

Trans-bronchial artery chemo-embolization for the treatment of primary lung cancers

Institute for Image Guided Therapy, Osaka Japan



Shinichi Hori MD,
Tatsuya Nakamura MD,
Atsushi Hori MD,
Ikuo Dejima MD,
Ryusuke Kuzumi MD,
Norifumi Kennoki, MD

Disclosures: No COI

Purpose

The purpose of this study is to present the clinical efficacy of transarterial approach to the lung and mediastinal malignancies using recent techniques of interventional radiology.

Backgrounds

- Although significant progress has been achieved also in the treatment of lung cancer in recent years due to advances in anticancer drugs, molecularly targeted agents, and immune checkpoint inhibitors, treatment options are often limited when the disease is diagnosed in highly advanced stages or recurrence occurs after standard treatments (Bie et al. 2019).
- The number of lung cancer patients still continues to increase worldwide compared with other malignant diseases.
- Lung cancer treatment via the bronchial artery has a long history (Viamonte 1964) (Kahn, Paul, and Rheinlander 1965) (Nevazaki et al. 1969), but has long been neglected due to technical difficulties and advances in other lung cancer treatments. (Nakanishi et al. 2008).
- However, recent advances in diagnostic imaging, catheter technology, and arterial embolization materials have led to significant advances in transarterial treatment, which can now be utilized for treatment via bronchial arteries (S. Hori et al. 2021).

Materials and Methods

Patients;

- From October 2016 to December 2023, 98 patients who had advanced lung cancer or recurrence after standard treatments were investigated retrospectively.
- They were treated with trans-arterial methods and were followed up by CT at least one month after treatment.
- The mean age of patients was 66.5 years (46-87); male; 65 cases, female; 33 cases. Previous treatments in other hospitals included systemic chemotherapy (65 patients), radiotherapy (22 patients), and surgery (13 patients).
- Seventeen patients were performed as the initial treatment due to advanced stages for chemotherapy or radiotherapy.
- Histological examination showed non-small cell lung cancer; 83 cases (adenocarcinoma; 52 cases, squamous cell carcinoma; 31 cases), small cell lung cancer; 14 cases, large cell lung cancer; 1 case (Table 1).
- This retrospective study was approved by IRB.

Patients' characteristics	Number
Age;	66.5 (46 – 87)
Male/Female	65/33
Histology;	
Adenocarcinoma	52
Squamous cell carcinoma	31
Small cell carcinoma	14
Large cell carcinoma	1
Initial tumor treatment	17
Recurrent tumor treatment	81
Previous therapy;	81
Systemic chemotherapy	65
Radiotherapy	22
Surgery	13
None	16
T factors;	
T1	7
T2	14
T3	28
T4	49
N factors;	
N(-)	21
N(+)	77
M factors;	
M(-)	61
M(+)	37
Clinical Stages;	
Stage I	8
Stage II	3
Stage III	50
Stage IV	37

Materials and Methods

Diagnostic modalities and Devices

Imaging modalities:

- Contrast-enhanced dynamic CT (64-row MDCT, Fuji Medical, Tokyo, Japan) scan was used for diagnostic imaging.
- 3D reconstruction (TeraRecon, Durham, USA) to identify tumor feeders from the subclavian, intercostal, and inferior phrenic arteries, as well as the bronchial arteries directly from the aorta.
- Angio-CT (80-row MDCT, Canon Medical, Tokyo, Japan) was combined with DSA-machine(Canon, Medical, Tokyo, Japan) to identify the tumor feeding arteries.



Devices:

- 4.0 Fr guiding catheters (Cobra shape, Medikit, Tokyo, Japan)
- 2.0 Fr microcatheter (Estream, Toray Medical, Tokyo, Japan)
- Super absorbent polymer microsphere; HepaSphere (50-100 micron, Merit Medical Systems, Utah, USA)
- List of Anti-neoplastic agents;

Doxorubicin;20-30mg, Fluorouracil;250-500mg, Cisplatin;10-40mg, Gemcitabine;100-200mg, Irinotecan;20-40m, Docetaxel;10-20mg Bevacizumab;100mg

Preshaped microcatheter



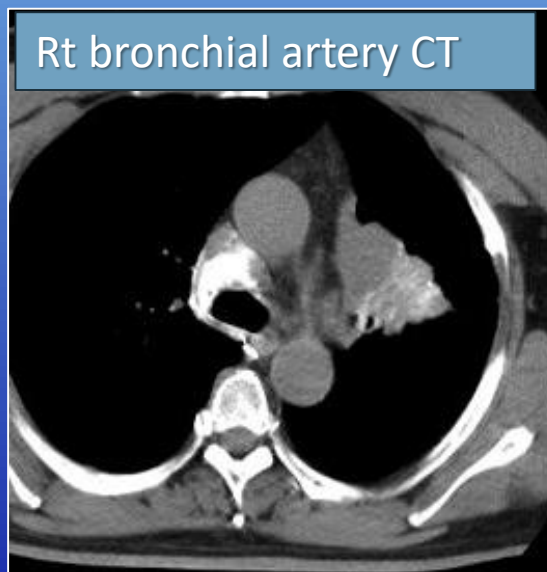
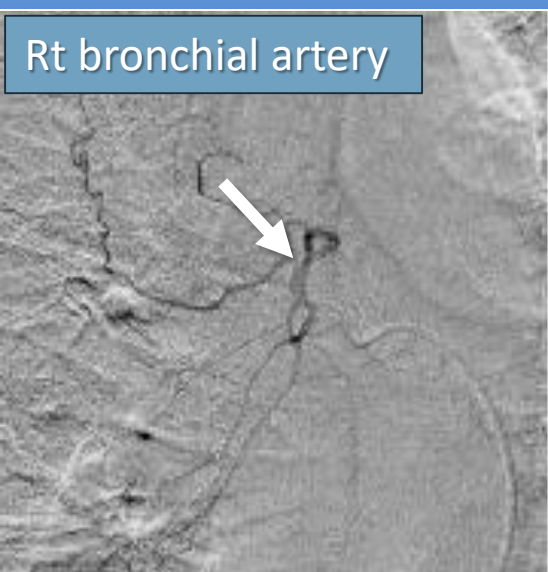
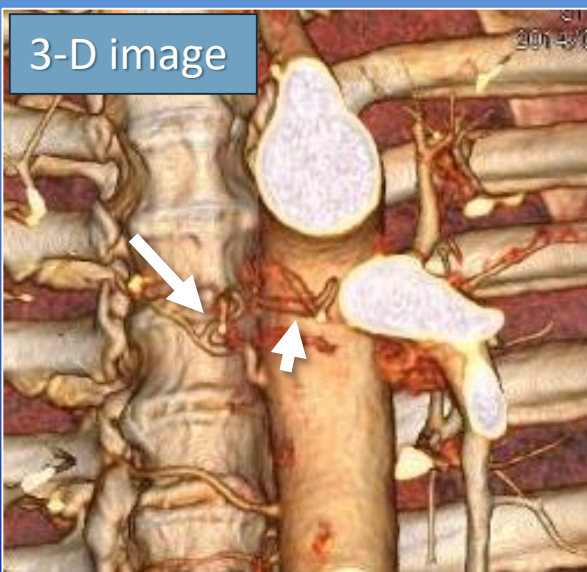
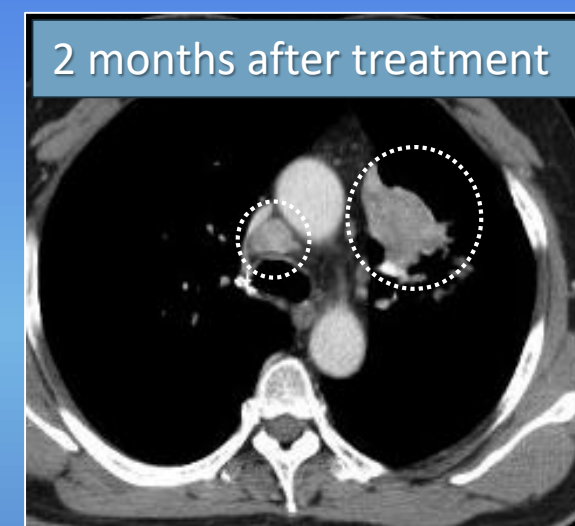
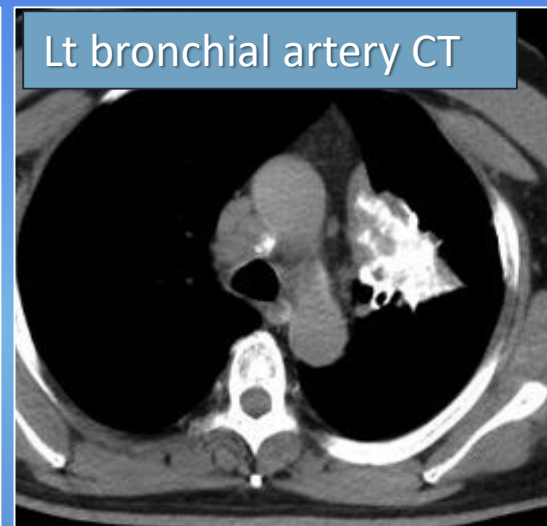
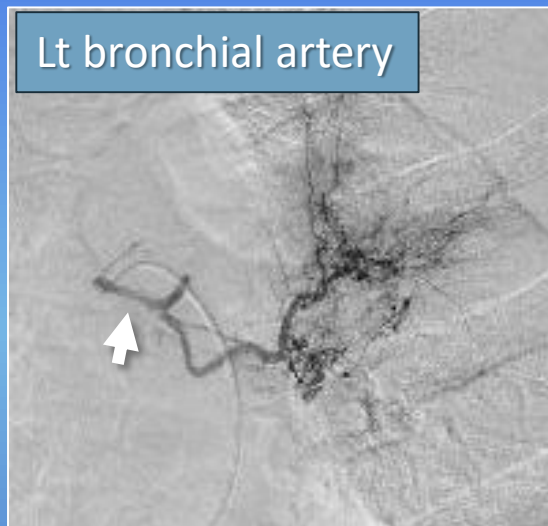
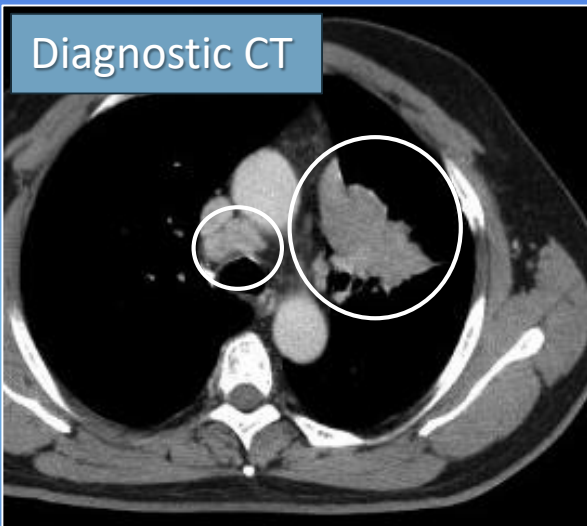
SAP-MS



Materials and Methods

CASE 1; 50 y/o Non-small cell lung cancer

Treatment Procedure



Arterial infusion

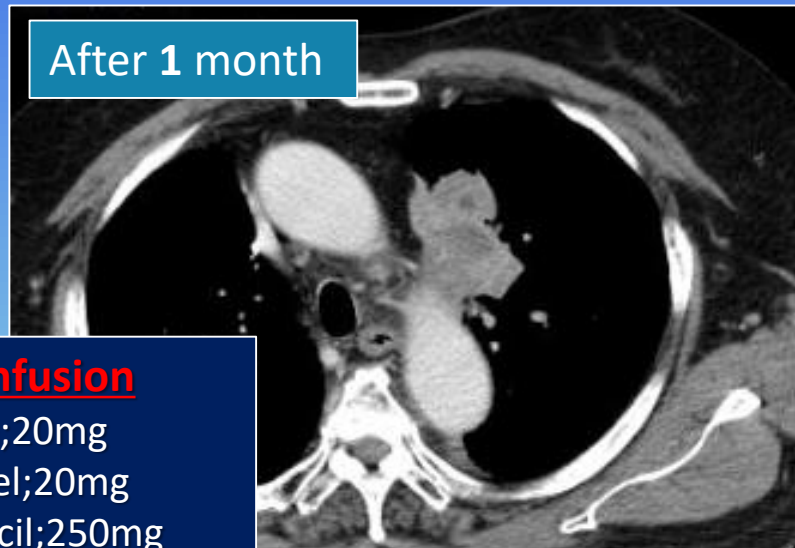
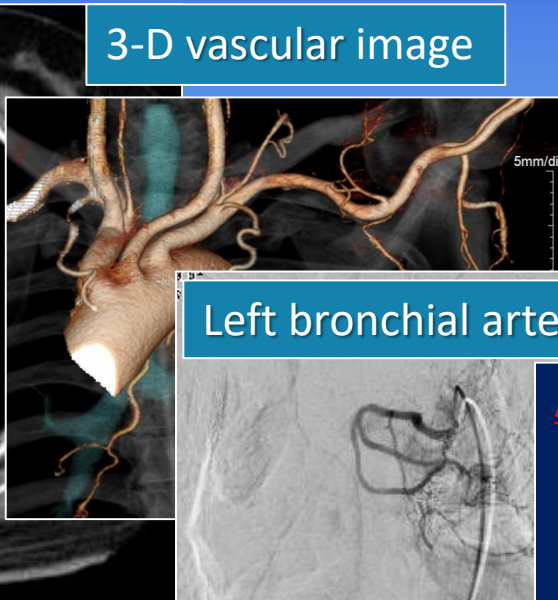
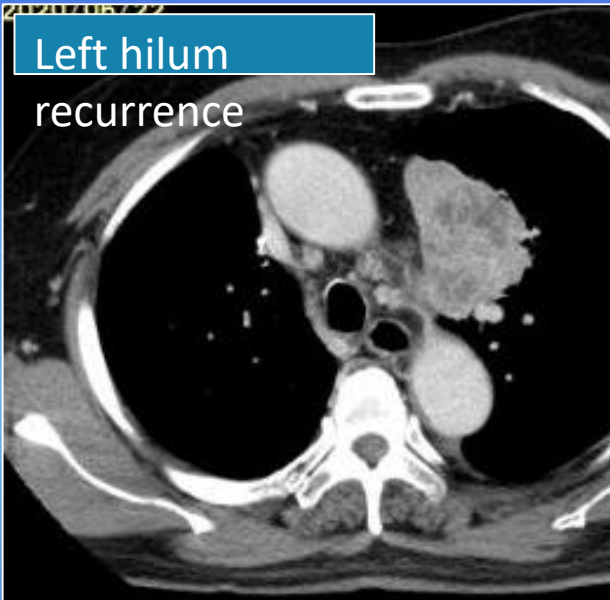
Cisplatin;20mg
Docetaxel;20mg
Fluorouracil;250mg
Bevacizumab;200mg

Embolization

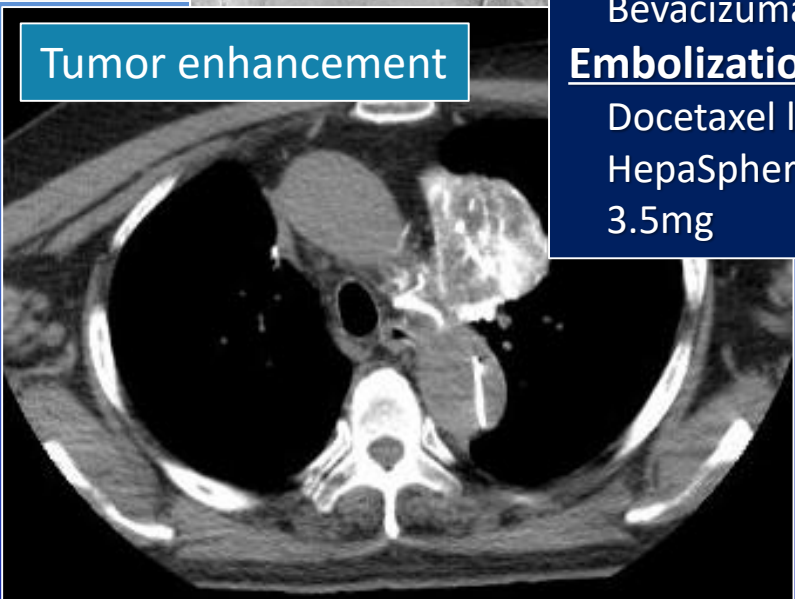
Docetaxel loaded
HepaSphere(50-100);
3.5mg

Results

Case 2: Recurrent Lung Cancer (Adenocarcinoma) 67 y/o M

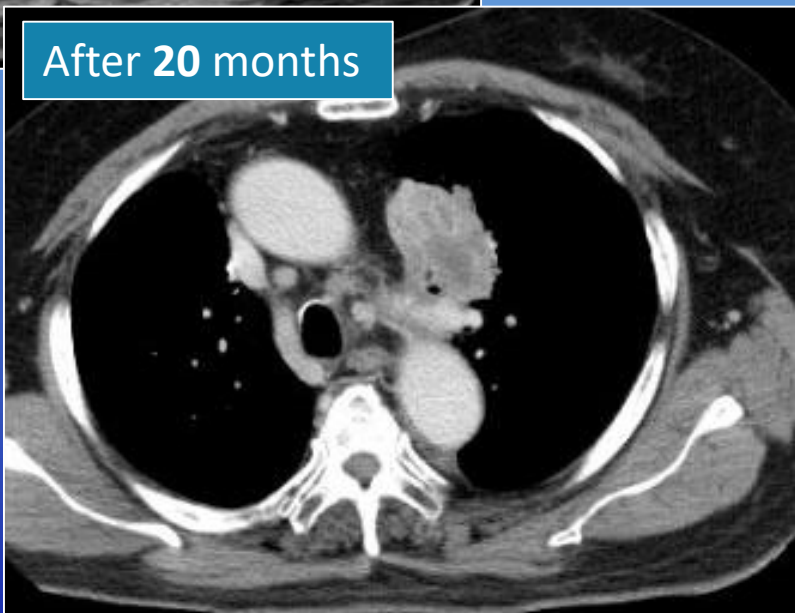


- Treatment History**
- Systemic chemotherapy
 - Immunotherapy
 - Radiotherapy
 - Proton therapy



Arterial infusion
Cisplatin;20mg
Docetaxel;20mg
Fluorouracil;250mg
Bevacizumab;200mg

Embolization
Docetaxel loaded
HepaSphere(50-100);
3.5mg



Results

Case 3; Lung Cancer 62 y/o M, Non-small cell lung cancer, T4N2M1

Lt main bronchial artery

After 2 months

PA occlusion

PA occlusion

Lt accessory bronchial artery

After 3 months

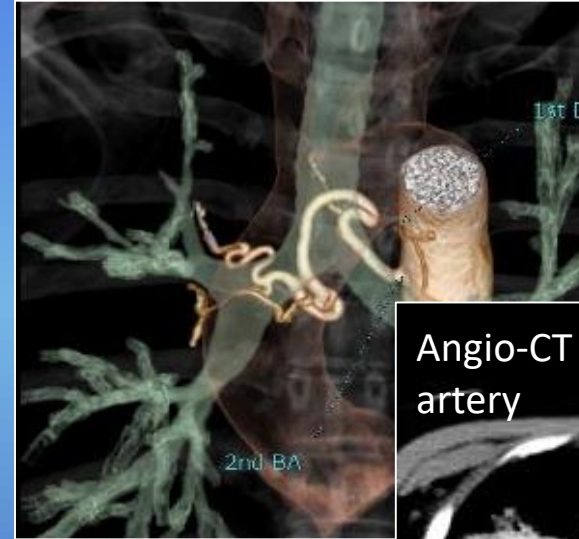
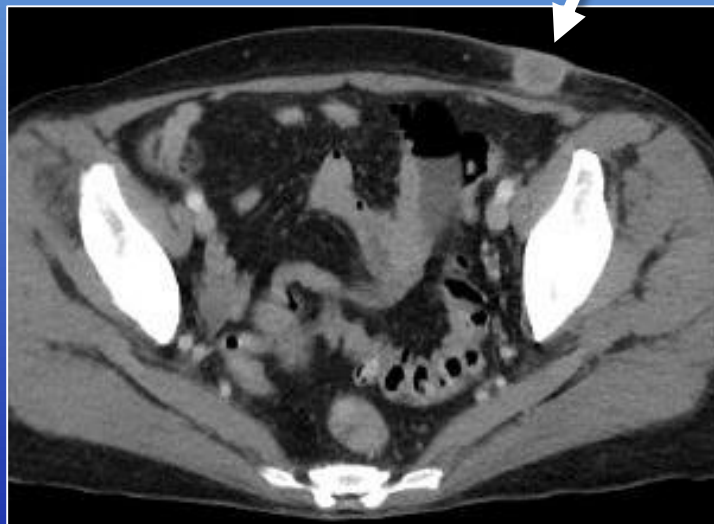
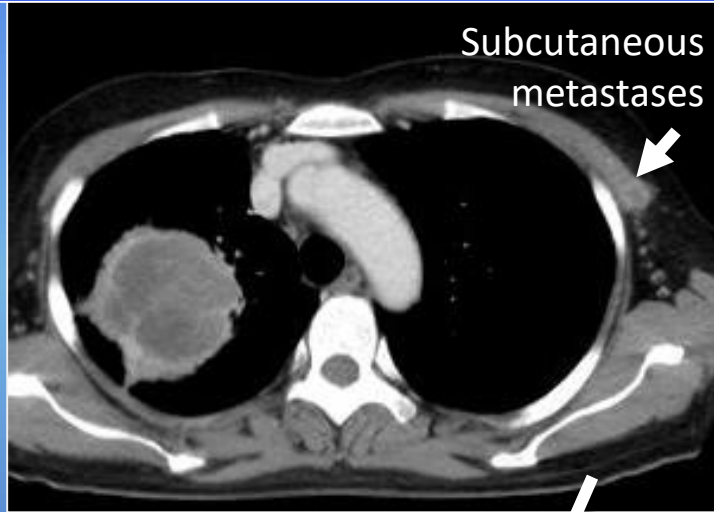
PA recanalization

Arterial infusion
Cisplatin;20mg
Docetaxel;20mg
Florouracil;250mg
Bevacizumab;200mg

Embolization
Docetaxel loaded
HepaSphere(50-100);
3.5mg

Results Case 4-1; Lung Cancer 63 y/o F SCC, T4N2M1

KRAS mutant, Systemic chemotherapy, Pembrolizumab; poor response



Angio-CT of the bronchial artery



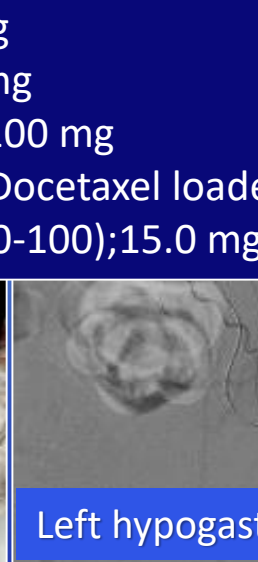
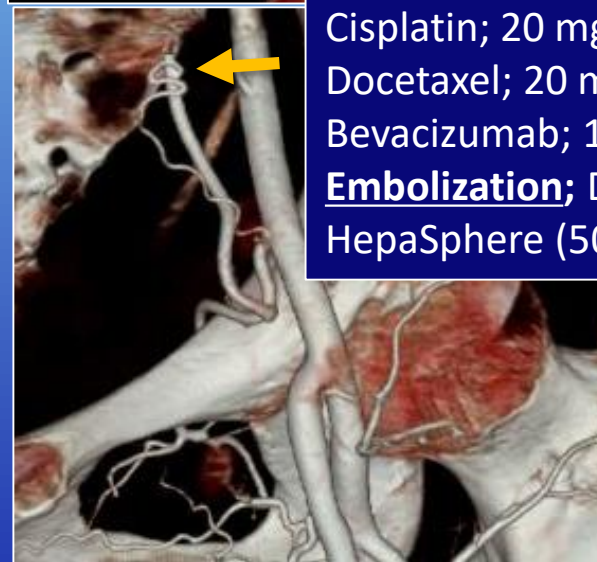
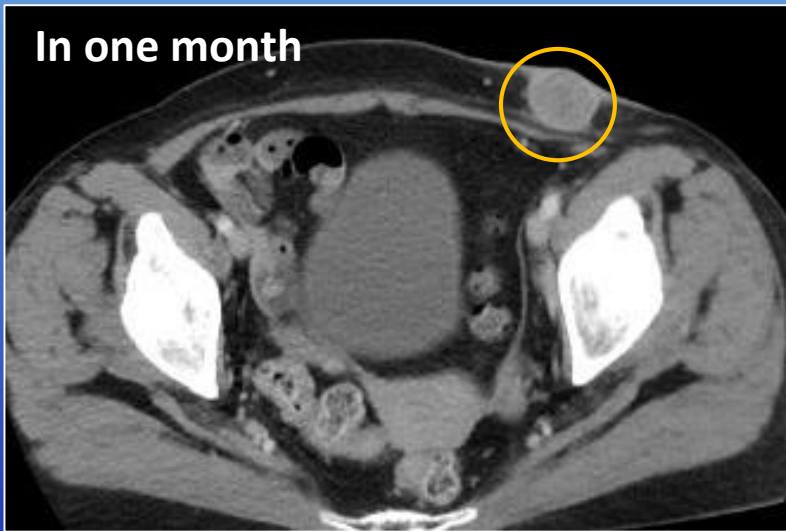
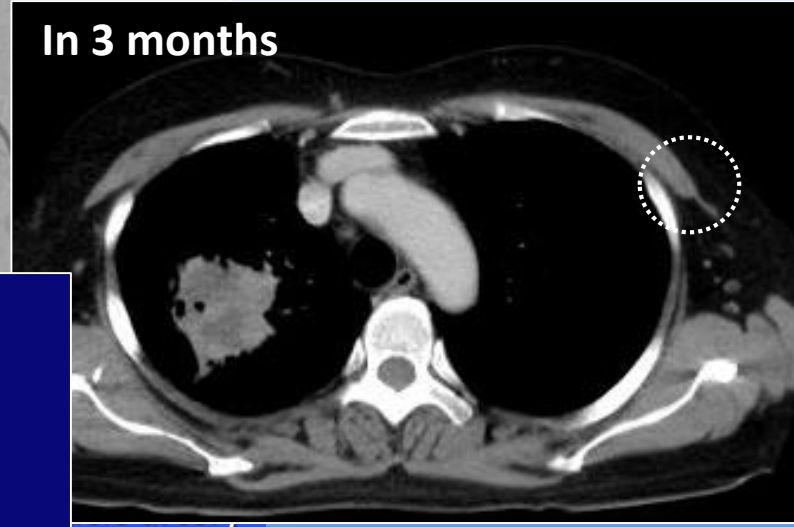
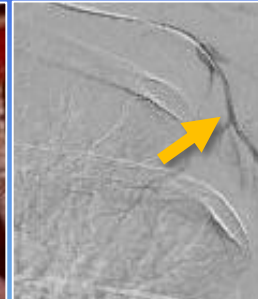
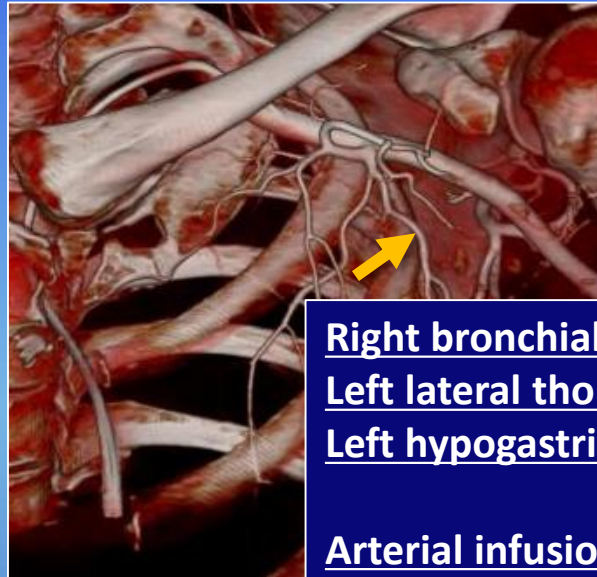
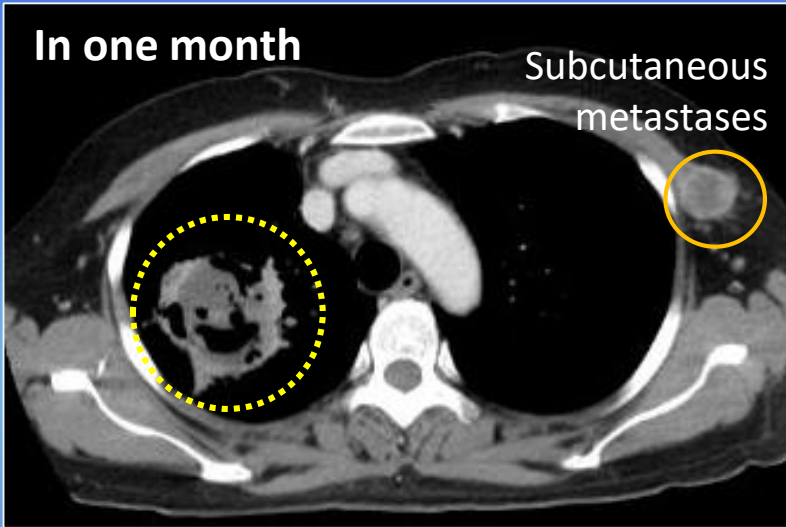
Right bronchial artery

Arterial infusion:

- Cisplatin; 20 mg
- Docetaxel; 20 mg
- Bevacizumab; 100 mg

Embolization: Docetaxel loaded HepaSphere (50-100);15.0 mg

Results Case 4-2; Lung Cancer 63 y/o F SCC, T4N2M1



Right bronchial artery
Left lateral thoracic artery
Left hypogastric artery

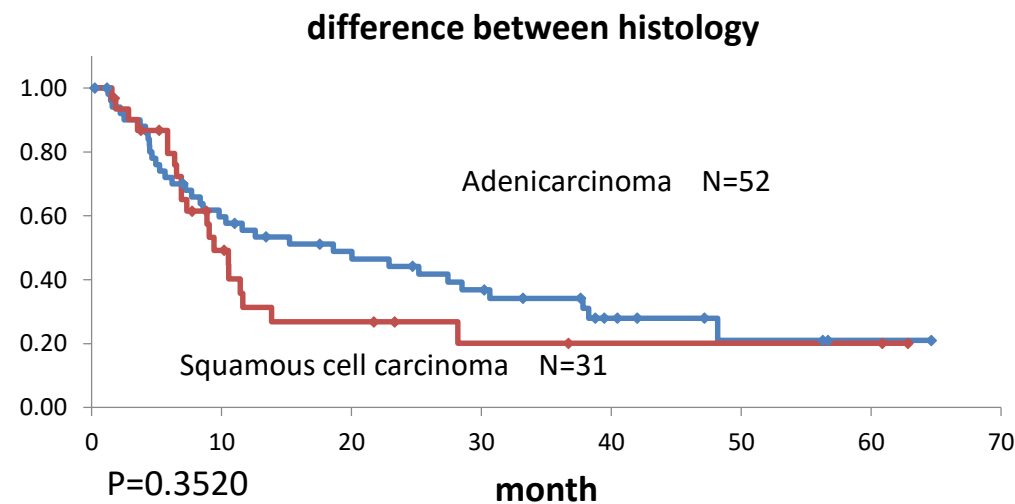
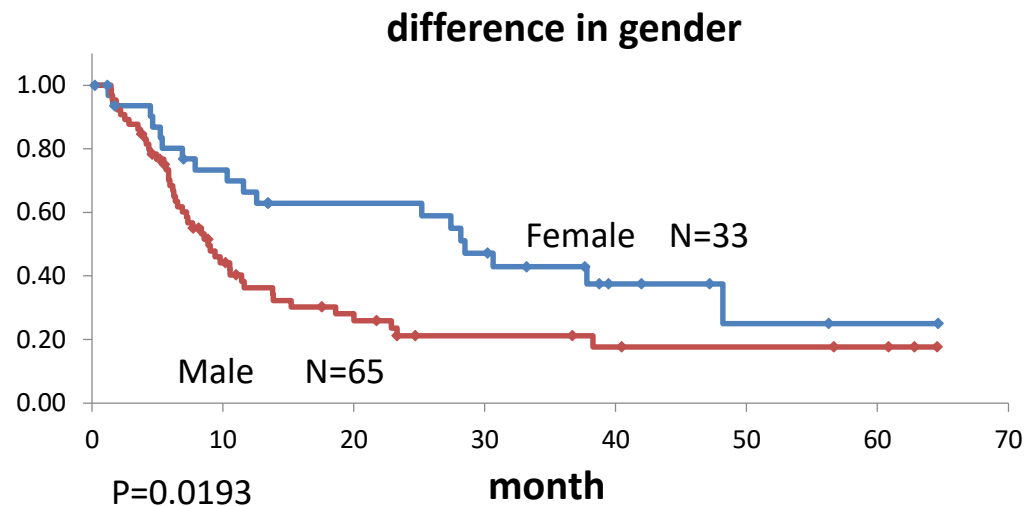
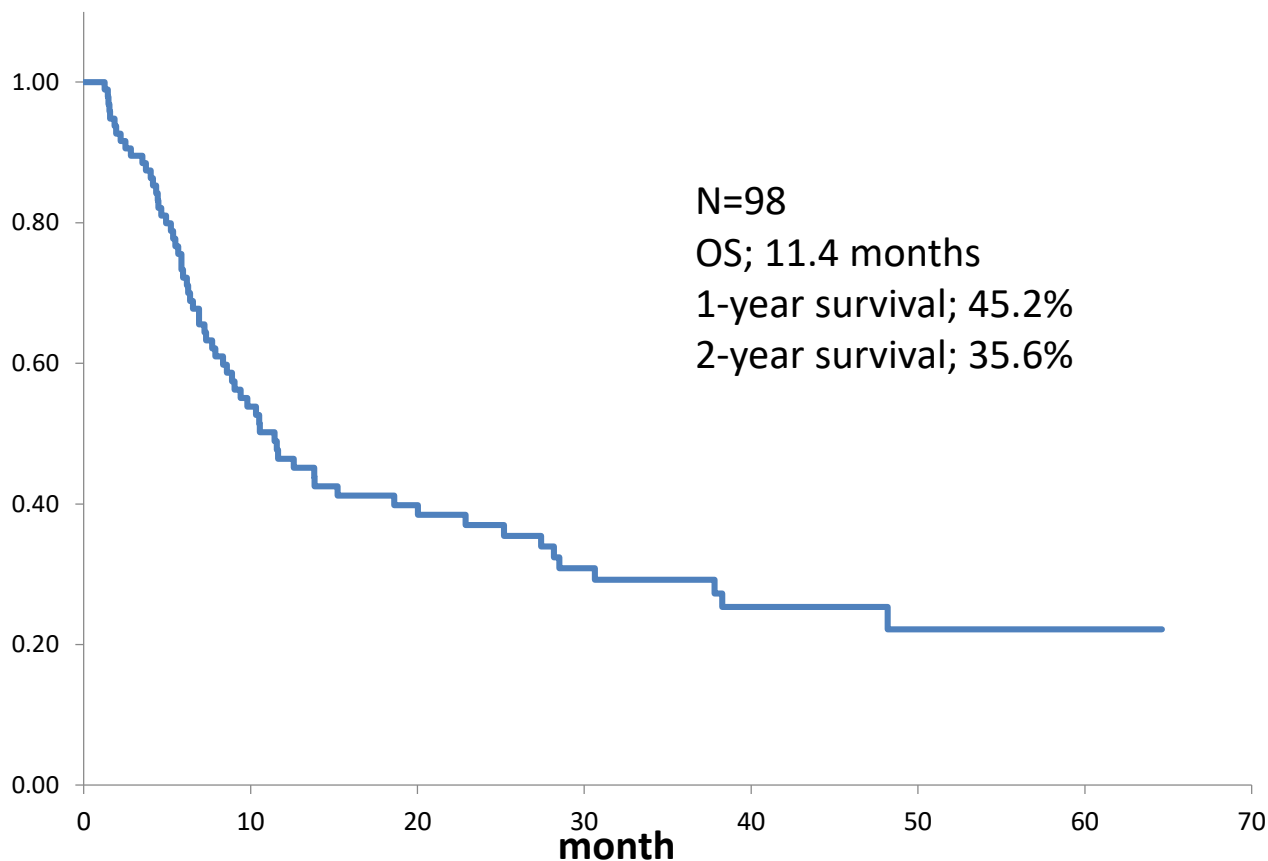
Arterial infusion:
Cisplatin; 20 mg
Docetaxel; 20 mg
Bevacizumab; 100 mg

Embolization; Docetaxel loaded
HepaSphere (50-100);15.0 mg

Left hypogast

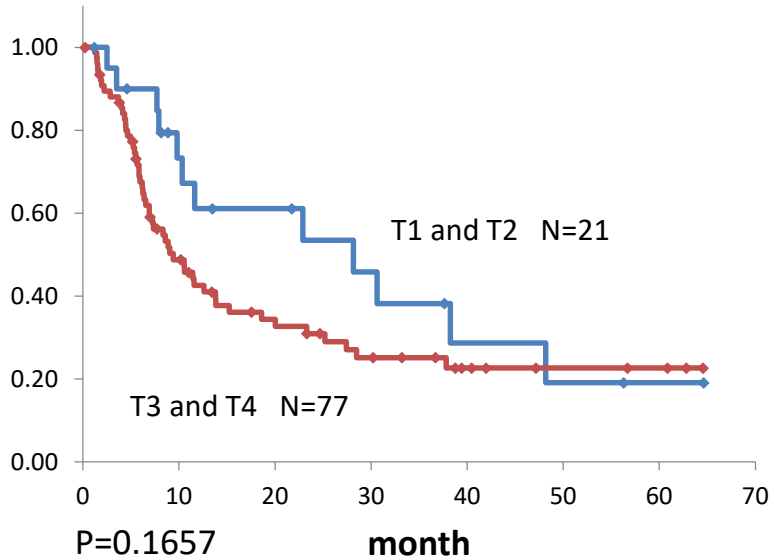
Results

Survival Curve (Kaplan Meier)



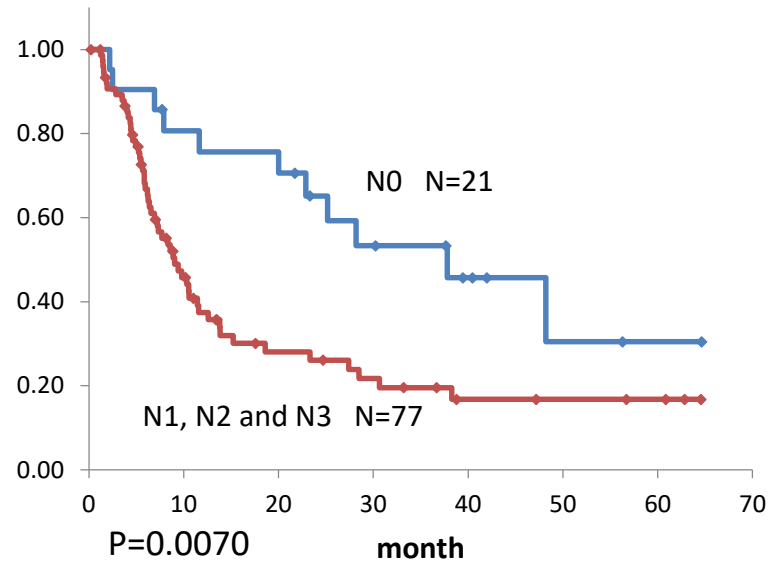
Results

**Survival Curves(Kaplan Meier)
difference in T factor**



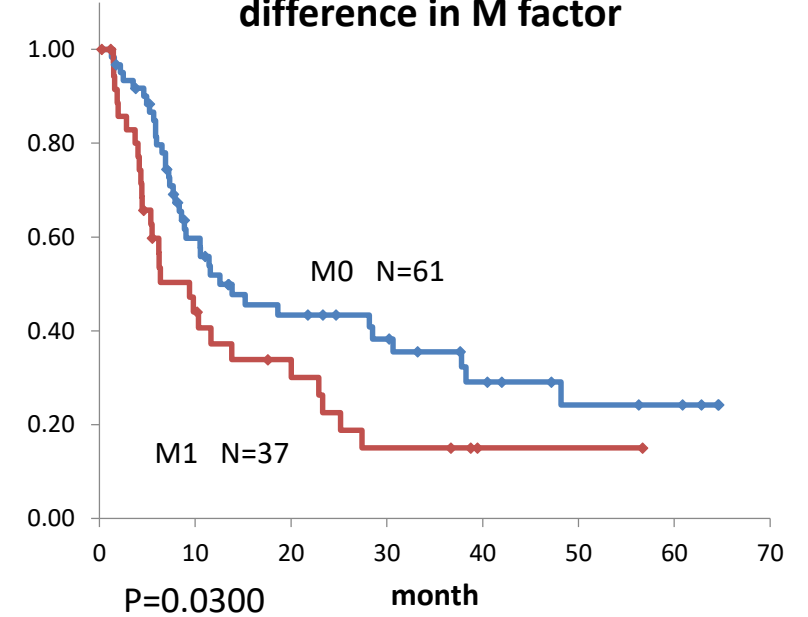
Tumor size was not an important prognostic factor.

**Survival Curves(Kaplan Meier)
difference in N factor**



Lymph adenopathy was a prognostic factor.

**Survival Curves(Kaplan Meier)
difference in M factor**



Distant metastases was a prognostic factor.

Discussion

- Three dimensional images from preoperative CT examination is indispensable to analyze the tumor relating arteries and to successful insertion of microcatheter to the target arteries.
- Microcathet manipulation without a microguide wire is critical to avoid arterial spasm and to get sufficient distribution of anti-cancer drugs with in the target lesions.
- Angio-CT during selective contrast infusion to the target artery is reliable to allocate drugs to each artery and to avoid complications.
- Selection of effective anti-neoplastic agents is important and Spherical embolic material is critical to get good results.
- The critical points to avoid spinal damage are careful observation of intercostal arteriography, angio-CT of the intercostal artery and/or the lidocaine test.
- Transarterial treatment for lung and mediastinal tumors is feasible with use of recent techniques not only imaging techniques and interventional radiology.

References; refer to presentation number 1295

- S Hori, T Nakamura, N Kennoki, I Djima, A Hori Transarterial management of advance lung cancer *Japanese Journal of Clinical Oncology*, 2021, 1–7 doi: 10.1093/jjco/hyab050
- A Hori, I Dejima, S Hori, T Nakamura, S Ueda Transarterial Treatment of Lung Cancer *Life* 2022, 12, 1078. <https://doi.org/10.3390/life12071078>