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Peri-operative outcomes following major surgery for head and neck cancer in the elderly: institutional audit and case–control study

N Subramaniam[1], D Balasubramanian[1], P Rka[2], P Rathod[1], S Murthy[1], S Vidhyadharan[1], S Rajan[3], J Paul[3], K Thankappan[1] and S Iyer[1]

Departments of [1]Head and Neck Oncology, [2]Otorhinolaryngology, and [3]Anaesthesia, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham, Kochi, India

Main Article

Dr D Balasubramanian takes responsibility for the integrity of the content of the paper

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Author for correspondence:
Dr Deepak Balasubramanian,
Department of Head and Neck Oncology,
Amrita Institute of Medical Sciences,
Amrita Vishwa Vidyapeetham, Kochi,
Kerala 682041, India
E-mail: deepakbala@live.com

Abstract

Objective. Elderly patients have been consistently shown to receive suboptimal therapy for cancers of the head and neck. This study was performed to determine the peri-operative outcomes of these patients and compare them with those of younger patients.

Methods. In this retrospective analysis, 115 patients aged 70 years or more undergoing major surgery for head and neck cancers were matched with 115 patients aged 50–60 years, and univariate analysis was performed.

Results. Elderly patients had a reduced performance status ($p < 0.001$) and more co-morbid illnesses ($p = 0.007$), but a comparable intra-operative course. They had a longer median hospital stay ($p = 0.016$), longer intensive care unit stay ($p = 0.04$), longer median tracheostomy dependence ($p = 0.04$) and were more often discharged with feeding tubes ($p < 0.001$). They also had a higher incidence of post-operative non-fatal cardiac events ($p = 0.045$).

Conclusion. Elderly patients with good performance status should receive curative-intent surgery. Although hospital stay and tube dependence are longer, morbidity and mortality are comparable with younger patients.

Introduction

Head and neck cancers account for almost half of the cancer burden in India, and an estimated 15 per cent of these patients are aged 70 years or older.[1] Current data suggest that with better access to healthcare and the resultant improvement in life expectancy, the percentage of elderly patients with head and neck cancer is likely to rise dramatically, especially in developing countries.[2,3] A majority of these patients have an advanced stage of disease at presentation, requiring aggressive multimodal therapy to achieve cure.[4]

Advanced age, when associated with co-morbid illnesses and impairments in functional status, can have a significant impact on the patient's ability to tolerate treatment-related toxicity, which can have profound implications on subsequent quality of life. A patient's ability to withstand treatment-related toxicity is a crucial determinant of therapeutic intention. Patients with poor performance status are unlikely to withstand curative-intent therapy, and are suitable only for palliative therapy or supportive care. This is reflected in guidelines, such as those framed by the National Comprehensive Cancer Network.[5]

Elderly patients have been consistently shown to receive suboptimal therapy for cancers of the head and neck,[6] as well as other subsites.[7] This likely reflects the belief that geriatric patients have a limited life expectancy and greater risks of treatment-related morbidity. Another popular misconception is that elderly patients are less likely to be compliant with therapy.[8] This is reflected in the poor representation of elderly patients in major cancer therapy trials.[9]

There are several fallacies to this approach. Firstly, age alone is not an indicator of physiological status; functional status and co-morbid illnesses are more pertinent predictors of outcome than chronological age alone.[10,11] Secondly, the definition of 'elderly' is highly variable, with patients anywhere between 65 and 80 years being labelled as 'elderly'.[12] Seventy years of age has been described to represent an alteration in physiological status and response to treatment-related toxicity.[13] Thirdly, there is insufficient evidence to suggest that elderly patients are unlikely to tolerate curative-intent therapy; several studies have shown that they tolerate radiotherapy,[14–16] chemoradiotherapy[17–19] and surgery.[20–22]

This study aimed to determine if age influenced peri-operative morbidity, 30-day mortality or the post-operative course of patients undergoing major surgical procedures for head and neck cancer.

Materials and methods

From a prospectively maintained database of patients treated at the Amrita Institute of Medical Sciences, Kochi, India, we identified all head and neck cancer patients treated

between 2011 and 2016. The management for all cases was discussed by the multidisciplinary tumour board, and only those patients who were recommended for curative-intent surgery at our institution were included in the study.

A total of 115 patients aged 70 years or older (elderly patients) who underwent major surgery with curative intent were identified. They were matched with an equal number of patients aged 50–60 years (younger group). The groups were matched as much as possible with respect to histological diagnosis, American Joint Committee on Cancer tumour–node–metastasis (TNM) disease stage, American Society of Anesthesiologists score (physical status classification),[23] primary surgical procedure performed and reconstruction method. For example, we matched a younger patient with T_4 alveolar cancer who underwent segmental mandibulectomy with free fibular flap reconstruction to an older patient who underwent the same procedure, to minimise as far as possible the differences between the two patients at baseline. These matched pairs were carefully selected to minimise bias and confounding factors related to disease stage and biology, treatment method, and post-operative recovery.

All patients underwent pre-operative clinical evaluation, cross-sectional imaging (contrast-enhanced computed tomography, magnetic resonance imaging or positron emission tomography) and tumour biopsy. All patients also underwent routine pre-anaesthetic evaluation. Further assessments and clinical consultations were sought as required.

Patients were included irrespective of their American Society of Anesthesiologists score. Only patients undergoing 'major' ablative surgical procedures were included (i.e. those procedures with a median minimum operating time of 3 hours, with or without reconstructive (pedicled or microvascular flap) procedures).

Details of the intra-operative course were recorded after detailed review of the patients' anaesthetic charts. The information obtained included intra-operative hypotension, adverse events, estimated blood loss and treatment administered. Details of the post-operative course were recorded after review of the in-patient charts, progress notes and discharge summaries. The information obtained included duration of intensive care unit stay, date of feeding tube removal, date of tracheostomy decannulation, and post-operative morbidity and mortality. The dates of tracheostomy decannulation and feeding tube removal were decided by clinical judgment after daily assessment, supplemented by videofluoroscopy and/or functional endoscopic evaluation of swallowing wherever indicated. All patients received routine post-operative swallowing rehabilitation in our unit.

The ablative surgical procedures performed included: total laryngectomy, glossectomy, radical oral cavity resections (including wide excisions of the lip, hard palate, floor of mouth and buccal mucosa), segmental mandibulectomy, extended thyroidectomies (total thyroidectomy with laryngeal or tracheal resections), maxillectomy and temporal bone resections. Reconstruction was performed with microvascular flaps (radial forearm free flap, fibula free flap, anterolateral thigh flap or others) or pedicled flaps. Both groups of patients were matched as much as possible with respect to the distribution of ablative and reconstructive procedures.

Peri-operative morbidities were defined as follows. Blood pressure was determined by arterial line readings, and hypotension was defined as systolic blood pressure below 90 mmHg. Intra-operative hypotension was defined as hypotension not resulting from hypovolaemia, not responding to a fluid challenge and requiring peri-operative inotropic support. Arrhythmias included bradyarrhythmias or tachyarrhythmias, and were most commonly atrial fibrillation, ectopic beats or bradycardia (sustained heart rate below 50 beats per minute). Peri-operative sepsis was defined as systemic inflammatory response syndrome with a demonstrable focus of infection occurring within 72 hours of surgery.

Post-operative inotropic support was defined by the requirement of inotropic support post-operatively in the absence of hypovolaemia or in spite of adequate intravascular volume replacement. Minor post-operative morbidities included minor wound complications (haematoma, seroma, mild surgical site infection), dyselectrolytaemia, urinary retention and thrombophlebitis. Major post-operative morbidities included flap loss, fistulae (pharyngocutaneous and orocutaneous), non-fatal cardiac events and aspiration pneumonia.

The two groups, comprising patients aged 70 years or more (elderly, group 1) or patients aged 50–60 years (younger, group 2), were compared to determine whether age influences the incidence of peri-operative adverse events, post-operative morbidity and mortality, surgical re-exploration, duration of intensive care unit and hospital stay, and duration of tracheostomy dependence and feeding tube dependence. Pearson's chi-square test was used to compare differences between sets of categorical data, such as the incidence of morbidities. The Mann–Whitney U test was used to compare duration of feeding tube dependence, tracheostomy tube dependence and hospital stay. Odds ratios were calculated. All comparison test results were two-sided. A significance level of 0.05 was used throughout. Statistical analysis was performed using SPSS software, version 20 (IBM, New York, USA).

Results

Patient and disease characteristics

The study included 230 patients (157 males and 73 females): 115 patients were in the older group and 115 were in the younger group. The mean age was 57 years (range, 50–60 years) in the younger group and 75 years (range, 71–84 years) in the older group.

Both groups were comparable in terms of: gender distribution, smoking status, American Society of Anesthesiologists score, TNM disease stage and histological diagnosis (Table 1). European Cooperative Oncology Group status scores were higher in the elderly group ($p < 0.001$); patients over 70 years had a significantly worse performance status when compared to their younger counterparts. The number of co-morbid illnesses in the elderly group was also significantly higher ($p = 0.007$).

The groups were matched, as much as possible, with respect to the ablative and reconstructive procedures performed (Table 2). Patients were followed up for a median of 12 months (range, 3–84 months).

Peri-operative morbidity

The peri-operative morbidity and mortality data for the two groups are shown in Table 3. Both groups were compared in terms of the incidence of intra-operative hypotension or arrhythmias. The incidence in elderly patients was 3 per cent.

The requirement for post-operative inotropic support in elderly patients was 3 per cent. Although overnight ventilation was routine for many of our patients, extended dependence on mechanical ventilation beyond this period was relatively rare, occurring in 2 per cent of elderly patients.

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Table 1. Patient and disease characteristics

Characteristic	Group 1 (aged ≥70 years)	Group 2 (aged 50–60 years)	*P*-value
Number of patients	115	115	–
Mean age at surgery (years)	75	60	–
Gender			0.119
– Male	84	73	
– Female	31	42	
ECOG status score			<0.001*
– 0	14	62	
– 1	70	49	
– ≥2	31	4	
Smoker			0.690
– Yes	50	53	
– No	65	62	
Number of co-morbid illnesses			0.007*
– 0	27	46	
– 1	37	34	
– 2	32	30	
– 3	9	5	
– ≥4	10	0	
ASA score			0.509
– I	61	56	
– II	28	32	
– III	16	20	
– IV	10	7	
TNM disease stage			0.544
– I	20	17	
– II	11	13	
– III	70	73	
– IV	15	12	
Histology			0.646
– Squamous cell carcinoma	85	88	
– Adenoid cystic carcinoma	8	9	
– Mucoepidermoid carcinoma	13	15	
– Papillary carcinoma thyroid	9	3	

Data represent numbers of cases, unless indicated otherwise. *Indicates statistical significance. ECOG = European Cooperative Oncology Group; ASA = American Society of Anesthesiologists; TNM = tumour–node–metastasis

Table 2. Characteristics of surgery performed

Characteristic	Group 1 (aged ≥70 years)	Group 2 (aged 50–60 years)
Primary procedure		
– Total laryngectomy	14	20
– Glossectomy	20	24
– Radical oral cavity resections	39	31
– Maxillectomy	6	12
– Segmental mandibulectomy	34	27
– Temporal bone resection	2	1
Reconstruction		
– Radial forearm free flap	20	24
– Fibula free flap	12	15
– Anterolateral thigh flap	10	13
– Pedicled flap	46	40

Data represent numbers of cases

Peri-operative sepsis occurred in only 2 per cent of patients. Intra-operative blood transfusions (packed cells or fresh frozen plasma) were administered in 6 per cent of the elderly patients and in 5 per cent of the younger patients. The incidences for these parameters of peri-operative morbidity were comparable in both age groups.

Duration of stay

The median duration of hospital stay was 12 days (standard deviation (SD) = 7.34 days) in the elderly group and 10 days (SD = 4.4 days) in the younger group. This difference was statistically significant ($p = 0.016$). The median duration of intensive care unit stay was also found to be significantly longer in the elderly group, at 5 days (SD = 3.5 days), when compared to the younger patients, at 2 days (SD = 1.2 days) ($p = 0.04$).

Post-operative course of events

At discharge, 48 per cent of the elderly group was feeding tube dependent, compared to only 7 per cent of the younger group ($p < 0.001$). Tracheostomy dependence was also higher in the elderly group, with 11 per cent of elderly patients being discharged with a tracheostomy in situ, compared to 2 per cent in the younger group ($p = 0.003$). Time to decannulation was significantly longer in the elderly group, with a median of 5 days (SD = 3.5 days), compared to a median of 2 days (SD = 1.2 days) in the younger group ($p = 0.04$).

Post-operative complications

Minor morbidities occurred in 3 per cent of patients, with an equal incidence in both age groups. Wound complications and haematomas were found to have an almost equal incidence in both age groups. However, dyselectrolytaemia and urinary retention were more common in the elderly group (6 *vs* 2 per cent), with an odds ratio of 3.6. Although not statistically significant, this showed a positive association ($p = 0.171$).

Major morbidities were significantly more common in the elderly; the incidence was 21 per cent in the elderly group, compared with 11 per cent in the younger group ($p = 0.048$). This was not reflected in the incidence of flap loss, pharyngocutaneous fistulae or aspiration pneumonia, which were comparable in both age groups ($p > 0.05$), but rather in the incidence of non-fatal cardiac events in those with no pre-existing history of coronary artery or cardiac disease. These cardiac events occurred in 7 per cent of elderly patients, but in only 2 per cent of younger patients ($p = 0.045$). The cardiac events included myocardial infarction (both ST elevation and non-ST elevation), arrhythmias requiring pharmacological or non-pharmacological intervention, or other proven cardiac

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Table 3. Peri-operative morbidity, duration of stay and post-operative course

Parameter	Group 1 (aged ≥70 years)	Group 2 (aged 50–60 years)	*P*-value
Peri-operative morbidity (*n* (%))			
– Intra-operative hypotension or arrhythmia	3 (3)	2 (2)	0.651
– Post-operative inotropic support	3 (3)	2 (2)	0.651
– Extended post-operative ventilator support	2 (2)	1 (1)	0.561
– Peri-operative sepsis (<72 hours)	2 (2)	1 (1)	0.561
– Intra-operative blood transfusions required	7 (6)	6 (5)	0.775
Duration of stay (median (SD); days)			
– Duration of hospital stay	12 (7.34)	10 (4.4)	0.016*
– Duration of ICU stay	5 (3.5)	2 (1.2)	0.04*
Post-operative course in hospital			
– Patients discharged with feeding tube (*n* (%))	50 (43)	8 (7)	<0.001*
– Patients discharged with tracheostomy (*n* (%))	13 (11)	2 (2)	0.003*
– Duration of tracheostomy dependence (median (SD); days)	5 (3.5)	2 (1.2)	0.04*
Post-operative complications (*n* (%))			
Minor			
– Wound-related	5 (4)	4 (3)	0.733
– Haematoma	5 (4)	6 (6)	0.533
– Dyselectrolytaemia	7 (6)	2 (2)	0.171
– Urinary retention	7 (6)	2 (2)	0.171
– Others (early bed sore, thrombophlebitis)	4 (3)	4 (3)	1
– Overall	28 (24)	24 (21)	0.528
Major			
– Flap loss	6 (6)	5 (4)	0.757
– Fistulae	7 (6)	4 (3)	0.353
– Aspiration pneumonia	3 (3)	2 (2)	0.651
– Non-fatal cardiac events	8 (7)	2 (2)	0.045*
– Overall	24 (21)	13 (11)	0.048*
Surgical re-explorations (*n* (%))	15 (13)	8 (7)	0.123
30-day mortality (*n* (%))	2 (2)	2 (2)	1

*Indicates statistical significance. SD = standard deviation; ICU = intensive care unit

dysfunctions occurring within 10 days of surgery. The cardiac events were usually associated with prolonged hospital stay and re-admission to the intensive care unit.

Surgical re-exploration was also more common in elderly patients (13 per cent) compared to younger patients (7 per cent); however, this difference was not statistically significant ($p = 0.123$).

There were four cases of 30-day mortality. Thirty-day mortality was equal in both age groups (2 per cent). In elderly patients, one case was due to sepsis and one due to acute coronary syndrome; in the younger patients, one case was due to secondary haemorrhage and one was due to acute coronary syndrome.

Discussion

This paper aims to highlight the outcomes related to peri-operative morbidity in head and neck cancer patients aged 70 years or more. We compared these patients with those aged 50–60 years. The rationale for selecting patients between 50 and 60 years was two-fold. Firstly, a larger age range (e.g. 30–60 years) would make the group heterogeneous, especially with regard to co-morbidities and performance status. Secondly, the median age of patients treated in our unit is 55 years; hence, the range of 50–60 years yielded the maximum number of patients for comparison. We considered matching the two groups for performance status as well; however, this was not possible as the younger patients had a markedly better functional status and fewer co-morbidities, likely related to their age.

The patients in our cohort aged 70 years or more tolerated major surgical procedures for head and neck cancer with an acceptable morbidity profile. When compared to younger patients, they had a significantly worse functional status and more co-morbid illnesses. Yet the peri-operative morbidity and post-operative complication rate were comparable to younger patients who were matched in terms of type of surgery, histology and stage of disease. Elderly patients also tolerated adjuvant radiotherapy well; of this cohort, 82 of 85 patients (96 per cent) completed this therapy.

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There were, however, significant differences between the two groups in certain respects. Elderly patients had a significantly longer post-operative intensive care unit stay and hospital stay when compared to younger patients. Although the decisions regarding a shift to the ward and discharge were not directly influenced by patient age, it is likely to be a reflection of the additional time taken to improve functional status and control co-morbid illnesses after the stress of major surgery. These findings are similar to those of other studies,[24,25] which show that elderly patients undergoing major surgery are more likely to have a prolonged hospital or intensive care unit stay.

Elderly patients were also much more likely to be dependent on a tracheostomy or feeding tube post-operatively, and to be discharged with them in situ. Extrapolating from other studies, tracheostomy dependence in the elderly may result from a poor pulmonary reserve, a higher number of co-morbidities and an inability to clear pulmonary secretions.[26–28] Whether there was hesitation in decannulating elderly patients because of airway obstruction and/or aspiration fears is difficult to determine. Elderly head and neck cancer patients had a higher risk of dysphagia and tube dependence than younger patients in other studies as well.[25,29] This is explained as being due to intrinsic issues in neuromuscular co-ordination, motility disorders and age-related degenerative changes in the swallowing mechanism, resulting in reduced connective tissue elasticity, muscle mass and range of motion. Whether tracheostomy dependence also affected swallowing is unknown; the presence of a tracheostomy has been known to aggravate dysphagia because of reduced hyolaryngeal elevation and persistent oedema in the upper aerodigestive tract.[30,31] All our patients receive routine post-operative swallowing therapy. Despite active rehabilitation, there was disparity between the two groups with respect to feeding tube and tracheostomy dependence, highlighting that elderly patients are at an intrinsically higher risk for post-operative dysphagia.

Elderly patients also had a higher risk of urinary retention and dyselectrolytaemia post-operatively. Anticipating these complications and addressing them early may significantly reduce morbidity for these patients.

- Elderly patients often receive substandard surgical treatment for head and neck cancers
- Compared to younger patients (50–60 years), elderly patients (70 years or older) had reduced performance status and more co-morbid illnesses
- However, elderly patients had comparable intra-operative course and post-operative morbidities
- Elderly patients had longer stays, feeding tube and tracheostomy dependence, and more non-fatal cardiac events post-operatively
- Major head and neck cancer surgical procedures are safe and well tolerated in the elderly
- These patients benefit from aggressive swallowing therapy; early detection and treatment of post-operative cardiac events are crucial

An important finding in our study was the significantly higher incidence of post-operative non-fatal cardiac events in elderly patients with no previous history of coronary artery or cardiac disease. It is our understanding that in elderly patients with a compromised physiological reserve, the high incidence of co-morbidities may contribute to cardiac dysfunction. When combined with the peri-operative stress, there is an increase in myocardial oxygen demands that can unmask cardiac dysfunction. Almost all of our patients received pre-operative cardiac evaluation, with physical assessment, electrocardiograms, echocardiograms and treadmill testing being used whenever there was suspicion of coronary artery disease. The screening method was identical in both patient groups. Nevertheless, we were unable to determine any pre-operative predictors of post-operative cardiac events. Post-operative cardiac events have been associated with a higher risk of mortality.[32] In this study, these cardiac events were detected early, with no fatal consequences. Our institutional protocol of routine post-operative troponin I level measurements for all elderly or high-risk patients (history of diabetes, hypertension or cardiac disease) at 12 hours, 24 hours and 36 hours may have contributed to this. We were also able to successfully identify several cases of non-symptomatic coronary ischaemia.

Conclusion

Head and neck cancer patients aged 70 years or more, with a good performance status, should be considered for curative-intent surgery wherever possible. Their morbidity profile is comparable to that of younger patients. They are at a higher risk of feeding tube and tracheostomy dependence, for which aggressive swallowing therapy and rehabilitation should be initiated as early as possible. They are also likely to require a longer hospital stay and intensive care unit stay, and are at a significantly higher risk of non-fatal cardiac events post-operatively.

Competing interests. None declared

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