Laser Ablation Surgery in Late Stage Buccal Cancer

Rusy Bhalla, Seemantini Bhalla, Duleep Bhonsale, Dilip Pawar*

Orchid Cancer Centre for Laser Surgery, Mumbai, India

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Abstract Oral cancer is a major health problem in India. The use of tobacco in various forms has escalated the problem to be the leading cause of cancer in males in India. Many patients postpone surgery for fear of facial mutilation and therefore present with Late stage Buccal Cancer. The management of Late stage buccal cancer has very few options. Conventional surgery, chemotherapy and radiation give very little relief to patients. The occurrence of inevitable recurrence after surgery due to Field cancerisation makes the surgery a futile exercise in controlling the spread of the tumor. The treatment in unresectable tumors which is given as palliation is often limited to pain control and bypassing of oral functions by inserting a nasogastric tube. The mortality rate has remained changed over last 10 years. Therefore Quality of life in these patients has become a discussion matter in most cancer forums. The main cause of the suffering of the patient is the bulk of the tumour. Intralesional Laser ablation offers an alternative way to destroy the bulk of the tumor. The reduction in tumor volume allows good restitution of oral function and pain. There were 49 patients observed in this study. Many patients went into remission after laser ablation and Chemotherapy. The ensuing results were analyzed taking into account Quality and Quantity of life and the resulting Quality index was applied on the patients. Most patients had a good Quality Index post-procedure. All patients were highly satisfied with the procedure. There was an enhanced benefit noted in the quality of life and the expected overall survival time of the patients. Conclusion: Laser Ablation offers an alternative treatment in late-stage Oral Cancer for palliation as well as remission.

Keywords Oral Cancer, Laser Ablation, Late Stage Buccal Cancer, Quality Index

1. Introduction

Oral cancer is the most frequently occurring cancer in India in males. For all regions, the incidence of oral cancer for males and females was highest in the central region of India. For males, it was 64.8% and for females it was 37.2% at 70 years of age (1).

The aim in all studies so far in this category has been palliation (2). This is a multidisciplinary approach in which the main aim is to decrease pain and institution of feeding and maintenance of airway by any means. Some doctors also use surgery as a means of palliation (3) Various options include mandibulectomy with free and regional flaps. Quality of life parameters have been assessed in various options in management of Late stage Oral carcinoma (4).

Due to the specific anatomical sites and structures that characterize oral cancer, both the disease process and its treatment may greatly impair the body image and practical functions of patients in even the most essential life tasks such as breathing, speaking, swallowing, and eating. (5)(6). During the past six decades, both the mortality and 5-year survival rates among oral cancer patients basically remain unchanged. (7)(8) For these reasons, the improvement of quality of life after conventional surgery has gained the attention of the medical community.(9)

Preserving of Quality of life is of paramount importance in late stage oral cancer.

2. Materials and Methods

Thermoablation of tumours have been in use since 1990s.

Several ablation techniques are currently available.

Thermoablation involves the following techniques

1. Radiofrequency
2. Microwave
3. Cryotherapy
4. Laser

All of these methods cause fatal damage at a cellular level and irreversible architectural deconstruction at a tissue level by thermal effects. Ablation of a tumour using one of these techniques, whether thermal or otherwise, requires applicators to be positioned from which the energy is delivered in situ. (10)

Lasers are currently approved by USFDA for treatment of soft issue tumours. (11) There has been a concerted effort to use ablative techniques in various cancers by institutions around the world with excellent results. (12) Increasingly laser treatment is being used in Oral and maxillofacial surgery in specialized institutions. (13)

Newer techniques with accurate sonographic and radiographic localisations have made this technique into a formidable field.

Though it is unlikely to replace conventional surgery, it is definitely emerging as an alternative in cases which are not willing for surgery or are not fit for surgery due to various reasons.

In many cases where the tumour is too big for resection, laser can be used for debulking of tumour for a better effect of the adjuvant therapy.

Laser Ablation is performed by using a laser and a medium which transports the laser light inside the tissue. The laser, which consists of a power source, a lasing medium, and reflecting mirrors, provides a monochromatic light (the light is emitted at a specific wavelength), whose wavelength defines the properties of the laser and the interaction with biological tissue. The medium is usually a small diameter (0.2–0.8 mm) flexible optical fibre that transports the laser light inside deep organs. Laser-tissue interaction can be described by three phenomena: scattering, reflection, and absorption. The light absorbed by tissue is converted into heat. Prolonged exposure of tumour cells at temperatures ranging from 45 °C to 55 °C or short exposure at temperature higher than 60 °C causes irreversible cell damage. (14)

Laser works by causing an irreversible damage to the cells when there has been a delivery of heat through laser probes.

Accurate placement of probes determines the final outcome of the destruction of the tumour.

As such knowledge of adjuvant technologies like CT scan MRI and ultrasonography is a must for a good result.

Laser ablation of Head and neck cancers is now a part of NCCN guidelines and Cancer.org. (15)

Main Aims of Conventional Palliation in Late Stage Buccal Cancer:

1. Reduction of pain

2. Administration of nutrition by natural or artificial means
3. Maintenance of airway
4. Psychological management of patient.

The aim of tumor control is not possible so not addressed in the above directions.

Palliation in Laser technology assesses all of above with debulking of the tumor with no surgical intervention

3. Patients and Methods

Laser Diode machine was used in this study of 60W. This was of a standard make by Gigaa laser. All the patients were assessed for inoperability of standard surgical procedure. The patients had been advised chemotherapy and radiation with a palliative intent.

This study was carried out between January 2017 and July 2020. A written and informed consent was obtained from all patients.

The criteria for inoperability were a wide resection of Upper and Lower Jaw in the buccal region.

Table 1. Age wise distribution of Buccal cancer patients included in the study

Group	Surgical status	No of patients	Male	Female	Normal life expectancy
1	Resectable	34	30	4	18 months
2	Unresectable	15	12	3	8 months

The ages of patients ranged from 25 yrs to 70 yrs with a mean of 41.3 yrs

Resectable meant R0 resection not possible.

Unresectable where only option was chemotherapy and radiotherapy with palliative intent.

All patients had their oral, tracheal functions intact. Exclusion criteria

1. Large fungating tumour
2. Involvement of maxillary orbital floor
3. Large multiple lymph nodes.
4. Comorbid condition leading to Anaesthetic non fitness.
5. Inability to take chemotherapy for any medical reason.

The procedure was carried out under General Anaesthesia by Nasotracheal intubation with a bronchoscope. The tumour was visualised under Ultrasonography control. The laser fibre of 400 microns was inserted with the help of 18 gauze needle and the tumour was laserised under direct vision. The lymph nodes were similarly seen in the sonography and laserised. The outer margin of the laserisation was the outer extent of the tumour. All lymph nodes seen on sonography were laserised. All patients were administered Chemotherapy in standard protocol for Cisplatin, Paclitaxel and 5-FU. There was no radiation used after the Ablation procedure.

Pain relief was assessed as per Numerical rating scale (NRS)—the intensity of pain is measured by asking the patient to select a number from 0 to 10 that describes the intensity of his pain: “0” means “no pain” and “10” means “unbearable pain.” (16)

4. Results

Table 2. Pain relief as Assessed by NRS

Patients	Pain relief	Percentage
41	2	83
6	3	12
2	4	4

All patients had a 95% and above dissolution of the tumour in a single session by laser. This was a visual impression based on the necrotic white nature of the dead tumor.

83 % of patients had an excellent relief from pain within 48 hrs of laser. 12% had a good relief and 4% had a satisfactory relief.

Table 3. Patients return to work assessed on percentage basis

Return to work N=49

Return to work	Percentage
35	70
14	12

70% of cases patients were able to return to work and rest could continue with their daily activities at work.

Table 4. Recurrence in patients assessed by visual and scan reports in resectable patients

Recurrence Group 1 N=34	
Nos	Time in months
25	6
7	3
2	2

Table 5. Recurrence in patients assessed by visual and scan reports in Unresectable patients

Recurrence Group 2 N=15	
Nos	Time in months
10	2
4	4

Patients of Group 1 of buccal cancer had a better result as far as recurrence was concerned

Group 1 patients had longer time for recurrence as compared to Group 2. (table 4 and 5). The recurrences were apparent after 6 months and within 2 months of stopping chemotherapy. Most recurrences were managed by re laserising the area every 3 weeks under local anaesthesia. The procedure itself was done under OPD conditions and averaged 3 minutes.

The procedure was repeated on a monthly basis till the volume of recurrence and nodal recurrence exceeded the laser capabilities.

All patients were able to return to normal life within 2 weeks. The swelling decreased by more than 90% in 3 weeks. This was a visual confirmation based on pre procedure photographs.. 9 patients (20%) of patients had bleeding in 2nd week due to tumour detachment which was managed by local compression.

The average life span of all patients considered was 1 year with life span ranging from 8 months at the least and 4 years at the most. This was considerably better at expected life span of 3 months in this category. (17). The person at 4 years is still alive till date.

Table 6. Expected life expectancy v/s observed life expectancy after Laser Ablation

Group	Surgical status	No. of patients	Normal life expectancy	Post laser Average life expectancy
1	Resectable	34	18 months	24 months
2	Unresectable	15	8 months	14 months

All patients had a remission with a near normal quality of life. The main complaints were formation of Oral fistula in buccal cancer patients whose tumors had touched the skin and marginally fungated out. Most of these fistulas closed within 6 weeks. Persistent oral fistulas were managed by plugging tightly with plastic dressing. Other side effect was in drawing of cheek due to resolution of tumour and fibrosis. (Figure 5 and 7) 90% of our patients fell in good category and 10 % fell in satisfactory category

Case 1, a 40 year old male patient presents with unresectable buccal cancer. (Figure 1), Intra oral Figure shows extensive involvement of buccal mucosa with involvement of upper and lower jaw (Figure 2). Post laser and chemotherapy after 6 months shows a swelling decreased of the face with no neck swelling (Figure 3), Intraoral Figure shows no evidence of tumour (Figure 4) use Fig. in place of Figure

Case 1: Unresectable buccal cancer

Case 2, a resectable Buccal Cancer, 65 year old male patient presents with fungating tumour with minimal skin involvement (Figure 5) and (Figure 6). Post laser and chemotherapy 1 year.

Case 2: Resectable Buccal Cancer

No cosmetic deformity, retraction of cheek on ipsilateral side. No recurrence and no evidence of tumour (Figure 7) and (Figure 8).

To better assess the effectiveness of surgical procedures in cases of Oral cancer we propose to analyze patients through a feature called Quality Index. It is a combination of Quality of life assessment with Quantity of Life.

Table 7. Most common Quality of Life parameters and points given to the observations

Quality of Life Post Operatively of Oral cancer patients				
Sr no	Feature	1	2	3
1	Cosmesis	Confined to home	Confined to family and friends	Able to interact With office colleagues
2	Diet	Tube feeding	Liquids	Full diet
3	Speech	Hand gestures	Family	Comprehensible by everyone
4	Pain	Pain killers all day	Once a day	No pain killers
5	Drooling from mouth	All day	Intermittent	None
6	Sleep	Sedatives	Intermittent	Full sleep
7	Weight	Loss by more than 10% of pre surgery	Same as pre surgery	Weight gain

Table 8. Patient numbers as assessed by Quality of Life

Nos=patient Nos

Sr no	Feature	1	Nos	2	Nos	3	Nos
1	Cosmesis	Confined to home	0	Confined to family and friends	2	Able to interact With office colleagues	47
2	Diet	Tube feeding	0	Liquids	0	Full diet	49
3	Speech	Hand gestures	0	Family	0	Comprehensible by everyone	49
4	Pain	Pain killers all day	0	Once a day	4	No pain killers	45
5	Drooling from mouth	All day	0	Intermittent	0	None	49
6	Sleep	Sedatives	0	Intermittent	0	Full sleep	49
7	Weight	Los by more than 10% of pre surgery	3	Same as pre surgery	25	Weight gain	21

Table 9. Quantity of life and points given in increasing order of survival

Time	1	2	3	4
Months	0 to 6 months	6 to 18 months	18 months to 24 months	More than 24 months
Nos	0	25	20	4

Quality Index

Quality of Life X Quantity of Life

Table 10. Patients studied on Quality Index in the study

	Points	Nos
Poor	7-10	0
Average	10 to 14	0
Satisfactory	15 to 40	32
Good	41 to 84	17

In our study using laser for ablation of Late stage Buccal Cancer (Table 10)

65% patients had a satisfactory outcome

35% patients had a good outcome

5. Discussion

Oral cancer as discussed earlier is a major health problem in India. Wide consumption of Tobacco and Alcohol is attributed to this statistic in India. Dental problems in the form of sharp tooth or ill-fitting dentures are also causative factors in this cancer. Most patients present in India with stage 4 cancer also called inoperable or unresectable cancers due to late diagnosis and lack of primary health care in many areas.(18)

The treatment modalities differ on the stage and the location of the disease. The area's most commonly involved are buccal mucosa, retro molar trigone, tonsils and tongue. The buccal area includes alveolar area.

Inoperative cancers are divided into resectable where R0 status cannot be obtained and inoperable where no surgery can be attempted due to the size of the tumour. NACT-Neo Adjuvant Chemo therapy is attempted in these patients where the average response rate is 30% of tumour in 30% of patients.(17) with average survival time being 18 months after surgery following NACT. The average survival time in patients without surgery was 3 months and with surgery was 8 months in other studies (3). Most anteriorly based diseases have a surgical option and most posterior based diseases have chemotherapy and radiotherapy as treatment option. The treatment option of surgery is based on a wide three dimensional excision of the tumour accompanied by chemotherapy and radiotherapy.(5). Stage 4 cancer in Oral cancer refers to any cancer more than 4 cms in any one dimension on a scan report or actual measuring. Stage 4 also refers to local extension of tumour to surrounding skin, muscle and bone. It also involves than 1 malignant node. (6).

The main limiting factor in assuring a long-term survival in cases of Late stage oral cancer is due the phenomenon known as field cancerization (19). Field cancerisation refers to the phenomenon of multiple origins of deposits of genetically altered cells in the oral mucosa which are more prone to turn malignant as time goes by. This phenomenon is more apparent in late stage cancers and in patients ingesting tobacco, Alcohol products.

This leads to an inevitable recurrence in the surrounding tissue spaces of a surgically corrected tumor bed with excision and a surgical Flap. This makes any surgery in late stage oral cancer mainly palliative even if carried out with a curative intent with adequate surgical margins.(19)(20). Several studies have emphasized the Limited Quality of Life obtained after mandibular/maxillary removal operations. Considering both the studies in comparison an argument can be made for laser being an alternate form of management since it can give a better quality of life considering the above parameters.(17)(21)

6. Conclusions

Laser ablation surgery offers an excellent way to palliate patients starting with relief from pain, reduction of swelling and restitution of oral intake. Many of these patients can be stated to be in remission. There was a definite correlation between years of tobacco use and the frequency. Patients having more years and frequency fared worse than patients having less consumption of tobacco products. The quality of life is maintained to a large extent and there is a substantial increase in the overall survival time. The results were satisfying for the 80 percent of the patients.

Conflict of Interest

The authors declare they have no conflict of interest in the above study.

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