



Can My Patient Dive After a First Episode of Primary Spontaneous Pneumothorax?

A Systematic Review of the Literature

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Background

It is conventional wisdom that individuals with a history of primary spontaneous pneumothorax (PSP) should never dive. We performed this analysis to look for hard evidence to support or reject this recommendation

Methods

- We conducted a systematic literature review on the recurrence of PSP in the general population
- Studies were identified using pre-defined search criteria in PubMed, in addition to a hand search
- 482 publications were evaluated. Only those based on original research were reviewed
- After excluding reports that combined patients with primary and secondary pneumothorax or that lacked follow-up beyond one month, we included 35 articles in the final analysis

Results

Table 1.

Summary of Studies Included	
Number of studies	35
Number of subjects	4,256
Mean follow-up time	36 months
Follow-up range	10.7-120 months
Mean time to first recurrence	10 months
Overall incidence of recurrence	17.3%
Percentage of recurrences in first year	71%*
Recurrence after VATS for 1 st episode of PSP	3.3%*

*1-yr recurrence based on reports of 13 studies (n=2,133).

*Includes combined populations of pleurodesis and/or bleb/bullae resection.

Results

- Average risk of recurrence** of PSP in the general population is **17.3%**. This risk is **20% if patients treated surgically are excluded from the analysis**.
- 71% of all recurrences occur within the first year**, follow-up beyond 10 years is non-existent.
- Risk of **recurrence after surgical treatment** of first PSP is **3.3%**.

Is there a role for CT scan in predicting recurrence?

- Studies evaluating the role of CT scan in predicting recurrence after a first episode of PSP were evaluated separately to determine whether CT scan could play a role in clearance to dive evaluations
- All studies used HRCT except Mitlehner et al.

Table 2.

Studies with CT evaluation after first PSP occurrence					
Author	Year	n	Mean f/u time	Recurrence w/ blebs/bullae	Recurrence w/o blebs/bullae
Casali	2013	176	58 mo	ipsi- 68.1%/ contra- 19%	ipsi- 6.1%/ contra- 0%
Martinez-Ramos	2007	55	30.7 mo	26%	24%
Mitlehner	1992	35	31.7 mo	N/R*	N/R*
Ouanes-Besbes	2006	80	34 mo	15.5%	27.2%
Sihoe	2000	28	59 mo	contra- 26.7%	contra-0%
Huang	2007	231	92 mo	ipsi- 1.5%/ contra- 26%	ipsi- 0%/ contra- 0%
*Recurrence rates described as significantly higher in patients with blebs/bullae although not reported; CT: computed tomography; PSP: primary spontaneous pneumothorax; N/R: not reported; ipsi-/contra-: ipsilateral/contralateral to side of first PSP occurrence					

Follow-up

Table 3.

Studies with CT Scan and Survival-type analysis						
	Studies (N)	Mean follow-up	Average Recurrence	RFS 1y.	RFS 2y.	RFS 3y.
Patients with normal CT	2 (231)*	44 months	10%	93%	87%	86%
Patients with blebs/bullae	2 (231)*	44 months	37%	71%	68%	58%
Patients with "high-grade" blebs	1 (176)*	58 months	57%	50%	30%	22%

RFS: Recurrence free survival;

*0% of these patients underwent VATS after their first PSP episode

- Risk of recurrence **with blebs/bullae** on CT scan: **26.1%**
- Risk of recurrence **without blebs/bullae** on CT scan: **8.1%**

Conclusion

it seems that in the absence of thoracic imaging abnormalities, non-diving patients who have not experienced a recurrence after several years of follow-up are at low risk of recurrence. Conceivably divers in this category could be considered for clearance to engage in recreational diving.

However, exposure to increased gas density and high trans-pulmonary pressures while diving can increase the risk of pneumothorax recurrence. The effect of these physiological effects of diving on PSP recurrence are unknown.

References

References of the 35 studies included in this review will be provided in a hand-out to the attendants