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Prospective, randomised, comparative trail in head and neck cancer patients with short term enteral alimentation at TCC, coastal district of Vishakhapatnam, India

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ABSTRACT

INTRODUCTION

Head and neck cancer is the leading cancer in India and is linked mainly to tobacco chewing and smoking. Radiotherapy and concurrent chemotherapy is the current standard of care for locally advanced head and neck cancers. Patients with head and neck cancer undergoing curative treatment generally requires enteral nutritional support. This may be due to tumor effects leading to pre-treatment weight loss or anticipated acute toxicities of treatment (eg. Mucositis pain, anorexia, xerostomia). Historically, enteral feeding was performed using nasogastric tubes (NGTs). During late 1980s and early 1990s, percutaneous endoscopic gastrostomy (PEG) embraced by most head and neck cancer centers as the preferred feeding tube, with little in the way of scientific data on the relative advantages or disadvantages.

MATERIAL AND METHODS

This prospective randomised two arm comparative study was done to compare intensive nasogastric tube (NGTs) feeding with optimal oral nutrition in patients with advanced head and neck cancer while they are receiving concurrent chemoradiotherapy at TCC, King George Hospital, Visakhapatnam. The study population consisted of 40 patients of locally advanced head and neck cancers who underwent treatment from the department of Radiation Oncology.

RESULTS & CONCLUSION

Forty patients with inoperable squamous carcinoma of head and neck were randomized to either optimal oral nutrition (Arm A) or to intensive nasogastric tube feedings (Arm B) during concurrent chemoradiation for an average of 9 weeks. During the treatment period the mean dropout duration was high in Arm B compared with Arm A (8days vs 3 days). The tube fed group showed difference in the complete tumor response rate compared with oral fed group at 6wk follow up(18 of 20 patients vs 12 of 20 patients)(p=0.03).The tube fed group had a higher mean caloric intake(52Kcal/kg/day) s compared with orally fed group 25 Kcal/kg/day (p=0.004). The tube fed group had less mean body weight loss(60kgvs55.8kg(p=0.02)) during treatment period i.e., 9 weeks.

Keywords: Head and neck cancer, Enteral nutrition, Radiotherapy, Chemotherapy

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INTRODUCTION

Head and neck cancer is the leading cancer in India and is linked mainly to tobacco chewing and smoking. Squamous-cell cancers of the head and neck with advanced primary lesions, with or without regional lymph-node metastases, are challenging to treat effectively while maintaining the function of vital healthy structures. Extensive surgical resection of the primary tumor and regional cervical lymphatics used to be the standard of care. More recently, additional organ preserving strategies using either radiation alone or chemoradiotherapy has become a treatment option for these patients, and have been the focus of many investigations. Most of the head and neck cancers in India present at a locally advanced stage. Radiotherapy has long been the standard non-surgical therapy for locally advanced disease. Optimization of cure along with organ preservation and reduction of toxicities are the important aspects in treating locally advanced squamous cell carcinomas of head and neck. Many fractionation regimens including conventional once daily treatments, hyperfractionation, concomitant boost and accelerated fractionation have been used. Even the most effective radiotherapy regimens when used alone resulted in a local control rates of 50% to 70% and disease-free survivals of 30% to 40%. This led to investigations to explore chemotherapy with radiotherapy. (1)

Radiotherapy and concurrent chemotherapy is the current standard of care for locally advanced head and neck cancers. Chemotherapeutic agents radiosensitise cells and also have a direct cytotoxic effect on tumor cells. (2) Chemoradiotherapy although superior to radiotherapy alone causes greater toxic effects during the treatment. The patients undergoing concurrent chemoradiotherapy can have the side effects like nausea, vomiting, skin reactions, mucositis, dysphagia, Xerostomia, anemia, and leucopenia. (2)

Patients with locally advanced cancers have poor quality of life due to the disease itself affecting speech, swallowing, and pain. Treatment also affects the quality of life of these patients. The main factors affecting the quality of life include pain, swallowing, senses, speech, social eating, social contacts, and the more general domains of physical, mental and social determinants of life. (2)

Patients with head and neck cancer undergoing curative treatment generally requires enteral nutritional support. This may be due to tumor effects leading to pre-treatment weight loss or anticipated acute toxicities of treatment (eg. Mucositis pain, anorexia, xerostomia). Optimal nutritional status is an important goal in the management of individuals diagnosed with cancer. Although nutrition therapy recommendation may vary throughout the continuum of care, maintenance of adequate intake is important. Whether patients are undergoing active therapy, recovering from cancer therapy, or in remission and striving to avoid cancer recurrence, the benefit of optimal caloric and nutrient intake is well documented. (2)

The goals of nutrition therapy are to accomplish the following:

Prevent or reverse nutrients deficiencies, preserve lean body mass, Help patients better tolerate treatments, minimize nutrition- related side effects and complications, maintain strength and energy, protect immune function, decreasing the risk of infection, aid in recovery and healing, maximize quality of life, lessen side effects, , reduce asthenia, improve well – being. The essential nutrients are protein, carbohydrate, fats and different minerals and vitamins. Such a diet in which various foodstuffs are mixed in suitable proportions to carryout adequately the three functions i.e, body building, energy –yeilding and protective is known as Balanced Diet. (3) Historically, enteral feeding was performed using nasogastric tubes (NGTs). During late 1980s and early 1990s, percutaneous endoscopic gastrostomy (PEG) embraced by most head and neck cancer centers as the preferred feeding tube, with little in the way of scientific data on the relative advantages or disadvantages.

METERIAL AND METHODS

This prospective randomised two arm comparative study was done to compare intensive nasogastric tube (NGTs) feeding with optimal oral nutrition in patients with advanced head and neck cancer while they are receiving concurrent chemoradiotherapy at tertiary care hospital. The study population consisted of 40 patients of locally advanced head and neck cancers who underwent treatment from the department of Radiation

Oncology. Each of the two arms consisted of 20 patients.

Following institutional ethics committee approval (Approval Number No. 09/ IEC AMC/ JAN 2023), patients who fulfilled the inclusion criteria were enrolled in the study. Inclusion criteria were: histopathologically confirmed locally advanced non-metastatic Squamous cell carcinomas of head and neck, Age less than 70 years, ECOG performance status of 0-2, Haematological parameters with Heamoglobin >9gm/dl total leukocyte count of >4000cells/mm^3, platelet counts of >1.5 lakh/mm^3, Renal parameters with Serum creatinine <1.5 mg/dL., blood urea<30mg/dl. Tumors of non-squamous histology, Performance status ECOG PS >2, Any prior treatment received for the tumor, any co-morbid condition or acute infection where treatment is contraindicated were excluded.

TREATMENT PLANNING AND DELIVERY

Nasogastric tube (NGT) insertion:

Under strict aseptic conditions nasogastric tubes (NGTs) were inserted in 20 patients of arm –A and the patients were counselled and demonstrated for maintenance of tubes, procedure of feeding through feeding tubes. Dietetic counselling was provided to both groups (arm-A and arm-B).

Preparation of High Caloric Liquid food: Locally available, comparatively low cost, high protein and energy yielding, easily preparable food was selected and offered to Arm A patients. This liquid diet of 100gm of Bengal Gram powder,100gm of jaggery, 100gm of Raw Rice, 100Gm of Egg (2 no), 100 ml of water, with some flavour is prepared and 30ml/day i.e., 10ml each,3 times per day is given in Arm –A through NGT in addition to the routine normal oral feeding. The 30ml of this liquid diet gives 12-15Kcal/kg/day of extra energy, 0.5-1.0 gm/kg/day of protein.

Positioning and immobilization All the patients were treated in a supine position and properly immobilized by a thermoplastic cast (orfit cast).

Conventional Simulation and Implementation of treatment. Patients underwent a pretreatment conventional(2-D) simulation with the immobilizing thermoplastic cast. Check films (x-ray images) were obtained and corrected according to the treatment planning. The organs at risk identified and by using lead blocks such organs are protected from the field of irradiation.

Simulation and delineation of target volume and organs at risk (3D-CRT) Patient underwent a pretreatment CT simulation with the immobilization thermoplastic cast. Serial axial images with slice thickness of 3 mm were obtained and these images were transferred to the ECLIPSE™ planning system, where following image acquisition, the target volume and critical organs were contoured. The Gross Tumor Volume (GTV) included the areas of tumor visualized clinically and radiologically on the CT images. The Clinical Target Volume (CTV) was defined depending on the site and nature of the tumor. The planning target volume (PTV) was generated by adding a 5 mm margin around the CTV

Dose prescription and Treatment delivery

In conventional set, up patient in both arms received the 66 Gy/33 fractions over 7 weeks.

Phasel:44Gy/22 fractions, 5 fractions per week to volume comprising the gross disease with extension and nodal areas at risk.

PhaseII :22 Gy/11 fraction, 5 fraction per week to boost volume, sparing the spinal cord which includes the gross tumor volume with margin

Conformal radiation therapy plans were generated for the patients. The plans were evaluated using Dose Volume Histogram analysis and the best plan was selected for treatment, which was transferred to Linear accelerator for implementation. Set up verification was done with the electronic portal imaging device, Radiotherapy was delivered by linear accelerator (LINAC) using 6MV X rays.

Phase I: 54 Gy/27 fractions, 5 fractions per week to volume comprising the gross disease with extension and the nodal areas at risk.

Phase II: 16 Gy/8 fractions, 5 fractions per week to the boost volume, which included the gross tumor volume with margin.

Patients in both arms received concurrent chemotherapy with cisplatin 40 mg/ m2 given weekly with radio therapy.

All patients were assessed after every 5 fractions for treatment related acute toxicity. Acute treatment related toxicity was assessed and graded using Common terminology criteria for adverse events (CTCAEv3)

During the treatment period patient in both arms were followed up. Body weight, Dietary intake, toxicity to therapy were assessed at 3rd,

6th, 9th week. Serum protein concentration, Haemoglobin concentration and total leucocytic count were made at the time of entry, 4wk, 9wk of treatment. Anthropometric measurement like mid arm circumference, % of body weight loss were made at the time of entry, during the 3rd, 6th, 9th, week of the treatment. Locoregional tumor response evaluation was done at 6 weeks and 3rd month of follow-up.

Patients were assessed for acute toxicity, tumor response based on: Symptom history and toxicity grading using CTCAEv3. Local examination using inspection, palpation and indirect laryngoscopy to assess mucosal integrity, skin integrity, tumor and nodal status including bi-dimensional measurement of the tumor and the nodal site. Patients were also encouraged to visit earlier if new or progressive symptoms developed. All patients were encouraged to adhere to the prescribed regimen for good oral hygiene and abstain from any form of tobacco. Locoregional tumor response evaluation was done at 6 weeks and 3 months of follow up using the WHO criteria

The collected data was analyzed using standard statistical software package (IBM SSPS for statistics, version 20.0).

Table 1Distribution of subjects as per Tumour site

	ARM A	ARM B
Oral cavity	**7**	**8**
Tongue	4	4
Buccal mucosa	2	3
Lower lip	1	0
Alveolus	0	1
Oropharynx	4	5
Tonsil	2	3
Soft palate	2	2
Hypopharynx	**6**	**6**
Pyriform sinus	2	4
Postcricoid	3	2
Vallecula	1	0
Larynx	**2**	**1**
Supraglottis	2	1
Glotis		0
Muo neck	1	0

RESULTS

Patient characteristics

40 patients were divided into two arms Arm A and Arm B, each arm consisting of 20 patients. Median age in Arm A was 45 years, age ranging 23-67 years and male to female ratio was13:7. Median age in Arm B was 47.5 years, age ranging 20 -69 years and male to female ratio was 14:6

Table 2 PATIENT CHARACTERISTICS

	ARM A	ARM B
No of patients	20	20
Median age (years)	45	47.5
Age range (years)	23-67	20-69
Male: female	13:7	14:6
Ecog ps1	17	16
Ecog ps2	3	4
Stage		
Iii	16	15
Iva/ivb	4	5
EBRT		
Coventional(2d)	14	13
3DCRT	6	7

Mean body weight loss in Arm A at 3rd week was 1% and in Arm-B was 4%. Mean body weight loss in Arm A at 6th week was 0% and in Arm-B was 5%. Mean body weight loss in Arm A at 9th week was 0% and in Arm-B was 7%. Significant mean body weight loss (p=0.02) observed at the end of treatment i.e., at 9 wks in Arm B compared with Arm A.

Median mid arm circumference at first day of treatment was 22cm in Arm-A and 21 cm in Arm-B, at the end of 3rd week it was 22cm in Arm-A and 20 cm in Arm-B, at the end of 6th week it was 21.5cm in Arm-A and 20 cm in Arm-B, at the end of 9th week it was 22cm in Arm-A and 19cm in Arm-B. There was no significant change in mean mid arm circumference in both Arm A and Arm B.

Mean caloric intake at 1st week of treatment in Arm–A was 45kcal/Kg and in Arm –B is 28Kcal/Kg. At the end of 3nd week in Arm–A was 50kcal/Kg and in Arm –B is 28Kcal/Kg, At the end of 6th week in Arm–A was 50kcal/Kg and in Arm –B is 26Kcal/Kg, At the end of 9th week in Arm–A was 52kcal/Kg and in Arm –B is 25Kcal/Kg. There is significant (p=0.004) increasing mean caloric intake in Arm A compared with Arm B at 9th week. (52 to 25Kcal/kg/day).

Haemotological toxicity in the form of decreased haemoglobin levels was more common in Arm B during treatment at 9wks Grade 1 (10% Vs 15%), Grade 2 (5% Vs 2%). There was no significant change in haemoglobin levels in both Arm A and Arm B were observed during treatment. (Table 3)

Table 3Decrease in haemoglobin and total leucocyte count levels in two Arms

		Arm A				Arm B		
		0 wk	4wk	9wk		0wk	4wk	9wk
Haemoglobin	GRADE1	0%	10%	10%		2%	10%	15%
	GRADE 2	0%	5%	2%		0%	5%	2%
	GRADE 3	0%	0%	0%		0%	0%	0%
	GRADE4	0%	0%	0%		0%	0%	0%
Total leucocyte count	GRADE1	2%	1%	3%		1%	3%	3%
	GRADE 2	0%	0%	1%		0%	1%	2%
	GRADE 3	0%	0%	0%		0%	0%	0%
	GRADE4	0%	0%	0%		0%	0%	0%

Skin reaction during treatment at the end of 2nd week in Arm-A and in Arm-B Grade 1(30% vs 25%) Grade2(20% vs 20%) Grade3(5% vs 7%) Grade4(0% vs 0%), at the end of 4th week in Arm-A and in Arm-B Grade 1(25% vs 30%) Grade2(25% vs 25%) Grade3(10% vs 10%) Grade4(1% vs 1%), at the end of 9th week in Arm-A and in Arm-B Grade 1(30% vs 35%) Grade2(35% vs 35%) Grade3(15% vs 15%) Grade4(1% vs 2%). There was no significant change in skin reaction in both Arm A and Arm B. (Table 4)

Table 4 Showing skin reactions and mucositis during treatment in both Arms

		Arm A			Arm B		
		2wk	4wk	9wk	2wk	4wk	9wk
skin reaction	grade1	30%	25%	30%	25%	30%	35%
	grade 2	20%	25%	35%	20%	25%	35%
	grade 3	5%	10%	15%	7%	10%	15%
	grade4	0%	1%	1%	0%	1%	2%
mucositis	grade1	25%	25%	30%	25%	30%	40%
	grade 2	20%	25%	30%	25%	25%	35%
	grade 3	5%	10%	20%	7%	10%	20%
	grade4	0%	1%	3%	0%	2%	4%

Mucositis during treatment at the end of 2 weeks in Arm-A and in Arm-B ,Grade1(25% vs 25%) Grade2(20% vs 25%) Grade3(5% vs 7%) Grade4(0% vs 0%) at the end of 4th week in Arm-A and in Arm-B ,Grade1(25% vs 30%) Grade2(25% vs 25%) Grade3(10% vs 10%) Grade4(1% vs 2%), at the end of 9th week in Arm-A and in Arm-B ,Grade1(30% vs 40%) Grade2(30% vs 35%) Grade3(20% vs 20%) Grade4(3% vs 4%). There was no significant change in mucositis in both Arm A and Arm B. (Table 4)

Complete response (CR) in Arm A at 6wks and 3 months were 90% and 95% whereas CR in Arm B at 6wks and 3 months were 60% and 80%. Partial response (PR) in Arm A at 6wks and at 3 months were 10 % and 5% whereas PR in Arm B at 6wks and 3 months were 35% and 15 %. Significant (p=0.03) difference in CR observed at 6wk –FP in Arm A compared with Arm B.

DISCUSSION

The treatment of locoregionally advanced head and neck cancers has undergone a paradigm shift over the past three decades, with management strategies changing from surgery or radiation therapy as single modality to combined modality treatment. Robust and mature data from various randomized studies and a meta-analysis have shown the superiority of concurrent chemoradiation in locoregional control and overall survival.

Regardless of the cause, malnutrition in cancer patients is associated with poorer overall survival in various malignancies (4-6), as well as reduced benefit from surgical (7,8) and medical therapies (9,10), a poorer tumor response to chemotherapy (4,5,10), increased chemotherapy-related toxicity

(9,11,12), and poorer quality of life (5,13-15). Undernutrition and cachexia occur frequently in cancer patient and are indicators of poor prognosis. Enteral nutrition should be started if undernutrition already exists or if food intake is markedly reduced for more than 7-10 days. Nutritional needs are generally comparable to non-cancer subjects. Nutritional assessment of cancer patients should be performed frequently, and nutritional intervention initiated early when deficits are detected.

The American Gastroenterological Association (AGA) conducted a review of the research literature and found 26 randomised trials of parenteral nutritional support in cancer patients. Of these trials, 19 were conducted on patients who were undergoing chemotherapy treatment, three were conducted on patients who were undergoing radiation therapy (RT), and four were conducted on patients who were undergoing stem cell transplantation. (16). Key observations included the following: In 19 trials with 1050 patients, the use of parenteral nutrition did not significantly decrease mortality. There was a statistically significant rise of 40 percent in the overall complication rate in the treatment group across eight trials consisting of 333 individuals. These trials were conducted with the availability of information regarding overall complications. The occurrence of infectious complications saw a sizeable rise, one that was 16 percent higher than average. Patients who were given parenteral nourishment had a tumour response rate that was significantly lower (by an absolute value of 7 percent) than patients who were given oral nutrition. This was the finding from 15 trials that could be evaluated, each of which contained 910 patients.

At least four different systematic studies have looked into the role that enteral and oral nutritional support play in cancer patients, and none of them have found any evidence that this support improves survival (17-20). The most current and extensive of these studies included 13 randomised trials of oral nutritional intervention (oral nutritional supplements, dietary advice, or both), with a total of 1414 patients who had a variety of cancer types (18). Trials were considered for inclusion if they were conducted on adults who were clearly malnourished (although the definitions of malnutrition differed according to trial) or were judged to be at risk for malnutrition on the basis of their clinical condition, and who were also receiving active anticancer treatment or palliative care. The trials that were considered for inclusion compared oral nutritional intervention with usual care. Key observations included the following: All trials were judged to be of low to moderate quality and at risk for bias. There was a significant amount of clinical (in terms of cancer site and stage, duration and kind of dietetic intervention, baseline nutritional state) and statistical heterogeneity between the trials. Only four of the studies used nutritional status at baseline as a selection criterion; the other six included patients who were both well-nourished and malnourished.

Nutritional intervention was associated with statistically significant improvements in weight (mean difference 1.8 kg) and energy intake (mean difference 432 kcal) compared with routine care; however, these differences were no longer apparent when the data from trials that contributed the most to statistical heterogeneity were removed from the analysis. Nutritional intervention was associated with statistically significant improvements in weight (mean difference 1.8 kg) and energy intake (mean difference 432 kcal). Some areas of quality of life, such as emotional functioning, dyspnea, loss of appetite, and overall quality of life, were significantly improved as a result of nutritional intervention, although the intervention had no effect on the overall mortality rate.

Patient in this prospective trial were randomized into two groups. one group (Arm B) received optimal oral nutrition [30-40 Kcal/kg/day, 1-1.5gm/kg/day of protein] with dietetic consultation, whereas the other group (Arm A) received high caloric protein diet (30ml/day) which consists of extra energy of 12-15Kcal/kg/day,0.5-1gm/kg/day of protein through Nasogastric tube (NGT) feeding [total 40-55Kcal/kg/day of energy,1.5-2gm/kg/day of protein]. The active treatment period approximating 9 weeks.

The specific aims of this study were to compare the effects of intensive nasogastric alimentation with optimal oral nutrition during concurrent

chemoradiation in patients with inoperable stage III and IV head and neck cancer with respect to response rates, toxicities, Quality of life. In the study Weight Changes, Caloric and Protein Intake, Mid Arm Circumference, Severity of Reaction to therapy like Haemoglobin, Total Leucocytic Count, Serum Albumin, Skin Reaction and Mucositis were compared.

During this comparative study the dropout rates of treatment were observed and compared in both Arms. Due to inadequate nutrition, treatment related toxicities like mucositis, skin reaction, dysphagia the dropout rates were high in Arm B compare with Arm A (4% vs 1%) and the mean duration of absence during the total treatment period i.e., 9 wks. was high in Arm B compare with Arm A (8 days vs 3 days), but statistically there was no significant difference was observed between two Arms. At that time, the dropout patients were counselled, given rest for 3 days, restarted the treatment and completed the treatment accordingly.

Complete response rate at the end of treatment, which is known to reflect directly on long term disease control was reported in this study. A significant improvement (p=0.03) in complete response (CR) was observed at 6 weeks of follow-up period in Arm A who were tube fed compare with patients who were orally fed. There is no significant change in partial response observed between the two group at 6 weeks and 3 months of follow-up.

The significant (p=0.02) maintenance of body weight(60+1.1SD) was observed in Arm A i.e., tube fed group compare with Arm B i.e., oral fed group. At the time of initiation of treatment, the mean body weight in both Groups (Arm A and Arm B) were 60kg (SD-1.2 &1.0). At the end of the treatment (9^{th} week) there was no mean body weight loss in Arm A i.e., 0% (60+1.1SD), whereas in Arm B there was significant mean body weight loss of 7% (55.8+1.9SD) observed. This preliminary data indicating an effect of tube feeding in maintenance of body weight during the treatment period.

Although the target caloric intake was 30 - 40Kcal /kg/day, the continued decreasing in mean caloric intake in Arm B, i.e., orally fed Group from 28 Kcal /kg/day to 25 Kcal /kg/day,from the first week of treatment to the end of treatment period i.e., 9 weeks there was a significant decreasing in mean caloric intake (p=0.004) was observed compare with Arm A, i.e., tube fed Group which maintained 52 Kcal /kg/day throughout the treatment period.

Though, decreasing in median serum albumin levels observed in the patients of both Arm A and Arm B, there was no significant(p=0.50) difference in median serum albumin concentration at 3^{rd} wk, 6^{th} wk , 9^{th} wk of treatment period between the two Groups.(Arm A & Arm B).The continued decrease in serum albumin levels in tube fed Group who maintained their body weight may reflect alterations in body composition, specifically protein, water, adipose tissue.

During the treatment period both patients in Both Arms maintained median mid arm circumference, and there was no significant change in median mid arm circumference in both Arm A and Arm B was observed at the end of the treatment i.e., 9^{th} week (22 cm vs 19cm) p=0.67. Haemotological toxicity in the form of decreased haemoglobin levels was more common in Arm B during treatment at 9wks, Grade1 (10%Vs 15%), Grade2(5%Vs2%). There was no significant change in haemoglobin levels in both Arm A and Arm B were observed during treatment. Haemotological toxicity in the form of decreased total leucocyte counts, Grade –I was seen in both Arm-A and Arm-B at 4^{th} week (1% vs 3%), at 9^{th} week (3% vs 3%). No Grade- II, Grade –III, Grade – IV toxicities observed in both Arm-A and Arm-B. There was no significant change in Total Leucocyte Count in both Arm A and Arm B were observed during treatment.

Skin reaction (Grade I) during treatment period was seen more in Arm B than Arm A at 4^{th} week (30% vs 25%),9^{th} week (35% vs 20%). Mucositis (Grade I) during treatment period was seen more in Arm B than Arm A at 4^{th} week (30% vs 25%),9^{th} week (40% vs 30%, but there is no significance.

CONCLUSIONS

In the prospective study we could demonstrate clear superiority of Nasogastric tube (NGT) feeding for temporary enteral support of patients with locally advanced head and neck cancer undergoing concurrent

chemoradiotherapy. During the treatment period the mean dropout duration was high in Arm B compared with Arm A (8days vs 3 days). The tube fed group showed difference in the complete tumor response rate compared with oral fed group at 6wk follow-up (18 of 20 patients vs 12 of 20 patients) (p=0.03). The tube fed group had a higher mean caloric intake (52Kcal/kg/day vs 25 Kcal/kg/day(p=0.004) compared with orally fed group. The tube fed group had less mean body weight loss(60kg vs 55.8kg(p=0.02)) during treatment period i.e., 9 weeks.

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