

on X-ray film, especially in the tumors of soft tissues, mediastinum or lung with pleural effusion.

(3) This scanning was very effective for decision

of radiation field.

(4) Decrease of the uptake was recognized in 7 of 9 cases.

### **Comparative Studies of Lymphography and $^{67}\text{Ga}$ -citrate Scintigraphy on Malignant Tumors**

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Lymphography is an established procedure in the diagnosis and stage determination of malignant tumors but difficult problems such as tumor invasion and metastasis remain to be explored. On the other hand many radionuclides have been proved to visualize positive tumor in scintigram in clinical use. We have demonstrated and compared lymphography and tumor scintigraphy with  $^{67}\text{Ga}$ -citrate of malignant tumor (35 cases).

As the result, it was found that tumor size and

localization were recognized well especially in malignant lymphoma by information both from lymphography and from tumor scintigraphy. Such enlarged tumor especially lymph node involvement of malignant lymphoma that was not demonstrated by lymphography, was able to be recognized well by  $^{67}\text{Ga}$ -citrate scintigraphy. More accurate diagnosis may be obtained by combination of lymphography and tumor scintigraphy with  $^{67}\text{Ga}$ -citrate.

### **The Scintigraphic Distribution of $^{67}\text{Ga}$ in the Normal Human Being**

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In 83 cases 48 or 72 hours after the intravenous injection of 2 mCi of  $^{67}\text{Ga}$ -citrate, scintigrams were recorded in supine position. The concentration of radioactivity was divided into three grades, that is 2(+) when the concentration is the same as that of liver, and the lower area of radioactivity was divided into (+) for the darker and (−) for the lighter. The distribution of  $^{67}\text{Ga}$

is shown in Table 1. Furthermore, the score of  $^{67}\text{Ga}$ -distribution was calculated giving 1.0 for 2(+), 0.5 for (+) and zero for (−) as illustrated in Table 2. Finally the effect of smoothing and the semi-quantitative distribution of  $^{67}\text{Ga}$  in the scintigram were shown which were performed with Tosbac 40 computer connected by the telephone line.

Table 1  
Normal Distribution of Ga-67

|                         | (-)<br>(%) | (+)<br>(%) | (2+)<br>(%) |
|-------------------------|------------|------------|-------------|
| Eyes                    | 50         | 50         | 0           |
| Salivary gl.            | 31         | 69         | 0           |
| Nasopharynx             | 0          | 100        | 0           |
| Thyroid gl.             | 8          | 90         | 2           |
| Mediastinum             | 5          | 91         | 4           |
| Hilar nodes             | 64         | 30         | 7           |
| Lung fields             | 66         | 32         | 1           |
| Shoulder joints         | 47         | 53         | 0           |
| Liver                   | 0          | 0          | 100         |
| Spleen                  | 25         | 59         | 16          |
| Colon (ascend)          | 49         | 39         | 12          |
| (trans)                 | 53         | 37         | 10          |
| (descend)               | 40         | 46         | 14          |
| Rectum, Urinary bladder | 22         | 76         | 2           |
| Hip joints              | 54         | 46         | 0           |
| Lumbar vert.            | 19         | 79         | 2           |
| Testis                  | 27         | 73         | 0           |

Table 2

| Score of Ga-67 Distribution |      |
|-----------------------------|------|
| Liver                       | 100  |
| Nasopharynx                 | 50   |
| Mediastinum                 | 49.5 |
| Thyroid gl.                 | 47   |
| Spleen                      | 45.5 |
| Lumbar vert.                | 41.5 |
| Rectum, Urinary bladder     | 40   |
| Colon descend.              | 37   |
| Testis                      | 36.5 |
| Salivary gl.                | 34.5 |
| Colon ascend.               | 31.5 |
| Colon trans.                | 28.5 |
| Shoulder joints             | 26.5 |
| Eyes                        | 25   |
| Hip joints                  | 23   |
| Hilar nodes                 | 22   |
| Lung fields                 | 17   |

### Study on Silicosis using $^{67}\text{Ga}$ -citrate

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$^{67}\text{Ga}$ -citrate scan, MAA lung perfusion scan and selective bronchial arteriography for Silicosis with large opacities were performed.

MAA lung scintigram showed decreased deposit of MAA in the large opacities, on the contrary  $^{67}\text{Ga}$ -citrate Scintigram showed remarkable increased deposit. The selective bronchial arte-

riogram revealed dilatation in diameter of the bronchial artery, hypervascularization and staining of the contrast medium. The mechanism of  $^{67}\text{Ga}$ -citrate deposition for large opacities was presumed the increased bronchial arterial blood and increased permeability of the capillary.