

## Recent Advances In Oral Cancer Treatment- An Overview

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### Abstract

Oral cancer is one of the most common head and neck cancer in the world [1]. Oral cancer is a malignant neoplasia which arises from lip or oral cavity [2][3]. Oral cancer makes up approximately 1-2 % of all cancers, that may arise in the body. The great majority of all cancers consists of Squamous cell carcinoma [4]. More than 90% of oral cancers are carcinomas with squamous differentiation from mucosal epithelium, thus called as Oral Squamous cell carcinoma, which is sixth most common cancer worldwide with ~50% of 5 years Survival rate [5][6]. The high mortality and morbidity rate associated with the disease highlight the need for an effective screening method and development of early diagnostic tool [7]. Oral and oropharyngeal cancers can often be cured, especially if cancer is found in early stage. Treatment options and recommendations depends on several factors, including the types and stages of cancer, possible side effects, patients' preference and overall health. One of these therapies or combinations of them are used [8]. The primary goal is disease eradication and preservation of oropharyngeal function. For early cancer surgical excision remains as the most effective and least morbid approach. When surgery is likely to result in functional deficits of speech, swallowing, radiation therapy can also be used. Often the choice of treatment is based on institutional expertise and bias. [9]

**Key words:** Oral cavity cancer; treatment, surgery, radiotherapy, chemotherapy, biotherapy, nanoparticle therapy, carcinoma

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### I. INTRODUCTION

Oral cancer is one of the most common head and neck cancer in the [1]. Oral cancer is a malignant neoplasia which arises from lip or oral cavity [2][3]. Oral cancer makes up approximately 1-2 % of all cancers, that may arise in the body. The great majority of all cancers consists of Squamous cell carcinoma [4]. More than 90% of oral cancers are carcinomas with squamous differentiation from mucosal epithelium, thus called as Oral Squamous cell carcinoma, which is sixth most common cancer worldwide with ~50% of 5 years Survival rate [5][6]. The high mortality and morbidity rate associated with the disease highlight the need for an effective screening method and development of early diagnostic tool [7]. Oral and oropharyngeal cancers can often be cured, especially if cancer is found in early stage. Treatment options and recommendations depends on several factors, including the types and stages of cancer, possible side effects, patients' preference and overall health. One of these therapies or combinations of them are used. There are 3 main treatment options for oral and oropharyngeal cancers – surgery, radiation therapy, therapies using medications, biotherapy, nanoparticles for oral cancer therapy.[8]

### II. SURGERY

Primary site, location, size, proximity to bone, and depth of infiltration are factors which decides a particular surgical approach. Tumours that involve the mandible require specific understanding of the mechanism of bone involvement. This facilitates the employment of mandible sparing techniques such as marginal

mandibulectomy and mandibulotomy. Reconstruction of major surgical defects in the oral cavity requires use of a free flap. The radial forearm free flap provides good soft tissue and lining for soft tissue defects in the oral cavity. The fibula free flap remains the top choice for mandibular reconstruction. Factors affecting choice of treatment are- (1) tumour factors, (2) patient factors; (3) physician factors [10]. The mandible is considered at risk when the primary tumour present in the mandible, is adherent to the mandible, or is in proximity to the mandible. Reconstructive surgery for oral cancer is considered when there is functional or aesthetic loss of structures in the oral cavity. Thus, loss of a significant part of the tongue, floor of mouth and buccal mucosa, and loss of a segment of the mandible following resection of the primary tumour would be indicators for the reconstructive surgery. The important factor which affects long term outcome following initial treatment of oral cancer is the stage of disease at the time of presentation. Early staged tumours offer excellent cure rates, however once regional lymph node metastases occur a significant drop in the cure rate is to be expected.[10]

### **III. RADIATION THERAPY**

Radiation therapy uses external energy beams and radioactive materials placed in the body to destroy cancer cells in oral cavity.[2]

#### **Intensity Modulated Radiation Therapy**

Doctors uses intensity modulated radiation therapy after surgery for oral cancer to destroy any remaining cancer cells. It is used to manage oral cancer in individuals who cannot tolerate surgery. In this therapy, a machine delivers the radiation of beams from different directions. This type of radiation therapy is broken into many small, computer-controlled doses of differing strengths. Intensity modulated radiation therapy may sometimes combined with chemotherapy. This approach, called chemoradiation, is used to destroy the remaining cancer cells after the cancer is surgically removed. It may also be used after surgery in patients having cancer that spread to the lymph nodes.[11]

#### **Brachytherapy**

Brachytherapy is a form of therapy in which radioactive materials are placed directly in the oral cavity. This makes the radiation dose to be highly concentrated in the tumour while sparing surrounding healthy tissue. Brachytherapy may be used instead of surgery to manage small oral cancer tumours, especially if doctors think it could help to preserve more chewing, swallowing, and speaking. Brachytherapy may also be used after surgery to destroy any remaining cancer cells or to manage tumours that have recurred. Brachytherapy is combined with intensity modulated radiation therapy to destroy tumours. Combined therapy allows radiation oncologists to use low doses of external radiation therapy, that reduces the exposure of healthy tissue to the treatment.[2] Brachytherapy is used after the external therapy to increase the radiation dose directly to the tumour. To deliver this type of radiation, doctors place catheters, small tubes, directly into the tumour or sometimes the tumour bed. Radioactive material is delivered into the catheters, normally a day after the catheter placement. Catheter placement and radiation delivery take place in the hospital and done under general anaesthesia. Treatment lasts for two to seven days. After treatment, all catheters and radioactive materials are removed.[11]

### **IV. CHEMOTHERAPY**

Oral cancer is usually detected earlier and treated with surgery and radiotherapy. Oropharyngeal cancer may be advanced when it is found and is treated with radiotherapy. Both treatments may be associated with defacement and decreased ability to eat, drink, and talk. Treatment with chemotherapy (drugs which kill cancer cells), in addition to radiotherapy (surgery when required) offers prolonged survival. Chemotherapy given simultaneously with radiotherapy, is more effective than chemotherapy given before radiotherapy, and may reduce the need for surgery. The improvement in overall survival with the use of chemotherapy is estimated to be between 8% and 22%. The side effects of combined chemoradiotherapy (nausea, vomiting, diarrhoea, hair loss, and infections) were not measured [12]. Chemotherapy can be given in patients with advanced squamous cell carcinoma. Cisplatin based chemoradiation is still the standard one for advanced SCC.TPF has become the new standard regimen when induction chemotherapy is specified. None of the combination chemotherapy regimens demonstrated an overall survival benefit when compared to single agent like methotrexate, cisplatin or 5-fluorouracil in metastatic disease.[13] Thus primary radiotherapy and chemotherapy is usually reserved for patients unable to tolerate or who are not preferring surgery.[11]

### **V. BIOTHERAPY**

Biotherapy is treatment designed to stimulate or restore the capability of the body's vulnerable (natural internal defence) system to fight infection and complaint. Biological remedy is also as natural remedy or immunotherapy treatment. Biological remedy is a form of treatment that uses portions of the body's natural vulnerable system to treat complaint. Biological remedy is used to cover the body from the side goods of certain

treatments. [14] Biological remedy frequently involves the use of substances called natural response modifiers. The body typically produces substances in small quantities in response to infection and complaint. Using ultramodern laboratory ways, scientists can produce BRMs in large quantities for use in the treatment of cancer and other conditions, similar as rheumatoid arthritis and Crohn's complaint. Biological remedy may also target specific moles on cancer cells to destroy the cells, or it may target proteins that inhibit the growth of cancer cells [14][15][16]

### **Types of natural remedy**

- 1) Nonspecific immunomodulating agents
- 2) Colony- stimulating factors,
- 3) Monoclonal antibodies Vaccine remedy
- 4) Auto T- cell remedy

### **Nonspecific immunomodulating agents**

The 2 types frequently used to treat cancer are Interferons. Interferons are a natural type of natural response modifier in the body. They ameliorate the way the vulnerable system acts against some kinds of cancer. The drug may work directly on cancer cells to decelerate down their growth. Some interferons may also let white blood cells to fight cancer cells, Interleukins. These are proteins called as cytokines. They're naturally present in the body. They boost the growth and exertion of the vulnerable cells. This can help the vulnerable cells destroy cancer cells.

### **Colony- stimulating factors.**

These drugs help stem cells in the bone gist to make white blood cells. White blood cells are part of your vulnerable system. They help you fight off the origins.

### **Monoclonal antibodies**

These are drugs that stick to the certain corridor of cancer cells. Some of these antibodies work by label cancer cells. This helps them to be set up and killed by corridor of the vulnerable system. Others work by stopping some functions that cancer cells need to survive. In some cases, the antibodies are attached to another substance. This may be another anticancer drug, radioactive substance, or another BRM. When the antibodies attach cancer cells, they shoot other substance into the cancer. This helps to destroy the cancer cells. Vaccine remedy Vaccine remedy is growing area of the cancer exploration. Vaccine remedy may help the body's vulnerable system start attacking cancer cells. For contagious illness, similar as flu, vaccines are given before the complaint starts. But cancer vaccines are given after the complaint starts. This is done when the quantum of cancer is small. numerous types of cancer. A vaccine may be used with other types of natural remedy.[14]

### **Auto T- cell remedy**

Auto T- cell remedy takes the T cells from a person's blood and changes them in a lab to add a gene for a receptor. This helps the T cells to find and destroy cancer cells. The changed T cells are also put back in the person's body. Some people may have chemotherapy before they admit the Auto T- cell infusion. This is helps make the auto T cells more effective.[14][16]

### **Side effects**

Side effects may be mild or severe, or you may have no side effects. Side effects may include Skin rash, itching, redness, mild to severe allergies, vomiting, nausea, low blood pressure, headache, Extreme tiredness.[15][16]

## **VI. NANOPARTICLES FOR ORAL CANCER THERAPY**

Because of the controllable chemical and physical characteristics, nanoparticles show an increase in popularity on targeted drug delivery system with enhanced bioactivity and effective therapy, thus reducing its systemic toxicity for oral cancer therapy. These carriers mainly comprising of polymeric and inorganic nanoparticles can kill cancer cells by loading, stabilizing, and delivering the chemotherapeutic drugs.[17][18][19]

### **Polymeric Nanoparticles for Oral Cancer Therapy**

An ideal drug carrier should possess favourable biocompatibility, biodegradability, and controlled drug release property at specific sites. Naturally derived and synthetic polymers [e.g., polysaccharides, polycaprolactone (PCL), poly (lactic acid) (PLA), poly (glycolic acid) (PGA), and polyethylene glycol (PEG)] are series of suitable biomaterials for preparation of polymeric nanoparticles by many techniques like nanoprecipitation, emulsifications, and self-assembly. They are modified as chemo-preventive agents to be

directly delivered into the affected sites within the oral cavity, so the malignant conversion is effectively prevented from oral epithelial dysplasia to frank carcinoma.[17][20][21][22][23]

### **Inorganic Nanoparticles for Oral Cancer Therapy**

Inorganic nanoparticles are extensively employed due to their low toxicity, high tolerance of organic solvents and good bioavailability, and thus these inorganic nanoparticles (e.g., Au NPs, Ag NPs) are applied in diagnostic and therapeutic fields for tumours with high efficacy, especially for their unique photo-thermal functions for oral cancer therapy.[17][24][25]

### **Combinational Nanoparticles for Oral Cancer Therapy**

Combinational drug treatment is recognized as advanced therapeutic benefits for the targeted drug delivery system which allows for the reduced toxicity and improved therapeutic efficacy. Based on the self-assembly of amphiphilic poly (DL-lactide-co-glycoside) (PLGA)-PEG polymers, VCR was physically encapsulated into the polymeric corona through the chem-covalently assembly around silica coated gold nanorods (GNRs). The breakage of amide linkages impelled the sustainable VCR release under acidic intracellular environments, revealing the prepared combinational therapeutic nanoprobes are identified as promising candidates for potentially clinical translation.[17][26]

### **Hydrogels for Oral Cancer Therapy**

Hydrogels have a three-dimensional porous and interconnected structures that provide a biocompatible microenvironment for cell attachment and proliferation and possess many unique advantages on the targeted drug delivery systems. Compared to the nanoparticle-based carriers, hydrogels provide sustained and triggered administration of hydrophilic and hydrophobic agents. In addition, hydrogel carriers allow for the co-administration of multiple drugs for achieving the synergistic anti-cancer effects with high drug loading content and low drug resistance.[17][27][28]

## **VII. CONCLUSION**

Palliative care can be provided anywhere along the cancer care from initial diagnosis to end of life. When a patient begins to receive palliative care, they can continue to receive oral cancer treatment. Palliative care for oral cancer patients is designed to relieve symptoms like pain, nausea, shortness of breath, constipation, itching, and many other symptoms so that patients can feel better and enjoy life. General palliative care is provided by the usual professional cares of the patient and family with low to moderate complexity of palliative care need. In dentistry, surgery has come a long way in the treatment of malignancy and is still one of the most common methods in managing primary solid tumours today. The impacts of surgical resection on patients' lives are particularly evident in the cases of oral and oropharyngeal cancers.

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