

Mini-nutrition assessment, malnutrition, and postoperative complications in elderly Chinese patients with lung cancer

Lei Zhang¹, Chen Wang², Sheng Y. Sha¹, S. Kwauk³, A.R. Miller⁴, Min S. Xie⁵, Yi Q. Dong⁵, Qing Q. Kong¹, Lian J. Wu¹, Fa Z. Zhang¹, Jun Liu¹, Guang S. Wang¹, Yang Jing², Li C. Wang¹

¹Department of Thoracic Surgery, Tianjin Lung Cancer Center, Tianjin Medical University Cancer Institute and Hospital, Tianjin, PR China; ²Tianjin Medical University, Tianjin, PR China; ³School of Public Health, Harvard University, Boston, Cambridge, USA; ⁴Indiana University School of Medicine, Indianapolis, IN, USA; ⁵Xiang Ya Medical School, Central South University, Changsha, PR China

Summary

Purpose: To assist healthcare professionals in using the mini nutrition assessment (MNA) and its short-form (MNA-SF) for early identification of malnourished elderly lung cancer patients, conducting preoperative nutritional support, and improving patients' postoperative prognosis, quality of life, and survival.

Methods: The MNA with revised cut-off points to better suit the Chinese population was conducted on 103 elderly lung cancer Chinese patients aged 60 or above in the Tianjin Cancer Hospital prior to their scheduled surgery. Patient demographic data, anthropometric parameters, biochemical markers, and postoperative complications were collected and analysed.

Results: Of the 103 patients studied 12.6% (13/103) were malnourished, 31.1% (32/103) were at risk of malnutrition, and 56.3% (58/103) had adequate nutrition; the average MNA score was 23.6±3.7. Significant positive correlations were found between total MNA score and body mass index

(BMI), mid-arm circumference (MAC), calf circumference (CC), and hemoglobin (Hb) ($p < 0.05$), as well as between total MNA-SF score and BMI, MAC, CC, and total MNA score. Significant negative correlations occurred between total MNA-SF score and age ($p < 0.05$). Among postoperative complications, cardiovascular diseases had the highest morbidity rate (23%), followed by respiratory diseases (22%), and cardiovascular and respiratory diseases combined (19%). No significant relationship between nutritional status with types of morbidity ($p = 0.235$) and postoperative complications ($p = 0.362$) was found.

Conclusion: The MNA scale is an effective tool to preoperatively evaluate the nutritional status of elderly Chinese patients with lung cancer. These patients have poor nutritional status. Further investigations are needed to re-examine the correlation between the MNA results and postoperative complications.

Key words: elderly patients, lung cancer, mini nutrition assessment, prognostic correlation

Introduction

Malnutrition is a common and serious problem among geriatric patients, particularly for those who are diagnosed with lung cancer. Malnutrition may lead to increased surgical risk, decreased quality of life, increased incidence rate of postoperative complications, increased mortality and decreased survival rate among elderly lung cancer patients [1,2]. Hence, it is necessary to create a practical system that enables the nutritional status of these patients to be assessed accurately

and effectively. The MNA is a tool that is mostly used in the United States and Europe to evaluate patients' nutritional status. In the present study, the MNA and the MNA-SF, both with revised cutoff points to better suit the Chinese population [3], were used to carry out preoperative nutritional assessments of elderly lung cancer patients. Following surgery, data on postoperative complications of these patients was also collected. The relationship between preoperative nutritional status and postoperative prognosis of elderly lung cancer patients was then analysed.

This study was intended to assist healthcare professionals in using the MNA and MNA-SF for early identification of malnourished elderly Chinese patients with lung cancer, receiving preoperative nutritional support, and improving patients' postoperative prognosis, quality of life, and survival.

Methods

Participants

One hundred and three elderly lung cancer patients (66 men, 37 women) aged 60 years or above were randomly selected from the Tianjin Cancer Hospital between June and December 2010 to participate in this study. All patients were scheduled for surgery and investigated within 5 days following admission. All study participants provided written informed consent.

Professionally trained nurses carried out preoperative nutritional assessments of patients.

MNA/MNA-SF

The MNA measures the elderly patients' nutritional status based on the following score system (maximum score = 30): adequate nutrition (score ≥ 23.5), risk of malnutrition (score = 19-23.5), and malnutrition (score < 19). BMI cut-off points were also revised to take into account differences in height and weight between Chinese and Western populations: $< 18.5=0$ (vs. $< 19=0$), $18.5-21.25=1$ (vs. $19-21=1$), $21.25-24=2$ (vs. $21-23=2$), $> 24=3$ (vs. $> 23=3$). In addition, in the dietary section of the MNA, "cheese" was replaced with "soy milk" and "peanut milk" to take into account cultural differences in diet [3]. For the MNA-SF, the maximum score is 14, with a score of 12 or higher indicating satisfactory nutritional status.

Data collection

Patient demographic data such as age, gender, and smoking history were collected. Additionally, clinical information about patients' lung cancer prognosis were collected, including pathologic type, tumor locations, preoperative comorbidities, and operative conditions.

Anthropometric parameters and biochemical markers were determined based on previous research [3]. Biochemical markers were provided by clinical laboratories at the Tianjin Cancer Hospital, and reference values of biochemical markers were adapted to evaluate the nutritional status of hospitalized patients.

Postoperative complications data was also collected for cardiovascular and respiratory diseases. Cardiovascular disease data included arrhythmia-atrial fibrillation, atrial/ventricular premature contraction, and paroxysmal supraventricular tachycardia. Respiratory disease data comprised of pulmonary atelectasis, sputum retention, pulmonary edema, pulmonary air leak, and hypoxemia.

Statistical analysis

Data evaluation was carried out using the SPSS 13.0 software. Correlation analysis and Kruskal-Wallis test were utilized for data analyses. All results were displayed in the form of mean \pm standard deviation. A p -value < 0.05 was considered as statistically significant.

Results

General findings on elderly lung cancer patients

The average age of the 103 subjects was 67.6 ± 5.0 years (range 60-85), in which 66 males averaged 66.5 ± 4.8 years (range 60-85) and 37 females averaged 69.5 ± 4.9 years (range 61-85). For all inpatients, MNA total scores averaged 23.6 ± 3.7 (range 12.5-29, median 24). MNA-SF scores averaged 11.5 ± 2.4 (range 5-15, median 12).

Types of operation were available for 91 elderly lung cancer patients: 73 patients had lobectomy, 1 sleeve lobectomy, 8 wedge-shape excisions, 3 total pneumonectomies, and 6 patients had other types of operation. Ninety out of 97 patients suffered from multiple preoperative diseases (Table 1). Thirteen common preoperative diseases with high morbidity rates were identified including hypertension (48.5%), pulmonary dysfunction (40.2%), coronary heart disease (19.6%), and diabetes mellitus (14.4%).

Correlation analysis between total MNA score, total MNA-SF score, and nutritional parameters

Positive correlations were found between total MNA score and BMI ($r = 0.422$, $p < 0.001$), CC ($r = 0.363$, $p < 0.001$), MAC and Hb ($p < 0.05$); however, no correlations were found between total MNA score and age, triceps skinfold (TSF), albumin, lymphocyte count (Lc) and lymphocyte ratio (Lc %). In addition, there were positive correlations between total MNA-SF score and BMI, MAC, CC, and total MNA score ($p < 0.05$), and negative correlations between total MNA-SF score and age (Table 2).

Table 1. Types of preoperative diseases among elderly lung cancer patients

Preoperative diseases	N (%)
No preoperative diseases	7/97 (7.2)
Hypertension	47/97 (48.5)
Pulmonary dysfunction	39/97 (40.2)
Coronary heart disease	19/97 (19.6)
Diabetes mellitus	14/97 (14.4)
History of malignant tumors	6/97 (6.2)
Pleural effusion	4/97 (4.1)
Pulmonary tuberculosis	3/97 (3.1)
Chronic bronchitis	2/97 (2.1)
Mediastinal lymph node enlargement	2/97 (2.1)
Heart failure	1/97 (1.0)
Myocardial infarction	1/97 (1.0)
Pulmonary atelectasis	1/97 (1.0)
Pulmonary emphysema	1/97 (1.0)

Table 2. Correlation analysis between total MNA score, total MNA-SF score, age, and nutritional parameters

Parameters	N	MNA total score		MNA-SF score	
		r	p-value	r	p-value
Age	103	-0.139	0.161	-0.221	0.025
BMI	103	0.422	<0.001*	0.425	<0.001*
TSF	103	-0.009	0.926	0.096	0.338
MAC	103	0.255	0.010*	0.202	0.042*
CC	103	0.363	<0.001*	0.249	0.012*
ALB	103	-0.105	0.295	-0.106	0.288
LC	103	-0.092	0.358	-0.123	0.219
Hb	103	0.246	0.013*	0.181	0.068
LC%	103	0.161	0.107	0.105	0.295
MNA total score	103			0.914	<0.001*

BMI: body mass index, TSF: triceps skinfold, MAC: mid arm circumference, CC: calf circumference, ALB: albumin, Lc: lymphocytes, Hb: hemoglobin, Lc%: lymphocyte ratio, MNA: mini-nutritional assessment
*Correlations were found between total MNA score and BMI, MAC, CC and Hb ($p<0.05$), and between total MNA-SF score and age, BMI, MAC, CC, and total MNA score ($p<0.05$).

Correlation analysis between total MNA score and postoperative complications

Cardiovascular diseases accounted for 23% of postoperative complications among elderly lung cancer patients, followed by respiratory diseases (22%), and both cardiovascular and respiratory diseases combined (19%) (Table 3). Among postoperative cardiovascular complications, atrial fibrillation, paroxysmal supraventricular tachycardia, and atrial/ventricular premature contraction were the most common, with morbidity rates of 24, 16, and 7% respectively. In addition, among postoperative respiratory complications, sputum retention, hypoxemia, and pulmonary air leak were the most frequent with high morbidity rates of 32, 22, and 11% respectively.

All postoperative complications were categorized into 5 groups based on morbidity rate, and 4 groups based on the type of system (Table 4). The Kruskal-

Table 3. Types of postoperative complications among elderly lung cancer patients

Postoperative complications	N (%)
No postoperative complications	36/100 (36)
Cardiovascular system	42/100 (42)
Atrial fibrillation	24/100 (24)
Paroxysmal supraventricular tachycardia	16/100 (16)
Atrial/ventricular premature contraction	7/100 (7)
Heart failure	1/100 (1)
Respiratory system	41/100 (41)
Sputum retention	32/100 (32)
Hypoxemia	22/100 (22)
Pulmonary air leak	11/100 (11)
Pulmonary edema	3/100 (3)
Pulmonary atelectasis	2/100 (2)

Table 4. Comparison of nutritional status by number and type of postoperative morbidities among elderly lung cancer patients

Postoperative complications	Nutritional status			Total
	Malnutrition	Risk of malnutrition	Adequate nutrition	
Morbidity number*				
0	6	14	16	36
1	5	8	21	34
2	1	2	10	13
3	0	7	3	10
≥4	1	1	5	7
Total	13	32	55	100
Morbidity type#				
Without complications	6	14	16	36
Cardiovascular system	3	4	16	23
Respiratory system	3	7	12	22
Combination	1	7	11	19
Total	13	32	55	100

*Kruskal-Wallis test, $\chi^2=5.559$, $v=4$, no statistical significance ($p=0.235$)
#Kruskal-Wallis test, $\chi^2=3.198$, $v=3$, no statistical significance ($p=0.362$)

Wallis test was then conducted. Results showed that there was no significant difference in nutritional status between the various groups ($p=0.235$) and types of postoperative complications ($p=0.362$).

Discussion

Published results on the nutritional status of lung cancer patients vary within the medical literature. Some studies state that there is a high incidence of malnutrition among operative lung cancer patients. For example, Hallaus et al. [4] and Chauhman et al. [5] respectively found that 10-20% and 30% of patients suffered from malnutrition. In contrast, other studies have concluded that malnutrition rates have been overestimated among operative lung cancer patients. For instance, Thomas et al. [6] reported that severe malnutrition was uncommon among patients referred for lung cancer surgery. In this study, it was found that 43.7% of elderly lung cancer patients were malnourished prior to undergoing surgery. Malnutrition among these patients may be caused by a slow down in metabolism due to decreased organic functions, or absorption of the body's nutrients by malignant tumors before metastasis, which leads to malnutrition and cachexia [7].

In investigating the use of the MNA on nutritional status of elderly lung cancer patients, positive correlations were found between total MNA score and BMI, MAC, CC, and Hb ($p<0.05$). In accordance with previous research [3], BMI was an important factor in determining appropriate cut-off points and the accuracy of the MNA. Furthermore, negative correlations were found between the MNA-SF and age, and positive correlations

occurred between the MNA-SF and BMI, MAC, CC, and total MNA score ($p < 0.05$). This suggests that the parameters of MNA-SF are in accordance with the MNA and can be applied as a screening tool to determine the nutritional status of elderly lung cancer patients.

Postoperative complications occurred in 64% of the cases, stemming from both cardiovascular diseases (23%) and respiratory diseases (22%), thereby suggesting that resections had similar influence on both cardiovascular and respiratory systems. Among cardiovascular diseases, atrial fibrillation (57.1%) and paroxysmal supraventricular tachycardia (38.1%) were the most common; for respiratory diseases, sputum retention (78.0%), hypoxemia (53.7%), and pulmonary air leak (26.8%) were most prevalent. These results are similar to several previous studies, for example, Tewari et al. [1] determined that atrial fibrillation (14.5%) was the most common cardiovascular disease and Bashir et al. [8] found that pneumonia (20.5%) and pulmonary air leak (10.3%) were of greatest prevalence among respiratory diseases.

Some studies have demonstrated the impact of preoperative nutritional status on prognosis and postoperative complications among lung cancer patients. Pierce et al. [9] concluded that BMI was a strong predictor of respiratory complications among patients undergoing lobectomy or lesser resections; Busch et al. [10] found that weight loss of greater than 10% and serum albumin of less than 37 g/L were associated with increased risk of complications. Additionally, Jagoe et al. [11] stated that malnutrition was a key predictor of mortality requiring reventilation after lung cancer operation. Tewari et al. [1] showed that good nutritional status was a strong predictor for increased long-term survival.

In contrast to these studies, other research has demonstrated that there is no significant relationship between preoperative nutritional status and postoperative complications [8]. This study found no significant relationship between nutritional status with different types of morbidity ($p = 0.235$) and postoperative complications ($p = 0.362$). This lack of conclusive data may be due to the limited number of cases examined; hence, further research needs to be conducted to examine a larger number of cases and draw a more reliable conclusions.

Conclusions

The MNA scale with revised cutoff points is an effective tool to evaluate the nutritional status of elderly Chinese patients with lung cancer. The findings in this

study show that these operative patients have poor nutritional status. Further investigations are needed to re-examine the correlation between the MNA results and postoperative complications.

Authors' contributions

LZ, CLW and CW participated in the design of the study and coordination. KS, ARM, MSX and YDQ helped to draft and modified the manuscript. SYS, QQK, LJW participated in the data collection and modified the manuscript. FZZ and JL performed the statistical analysis. All authors read and approved the final manuscript.

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