Prosthodontic Pathways for Head and Neck Cancer Patients

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Head and neck cancer is increasing and therefore the proportion of patients living longer with the consequences of their oncology treatment is also increasing. 28-67% of head and neck cancer patients are given the all clear at 5 years and 19-59% are still surviving at 10 years, and however continue to have the problems of xerostomia, trismus, radiation caries and are at risk of osteoradionecrosis (ORN) of the jaws, much of which may remain for life.

The dental priorities for these patients are to ensure that:

- They all receive clinical and radiographic assessment prior to starting their oncology treatment
- They all receive stabilisation and comprehensive prevention regimes
- We extract teeth that are likely to flare up during radiotherapy, are of questionable prognosis that may give potential problems in the future which we may not be able to remedy due to issues such as trismus
- Transitional prostheses such as surgical/interim obturators are constructed
- Palliative care and improving short term quality of life such as giving someone their smile back
- Oral problems such as taste disturbances and mucositis are managed during radiotherapy
- Definitive restorations and ongoing prevention are provided to restore function and improve quality of life
- Ongoing review and maintenance with an emphasis on prevention are provided (usually in close liaison with primary care practitioners) including maintenance of implant-based rehabilitations and complex maxillofacial prostheses

Pre-oncological treatment assessments require adherence and understanding of the 62-day cancer pathway guidance and can be challenging to deliver, and it may not always be possible to provide stabilisation of periodontal disease and restoration of caries in the given time frame. Patient frame of mind during this time may pose complications for decision-making. Competing interests during oncology treatment include dietetics advice on high calorific intake little and often, when patients are struggling to maintain their weight due to mucositis, taste disturbances and loss of appetite. This energy intake is essential for healing following insult from radiotherapy +/- chemotherapy. Post-oncology treatment includes prevention and rehabilitation, followed by prevention and maintenance, which the patient will need to stay motivated for life with support from their primary care dental and medical practitioners.

National guidelines for Head and Neck cancer pathways:

1. NHS England Oral healthcare provision for cancer pathways 2024 - A guidance document of clinical and commissioning standards: https://www.england.nhs.uk/long-read/oral-healthcare-provision-for-cancer-pathways/

2. Faster diagnostic pathways. Implementing a timed head and neck cancer diagnostic pathway. Guidance for local health and care systems. NHS. 20 March 2023: https://www.england.nhs.uk/wp-content/uploads/2018/04/B1130-head-and-neck-cancer-implementing-a-timed-diagnostic-pathway.pdf

3. NHS Scotland Head and Neck Cancer Optimal Diagnostic Pathway 2023: https://www.nhscfsd.co.uk/our-work/cancer-improvement-and-earlier-diagnosis/diagnostics/optimal-cancer-diagnostic-pathways/head-and-neck-cancer-diagnostic-pathway/ https://www.nhscfsd.co.uk/media/wdnfqyxz/nhs-scotland-optimal-head-and-neck-cancer-diagnsotic-pathway-v1-december-2023.pdf

4. NHS Wales Cancer Network. National Optimal Pathway for Head and Neck Mucosal Cancer. 2nd Edition (2023): https://executive.nhs.wales/functions/networks-and-planning/cancer/wcn-documents/clinician-hub/csg-pathways-and-associated-documents/headnop/

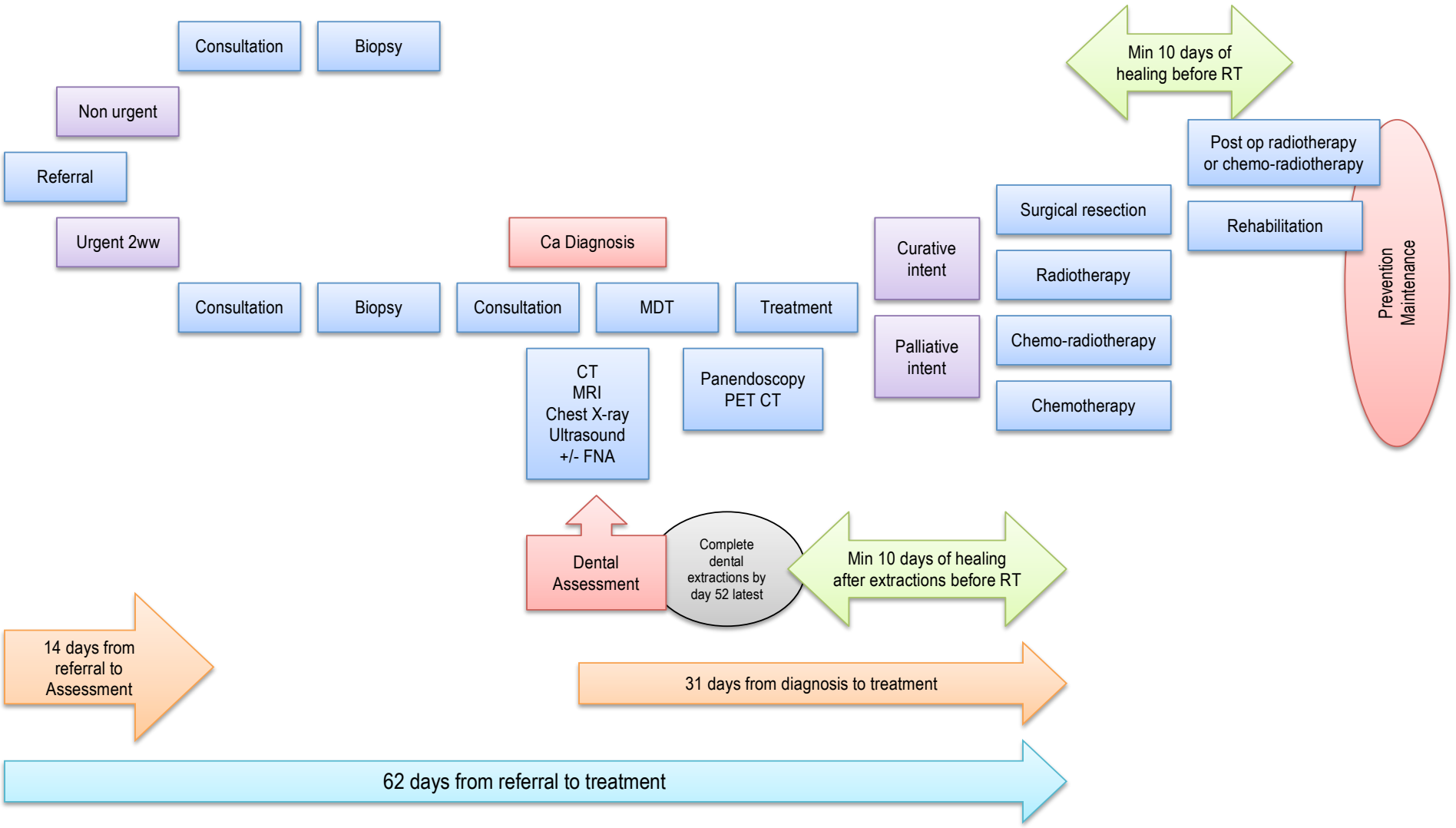
5. NICE guidance:
   - Guidance and quality standards: https://www.nice.org.uk/guidance/conditions-and-diseases/cancer/head-and-neck-cancers
   - NICE Information for the public: https://www.nice.org.uk/guidance/csg6/resources/healthcare-services-for-head-and-neck-cancers-pdf-2190221821#:~:text=Dental%20services&text=This%20may%20be%20a%20result,patients%20if%20they%20need%20them.

6. The Royal College of Surgeons of England / The British Society for Disability and Oral Health. The Oral Management of Oncology Patients Requiring Radiotherapy, Chemotherapy and / or Bone Marrow Transplantation. 2018: https://www.rcseng.ac.uk/-/media/files/rcs/fds/publications/rcs-oncology-guideline-update--v36.pdf

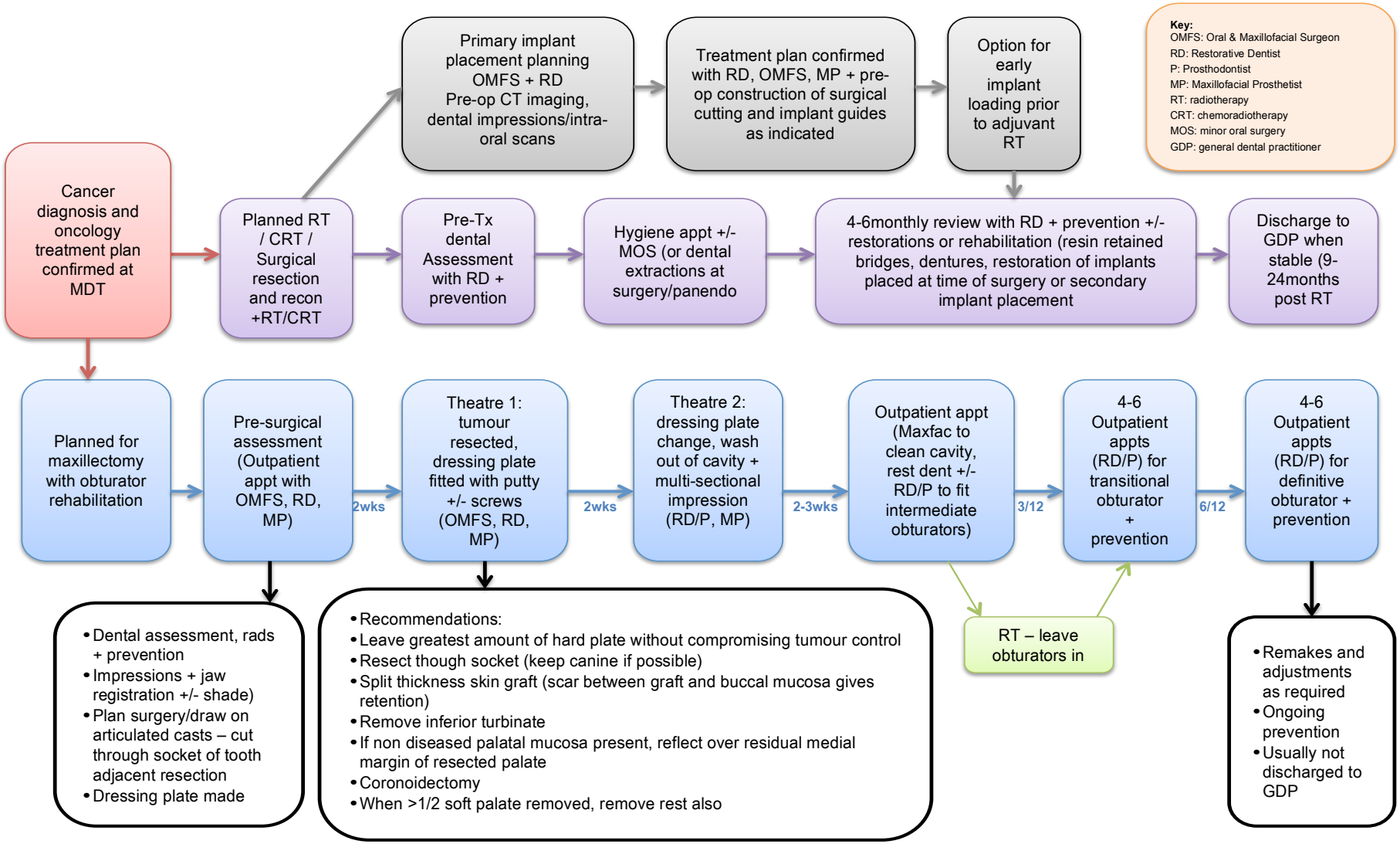
7. Diagnosis and management of head and neck cancer – SIGN 90: https://www.scottishdental.nhs.scot/library/diagnosis-and-management-of-head-and-neck-cancer-sign-90/#:~:text=The%20guideline%20follows%20the%20patient's,all%20head%20and%20neck%20cancers.

Local guidelines are also available through local Head and Neck Cancer alliances.

Head and Neck Oncology patient pathway can be complex and needs to align to a 62-day cancer pathway:



Potential pathways for patients undergoing radiotherapy to the head and neck region, and for those planned for obturators:



Prosthodontic options for head and neck cancer patients:

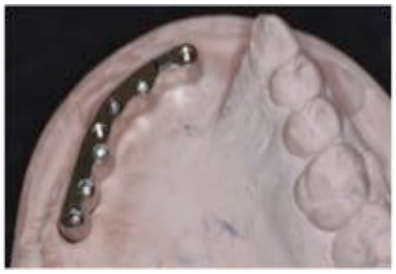
Accept and prevention: The importance of prevention cannot be stressed enough. Teeth can deteriorate rapidly in those who have undergone radiotherapy, especially with regular sugar intakes, poor oral hygiene and irregular use of high fluoride and bio-available calcium and phosphate pastes. Even if radiotherapy is only to one side of the head and neck region, there may not be enough compensation from the other side to avoid radiation caries. Acceptance of posterior edentulous spaces may be the easiest of the options for patients to maintain. Function may not necessarily be affected by the lack of teeth alone. For those having undergone radiotherapy; xerostomia, trismus, taste disturbances and limitations in swallowing may impact food choices and confidence in eating. Any replacement for missing teeth should not put the remaining natural teeth at risk. As the population ages, any dentistry provided must take into account the ability of the patient to maintain and prevent dental disease around these restorations as the patient ages.

Resin Retained Bridges: These are a good option for those wanting to replace one missing unit using one good abutment tooth. There is limited contact with the gingival tissues and therefore no possibility of developing ORN from trauma from this type of restoration. The patient does, however, need to maintain the abutment with care, without which, the abutment may develop caries and eventually need extraction, which in turn may lead to ORN. All restorations will have a poorer outcome in parafunctional patients. Please see the BSSPD guidance document on Resin-Retained Bridges for more detail.

Dentures (Metal-based/Acrylic): Removable partial dentures, especially metal-based and Scandinavian designs can be useful for replacing numerous missing teeth. Thoughtful design and good oral hygiene can maintain a healthy dentition. Complete dentures made with clear acrylic bases can be very useful to identify areas of trauma. Ill-fitting dentures can lead to ORN, therefore close and careful inspection of the soft tissues on a regular basis are essential.

Swing lock dentures can be very useful. These have a hinge at one end and a lock at the other, however 6-8mm of vestibular depth and a minimum of 4 teeth are needed, although in some of these head and neck patients, 3 natural teeth may be sufficient if replacing a shortened dental arch. Guide planes to reduce torque and reciprocation are essential. Attempt to provide light contacts on the defect side and ensure the denture is passive at rest. Rest seats to allow proper abutment loading and aim to place the hinge 1 tooth away from abutment tooth. The bulk of the hinge/lock mechanism should be in acrylic and regular review is essential.

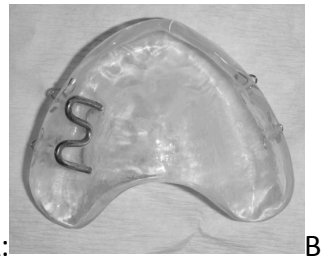
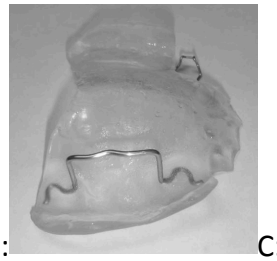
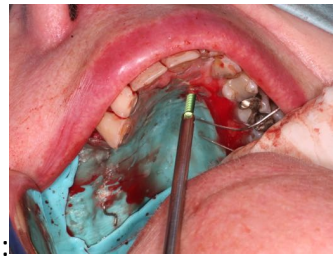
When implant placement has been possible, the use of milled bars and sleeve dentures can be very useful, not only to replace missing soft tissues, but also for easier access to hygiene around the implants, as well as surveillance of the soft tissues.

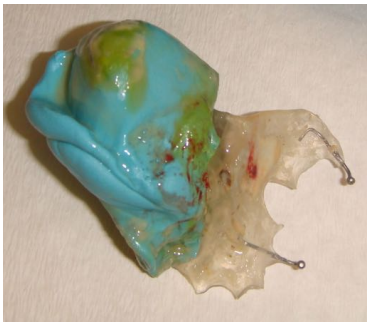


Cover plates and Surgical Obturators: Cover plated are planned pre-operatively and become the surgical obturator. They are a clear plate, with or without acrylic teeth. They have a 'goal post' to retain putty or compound to shape the defect during healing (A & B). If the patient is partially dentate roach clasps and Adams clasps can be used for retention. They can also be implant-

-retained (C) or retained with a surgical screw (D). Often these are left in situ whilst the radiotherapy is completed to maintain the facial shape and allow correct positioning of the radiotherapy mask.

A:  B:  C:  D: 

Interim obturators: Interim obturators are created by conversion of the surgical obturator or on a model created from an intra-operative impression of the defect. This is often the first time the patient has understood the full impact of their cancer treatment on their function. This can be a very emotional time. As the patient heals, regular review is required to adjust the interim obturator. The interim obturator may be left in place for 3-6months or longer if healing indicates.

Definitive obturators: Definitive obturators require a variety of impressions and assessment of the retention before moving onto the jaw registration. They ought to allow for drainage of mucous medially and posteriorly. Anterior and lateral aspects of the obturator need to provide support for facial muscles. Maximise support from the remaining hard palate, alveolar ridges and remaining teeth. Guide planes parallel to the walls of the defect can be useful for retention, and splinting adjacent teeth to the defect reduces tipping movements. Aim to obturate the full width of the defect, but not necessarily the height.

The weight of the obturator can be reduced significantly by using a hollow bulb. Open bulbs collect fluid and increase in weight, whilst closed bulbs prevent fluid collection, however engages

defect superiorly and reduced air space. Some say, if the defect is very large, avoid a surgical obturator and wait for some healing, before constructing an interim obturator. Post radiotherapy, soft tissues can be friable, therefore limit trauma, using materials such as alginate for making impressions. Close review of the obturator and the defect is recommended.

Implants: Primary placement of dental implants was previously planned on plain film radiographs. Following tumour resection and dental extractions, the bony ridge was typically reduced, and the implants were placed and buried. With advancement in digital planning and guided techniques, placing implants in a bone graft such as a fibula has greatly improved. Typically, at least four weeks of healing can occur before radiotherapy begins. Secondary implant placement may be more predictable in those who have not undergone radiotherapy. Tissues around implants can be difficult to manage with debulking procedures sometimes required of thick graft tissue. Keratinised tissue around the implants is the ideal, without which maintaining good oral hygiene can be very difficult. Mini-implants can be a useful short-term option for patients being treated palliatively. Zygomatic implants are a useful option for where there is very limited alveolar bone for traditional implants in the maxilla.

Maintenance: Lifelong maintenance is essential, usually a shared approach between the general dental practitioner and Prosthodontist/Restorative Dentist. This is inclusive of prevention of further dental disease and surveillance of the soft tissues under dentures, as well as maintenance, repair and replacement of restorations and prostheses. It is advisable to avoid options that reduce the restorability or prognosis of teeth such as full coverage crowns, where variations of onlays and three quarter crowns may suffice, in order to preserve as much tooth structure as possible. Consider composites rather than ceramic to improve appearance where possible, as these are more straightforward to repair and maintain.

Quality of life: The loss of teeth has been shown to be a determinant of patient quality of life, with a reduced self-perceived oral health status in association with greater numbers of missing teeth. Patients rendered edentulous by oral cancer treatment and having no occlusion fare worse in terms of their quality of life, and are less likely to wear dentures. Significantly increased psychological morbidity has been demonstrated in this group of patients. Retention of natural teeth, even in one jaw, can have a marked positive effect on the psychological well-being of the patient and potentially facilitates future oral rehabilitation.

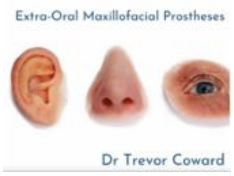
Links to BSSPD webinars on Head and Neck Cancer:

Schottlander Oral Prize Presentations 2024: Rachael Jablonski from the School of Dentistry Leeds "The IMPRESSeD Study: Improving facial prosthesis construction with contactless scanning and digital workflow"
https://www.bsspd.org/CPD%20Movie.aspx?prodid=962

Where have we come from and where are we going with dental pre-assessment for head and neck cancer webinar by Will Keys
https://www.bsspd.org/CPD%20Movie.aspx?prodid=781

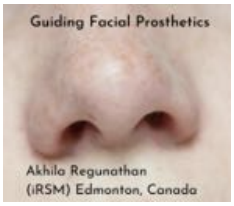
Restorative Dentistry - Caring for the Cancer patient
Theresa Leung & Claire Morgan
https://www.bsspd.org/CPD%20Movie.aspx?prodid=434

Restorative approaches in the early and definitive management of the maxillectomy patient
James Owens
https://www.bsspd.org/CPD%20Movie.aspx?prodid=334



Extra-oral maxillofacial prostheses
Dr Trevor Coward
https://www.bsspd.org/CPD%20Movie.aspx?prodid=508

Jaw in a Day: Restoratively Driven Fibulas with Immediate Implants and Teeth webinar
Fayette Williams
https://www.bsspd.org/CPD%20Movie.aspx?prodid=927



Guiding facial prosthetics webinar
Akhila Regunathan
https://www.bsspd.org/CPD%20Movie.aspx?prodid=851

Restorative Dentistry management of patients treated primarily with radiotherapy for head & neck cancer
Professor Mike Fenlon
https://www.bsspd.org/CPD%20Movie.aspx?prodid=552

Links to EJPRD articles on Head and Neck Cancer:

Teixeira ABV, Aguiar HC, Tardelli JDC, Dos Reis AC. Prevention of Caries in Cancer Patients: A Systematic Review on the Effectiveness of Dental Materials. Eur J Prosthodont Restor Dent. 2023 Aug 31;31(3):224-233. doi: 10.1922/EJPRD_2445Teixeira10. PMID: 37067356.
https://www.ejprd.org/view.php?article_id=1131&journal_id=143

Pollard AJ, Garner S, Patel S, Jerreat M. A Retrospective Service- Evaluation of Implant Success, Survival, Periimplant Health and Prosthetic Complications in a Cohort of Head and Neck Cancer Patients. Eur J Prosthodont Restor Dent. 2023 May 31;31(2):92-103. doi: 10.1922/EJPRD_2441Pollard12. PMID: 35917210.
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Aydin YA, Anderson W, Keys W. A Service Evaluation of Dental Assessments Prior to Treatment for Head and Neck Cancer in NHS Grampian. Eur J Prosthodont Restor Dent. 2022 May 29;30(2):121-125. doi: 10.1922/EJPRD_2297Aydin05. PMID: 34862860.
https://www.ejprd.org/view.php?article_id=1019&journal_id=134

Moore C, Killough S, Markey N, Winning L, McKenna G. Oral Health Status of Patients Undergoing Treatment for Head and Neck Oncology in Northern Ireland. Eur J Prosthodont Restor Dent. 2016 Jun;24(2):58-62. PMID: 27424336.
https://www.ejprd.org/view.php?article_id=800&journal_id=108

Nayar S, Brett R, Clayton N, Marsden J. The Effect of a Radiation Positioning Stent (RPS) in the Reduction of Radiation Dosage to the Opposing Jaw and Maintenance of Mouth opening after Radiation Therapy. Eur J Prosthodont Restor Dent. 2016 Jun;24(2):71-7. PMID: 27424338.
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Pace-Balzan A, Butterworth C, Lowe D, Rogers SN. Do head and neck cancer survivors attend a high street dentist on a regular basis? Eur J Prosthodont Restor Dent. 2014 Sep;22(3):101-6. PMID: 25831711.
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Eliyas S, Porter R, Briggs P, Patel RR. Effects of radiotherapy to the jaws. I: The scale of the problem. Eur J Prosthodont Restor Dent. 2013 Dec;21(4):161-9. PMID: 24479213.
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https://www.ejprd.org/view.php?article_id=687&journal_id=92

Rahman S, Maillou P, Barker D, Donachie M. Radiotherapy and the oral environment the effects of radiotherapy on the hard and soft tissues of the mouth and its management. Eur J Prosthodont Restor Dent. 2013 Jun;21(2):80-7. PMID: 23888531.
https://www.ejprd.org/view.php?article_id=661&journal_id=90

Useful links for patients:

Cancer Research UK: https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/head-and-neck-cancers

Mouth Cancer Foundation:

- https://www.mouthcancerfoundation.org
- https://www.mouthcancerfoundation.org/wp-content/uploads/2021/02/mouth-cancer-foundation-handbook.pdf

Macmillan support:

- https://www.macmillan.org.uk/cancer-information-and-support/head-and-neck-cancer
- https://www.macmillan.org.uk/cancer-information-and-support/impacts-of-cancer/mouth-care-after-head-and-neck-cancer-treatment#:~:text=Mouth%20care%20and%20preventing%20tooth%20decay,-Looking%20after%20your&text=You%20need%20regular%20check%2Dups,in%20keeping%20your%20mouth%20clean.

The Swallows: https://theswallows.org.uk

Head and Neck Cancer UK: https://hancuk.org

Recommended reading:

General:

Owens, D., Paleri, V. & Jones, A. Head and neck cancer explained: an overview of management pathways. Br Dent J 233, 721–725 (2022). https://doi.org/10.1038/s41415-022-5199-1

Rogers, S.N., Lowe, D., Lowies, C. et al. Improving quality of life through the routine use of the patient concerns inventory for head and neck cancer patients: a cluster preference randomized controlled trial. BMC Cancer 18, 444 (2018). https://doi.org/10.1186/s12885-018-4355-0

Rogers SN, Scott B, Lowe D et al. Fear of recurrence following head and neck cancer in the outpatient clinic. Eur Arch Otorhinolaryngol 2010; 267: 1,943–49.

Radiotherapy:

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Lajolo C, Rupe C, Gioco G, Troiano G, Patini R, Petruzzi M, Micciche' F, Giuliani M. Osteoradionecrosis of the Jaws Due to Teeth Extractions during and after Radiotherapy: A Systematic Review. Cancers (Basel). 2021 Nov 18;13(22):5798. doi: 10.3390/cancers13225798. PMID: 34830954; PMCID: PMC8616343.

Liao PH, Chu CH, Tang PL, Wu PC, Kuo TJ. Preradiation tooth extraction and jaw osteoradionecrosis: Nationwide population-based retrospective study in Taiwan. Clin Otolaryngol. 2020 Nov;45(6):896-903. doi: 10.1111/coa.13624. Epub 2020 Sep 17. PMID: 32738824.

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Eliyas S, Porter R. An impossible choice: MRONJ vs ORN? The difficulties of the decision-making process for head and neck cancer patients on long-term anti-angiogenic medication. Br Dent J. 2020 Nov;229(9):587-590. doi: 10.1038/s41415-020-2276-1. Epub 2020 Nov 13. PMID: 33188335.

Obturators:

Huryn JM, Piro JD. The maxillary immediate surgical obturator prosthesis. J Prosthet Dent. 1989 Mar;61(3):343-7. doi: 10.1016/0022-3913(89)90142-x. PMID: 2646447.

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Aramany MA. Basic principles of obturator design for partially edentulous patients. Part I: classification. J Prosthet Dent. 1978 Nov;40(5):554-7. doi: 10.1016/0022-3913(78)90092-6. PMID: 364015.

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Parr GR, Tharp GE, Rahn AO. Prosthodontic principles in the framework design of maxillary obturator prostheses. J Prosthet Dent. 1989 Aug;62(2):205-12. doi: 10.1016/0022-3913(89)90315-6. PMID: 2668517.

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Rehabilitation with implants:

Schiegnitz E, Reinicke K, Sagheb K, König J, Al-Nawas B, Grötz KA. Dental implants in patients with head and neck cancer-A systematic review and meta-analysis of the influence of radiotherapy on implant survival. Clin Oral Implants Res. 2022 Oct;33(10):967-999. doi: 10.1111/clr.13976. Epub 2022 Aug 26. PMID: 35841367.

Butterworth C.J., Rogers S.N. The zygomatic implant perforated (ZIP) flap: A new technique for combined surgical reconstruction and rapid fixed dental rehabilitation following low-level maxillectomy. Int. J. Implant. Dent. 2017;3:37. doi: 10.1186/s40729-017-0100-8.

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