

Pulmonary Barotrauma Associated with “Lung Packing”

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Asymptomatic Pulmonary Barotrauma

- Glossopharyngeal Insufflation commonly referred to as buccal pumping or lung packing is a method of increasing lung volume above Total Lung Capacity used by breath-hold divers to achieve greater dive depths and breath-hold times.

Glossopharyngeal Insufflation

- Increases Lung volumes above TLC
- Increases transpulmonary and intrathoracic pressure
- Is associated with hypotension and impaired cardiac output.

Methods

- Two **asymptomatic** elite breath-hold divers underwent Chest CT scanning.
- Multiple images of the chest were obtained using a GE LightSpeed Plus helical multi channel scanner.
- Images were obtained at full inspiration in a pre-“packing” and post “packing” mode.

RESULTS

- Neither diver had prior pulmonary problems, symptoms or abnormalities on exam at the time of chest imaging.
- Previously measured lung volumes:
- Diver 1- pre packing VC 7.01 (L) post VC 10.3 (46%)
Diver 2- pre packing VC 5.73 (L) post VC 7.31 (31%)

CHEST CT SCANS IN BOTH DIVERS
DEMONSTRATED PNEUMOMEDIASTINUM

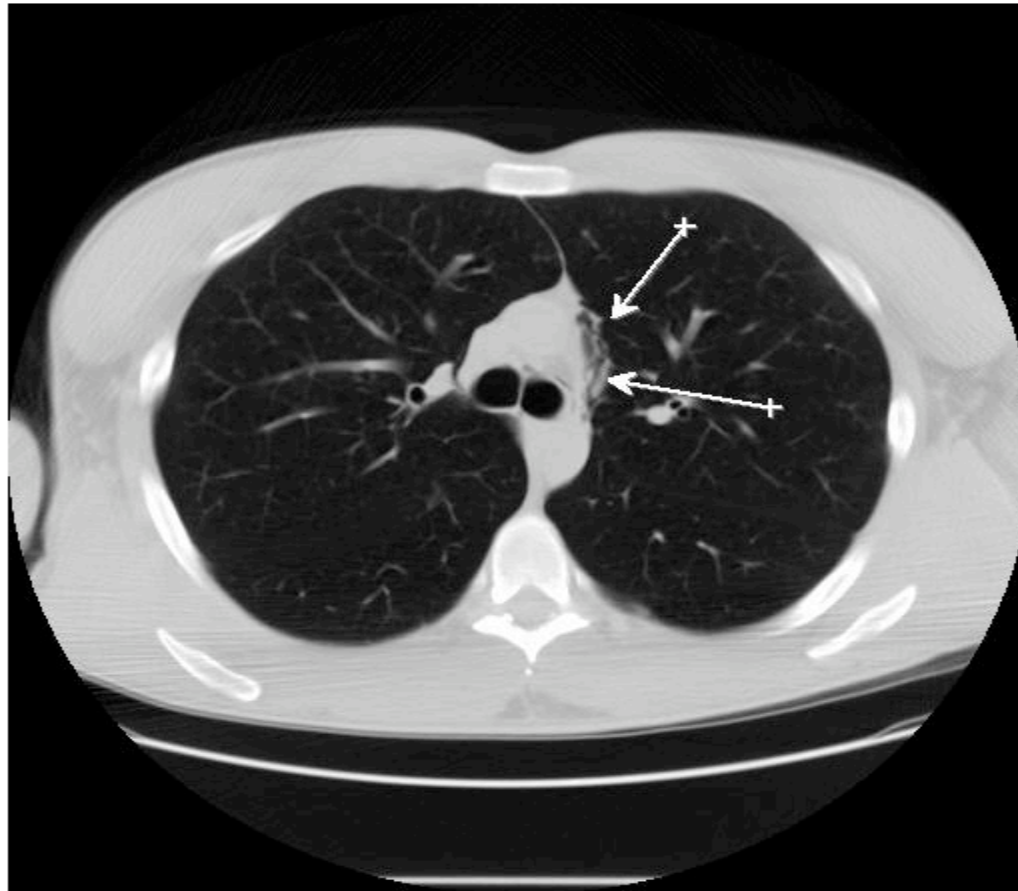
Pneumomediastinum Diver 1

arrows point to mediastinal air anterior to left mainstem bronchus



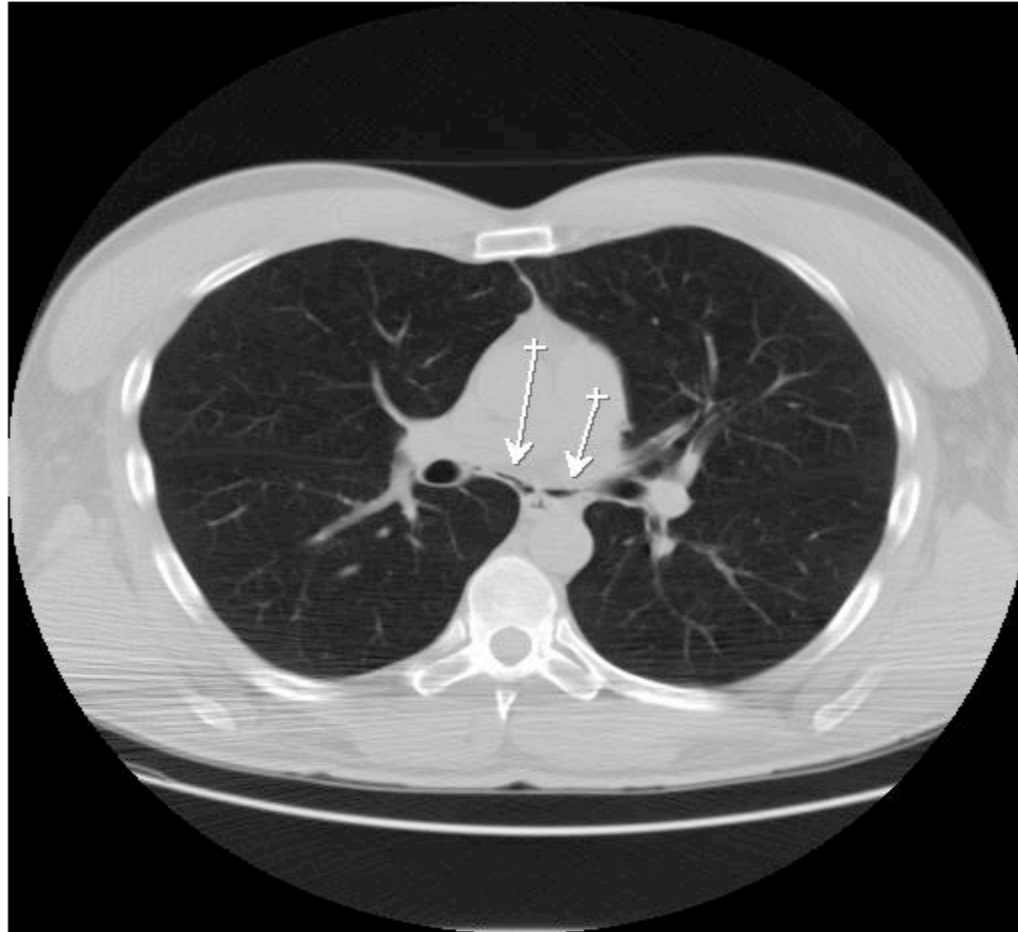
Pneumomediastinum Diver 1

arrows point to mediastinal air in left para-aortic area



Pneumomediastinum Diver 2

arrows point to mediastinal air anterior to the esophagus



Pneumomediastinum Diver 2

arrow points to mediastinal air anterior to the esophagus



SOURCE OF EXTRAPULMONARY AIR

- UPPER AIRWAYS AS AIR IS FORCED INTO THE LUNGS
- RUPTURED ALVEOLI SECONDARY TO HIGH TRANSPULMONARY PRESSURES OR INCREASED LUNG VOLUMES

CONCLUSIONS

- Glossopharyngeal Insufflation may induce pulmonary barotrauma as demonstrated by pneumomediastinum in asymptomatic breath-hold divers and could potentially result in air embolism. THE SAFETY OF THIS PRACTICE WARRANTS FURTHER INVESTIGATION.

PULMONARY BAROTRAUMA ASSOCIATED WITH “LUNG PACKING”

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BACKGROUND: Glossopharyngeal insufflation commonly referred to as buccal pumping or lung packing is a method of increasing lung volume above total lung capacity used by breath-hold divers. This maneuver has been associated with hypotension and impaired cardiac output. Lung volumes increase significantly by this maneuver and may result in pulmonary barotrauma. Recently a case report of pneumomediastinum after lung packing has been published.

METHODS: Two elite breath-hold divers underwent chest CT scanning. Using a GE LightSpeed Plus helical multi channel scanner, multiple images were obtained through the chest. Images were obtained at full inspiration in pre-packing and post packing mode.

RESULTS: Neither participant had prior pulmonary problems nor symptoms or abnormalities on physical examination at the time of the chest imaging. Previously measured lung volume changes with packing demonstrated baseline Vital capacity (VC) of 7.01 liters (131% predicted) to post packing (VC) of 10.26 liters (191% predicted or 46% increase in the first diver and previously measured (VC) 5.73 liters (130% predicted) and post packing VC of 7.31 liters (166% predicted or 31% increase) in the second diver. Chest CT scans in both divers demonstrated pneumomediastinum.

CONCLUSIONS: Glossopharyngeal insufflation is associated with asymptomatic chest CT scan abnormalities diagnostic for pneumomediastinum. The source of the extra pulmonary air is not clear. It is possible that the air enters the mediastinum from the upper airways as it is forced into the lung. An alternative source may be from ruptured alveoli secondary to the high transpulmonary pressures and/or created by increased lung volumes. Glossopharyngeal insufflation may induce pulmonary barotrauma in asymptomatic participants and could potentially result in air embolism.

Category: Diving

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