

Swallowing outcomes in brachytherapy radiation approach for head and neck cancer survivors- A twin case-based observations

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World Journal of Biology Pharmacy and Health Sciences, 2024, 20(02), 154–158

Publication history: Received on 17 September 2024; revised on 02 November 2024; accepted on 05 November 2024

Article DOI: <https://doi.org/10.30574/wjbphs.2024.20.2.0861>

Abstract

Swallowing dysfunction is a prevailing state following radiotherapy in patients with head and neck cancer. The progress in the treatment techniques has allowed more precise radiation administration to the tumour and has reduced damage to adjacent issues. Nonetheless, a proportion of patients still suffer from swallowing dysfunction following radiotherapy. Brachytherapy is an advanced procedure to treat and manage cancers increasing in recent clinical practice. BT has been used as a tool to facilitate the delivery of a high tumour dose in which it eventually reduces the doses to neighbouring swallowing structures, compared with conventional RT. There are no studies reported the swallowing abilities following brachytherapy. Hence considering the lacunae in the literature and the effect of radiation on swallowing abilities the present case study was taken to represent the swallowing abilities in oral cancer patients received brachytherapy. Two cases diagnosed with carcinoma of buccal mucosa and tongue were given brachytherapy. The speech and swallowing abilities were affected in both the condition prior to brachytherapy. Following brachytherapy speech and swallow rehabilitation was carried out for one month and both of them showed significant improvement and case with buccal mucosa showed greater improvement than carcinoma of tongue. The present concludes that there will be organ specific dysphagia symptoms in brachytherapy and involvement of adjacent structures are minimal.

Keywords: Brachytherapy; Oral Carcinoma; Carcinoma of Tongue; Dysphagia; Head and Neck Cancer

1. Introduction

Swallowing dysfunction is a prevailing state following radiotherapy in patients with head and neck cancer. Following the advancement of cancer treatment in recent years, the survival rate of head and neck cancer has gradually increased. Simultaneously, patients with head and neck cancer suffer due to the long-duration and more prominent swallowing dysfunction [1]. Swallowing problems in these individuals occurs as a consequence of tumour destruction, sequelae of surgical resection, and side effects from radiotherapy and chemotherapy. Swallowing dysfunction often declines in the quality of life in these individuals. Therefore, special emphasis should be placed on swallowing dysfunction in patients with head and neck cancer. Radiotherapy is the mainstream nonsurgical intervention in cases of head and neck cancer. In recent years, radiotherapy has gradually evolved from conventional radiotherapy to intensity-modulated radiation therapy (IMRT) and Brachytherapy (BT) [2]. The progress in the treatment techniques has allowed more precise radiation administration to the tumour and has reduced damage to adjacent issues. Nonetheless, a proportion of patients still suffer from swallowing dysfunction following radiotherapy [1].

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Brachytherapy is an advanced procedure to treat and manage cancers increasing in recent clinical practice. BT acts by placing sources with radioactive isotopes which emits the radiation for a specified area. Brachytherapy can be delivered by several means, including intraluminal, intracavitary, and multi-catheter interstitial. Brachytherapy is different from other forms of radiation therapy because it allows for administering higher doses of radiation, minimizing insult to surrounding organs. This advanced radiotherapy technique devices are inserted near tumours by delivering high doses of radiation to treat the tumours. The first brachy therapy was used to treat cervical cancer. Brachytherapy has been used in the oral cavity as both a boost and a monotherapy. External beam is limited by the dose delivered to the mandible, and brachytherapy can allow for a more conformal dose. The most common sites are oral tongue, lip, and floor-of-mouth tumour [3]. Some researchers have reported that the early-stage T1-T2 oral tongue cancers treated with 16-32 Gy of external beam and then boosted with 40-55 Gy of interstitial brachytherapy had a two-year local control rate of 92% [4]. BT has been used as a tool to facilitate the delivery of a high tumour dose [5,6] in which it eventually reduces the doses to neighbouring swallowing structures, compared with conventional RT. There are no studies reported the swallowing abilities following brachytherapy. Hence considering the lacunae in the literature and the effect of radiation on swallowing abilities the present case study was taken to represent the swallowing abilities in oral cancer patients received brachytherapy.

2. Case Description

The present case series observations are documented upon the consent from the patient and the Institutional ethical committee approval. The present cases visited a tertiary cancer care hospital in north Karnataka with the complaint of an extra growth in the oral cavity. Routine clinical examination was carried out by taking detailed case history and background information. The histopathological and radiological investigations confirmed squamous cell carcinoma in these patients. The head and neck cancer team considered the type and severity of the condition and recommended for an organ preservation treatment and evaluated the candidacy for different radiation approaches. Both Intensity modulated radiation therapy and brachy therapy was suitable for these patients. Based on the clients and their care giver approval brachytherapy was decided as an organ preservation treatment for these patients.

2.1. Case 1

43-year male diagnosed with squamous cell carcinoma of buccal mucosa. The patient reported pain and lump in the oral cavity. The client had referred pain of the face and reported difficulty in speaking and eating. The head and neck cancer team evaluated completely including speech and swallowing abilities. The radiation oncologist performed a candidacy evaluation for the brachytherapy which reported that the client had adequate site and accessibility for brachytherapy with less than 2cm site and greater than 5mm of mandibular margin. The client doesn't have trismus, fibrosis, and no history of previous treatment and relapse. The client is also a good candidate for general anaesthesia for brachytherapy. Considering all the potential possibilities low dose rate brachytherapy was recommended.

Table 1 Pre and Post therapeutic swallowing evaluation findings.

Domains of Assessment	Evaluation 1 (After 1 week after brachytherapy speech and swallow pretherapy)	Evaluation 2 (After 1 month after brachytherapy and speech and swallow therapy)
Patient Complaint or Reported Symptoms	Pain while swallowing, pain in the face area, only on liquid diet, more time for swallowing and dryness of mouth.	Pain while eating solids occasionally improved food intake with no difficulty in swallowing
Dysphagia Handicap Index	Score: 35 Moderate Swallowing Difficulty	Score: 15 Very mild Swallowing difficulty
Functional Oral intake of Scale	Score- 4: Total oral diet of a single consistency	Score- 6: Total oral diet with multiple consistencies without special preparation, but specific food limitations
The Mann Assessment of Swallowing Ability	Total Score obtained- 167 Mild to Moderate Dysphagia	Total Score obtained 182 No abnormality detected
Swal- Quality of Life	Score 63%	Score 32%
Articulation tests	SODA errors present predominantly substitution, omission and cluster reduction	Minimal or occasional errors perceived

Prior to the radiological treatment the speech and swallowing abilities were also evaluated and reported speech sound errors with oral phase dysphagia with more than 60 percent of affected swallowing quality of life. The low dose rate brachytherapy was started with the minimum dose of 14.5 Gy and maximum dose of 115 Gy and the mean dose given was 65.4Gy delivered in one fraction with 4 Gy/hour over 3 days. Following one week of the brachytherapy, the speech and swallowing therapy was carried out with appropriate treatment techniques and approaches. The speech and swallow abilities were found to be disturbed with altered quality of life with tumour. Based on the findings the client attended a speech and swallow therapy thrice a week for a month. As treatment progressed the client reported improvement and treatment outcomes were measured after one month. However, the findings were showed promising improvement in comparison to earlier findings as depicted below in table 1. The findings also suggested that the brachytherapy is minimally affecting the swallowing abilities in those head and neck cancer survivors.

2.2. Case 2

51-year male diagnosed with squamous cell carcinoma of tongue. The patient reported pain and a mass on the lateral border of the tongue. The client reported difficulty in speaking, swallowing and chewing. The head and neck cancer team evaluated completely including speech and swallowing abilities. The radiation oncologist performed a candidacy evaluation for the brachytherapy which reported that the client had adequate site and accessibility for brachytherapy with less than 2cm site and greater than 5mm of lingual margin. The client doesn't have trismus, fibrosis, and no history of previous treatment and relapse. The client is also a good candidate for general anaesthesia for brachytherapy. Considering all the potential possibilities high dose rate brachytherapy was recommended. Prior to the radiological treatment the speech and swallowing abilities were also evaluated and reported speech sound errors with oropharyngeal dysphagia with more than 80 percent of affected swallowing quality of life. The high dose rate brachytherapy was started with the minimum dose of 35 Gy and maximum dose of 175 Gy and the mean dose given was 87.5 Gy delivered in three fractions with 4 Gy/hour for 4 days. Following the brachytherapy, the speech and swallowing therapy was carried out after 1 week. The speech and swallow abilities were found to be predominantly affected with altered quality of life with the tumour. Based on the findings the client attended a speech and swallow therapy thrice a week for a month. As treatment progressed the client reported improvement and treatment outcomes were measured after one month. However, the findings were showed promising improvement in comparison to earlier findings as depicted below in table 2. The findings also suggested that the brachytherapy is minimally affecting the swallowing abilities in these head and neck cancer survivors however the dosage of the therapy have an impact.

Table 2 Pre and Post therapeutic swallowing evaluation findings.

Domains of Assessment	Evaluation 1 (After 1 week after brachytherapy speech and swallow pretherapy)	Evaluation 2 (After 1 month after brachytherapy and speech and swallow therapy)
Patient Complaint or Reported Symptoms	Pain while swallowing, pain in the tongue and restricted tongue movements, Halitosis, completely on liquid diet with reduced intake.	Difficulty in bolus propulsion of solids mastication and more effort in chewing and bolus accumulation
Dysphagia Handicap Index	Score: 75 Moderate to Severe Swallowing Difficulty	Score: 26 Mild Swallowing difficulty
Functional Oral intake of Scale	Score- 4: Total oral diet of a single consistency	Score- 6: Total oral diet with multiple consistencies without special preparation, but specific food limitations
The Mann Assessment of Swallowing Ability	Total Score obtained- 138 Moderate to Severe Dysphagia	Total Score obtained: 167 Mild Dysphagia
Swal- Quality of Life	Score 78%	Score 37%
Articulation tests	SODA errors present predominantly substitution, omission distortion and cluster reduction	Minimal substitution errors perceived

3. Discussion

Swallowing problems are primary consequences in head and neck cancer and its treatment. Practice changes in radiation approaches for head and neck cancer organ preservation has led comparatively lesser impact on swallowing [7]. However, there is an immediate and late effects of radiation on swallowing abilities. Brachytherapy is one such advanced radiation approach in the recent clinical practice and its effect on swallowing abilities reports are minimal. The present case observations are preliminary attempt to document the effect of brachytherapy on swallowing abilities in different oral cavity cancers received brachytherapy. Case 1 presented with carcinoma of buccal mucosa received brachytherapy and had impeded speech and swallowing abilities by tumour itself. The brachytherapy approach in the case succeeded in cure of carcinoma and relived from the symptoms. However, the speech and swallow rehabilitation were started immediately after a week of brachytherapy and gradual improvements were observed and post treatment evaluation findings suggested that there is a promising improvement in the speech and swallowing abilities. Since the carcinoma of buccal mucosa is at the marginal end of oral cavity and actively not involved in speech and swallow mechanism the tumour was impeding the function prior to the brachytherapy following the brachytherapy the functional changes and histological changes would contribute for the Dysphagia. Hence early identification and intervention for speech and swallow showed improvement within a month span. The contributing factors like site of lesion, dose of brachytherapy radiation, treatment approaches had showed improved quality of life and their abilities. Similarly, case 2 was diagnosed with carcinoma of tongue and had significant swallowing and speech problems by tumour itself after brachytherapy the speech and swallow therapy were started and showed a significant improvement as day progresses. Tongue is an active articulator and an active oral structure for the oral phase of swallowing. The carcinoma of tongue and its treatment had significant impact on swallowing abilities and the quality of life. During the span of one month with the therapy there was an improvement in the findings however, the problem has not completely cured. The carcinoma of tongue, doses of the brachytherapy and other functional factors have a promising effect on the current improvement status and requires much more time. In comparison to carcinoma of tongue, carcinoma of buccal mucosa showed clinically near normal abilities. The dosage of the brachytherapy would be the reason and the site of lesion was at the marginal end of oral cavity since the radiation is precisely given to tumour the constrictor muscles are less exposed to radiation and brachy will give the penetration to only structure with carcinoma other adjacent sides have minimal effects [8]. The tongue is a mobile structure and hydrated which is very important in speech and swallowing the radiation for the carcinoma penetrated through the tongue would definitely alter the tongue mobility and histopathology and the doses given to the tongue were higher in this condition and the organ specific changes were more in brachytherapy than intensity modulated radiation therapy [9, 10].

4. Conclusion

The present observations reported that brachytherapy have minimal effects on adjacent structures as the radiation will be delivered to only the one structure precisely by penetration to the structure affected. The doses given to the structure would alter the function of the structure and impede the speech and swallowing ability. However, speech and swallow rehabilitation in any form of radiation approach should be advised for any head and neck cancer survivors for better quality of life and avoid further late effects of radiation.

Compliance with ethical standards

Acknowledgments

The authors would like to thank the participants and their family members for their willingness to the study. We also thank our institute for giving the opportunity to conduct and document the case observations as evidence.

Disclosure of conflict of interest

The authors declare that there is no conflict of interest/competing interest with the publication.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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