surgical Template

*J Curtis, E Foster, S Ananth, C Eckhardt, J Knox, A Gonzalez Alvarez, Morriston Hospital, Swansea, UK*

Autotransplantation is a treatment option with high reported survival rates to replace failing anterior maxillary teeth. Autotransplantation requires a multidisciplinary approach and treatment success is dependent on numerous factors including stage of root development, protection of the periodontal ligament, extra-alveolar time and splinting.

This poster presents a novel technique for autotransplantation in a case of significant root resorption to an ULI caused by ectopic unerupted maxillary canine in a 13-year-old patient. A CBCT confirmed that the UL3 was in an unfavourable position for orthodontic alignment and a decision made to autotransplant this tooth. Digital planning software was used to design and 3D-print surgical templates that were used intra-operatively under GA to aid ULI socket preparation prior to transplanting the UL3 into its position, thus reduce extra-alveolar time of the extracted UL3. Digital planning and the use of 3D printed surgical templates improved clinical accuracy and thus minimised both damage to the PDL and extra-alveolar time. It is anticipated that this patient will require ongoing multidisciplinary care during dental development and therefore, will be regularly clinically and radiographically reviewed.

### Developing Resilience And Local Supply Chains For Precision Design Engineering Technology In Resource Constrained Environments

*D Eggbeer, Cardiff Metropolitan University, Cardiff, UK*

Precision design engineering technologies can reduce the cost of fabrication as well as improve accessibility to patient specific devices through distributed manufacturing. The provision of such methods in resource constrained countries are, however, severely limited. Production methods require highly skilled specialists to hand make each piece which limits availability by both proximity to a specialist centre and high manufacturing costs.



This poster reports on a project between patterns in the UK and India, which builds on the culture of Jugaad (developing low cost innovative solutions using locally available resources) to discover novel ways of using technologies to develop locally appropriate solutions to the treatment of facial deformities.

The outcomes of methods including the Design Council's 'Double Diamond' and Design Research Methodology (DRM) are reported in this poster. The Double Diamond is a National Institute for Health Research (NIHR)-recognised method for application in healthcare. The DRM describes the value of influencing design factors from literature, specific experiments, and participatory experience; and uses these to formulate and validate models of their relationships for current and intended future practice. These methods enable new systems and practices to be developed based on user needs and for the impact to be managed.

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## The Use Of A Patient Specific Titanium Implant To Anatomically Reconstruct A Large Chest Wall Defect

*A Gonzalez-Alvarez, I Goldsmith, L Dvagski, P Evans, Morriston Hospital, Swansea, UK*

Chest wall reconstruction of large oncological defects following resection is clinically and technically challenging. Traditional management involves the use of different materials that surgeons creatively shape intraoperatively to restore the excised anatomy. This is time consuming, difficult to mould into shape and cause some complications.

We present the development and clinical implantation of a novel custom-made 3 dimensional laser sintered titanium alloy implant that mimics the shape of the anatomy resected and maintains the integrity of the thoracic cage.

The implant provides excellent aesthetical and functional results. The virtual planning and production of the implant prior to surgery reduced surgery time and uncertainty. It also improved safety and accuracy. During surgery, the implant sited nicely on the patient anatomy after resection following the virtual plan. This technique is effective and offers a fast lead-time for implant production, which is crucial for oncological treatment.

## Mandibular Distraction in Neonate & Paediatric Airway Compromised Patients

*J Smith, J Watson, D Srinivasan, N Ahmed, Nottingham University Hospitals NHS Trust, Nottingham, UK*

### Problem

Neonates with congenital conditions such as Pierre Robin Syndrome often have severely obstructed airways and have to have a tracheostomy fitted. This creates developmental problems with speech, feeding and a huge burden on parents to maintain the airway.

### Aim

To improve the airway in paediatric patients with craniofacial abnormalities by the use of mandibular distraction osteogenesis. The primary aim, de-cannulate the tracheostomy, or to prevent tracheostomy entirely.

### Method

4 cases (0-8 years old) were identified for bilateral distraction of the mandible by fixation of 2 Micro Zurich II distractors (KLS Martin, Germany). 2 cases were on PICU and 2 followed up as out patients. Daily activation rates varied between 1.0mm or 1.5 mm per day for 10-15 days (depending on the activation 10-15mm).

### Results

The patient airways and occlusion was assessed prior to surgery and post-surgery clinically and

using CBCT data. The results were reviewed in Dolphin (USA) and MIMICS (Materialise, Belgium) software. There was a significant increase of airway volume for each patient.

#### Conclusion

All four patients were successfully de-cannulated. The distraction of airway compromised children already in an ITU setting is a potential option to prevent long term tracheostomy and its associated complications.

## Introduction to the Use of High Consistency Silicone Rubbers for Digit Prostheses

*S Campbell, Guy's and St. Thomas NHS Foundation Trust, London, UK*

A custom made digit prosthesis offers cosmetic rehabilitation for patients following amputation. Similar to other maxillofacial prostheses these are traditionally made from liquid based silicone rubbers. However the use high consistency rubber silicones offer an alternative way to fabricate prosthetic fingers using similar techniques to those used in orthotics. These silicones have shown advantages such as higher tear strengths and more predictable colour matching. This poster illustrates the fabrication of a custom made digit prosthesis using this different material and our experience at Guy's and St Thomas' NHS Trust with these silicones over the past two years.

## How Do We Measure Up? A Pilot Study Exploring Key Measures for Assessing Current Digital Orthognathic Planning Techniques

*J Watson, D Srinivasan, A Flett, S Clark, Nottingham University Hospitals NHS Trust, Nottingham, UK*

#### Aim

Digital orthognathic planning offers perceived advantages, increased radiation for the patient and investment are barriers to implementation. Current adoption is not based on any measure but on a perception of technological progress.

#### Method

A retrospective pilot study to explore potential performance measures. 40 bimaxillary & single jaw osteotomies were considered, 20 traditional, 20 digital (KLS IPS Case Designer) planning, surgical occlusal wafers (Objet Prime 30; Med610), guides (thermoplastic in house) and pre bent plates (KLS Martin). We explored measures such as planning & operative time, complications, costs and a subjective assessment of the process.

#### Results

Digital planning produced positive verbal feedback on accuracy of the surgical wafers and plan. Increased data sets supported more planning discussions. Laboratory time and theatre time were not appreciably shortened. Complications were not reduced. Digital was not appreciably cheaper, but compared to similar external commercial, in-house does have some advantages.

#### Conclusion

In house digital planning has perceived value over analogue methods. Measures could be developed on the values we outline for improved evaluation. In house digital and external commissioned have to be seen as developing alongside each other with communication at the centre of improvements. The MfP or Reconstructive Scientist is ideally placed to push this development forwards.

## The Use of Silicone Gels in Facial and Body Prostheses

*H Silk, M Townend, Poole Hospital NHS Foundation Trust, Poole, UK*

The combination of using silicones with silicone gels in facial and body prostheses is a beneficial technique for increasing the flexibility and comfort for the patient. The consistency can be modified for each individual's requirements resulting in a more malleable/supple prosthesis that allows movement with the soft tissues, reducing friction, especially in areas with extreme mobility. Adaptation of the gel

to assist in retention of the prosthesis is an adjunct feature to this technique. This poster presentation demonstrates ways in which gels have been utilised at Poole Hospital, Dorset and shows the methods for their application.

## A New Technique for Septal Buttons: The Swansea Mouldable Silicone Technique

*S Hollisey, P Evans, L Dvulgalski, A Gonzalez-Alvarez, Morriston Hospital, Swansea, UK*

### Introduction

We propose a new technique using High Consistency Rubber mouldable silicone for the construction of septal buttons. It has been developed by the team at Morriston Hospital, Swansea.

### Method

The poster presentation illustrates the Swansea HCR Mouldable Silicone technique, stage by stage.

### Results

Computer Tomography and 3D printing eliminates the need for an impression of the patient's septum, saving surgical time. The Swansea HCR Mouldable Silicone technique has fewer stages of construction compared to traditional wax-loss techniques. The unique nature of HCR silicone produces an adaptable, resilient, and well-fitting septal button.

### Conclusion

This technique, using these materials and computer software, has been developed at Morriston Hospital, Swansea; HCR silicone (as far as we are aware) is not used elsewhere for septal buttons. We propose that this time-saving technique has several benefits and could be adopted by many units offering nasal septal prosthesis services.

## Rigid Compression Masks for the Management of Hypertrophic Facial Scarring in the Paediatric Population: Not Just for Burns

*R Hughes, J Evans, S Hollisey-McLean, Morriston Hospital, Swansea, UK*

### Introduction

Custom-made thermoplastic masks are widely used to treat facial hypertrophic scarring in children post burn injury, yet are rarely reported in the treatment of non-burns hypertrophic scarring. This poster presentation reports on the use of such a mask for a seven year old girl with facial hypertrophic scarring following a dog-bite.

### Method

This study adopted a longitudinal, single case follow up design with multiple measurements taken pre and post treatment. Following three-dimensional surface capture and printing, the patient was provided with a custom-made thermoplastic mask and instructed to wear this for 20 hours per day. POSAS Observer scores were recorded and 3D images taken prior to commencing use of mask, and at point of scar maturation one year later.

### Results

The POSAS Observer scale and 3D images demonstrated an improvement in surface texture and thickness of the scar.

### Discussion

Three dimensional surface capture devices creating a digital record of the patient's facial contour are non-invasive and take only minutes to complete in a clinic environment, so are therefore suitable for use with compliant children.

### Conclusion

Custom-made thermoplastic masks are convenient and efficient to fabricate with access to 3D imaging and printing facilities, and can therefore be considered a useful treatment option for children with non-burn facial hypertrophic scarring.

## Silicone Splints in the Treatment of HHT Related Epistaxis

*P Brahmabhatt, S Hollisey-McLean, P Puttasiddaiah, H Whittet, Morriston Hospital, Swansea, UK*

### Objectives

Epistaxis related to Hereditary Haemorrhagic Telangiectasia (HHT) can be challenging and its management is complex, often needing multiple interventions. Various treatment options have been proposed including anti-fibrinolytic agents, hormonal therapy, repeated cautery, laser photocoagulation and septodermoplasty. However, each of these has associated limitations and pitfalls. We propose a novel method using silicone splints which act as barriers to protect the friable telangiectasias against the drying effect of nasal airflow.

### Method

In patients with this condition, note was made of the extent and distribution of telangiectasias within the nasal cavity. A CT scan was then performed to guide the production of a bespoke silicone splint for each patient using 3D printing. If the patient had a septal perforation then a septal button with magnetic contacts was incorporated. Patients underwent a general anaesthetic procedure with initial coblation assisted coagulation of telangiectasias prior to fitting of the splint. At their follow-up review they were questioned about their symptoms and experience.

### Results

5 patients were treated using this technique; they all reported a complete cessation in epistaxis and an improvement in their quality of life. 2 patients reported occasional and partial nasal obstruction and some reported persistent crusting. However, these side effects were preferred when compared to recurrent bleeding.

### Conclusion

We propose the use of this novel technique to treat a recurrent and debilitating condition. All our patients reported good tolerance to the splints with minimal side-effects and no complications. The improvement in quality of life and symptom control was significant.

## A Reflection on the Educational Trip with King's College to Pune, India

*F Velásquez, C Tsai, P Taylor, Academic Centre of Reconstructive Science*

This year, from 28th February - 9th March, we travelled to Pune (India) to work in the M. A. Rangoonwala College of Dental Science & Research Centre providing maxillofacial prostheses for patients from across the country. This trip is organised every year by the Academic Centre of Reconstructive Science at King's College London as a compulsory activity for distance learning students of the MSc Maxillofacial Prosthetic Rehabilitation.

As students on the full time Maxillofacial and Craniofacial Technology MSc, we were invited to join them and we readily accepted this wonderful opportunity. At the time, with only 5 months of training in the field, the anticipation of the trip and the quality of work we were expected to produce, understandably ensued some anxiety.

Yet after 10 days of intense but highly rewarding work we built enormously on our skillset as trainee prosthetists. The humanitarian nature of this trip accredited the important work of a maxillofacial prosthetist and improved our already revered view of this role within the healthcare setting.

We are looking forward to attending next year, to again provide this vital service to the community. The continuity of our degree at King's College London will certainly help us to achieve this goal.

## Notes

## Notes





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The President, Chairman and council of the IMPT would like to express their thanks to all of the commercial organisations that have supported this congress. Representatives from each organisation will be available during coffee and lunch breaks, so we encourage delegates to visit the exhibition area to discover the latest in 3D technology and innovative materials.

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