Singapore Med J 2000 Vol 41(11) : 538-541

Questionnaire Survey on Management of Spontaneous Pneumothorax

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ABSTRACT

Introduction: Management of spontaneous pneumothorax (SP) is variable and the initial management of SP is often undertaken by front-line junior medical staff.

Objectives: To assess if medical education in the principles of SP management is adequate and to determine if practice variability exists among different disciplines.

Methods: A validated questionnaire survey on the knowledge and practice of the junior medical staff posted to a general hospital from May to December 1998 was performed. 138 doctors posted to the various departments: medical (n=S9), surgical (n=46) and emergency (n=33) were surveyed.

Results: The response rate was 95%. 73% surveyed had experience inserting chest tubes (CT). Of the 27% (n=37) who had never inserted CT, 41% were medical officers. Our results showed adequate knowledge pertaining to initial management of primary SP (PSP). The preferred site and method for CT insertion was the 5th intercostal space, anterior axillary line and open method. There was significant practice variability in the CT size, method of insertion and CT removal sequence among the disciplines ($p<0.05$). However a significant proportion of staff (49%) chose to observe or aspirate an acutely breathless patient with a 10% secondary SP (SSP) instead of CT insertion.

Conclusion: While knowledge in PSP appears adequate, management of SSP and practical training in CT insertion must be emphasized as it is a simple procedure that is potentially life-saving.

Keywords: pneumothorax, spontaneous, education, practice variability

Singapore Med J 2000 Vol 41(11):538-541

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INTRODUCTION

Management of spontaneous pneumothorax (SP) is variable. In Singapore, the initial management of SP is often undertaken by front-line medical staff, namely, the medical officers (MO) and the house-officers (HO).

We therefore conducted a questionnaire survey of MOs and HOs in a 1000 bedded acute hospital to assess the adequacy of basic knowledge in the principles of SP management and to determine, if any, practice variability among the medical, surgical and emergency departments of the hospital.

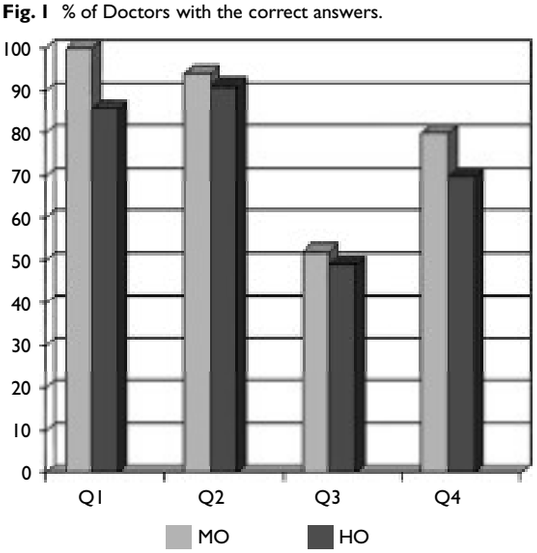
Table I. Validation of Questionnaire by 12 Chest Physicians.

	Q 1	Q 2	Q 3	Q 4
Correct	100%	100%	92%	92%
Wrong	100%	100%	8%	8%

Table II. Demographics of doctors surveyed.

Doctors	HO = 43 (31%)	MO = 95 (69%)	
Gender	Male = 39 (28%)	Female = 98 (71%)	
Trainee	Yes = 52 (55%)	No = 43 (45%)	
Respiratory Medicine	Yes = 47 (34%)	No = 91 (66%)	
Years of Practice	<1 = 43 (31%)	2-5 = 74 (54%)	6-8 = 21 (15%)
Posting	Medicine 59 (43%)	A & E 33 (24%)	Surgery 46 (33%)

Fig. 1 % of Doctors with the correct answers.



Annex 1.

Question 1-4	a) Observation and oxygen	b) Simple aspiration	c) Chest tube
1. A 24-yr-old fit male accountant who is a non-smoker, is found to have a 10% right-sided pneumothorax on routine CXR. He is asymptomatic. Your initial treatment:			
Doctors (%)	133 (96%)	4 (3%)	1 (1%)
Chest physicians (%)	12 (100%)	0 (0%)	0 (0%)
2 A 16-yr-old student developed breathlessness and left-sided chest pain after PE class. CXR shows 50% pneumothorax on the left side. Your initial treatment:			
Doctors (%)	0 (0%)	10 (7%)	128 (93%)
Chest physicians (%)	0 (0%)	6 (50%)	6 (50%)
3 A 75-yr-old chronic smoker is acutely breathlessness. His CXR shows a 10% right-sided pneumothorax. Your treatment:			
Doctors (%)	29 (21%)	38 (28%)	71 (51%)
Chest physicians (%)	0 (0%)	1 (8%)	11 (92%)
4 A patient required a simple aspiration for his right-sided pneumothorax and the repeat CXR shows worsening of the pneumothorax. He is asymptomatic. Your treatment:			
Doctors (%)	16 (12%)	16 (12%)	106 (76%)
Chest physicians (%)	0 (0%)	1 (8%)	11 (92%)

5 In your practice, the preferred site for chest tube insertion is:	a) 2nd intercostal space mid-clavicular linespace	b) 5th intercostal space anterior axillary line	c) 7th intercostal mid-clavicularline anterior
Doctors (%)	6 (4%)	121 (88%)	11 (8%)
Chest physicians (%)	6 (50%)	6 (50%)	0 (0%)

6 In your practice, your preferred method of insertion of chest tube is:	a) Close method	b) Open method
Doctors (%)	30 (22%)	138 (78%)
Chest physicians (%)	8 (67%)	4 (33%)

Question 7(i), 7(ii)	a) CT 12-19F	b) CT 20-24F	c) CT 28-30F	d) CT 32-36F
7i The ambulatory patient admitted to the general ward:				
Doctors(%)	44 (32%)	73 (52%)	21 (15%)	0 (0%)
Chest physicians (%)	8 (67%)	4 (33%)	0 (0%)	0 (0%)
7ii The patient with acute respiratory distress syndrome who is mechanically ventilated in ICU:				
Doctors (%)	10 (7%)	46 (33%)	66 (48%)	16 (12%)
Chest physicians (%)	0 (0%)	4 (33%)	6 (50%)	2 (17%)

8 In your practice, when would you remove the chest tube?
a) Remove as soon as the lung has re-expanded, but with air leak demonstrated.
b) After the lung has re-expanded, as soon as air leak stops, remove.
c) After the lung has re-expanded, as soon as air leak stops, clamp for 4-24h, remove if no pneumothorax.
d) After the lung has re-expanded, wait for > 24h after air leak stops, remove.
e) After the lung has re-expanded, wait for > 24 h after air leak stops, clamp for 4 to 24h, remove if no pneumothorax.

Answer	(a)	(b)	(c)	(d)	(e)
Doctors (%)	0 (0%)	8 (6%)	63 (46%)	15 (11%)	52 (37%)
Chest physicians (%)	0 (0%)	0 (0%)	4 (33%)	2 (17%)	6 (50%)

Correct/Preferred answers: 1) A 2)B,C 3)C 4)C 5)A,B 6)A,B 7i)A 7ii)C 8)E

MATERIALS AND METHODS

The questionnaire was validated by 12 chest physicians with good agreement in the responses. It was then administered to all MOs and HOs posted to the medical, surgical and emergency departments of a general hospital from May to December 1998. 8 questions were posed: 4 pertained to management decisions (Q1-4), 3 to preferred size, site and method of CT insertion (Q5-7) and 1 to the optimal CT removal sequence (Q8). Annex l and Table I.

Comparisons between answers for all respondents as well as between discipline sub-groups were performed by Chi square analysis with p values <0.05 as significant.

RESULTS

Of the 145 questionnaires administered, 138 were completed, giving a response rate of 95%. 69% (n=95) were MOs and 31% (n=43) were HOs (Table II). 26% of the doctors (n=36) had never inserted CT and 41% (n=l5) were MOs in their 2nd to 5th year of practice with 3 MOs in the emergency department at the time of survey.

Majority answered appropriately to the questions on PSP management (Fig. 1). However for Q3, 49% of the doctors (n=67) elected not to insert CT in an acutely breathless chronic smoker with 10% SSP: 21% selected observation and 28% simple aspiration as initial

Table III. Comparisons of knowledge and practice among disciplines.

Questions	Medicine (% correct)	Accident & Emergency (% correct)	Surgery & Orthopaedics (% correct)	P value
1	100	100	98	0.37
2	90	97	93	0.43
3	63	42	43	0.07
4	76	73	80	0.72

Table IV. Comparisons of knowledge between doctors with CT experience and those without.

Questions	With CT experience (% correct)	Without CT Experience (% correct)	P value
1	100	97	0.09
2	90	100	0.05
3	55	42	0.18
4	75	81	0.53

Table V. Comparisons of practice among disciplines.

	Medicine	Accident & Emergency	Surgery & Orthopaedics	P value
Method of CT insertion				
Close method	32%	12%	15%	0.03
Open method	68%	88%	85%	
Preferred chest tube size for ambulatory patient with SP				
CT 12-19F	48%	27%	15%	0.004
CT 20-24F	41%	64%	61%	
Preferred CT size for mechanically ventilated patient				
CT 20-24F	44%	39%	20%	0.015
CT 28-30F	34%	55%	57%	
Optimal CT removal sequence				
Clamp immediately after air-leak stops & remove	37%	61%	46%	0.026
Wait >24h after air-leak stops, clamp & remove	47%	15%	41%	

treatment choices. Of the 49% who had answered incorrectly, MOs constituted 67% (n=45). Subgroup analysis showed that seniority (p=0.005), MO in specialty training (p=0.01) and the number of CT inserted (p=0.03) had a positive influence on the outcome of getting the correct answer (c). Exposure to respiratory medicine however, did not affect the outcome statistically (p=0.31).

Most doctors preferred the fifth intercostal space and the open method for CT insertion. 46% of all doctors (n=63) preferred to clamp CT immediately after cessation of air-leak while 38% (n=52) elected to wait for 24h before clamping and removal.

For Q1-4, there was no difference in knowledge or practice among the medical surgical and A&E disciplines (Table III), as well as between doctors who had performed CT insertion and those who had not (Table IV). However, a greater proportion of doctors who had not inserted CT (11%) selected a wrong site compared with those who had (7%).

There was demonstrable practice variability in the method of CT insertion, choice of CT size and optimal CT removal sequence. Doctors in the medical discipline preferred close method, smaller CT and to wait for 24h after air-leak cessation, clamp CT and remove. Their surgical and A&E colleagues, chose open method, larger CT and to clamp CT immediately after air-leak cessation and remove if there was no recurrence of SP (Table V).

DISCUSSION

Management of SP is influenced by the many clinical settings in which it occurs. As there are few randomized trials done with respect to the optimal management of both PSP and SSP, there is much variability in practice[1]. PSP occurs in a person without obvious underlying lung disease and is often managed by observation or simple aspiration while secondary SP (SSP) usually complicates an underlying lung disease and the patient receives CT[2]. PSP is often viewed as a low mortality "nuisance"[3] but death has been reported[4]. SSP on the other hand, can be life-threatening in patients with chronic obstructive pulmonary disease (COPD). COPD patients have a 3.5 fold increase in mortality with the occurrence of SP[5] and 5% die before CT placement[6].

Supplemental oxygen, a valuable and often overlooked therapeutic modality, can be applied to all patients with SP. This results in a 3-4 fold increase in the basal rate of pleural air absorption. A symptomatic patients with PSP < 15% can be observed with oxygen (Q1), but this must be viewed with caution as unrecognized tension pneumothorax with cardiopulmonary arrest has been reported[7].

Simple aspiration with the placement of small catheter between the fourth and fifth intercostal space in the anterior axillary line allows for pleural air evacuation and re-expansion of the lung. It has been recommended as the initial treatment for patients with >15% PSP (Q2), but with a failure rate of 63% for SSP[8,9], it should not be a treatment option for a breathless patient with SSP (Q3).

CT is advocated for patients with PSP failing simple aspiration (Q4) and those with SSP (Q3). However questions regarding the optimal CT size, drainage device, CT removal sequence and the appropriate timing for surgical intervention have not been adequately addressed in clinical trials, allowing for practice variability.

Small-bore catheter (up to 14F) can be safely used as initial therapy for all SP (Q7i), provided the patient

is not at risk for a large air leak or has a pleural effusion. If the patient is mechanically ventilated or has a pleural effusion then, a large-bore CT 28F should be used (Q7ii). The advantage of suction application in the CT removal sequence is controversial[10,11] and the optimal CT removal sequence is to wait for 24h after air leak stops and the lung re-expands, clamp CT for 4-24h and remove (Q8). The shorter clamp time of 4h does not affect the eventual outcome but may reduce hospital cost significantly[12]. There is also controversy regarding the optimal timing for surgical intervention. Surgery is recommended if air-leak persists after 72h as pleural healing is reported to occur in 100% PSP and 71% SSP by 72h[13]. Chee et al however, show that pleural healing in PSP and SSP can take up to 15 days and will only recommend surgery if air-leaks persist beyond 2 weeks[14].

Recurrence prevention of SP is addressed by the application of a chemical sclerosing agent via CT or surgery viz. video-assisted thoracoscopy or thoracotomy. There are several sclerosing agents available but talc has shown a success rate of 91%[15].

Our survey also demonstrated practice variability among the medical, surgical and A&E disciplines in the method, CT size as well as optimal CT removal sequence. This could be attributed to the underlying practice variability between physicians and surgeons and the different patient groups encountered in each discipline. Doctors in surgical and A&E disciplines treat more patients with traumatic haemopneumothoraces while those in medicine encounter mostly patients with PSP and SSP. It is therefore not surprising that they prefer larger CT and open method even when confronted with SP.

CONCLUSION

We have shown from our survey that junior medical staff need more education and training in the management of SSP. SSP may be life-threatening in patients with underlying lung disease and prompt CT insertion is life-saving. Simple pleural aspiration and administration of oxygen may relieve symptoms but with a reported high failure rate due to continuing air-leak, it can lead to tension pneumothorax and cardiopulmonary arrest.

It is possible for a doctor to complete housemanship and be posted to A&E as an MO without the experience of CT insertion. We are of the opinion that doctors practicing acute medicine should be equipped with the skill of CT insertion as it is a simple procedure that is potentially life-saving. Practice variability among the junior staff in different disciplines may reflect the underlying variability between physicians and surgeons as well as the different patient demographics encountered in each group.

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