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Application of Fluorescent and Iodized Dual Marker for Pre-Operative Localization and Image-Guided Surgery of Pulmonary Nodule



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Background: This study evaluated the feasibility of pre-operative localization of pulmonary nodule using dual marker composed with indocyanine green (ICG) and lipiodol for minimal and accurate resection in video-assisted thoracoscopic surgery (VATS). **Method:** To minimize separation of two materials, we mixed with different frequency and ratio of ICG and lipiodol using a 3-way stopcock, and investigated their distribution with fluorescent microscope. Three rabbits were undergone thoracotomy after computed-tomography (CT) fluoroscopy-guidance injection of each 0.1 ml emulsions into different lobes of rabbit lung at 6, 12 or 24 hours. The localized lesions were evaluated by near-infrared optical imaging and radiograph. The 0.3 ml of emulsion was pre-operatively injected into 22 patients under CT fluoroscopy-guidance, and the localization was then evaluated during surgery by near-infrared imaging and mobile C-arm fluoroscopic x-ray. All freshly excised specimens were diagnosed by pathologic examination. **Result:** In *in vitro*, the separation time of ICG and lipiodol emulsion was delayed proportionally to mixing frequency and ratio. The emulsion mixed with 90 passages and 90% lipiodol was the least separated at 24 hours. On the rabbit lung, the optimal emulsion remained stably on injection site until 24 hours after injection. Pulmonary nodule localization using the optimal emulsion was performed successfully on the 22 patients without complications. **Conclusion:** This easy optimal method for pre-operative localization of pulmonary nodule was successfully established. The emulsion can be a useful marker to show the location of lesion to surgeons. However, ICG and lipiodol were not mixed perfectly and evenly. Therefore, there will be needed a future research to stabilize two materials completely. **Keywords:** Localization of pulmonary nodules, Indocyanine green and lipiodol, Image-guided surgery

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Video-Assisted Thoracoscopic Surgery (VATS) versus Thoracotomy in Locally-Advanced Lung Cancers – A Meta-Analysis



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Background: Video-assisted thoracoscopic surgery (VATS) has been established as the preferred approach for surgical resection of early-stage non-small cell lung cancers. It is shown to have improved oncological outcomes with lower perioperative complication rates when compared with conventional open lobectomy. However, there is a paucity of high-level evidence supporting its use in locally-advanced lung cancers. Moreover, published results have shown contrasting outcomes. We conducted a meta-analysis to compare oncological outcomes as well as perioperative complications for VATS versus conventional thoracotomy in this population. **Method:** Electronic databases (PubMed MEDLINE, EMBASE and Web of Science) were searched for studies evaluating VATS versus conventional thoracotomy for the resection of locally-advanced lung cancers. Individual outcome data was pooled to investigate the summary effect. **Result:** A total of 5 studies comparing the two approaches were identified. Of these, only 3 studies reported long-term survival data appropriately and were analyzed separately. There was no difference in 3-year overall survival (HR 0.67, 95% CI 0.29-1.53) or 3-year disease-free survival (HR 1.09,

95% CI 0.77-1.55) when comparing VATS against open thoracotomy. However, VATS was associated with a shorter length of stay (2.02 days, 95% CI 0.65-3.39 days). There was no difference in blood loss between the two approaches. **Conclusion:** Oncological outcomes of VATS resection appear to be at least equivalent to conventional thoracotomy in locally-advanced lung cancers. Length of stay is shorter for VATS, which has been shown to correlate with better cost-effectiveness. Ideally, randomized controlled trials should be designed to confirm and further investigate these conclusions. **Keywords:** Locally-advanced lung cancer, VATS, thoracotomy

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The Efficacy of Thoracoscopic Right Upper Lobectomy Using Fissureless Technique in Patients with Dense Fissures



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Background: We adopted the 'thoracoscopic fissureless technique' for patients with dense fissure undergoing right upper lobectomy to avoid postoperative air leakage. This technique is considered useful in thoracoscopic approach which has the limited direction in dissection. We investigated the efficacy of thoracoscopic right upper lobectomy using fissureless technique in this study. **Method:** Between April 2012 and March 2017, 77 patients underwent thoracoscopic right upper lobectomy with three or four ports, of whom 23 adopted fissureless lobectomy. We compared the characteristics and perioperative outcomes of the patients undergoing the fissureless technique (fissureless group, n=23) and the traditional fissure dissection technique for pulmonary artery exposure (traditional group, n=54). The details of the fissureless technique is as follows. While the upper lobe is retracted towards the back, the upper lobe vein and the anterior PA trunk to the upper lobe are exposed and divided. After the division of right upper lobe bronchus by a stapler, the ascending artery is divided. However, it is better to dissect and divide the ascending A2 prior to right upper bronchus when the ascending A2 branches from a comparatively proximal portion. The fissure is finally divided. **Result:** The patients' characteristics and perioperative results in the 2 groups are shown in the table. There was no significant inter-group difference about sex ratio, age, blood loss (p=0.95), intraoperative massive bleeding rate (p=0.66), conversion rate (p=0.55) or morbidity (p=0.13), fissureless group had shorter operation time (p=0.047) or postoperative hospital stay (p=0.0004). Additionally, fissureless group had tendency to reduce the duration of postoperative chest tube drainage (p=0.07). **Conclusion:** Thoracoscopic right upper lobectomy using fissureless technique is considered useful because it had a tendency to reduce the duration of postoperative drainage, and significantly reduced operation time and the length of postoperative hospital stay. **Keywords:** fissureless technique, Thoracoscopy, Right upper lobectomy

Variable	Fissureless group, n=23 (%)	Traditional group, n=54 (%)	p-value
Operation time (min.)	197±45	225±61	0.047
Blood loss (ml)	93±150	95±165	0.95
Intraoperative massive bleeding (n)	1 (4.3)	5 (9.3)	0.66
Conversion to thoracotomy (n)	0 (0)	3 (5.6)	0.55
Duration of chest tube drainage (days)	2.7±1.6	3.9±3.2	0.07
Length of postoperative hospital stay (days)	4.6±1.3	7.5±3.5	0.0004
Morbidity (n)	2 (8.7)	14 (25.9)	0.13