Restorative Dentistry Services for Head and Neck Cancer sufferers

A report from North America supported by the Winston Churchill Memorial Trust

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My Background.

I graduated from King’s College London in 2003 with a Bachelor’s degree in Dental Surgery (BDS). I then worked for 2 years in general dental practice. I followed this with a year as a Senior House Officer in Oral and Maxillo-facial Surgery and then 2 further years as a Senior House Officer in Restorative Dentistry and its allied fields.

During this time I completed my membership examinations at the Royal Colleges of Surgeons of Edinburgh and London (MFDS RCSEd and MJDF RCSEng) and gained my Master of Laws (LLM) at Cardiff University.

I then embarked on a 5-year specialist training post in Restorative Dentistry in preparation for becoming an NHS Consultant in this specialty. During this time I also worked as an Honorary Lecturer for the Royal College of Surgeons of England and completed a post-graduate certificate in teaching.

During my specialist training I have had the opportunity to become involved in the oral and facial rehabilitation of patients who require multiple medical and dental teams to be involved in their care. For example, patients who have suffered road traffic accidents, have complex medical conditions such as Haemophilia, those with developmental disorders such as a cleft lip or palate and finally sufferers of Head and Neck cancer (HANC). I was particularly drawn to the latter group and recognised that high quality Restorative Dentistry could have a significant positive effect in their lives from a functional, cosmetic and psychological perspective.

Why I applied for the Winston Churchill Memorial Trust Travel Fellowship.

I believed that applying for the fellowship would provide me with an opportunity to visit world-class providers of HANC care and learn practical tips to improve the treatment that I could provide for my patients.

I also wished to learn from the extensive research experience available in North America especially with regard to the use of dental implants and free-tissue transfer in the reconstruction of HANC patients.

Finally, I wished to explore the funding structures that were available in these countries and compare and contrast them to the NHS system in which I worked.
Aim.

My overall aim was to improve the care of my HANC patients and to teach others so that they could improve the quality of their care for their patients.

Objectives.

1. Observe, analyse and report on the full range of dental care services available for sufferers of head and neck cancer (HANC) in internationally recognised cancer hospitals in North America and how they are funded.

2. Using prepared case examples, discuss:
   a. surgical reconstruction of tumours of the maxilla (upper jaw) with defect closure in comparison to defect maintenance and use of a dental obturator
   b. dental implants and fixed Prosthodontic options for oral rehabilitation

What is Head and Neck cancer?

Head and neck cancer (HANC) is a collective term to describe many different types of malignant tumours that affect the upper aero-digestive tract. The term includes more than 30 different sites of disease as described by the World Health Organisation (WHO) in their International Classification of Diseases and Health Related Problems (ICD 10). The term HANC, however, does not include all malignant tumours of the head and neck region. The term specifically excludes malignancies which may affect other tissues such as the brain, eyes, skin et cetera.

A very common site for the cancer to begin is the mouth and oral cavity which represents over 40% of global cases. In some parts of the world, however, cancers of the oral cavity may represent the majority of HANCs. Other common sites for the initial disease include the (throat) pharynx, voice box (larynx), nose (nasal cavity) and the sinuses (paranasal sinuses).
The vast majority of these cancers are squamous cell carcinomas i.e. cancer of a type of epithelial cell, the squamous cell. Squamous cells constitute the majority of the epidermis of the skin and also the lining of the digestive tract, lungs and other parts of the body.

Head and neck cancers are one of the commonest types of cancer and constitute approximately 6% of all cancers that are diagnosed in the world. In an average year there are approximately 670,000 new HANCs that are diagnosed across the world and approximately 350,000 deaths from HANC worldwide. The majority of HANCs are diagnosed in men but this gap between the genders has been reducing in the last few decades.

The exact number of new cases of HANC in the UK is hard to ascertain. There are several reasons for this including incomplete records of the number of cases and because the cases are recorded in different ways by different centres i.e. some records are by the histology type and others are recorded by the anatomical sites affected. Nonetheless estimates can be obtained from key documents.

In a single year the Data for Head and Neck Oncology (DAHNO) recorded 6133 new diagnoses of HANC in England and a further 325 diagnoses in Wales. In a similar period there were another 1173 new reported cases in Scotland. This made HANC in Scotland the 5th most common type of cancer overall.
Key facts about HANC. Reported on the Mouth Cancer Foundation website 2013:

- In the UK 38,000 people are living with a diagnosis of head and neck cancer
- Every year in Europe, around 100,800 people are diagnosed with head and neck cancer and almost 40,000 die from the disease
- 5-year survival rate has not improved for the last few decades except in specialised cancer centres
- The mortality rate is just over 50% despite treatment
- Mouth Cancer kills one person every 3 hours in the UK because of late detection
- Two-thirds of cases are arising in developing countries with the highest rates reported in India and Sri Lanka
- The Indian sub-continent accounts for one-third of the world burden

The data also illustrates surprising regional differences for HANC cases and survival across the UK e.g. the incidence of HANC in males in the North Thames area is half the incidence of HANC in males in Scotland. In a similar vein the patient survival figures for HANC are poorer in Scotland, Wales and Northern Ireland compared to more affluent regions of England.

Famous sufferers of HANC. Sigmund Freud, Sammy Davis Jr. and Michael Douglas.
What is the treatment for Head and Neck cancer?

There are many different options available for treating cancers of the head and neck depending on the location, stage, histological grade, other concomitant illnesses et cetera. For millennia the only effective solution for cancer sufferers was surgical removal of the affected tissues and indeed it is still the commonest form of treatment for HANCs worldwide. This is especially the case for cancers that are small and/or easily accessible such as those in the lips. More modern techniques for the treatment of HANC include chemotherapy (drug therapy), radiotherapy (radiation therapy) and the use of laser technology. For some types and locations of tumours these have become the treatment of choice as large amounts of tissue do not need to be removed and thus in many cases patients are left with better functional and cosmetic results.
What is Restorative Dentistry?

Restorative Dentistry is defined by the Association of Consultants and Specialists in Restorative Dentistry as “…the study of the restoration of teeth and supporting structures that have been damaged, decayed or lost. Treatment involves the rehabilitation of the teeth or supporting tissues in the oral cavity to achieve functional, social, psychological and aesthetic requirements of patients. Its scope includes all the activities associated with Endodontics (root canal therapy), Periodontics (treatment of gum disease) and Prosthodontics (making crowns, bridges, dentures and implants)…”

It has been a recognised dental specialty since 1973 and has more than 300 registered specialists in the UK.

Restorative dentistry is provided for patient in both hospital-based clinics and in high street practices. The setting is dependent on the type of Restorative Dentistry that is required for patients and its funding, e.g. NHS funded care for complex care (relating to cancer, cleft lip/palate, trauma, medical conditions) is generally provided in hospital clinics whereas independently funded simpler treatment is provided on the high street.

Why are Restorative Dentistry services required in HANC?

There is no recognised specialist list in Dental Oncology and thus the dental treatment of adult patients with cancer is provided by a combination of specialists and generalists including Restorative dentists, Special Care dentists, Prosthodontists, Oral and Maxillo-facial surgeons and general dental practitioners. The dental care of children and adolescent cancer patients is usually provided by Paediatric dentists.

The National Institute of Health and Clinical Excellence produced a report in 2003 aiming to improve the outcomes for HANC in the UK. It asserted that a Restorative dentist must be part of the core group of professionals who care for such patients along with the surgical team, Oncologists, Histopathologists, Radiologists, Specialist nurses et cetera.

It also confirmed that allied dental professionals such as Maxillo-facial Prosthetists, Hygienists and Dental Therapists could improve the care of HANC patients.

Sadly, many of the centres for HANC care in the UK do not have access to a full team of dental professionals.
Restorative dental care is required at 3 stages in the treatment of HANC patients:

1. Pre-treatment. This is to assess the oral health of the patient prior to treatment. Poor oral health can compromise or delay some treatments for HANC, e.g. chemotherapy. If a patient does not have good oral health then attempts are made to remove any disease and prevent later problems. Common treatment includes extractions of teeth, adjusting dentures, fabricating surgical obturators et cetera. If patients have existing oral diseases and begin cancer treatment then these conditions often worsen and in rare cases may even cause death.

2. Mid-treatment. This is to mitigate the effects of the cancer therapy during treatment e.g. advice on oral soreness (mucositis) during radiotherapy and/or chemotherapy. It is also used as an opportunity to check and support the maintenance of good oral health.

3. Post-treatment. This is to help reconstruct the mouth and teeth after treatment has been completed. This is often the longest phase of treatment and may continue for many years. This stage is especially important for patients with significant surgical tissue removal who may require a palatal obturator.

How are Restorative Dentistry for HANC services funded in the UK?

The commonest system for funding HANC treatment, and indeed healthcare in general in the UK, is following the Beveridge model. This is a system in which the state funds/subsidises healthcare using revenue obtained through taxation.

At present this should extend to all dental treatment required as a direct consequence of the HANC or its treatment. There are however major geographical variations in the availability and funding of services across the UK. In general, the vast majority of patients will have access to immediate Restorative dental care, free at the point of delivery, though it may be in a distant location to the patient. In the longer term, however, patients are often discharged back to their dentist as there are insufficient resources in the NHS to continue providing hospital-based care for these patients. This dentistry has to be funded by patients unless they have exemptions for reasons other than their cancer diagnosis e.g. low-income, disability et cetera.

Other models of funding Restorative Dentistry for HANC sufferers in the UK are generally uncommon although there is an increasing number of insured patients seeking care independently of the NHS. Treatment funded by foreign states for HANC and out-of-pocket expenditure is relatively rare in the UK but is slowly growing.
Itinerary.

My 4 week fellowship funded me to spend 2 weeks at the Memorial-Sloan Kettering Cancer Centre located in the Upper East Side of Manhattan Island in New York, USA. I was then funded to spend a further week at the Princess Margaret Cancer Centre in Toronto, Canada, and a final week at the University of California in Los Angeles (UCLA), USA. The specific dates and schedule for the itinerary are as follows:

15th July – 26th July 2013 MSK, New York, USA

29th July – 2nd August 2013 PM, Toronto, Canada

5th August – 9th August 2013 UCLA, Los Angeles, USA

A diagram to summarise the itinerary for the WCMT fellowship.
The Memorial-Sloan Kettering Cancer Centre experience.

The Memorial Sloan-Kettering Cancer Centre (MSKCC) is the oldest and largest private cancer centre in the world. The centre was founded in 1884 as the New York Cancer Hospital on Manhattan’s Upper West Side by a John J. Astor and friends. In 1899, the name changed to the General Memorial Hospital for the Treatment of Cancer and Allied Diseases. In 1916, the name was shortened to the Memorial Hospital for the Treatment of Cancer and Allied Diseases.

In 1936 the hospital moved to its present location on the Upper East Side of Manhattan Island. The land was donated by John D. Rockefeller, Jr. and the hospital reopened in 1939.

Shortly after this Alfred P. Sloan and Charles F. Kettering together established a biomedical research institution adjacent to Memorial Hospital. In 1960 the institutions merged to create the Memorial Sloan-Kettering Cancer Centre.

Attending Dentists in the department of Dental Oncology at MSKCC. Dr. J. Huryn and Dr. C. Estillo.
The Princess Margaret Cancer Centre experience.

The centre was originally founded as the Ontario Cancer Institute in 1952. The hospital was officially opened in 1958 by HRH Princess Margaret and was re-named the Princess Margaret Hospital to mark the occasion.

The hospital relocated to its current site on University Avenue in 1996 and was re-opened once again by HRH Princess Margaret.

In 1998, the Princess Margaret Hospital became part of the University Health Network. The hospital merged its oncology services with those of Toronto General and Toronto Western Hospitals. It thus became the largest comprehensive cancer centre in Canada.

The Princess Margaret Hospital was renamed the Princess Margaret Cancer Centre (PMCC) in 2012.

Attending Dentist in the department of Dental Oncology at PMCC. Dr. R. Wood.
The University of California in Los Angeles experience.

In 1881 the state of California authorised a branch of the California State Normal School in Los Angeles. The school opened in 1882 and was renamed as the Los Angeles State Normal School in 1887.

In 1919 the Los Angeles State Normal School merged with the University of California as the Southern Branch of the University of California. In 1927 this was again renamed as the University of California in Los Angeles (UCLA).

UCLA is the currently the most applied-to university in the USA and received 72,000 applications in 2012 for degrees in nearly 150 departments. In 2011, UCLA exceeded $1 billion in competitively awarded research grants and is currently ranked 12th in the Times Higher Education World University Rankings.

The Weintraub Centre for Reconstructive Biotechnology was established in 1998 to improve methods for treating patients with developmental or acquired facial defects. It was the first centre of its type in the world and aspired to improve collaboration between basic scientists, clinical scientists, dentists, doctors and engineers based at UCLA.

UCLA provide a one year postgraduate residency program in Maxillo-facial Prosthetics. It is the most renowned program of its type in the world and aims to provide “advanced training in the diagnosis and supportive treatment of patients with maxillo-facial anomalies”.

Residents in this full-time salaried program treat patients with facial deformities from cancer, trauma or congenital malformations. The out-patient training clinic is situated in the Ronald Reagan Medical Centre of the main UCLA campus in Westwood, Los Angeles.

Faculty members in Maxillo-facial Prosthodontics at UCLA, Professor J. Beumer III and Dr. J. Kelly.
Professor Beumer III has also set up a Foundation for Oro-facial Rehabilitation which brings together the most respected Maxillo-facial Prosthodontists in the world. Its remit is to provide free educational support for dentists and doctors who care for patients who have suffered facial deformities. It has an excellent free website which has hugely improved my understanding of Maxillo-facial rehabilitation.

The Foundation for Oral-facial Rehabilitation was established by Professor J. Beumer III and others in 2011 to help improve the worldwide treatment of patients suffering oral impairments following HANC or congenital diseases.

The FFOFR website illustrating some of the free online educational content that dentists and doctors can use to improve the quality of life of their patients.
Organisation of clinical services

The MSKCC and the PMCC Dental Oncology units were both organised in a similar fashion because they had comparable remits. They were both dental departments in large comprehensive cancer centres and had a primary focus on providing dental care for cancer sufferers. This included both HANCs and other cancers. Both departments had post-graduate dentists receiving additional expertise in Dental Oncology but their primary role was to support patients in their cancer journey.

Both MSKCC and PHCC are organised in a way that is similar to the majority of NHS services in the UK which are not always linked to universities.

MSKCC and PMCC had attending dentists (supervising clinicians) who had a background in Oral Medicine/Oral Pathology or a background in Maxillo-facial Prosthodontics. The former type of dentist focused on the management of oral conditions common in HANC such as mucositis and oral thrush, whilst the latter type of clinician focused on rehabilitating patients with dentures, obturator and implants.

Regardless of the clinicians’ background, however, they were experienced dentists and able to undertake most aspects of general dentistry. Thus patients were able to access comprehensive oral care throughout their cancer treatment in a single unit. This contrasts with the majority of similar NHS services which are far more fragmented. In many cases in the UK, a patient will need to visit a Restorative Dentistry department for complex dental treatment, their general dentist for basic care, a department of Oral surgery for removal of teeth and a department of Oral Medicine for other oral infections and mucosal diseases. The exception to this, again, is dental care provided in large university hospitals.

HANCs suffers often travel to multiple sites, sometimes on the same day, and this creates a significant healthcare burden and often greatly adds to the anxiety associated with all aspects of cancer treatment for the patient and carers.

Additionally, it is worthy of note that the clinicians had expertise in treating all age groups and their oral condition. This is also in contrast to the UK. In MSKCC, PMCC and UCLA Dental Oncology was a single department where patients could attend regardless of age. In the UK the dental care for HANC patients is primary provided by Paediatric dentists up to the age of 16 and then by a variety of departments, outlined above, once they are older than 16. Thus the dental care during this important transitional phase can easily be overlooked as the patient, parent and carer is unclear where to seek their dental care.

Organisation of services in the MSKCC/PMCC consolidates expertise in a single centre for all age groups and in my view is likely to improve patient safety, clinical outcomes and the patient experience.
The converse argument, however, can also be forwarded. In North America this comprehensive care in Dental Oncology is only available in a few large cities e.g. Toronto, Edmonton, New York, Los Angeles, Rochester, Texas et cetera. Thus for patients who are geographically isolated from these urban centres, receiving this care is very burdensome. I regularly noted patients on every clinic who had spent more than three hours travelling to their dental appointment. Others had flown in from other parts of the mainland or North American islands and required overnight accommodation to receive care. Domestically this is extremely rare primarily because of the relative compactness of the UK.

I also recognised that the hospital dentists were also far more confident in the abilities of their local dentists than we are in the UK. It was my perception that basic and moderately complex dentistry was delivered to a high standard for the patients with whom I had contact. It is not uncommon in the UK to ask a patient to have basic dental care to be provided by generalists but to see them again without the completion of the treatment or with it completed to an unacceptable standard.

Attending clinicians and trainees, however, did not possess expertise in Endodontics or Periodontics and thus required visiting clinicians to provide this care.

The dental oncology centres also had integrated care provision for patients requiring prostheses for missing eyes, ears and noses. Although this was a fantastic service for patients and very interesting to observe, it is not something that falls within the remit of Restorative Dentistry in the UK.

All of the units had been providing dental care for cancer patients for several decades, received large numbers of patients each year and were recognised as centres of excellence for patient care, research and teaching. For example, the department of Dental Oncology at MSKCC alone attends to 2000 new patients per year and PMCC receives 1200 new patients. PMCC also has a database of 25,000 patients used for research and audit and it was part of the role of the attending dentists to publish scientific literature which is something that is encouraged far less for dentists in the UK. It was very clear from the offset that this length and breadth of experience in these centres allowed the clinicians to make both better experience-based and research-based healthcare decisions.

The salaried post-graduate Dental Oncology trainees were expected to attend lectures regularly which were provided by the hospitals and also expected to publish novel research. This integration with academia is far less common in the UK unless a trainee is enrolled in a dedicated teaching program linked to a University.

UCLA had a different remit to MSKCC and PMCC with a primary aim to educate post-graduate students enrolled at the university and, in addition, to provide maxillo-facial prostheses for HANC patients. Thus the UCLA department had far greater focus on the Prosthodontic elements of Dental Oncology with trainees attending daily lectures and tutorials and publishing research in the field. There was far less emphasis on the global management of the patient.
Patient management

The expertise that was available for patient management in all three centres was very impressive. This provided a unique opportunity for me to observe and learn from absolute experts in the field of Dental Oncology. I learned many skills that I was able to use immediately to benefit my patients in the UK.

I was invited to observe a variety of common and uncommon procedures relevant to my clinical practice in the UK which included the following:

- The clinical and laboratory stages of making a denture
- The clinical and laboratory stages of making a conventional obturator
- The clinical and laboratory stages of making an implant-retained obturator
- The clinical and laboratory stages of making an implant-retained crown
- The clinical and laboratory stages of making an implant-retained bridge
- The clinical and laboratory stages of making a nasal prosthesis
- The clinical and laboratory stages of making an ocular prosthesis
- The clinical and laboratory stages of making an ear prosthesis
- The clinical and laboratory stages of making a facial prosthesis
- The clinical and laboratory stages of making a soft tissue supporting appliance
- The in-theatre stages of making a surgical obturator
- The clinical dental assessment of patients prior to undertaking radiotherapy
- The clinical dental assessment of patients prior to undertaking chemotherapy
- The clinical dental assessment of patients prior to undertaking surgery

To facilitate debate of these clinical topics, I took case reports which I discussed with the heads of department at MSKCC, PMCC and UCLA. These allowed in depth case-based discussions from which I was able to determine their respective philosophies as outlined below:
Mr. HH is 50 years of age. He has few functional concerns and no aesthetic concerns. He is medically well, takes no medication and has no allergies. He has never smoked, drinks little alcohol and is a company director. Dentally the patient has excellent oral hygiene and high dental aspirations. His restorations and tooth loss are a result of a historic “sweet tooth”. He is happy to have whatever treatment you recommend. He has been diagnosed with cancer in the right side of his mandible after a period of increasing mobility of his lower right premolars and numbness of his lower lip. Investigations and imaging suggest that it is a high grade T₄N₁M₀ Squamous cell carcinoma of the right floor of mouth and alveolus. It is not close to the midline. The clinically palpable submandibular lymph nodes have evidence of extra-capsular spread on imaging. The surgical team advises you that he will require a segmental resection of the right part of his mandible, a neck dissection and a composite reconstruction. The resection will spare the right last molar tooth and all of the left mandibular teeth. The anaesthetic team has no concerns regarding his fitness for general anaesthetic. The patient will need post-surgical IMRT.
With the information that you have what would your broad treatment strategies be in relation to the following?

1. Reconstruction of the residual defect.
2. Extraction of any additional teeth.
3. Preferable mode of oral rehabilitation.
4. The use and timing of implants.
5. The effects of radiotherapy on your decision(s).
6. The surgical and dental maintenance.
7. The funding arrangements for treatment.
Mrs. AC is 60 years of age. She is concerned that she has no teeth in the right part of her upper jaw for function and aesthetics.

She is medically well, takes no medication and has no allergies.

She has never smoked, drinks little alcohol and is a volunteer worker.

Dentally the patient has excellent oral hygiene and high dental aspirations. She is happy to have whatever treatment you recommend as long as it is not a removable denture.

She was diagnosed with a high grade T4N1M0 Mucoepidermoid Carcinoma in the right side of her palate and a solitary palpable submandibular lymph node.

The surgical team provided a right partial low level maxillectomy and a levels 1-3 neck dissection. She was reconstructed with a composite radial forearm flap with secondary autogenous particulate grafting from her iliac crest.

The patient had IMRT with a maximum dose of 65Gy which she completed 6 months ago.
With the information that you have what would your broad treatment strategies be in relation to the following?

1. Alternative reconstructions of the residual defect.
2. Extraction of any additional teeth.
3. Preferable mode of oral rehabilitation.
4. The use and timing of implants.
5. The effects of radiotherapy on your decision(s).
6. The surgical and dental maintenance.
7. The funding arrangements for treatment.
Mr. CG

Mr. CG is 80 years of age and has no functional or aesthetic concerns.

He is medically well, takes no medication and has no allergies.

He has never smoked, drinks little alcohol and is an independent living retired accountant.

Dentally the patient has reasonable oral hygiene, several missing and fractured teeth and no caries. His teeth are surprisingly firm and he is happy to have whatever treatment you recommend.

He has been diagnosed with cancer in the left maxilla and palate.

Investigations and imaging suggest that it is a low grade T4N0M0 Squamous cell carcinoma of the alveolus which has invaded the floor of the sinus.

The surgical team advises you that he will probably require a low level partial maxillectomy which will leave a moderate sized defect. The resection is likely to spare the left tuberosity, the left side of the soft palate and some of the left part of the hard palate. The anaesthetic team has no concerns regarding his fitness for general anaesthetic.

The patient will not need chemotherapy but may need radiotherapy.
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With the information that you have what would your broad treatment strategies be in relation to the following?
1. The use of obturators as an alternative to reconstructing palatal defects. It is increasingly common to transfer tissue from a part of the body such as the leg, arm or hip to block the hole created after a tumour in the palate has been removed. The use of this technique, a vascularised free tissue transfer, has revolutionised the reconstruction of patients in all parts of the world. It is a technically long and difficult procedure that significantly increase the operation time, the time that the patient is in hospital and the cost. In all three centres they felt that in the vast majority of cases the same functional and aesthetic result could be achieved with an obturator. The defect could also be left open for visual observation of tumour recurrence. The argument was that if patients were not able to tolerate an obturator, they could have a second short operation for free tissue transfer when they were cured of the cancer.

2. In the mandible, a free composite fibula flap was the reconstruction of choice. This is because it had a higher success rate than DCIA flaps. The choice of prosthetic reconstruction would still be a denture but implant placement would be considered if the area was not to be irradiated.

3. For surgical obturators, no putty pack is used but alternatively the defect is obturated with B.I.P.P. The area is reviewed in the dental department in 3 days as opposed to 14 days in the UK.

4. All maxillectomy patients received a skin graft at UCLA to aid creation of soft tissue undercut for fabrication of a successful obturator.

5. The MSKCC and PMCC staff were conceptually against the use of dental implants in patients who had received radiotherapy to the head and neck region. Their view was that with their technical expertise in non-implant retained obturators and dentures, implants were rarely required. Also, they felt that the risks associated with implant use in irradiated patients were too high. The UCLA approach was different and they had decades of experience in using implants in irradiated patients. They were still relatively cautious but were much happier using implants in the maxilla on the non-irradiated side than the MSKCC and PMCC staff. For example in patient HH (above) UCLA would consider implant placement if the patient was very keen on this and the area had received less than 60Gy of radiation. If this was the case then the patient would have this no sooner that 4 months post-operatively and would require multiple dives of hyperbaric oxygen.

6. The primary placement of implants i.e. at the time of surgery, was considered ill-advised. The reasons for this were because at the time of surgery it would be unclear who would go on to survive the cancer, whether the area would be irradiated, whether the implants would interfere with imaging or treatment and the likely unfavourable position of the fixtures.
7. At MSKCC they were in favour of Bicarbonate soda and water as a mouthrinse to reduce the symptoms of mucositis.

8. Patients at all three units were provided with a simple and cheap 3 millimetre thick mouthguard to prevent backscatter during irradiation. This prevents areas of soft tissue ulceration around implants, crowns and fillings in HANC patients.

9. An on-call facility is provided for patients should emergency care or advice be required out of hours. This is available to a degree in the UK but is provided by an emergency dentist, Maxillo-facial surgery, the Ear, Nose and Throat department or Accident and Emergency rather than Dental Oncology.

10. The general view at all three units was that they would be far more aggressive than I would be regarding extraction of teeth in areas that were going to receive radiotherapy. The belief was that with patients having better cancer outcomes and thus surviving longer, untreated dental infections could jeopardise the health of patients in the longer term. Also, the treatment for osteoradionecrosis in North America was very costly and could reach Canadian $200,000 including hyperbaric oxygen, surgery, in-patient fees, medication, rehabilitation and review. With the use of aggressive extractions the osteoradionecrosis rate in PMCC fell from 20% to 3%.

11. Every radiotherapy patient was provided with a Fluoride mouthguard to be worn every night to prevent radiation caries. The patients in the US and Canada appeared to be far more compliant with this regime than UK patients.

12. With regard to maintenance, the patients would be seen far more frequently and would be seen for life if the patient desired. For example, after radiotherapy the patient would be seen every 2 weeks until completion and then every month for 1 year. In the UK this recall regime would be highly unlikely due to the resources required to provide this.

13. The use of an occlusal screw instead of a proprietary machine called a Thera-bite. The latter cost approximately $550 and is not easily available in the UK. The use of this trismus screw is a cheap and efficient alternative to the Thera-bite to prevent limited jaw opening (Trismus). I was also given one of these to take back to the UK with me so that it could be copied and easily refabricated at little cost.
Therabite jaw motion system used to increase jaw opening for a patient (above). Below is a cheap alternative to the Thera-bite system than can be made in a dental laboratory.
Funding of Restorative Dentistry for HANC in North America.

The funding of Restorative Dentistry for HANC patients in North America is incredibly complicated as indeed is the funding of healthcare in general.

The dentists in both the USA and Canada perceive that the NHS provides an ideal working environment where care is provided without cost at the point of service. This utopian view of the NHS has been propagated by people in the media such as Michael Moore.

Michael Moore’s critically acclaimed film Sicko (2007) critiquing the healthcare system in the USA

It was clear from the start of my fellowship that all of the clinicians were drawn in to conversations about financing treatment with their patients far more than we are in the UK. As a general principal hospital Restorative Dentistry is free for HANC sufferers in the UK and it is not in the US.
In the US patients paid for the dental care that they received in the cancer centres. These were based roughly on the prices charged by local dentist in the area of the hospital. Thus MSKCC, based on the affluent Upper East Side of Manhattan Island, charged relatively high prices for simple dentistry. For example, a tooth extraction may cost $350, a restored endodontically treated molar tooth may cost $2500 and a complex denture may cost more than $10,000.

Dentistry in the USA is largely insurance driven and patients base their treatment decisions on what they can afford after their insurance scheme has paid a percentage of the treatment fee.

There are several insurance type schemes in the USA that cover dental care:

1. Medicaid is a government healthcare program for individuals and families with low income. It is means-tested and is jointly funded by the state and federal governments. Each state has significant latitude for the implementation of the plan and its inclusions and exclusions. All of the states of the USA provide emergency dental care for adults under Medicaid whilst less than half offer a comprehensive service. Low reimbursement rates and bureaucracy are common reasons why some hospitals, doctors and dentists do not accept patients under this scheme.

The practical effects of this scheme are that patients who have no other dental insurance often choose to have teeth removed rather than more expensive fillings and root canal treatments based on what they can afford. This is especially detrimental to patients who have suffered HANC.

It also places dentists and doctors in a difficult position as they can provide different treatments under the Medicaid system dependent on which state the patient resides in. This is especially a problem for clinicians in large urban comprehensive care centres that attract patient from geographically disparate parts of the country.

This starkly contrasts to the NHS where patients are provided HANC care based on need rather than their ability to pay.

The Patient Protection and Affordable Care Act, known as “Obamacare” increased the federal funding for Medicaid and its eligibility criteria. Under the new law any adult with income up to 133% of the poverty line could qualify for coverage in any state that participated in the Medicaid program. The effects of this on dentistry are still unclear.

2. Medicare is a national health insurance program for people age 65 or older and people with certain disabilities. It provides very little coverage for dentistry but will fund dental services that are an integral part either of a covered procedure such as extraction of teeth required after a fractured jaw or extractions prior to radiotherapy for HANC.

3. Health maintenance organisations (HMOs) are organisations that arrange managed care for health insurance, provide care or manage self-funded healthcare benefit plans on a prepaid basis. HMOs covers care provided by clinicians who have entered a contract to treat patients in accordance with the HMO’s guidelines in exchange for
referrals e.g. Cigna, Aetna et cetera. The amount and extent of dental care varies with each HMO’s policies and HMOs are available specifically for dentistry e.g. DeltaCareUSA.

4. Preferred provider organisation (PPO) is a subscription-based medical care arrangement. Membership of a scheme allows a discount to be added to the treatment costs for an investigation or procedure. The breadth of dental coverage is dependent on the particular PPO.

5. Indemnity plan is the traditional model of insurance coverage. Patients are not restricted to doctors and dentists who are part of a Medicaid, Medicare, HMO or PPO plan. Fees are decided by the clinician with some limitations.

If a patient does not have any of these options then paying for fees out of pocket is likely to be the only option. Unsurprisingly, the patients who fall in to this group are often the most underprivileged and in effect it means these patients often receive no dental care at all.

It would not be uncommon for patient to have their cancer care funded under one of the aforementioned schemes and to pay out of pocket fees for the associated dental care. Costs for this care can often run it to the tens of thousands of dollars for complex maxillo-facial prostheses.

Sadly, the mode of reimbursement has a direct effect on the prescription of care in the US. For example, regardless of the type of insurance coverage, a second episode of general anaesthesia will not be covered for maxillectomy patients. Thus this second appointment, which is often very traumatic for the patient and clinician, is provided in the dental chair. This may be an exceptionally painful and bloody appointment for patients and is routinely provided under general anaesthesia in the UK.

Healthcare in Canada combines some elements of the NHS system with other elements of the US system. Canada delivers the majority of its healthcare through a publicly funded system which is predominantly free at the point of delivery but has most services provided by private organisations. This accounts for 70% of Canada’s expenditure on healthcare with the remainder being privately funded. The system is provincially based and the Medicare system is administratively straightforward, cost-effective and popular amongst its citizens.

The costs are predominantly paid through funding from taxation but in British Columbia, for example, this is supplemented by a fixed premium which is waived for those on low incomes. There is also provincial variation in the coverage for ocular and dental care but in general cosmetic procedures of any form are not included. The exception to this is dental care provided in hospitals and thus the majority of the dental care at PMCC was free or subsidised. Thus patient finances impacted on clinical decisions far less than in the USA. All the costs were not covered by Medicare, however, and removable Prosthodontics were subsidised by 65%. Implants, if indicated, were free to stabilise dentures and obturators but not funded for fixed reconstructions.
Conclusion and Recommendations.

Following my 4 week fellowship I can provide the following recommendations. Some of the recommendations are very local and affect my own clinical practice. Thus they are easy to implement to improve the care of my patients. Others are far broader and will require years to implement, if they are possible at all.

Clinical recommendations:

1. Consider the advantages of using obturators over vascularised free tissue reconstructions for maxillary defects. This would significantly reduce the theatre time, recovery time and costs for reconstructing these patients. It would also be much safer in patients with comorbidities and a poor performance status.

2. A high degree of caution should be maintained with regard to the use of implants in the irradiated areas of the jaw. The additional surgical trauma may induce osteoradionecrosis and has a higher chance of failure than non-irradiated areas. Implants may be used with caution in areas which are partially irradiated.

3. Consider more aggressive extraction of teeth in patients prior to irradiation. With increased survival rates the long-term effects of maintaining teeth may be very high.

Non-clinical recommendations:

1. Creation of a sub-specialty of Dental Oncology with clinicians from either an Oral Medicine or Prosthodontic background. They should have experience of general dentistry and be able to treat patients of all ages.

2. Creation of centres of excellence where comprehensive dental care can be provide in one organisation. This would increase expertise and clinical outcomes and reduce travel time for the majority of HANC sufferers.

3. Creation of 1 year postgraduate training programs in Dental Oncology with exposure to all elements of the above.

4. Greater integration of the academic and clinical aspects of Dental Oncology in the UK with dedicated lectures, tutorials and research sessions. For Restorative dentists this would require specific teaching on the Oral Medicine aspects of dental care.
Appendices.


v Mouth cancer foundation. www.mouthcancerfoundation.org


vii ACSR D. The role of a Consultant in Restorative Dentistry.

viii GDC annual report 2012.


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