**Supplementary Table 1: Patient demographic and clinical characteristics.**

|  |  |  |
| --- | --- | --- |
| Variables | *n* | % |
| Gender |  |  |
| Female | 10 | 33.3 |
| Male | 20 | 66.7 |
| Age (years), median (range) | 63.5 (37.0–79.0) |  |
| Smoking status |  |  |
| Previous | 11 | 36.7 |
| Never | 18 | 60.0 |
| Current | 1 | 3.3 |
| Prior history of cancer |  |  |
| None | 18 | 60.0 |
| Primary thoracic | 4\* | 13.3 |
| Primary extrathoracic | 10\* | 33.3 |
| Prior thoracic surgery |  |  |
| None | 26 | 86.7 |
| Lobectomy | 3 | 10.0 |
| Wedge resection | 1 | 3.3 |

\*Two patients had a history of both thoracic and extrathoracic tumors.

**Supplementary Table 2: Nodule and procedure characteristics.**

|  |  |
| --- | --- |
| Variables | Values |
| Lesion location |  |
| LUL | 12 (40.0) |
| LLL | 3 (10.0) |
| RUL | 8 (26.7) |
| RML | 2 (6.7) |
| RLL | 5 (16.7) |
| Lung centrality |  |
| Inner 2/3 lung Area | 17 (56.7) |
| Outer 1/3 lung Area | 13 (43.3) |
| Nodule type |  |
| Solid | 26 (86.7) |
| Part solid | 4 (13.3) |
| CT bronchus sign |  |
| Present | 23 (76.7) |
| Absent | 7 (23.3) |
| r-EBUS view before the first sampling attempt |  |
| Eccentric | 15 (50.0) |
| Concentric | 14 (46.7) |
| No ultrasound visualization | 1 (3.3) |
| Concentric view achieved before and/or during samplings |  |
| Yes | 21 (70.0) |
| No | 9 (30.0) |
| Lesion visible by fluoroscopy |  |
| Yes | 24 (80.0) |
| No | 6 (20.0) |
| Lesion visible by r-EBUS |  |
| Yes | 29 (96.7) |
| No | 1 (3.3 ) |
| Lymph node staging procedure performed |  |
| Yes | 5 (16.7) |
| No | 25 (83.3) |
| Lesion size (mm) |  |
| Axial | 17.1 ± 4.3 |
| Coronal | 16.9 ± 5.7 |
| Sagittal | 16.7 ± 4.8 |
| Airway generation\* | 7 (6, 8) |
| Distance from nearest pleura or pleural surface (mm) | 4.5 (0, 13.5) |
| Total cumulative fluoroscopy time (min) | 7.1 ± 3.3 |
| Nearest edge of the nodule (mm) | 10.5 (1.0, 17.3) |
| Total procedure time (min) | 40.7 ± 18.0 |
| Registration time (min) | 3.4 ± 1.2 |
| Navigation time (min) | 3.5 (2.0, 11.0) |
| Final diagnosis |  |
| Lung adenocarcinoma | 18 (60.0) |
| Non-small cell lung cancer-not otherwise specified | 5 (16.7) |
| Extrathoracic tumor metastasis | 6† (20.0) |
| Organizing pneumonia | 1 (3.3) |
| Primary lung cancer stage | 23 (76.7) |
| IA2 | 4 (17.4) |
| IA3 | 3 (13.0) |
| IIIB | 3 (13.0) |
| IVA | 9 (39.1) |
| IVB | 4 (17.4) |

Data are presented as *n* (%), mean ± standard deviation, or median (Q1, Q3). \*Defining trachea as the 0 generation, main bronchi as the 1st generation, lobar bronchi as the 2nd generation, segmental as the 3rd generation, and so on. †1 Breast cancer metastasis, 3 colorectal cancer metastasis, 1 osteosarcoma metastasis, 1 epithelial odontogenic ameloblastoma metastasis. CT: Computed tomography; LUL: Left upper lobe; LLL: Left lower lobe; RUL: Right upper lobe; RML: Right middle lobe; RLL: Right lower lobe; r-EBUS: Radial-endobronchial ultrasound.



**Supplementary Figure 1:** A case of ION™ procedure. (A) Screenshot of the registration process. (B) Screenshot of the navigation to the nodule. The blue curved line was the pathway created by the PlanPoint software. The green curved line showed the location of the catheter to the target (blue ball). The radial-endobronchial ultrasound and fluoroscopy images confirming the nodule were shown in the bottom left and center of the bottom monitor screen, respectively. Distances from the catheter tip to the target and to the visceral pleural border were displayed on the screen.