Cell Dissemination and Implantation of Neoplasms through Biopsy and Excision of Malignant Tumors*

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It is a self-explanatory medical requisite that before treatment a diagnosis must be made. Treatment without diagnosis can only be given in those cases in which the original diagnostic procedure was insufficient to give a clear impression of the disease. The diagnostic procedure, however, loses its meaning if it harms the patient or if his possibility of recovery is thereby endangered. To recognize and avoid exceeding the limit of diagnosis is very difficult. We especially refer here to the diagnosis of malignant intrathoracic neoplasms by needle biopsy or by excision. Countless observations have led to reports of the dissemination and implantation of malignant cells in healthy tissue through needle biopsy or by the excision of malignant tumors for diagnosis (Cole et al., Spjut and Matheo, Freise and Schüller).

While dealing with pneumonectomies, Spjut and Matheo found 59 per cent neoplasm cells in the water with which they rinsed the pleural cavity; they did not find a higher percentage of local neoplastic growth. However, Freise and Schüller, by means of diagnostic excision, were able to demonstrate that in cases of peripheral carcinoma of the lung, the percentage of local pathologic changes by implantation of neoplasm cells was increased and the five-year survival rate was decreased. They compared two groups of patients. In the first group, a typical diagnostic excision was done with a scalpel for a frozen section. In the second group, the neoplasm was totally resected by wedge excision, examined and then only lobectomy or pneumonectomy was performed.

One may clearly see from the graph that the five-year survival rate with a typical diagnostic excision is 40 per cent decreased by local pathologic changes caused by neoplasm cell implantation during the operation—in comparison to the group in which the neoplasm was directly and completely removed. The difference is statistically significant.

After studying countless reports and through their own observations of neoplasm cell implantation by needle biopsy or excision in cases of intrathoracic neoplasm, Freise and Schüller came to the conclusion that through biopsy of the mediastinum with Carlen’s method, a dissemination of neoplasm cells could occur. In the meantime, they observed a patient who had had mediastinoscopy done three months before, and who developed tumor-metastasis in the mediastinoscopy wound.

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Not the percentage of metastasis caused by cell implantation is important, but rather whether manipulation of the neoplasm was necessary. If a diagnostic excision or needle biopsy is made in a patient in good condition and malignant cells are implanted in healthy tissue, the chances of survival are decreased. Undoubtedly, certain conditions must exist for the development of disseminated malignant cells: the type of tumor, the quantity of disseminated cells and the resistance of the body. All these play an enormous role. The malignancy of cells of a malignant melanoma cannot be compared with a basaloma. While one cannot do any manipulating of a melanoma, in a basaloma, one may easily perform a puncture or an excision without danger. With regard to the quantity, in patients with malignant neoplasms, cancer cells can circulate in the blood without causing metastasis for a long time (Engel, Rassmussen). If the body is weak or the resistance low due to the progress of the neoplasm or other diseases or unknown factors, it comes to the settling down of neoplasm cells and then metastasis begins to develop. One cannot determine from a puncture or an excision of a suspicious tumor of unknown etiology: 1) in what state of resistance the body finds itself; 2) what type and degree of malignancy the tumor has, and 3) how the tumor would be damaged and how many cells and groups of cells will be disseminated and freed through manipulation.

The possibility of gross damage to a neoplasm by a scalpel (Butlin, Rydall, Saphir) or by an excision clamp (Freise and Schüller) will be more dangerous than with a thin needle. It is also possible to disseminate potentially dangerous cells with a thin needle and to cause the development of implantation metastasis (Unverricht, Ochsner, Freise and Schüler). Therefore, we tried by animal experimentation to clarify this question and experimented on rats with the Walker tumor and the Yoshida sarcoma. In each experimental group, 20 rats of the Sprague-Dowley type were intraperitoneally implanted with the Walker tumor or Yoshida sarcoma. From the sec-

FIGURE 1: Tumor-metastasis growth in the mediastinoscopy wound three months after mediastinoscopy.

FIGURE 2: Implantation-metastasis in abdominal wall of Walker tumor and Yoshida sarcoma.
ond to the sixth days, the tumor ascites was frequently punctured. Within three to five days, implantation metastasis developed in the abdominal wall, that is, 55 per cent Walker tumor and 80 per cent Yoshida sarcoma.

An opposing argument is that in ascites cases, the implantation of ascites fluid with tumor cells in the puncture channel is favored on account of interperitoneal pressure. In reality, it could be possible that the form of the ascites tumor or tumor pleuritis may be compared only partially with a solid tumor. Therefore, we have implanted both tumors in two experimental groups subcutaneously and intramuscularly. The rapid infiltrative growth of these tumors facilitated the evidence of tension of the tumors in the puncture channel.

In order to demonstrate further the dissemination and implantation of cancer cells, we punctured (in two experimental groups) the ascites tumor with a thin needle without aspiration. With the same needle, a puncture was immediately done in the abdominal wall of a healthy rat: a Walker tumor (40 per cent) and a Yoshida sarcoma (60 per cent) implantation metastasis developed in the puncture channel.

In both groups, in 10 per cent of the cases, an ascites developed as well.

We tried to prevent the implantation of neoplasm cells in the channel of another group by electrocoagulation of the puncture needle, but it was not possible. In the necrotic puncture channel, neoplasm cells grew in the same percentage as in the other group.

To ascertain the number of cells disseminated by a thin needle (0.64 mm Ø) after the puncture of an ascites tumor, we washed the puncture needle in a drop of ether alcohol solution on a microscopic slide and then stained by the Pappenheim method. One could see microscopically with a 6.3 objective 190 to 240 neoplasm cells in the field of vision.

Although these trials are only animal experiments with very aggressive neoplasms in tumor-sensitive rats, and although the relations are only limited as far as humans...
are concerned, it is evident that neoplasm cells can be disseminated and lead to implantation metastasis by using even the thinnest puncture needles. In spite of the fact that in humans, a very low percentage of dissemination and implantation of neoplasm cells would occur, in bronchogenic carcinoma the preoperative diagnosis of an operable intrathoracic neoplasm by needle puncture or excision is not only unnecessary, but also it is to be avoided on account of the danger, that the fate of the patient would be jeopardized by these manipulations.

**Summary**

Dissemination and implantation of malignant cells by needle biopsy or excision are known. Implantation tumors could be observed after typical excision during thoracotomy, after transthoracic punctures and excisions and after mediastinoscopy.

The development of implantation tumors depends upon certain favorable factors: 1) the quality of the neoplasm, 2) the quantity of disseminated cells, 3) the resistance of the organism. On aspiration biopsy or excision from a focus suspected of being neoplastic, it cannot be said *a priori*: what is the present state of resistance of the body, what is the morphologic structure of the tumor, to what degree of classification the tumor belongs, how many neoplasm cells are disseminated through the manipulation.

Through animal experiments on rats with the Walker tumor and Yoshida sarcoma, the frequency of tumor ascites and intramuscular tumor was examined. Implantation tumors occurred in a high percentage in the puncture channels. Electrocoagulation of the puncture needle did not prevent the development of implantation metastasis. Tumor ascites puncture needles, after their use without aspiration, caused, due to adhering neoplasm cells, the transfer of neoplasms to healthy rats in 40 per cent to 60 per cent, respectively. On account of the danger of implantation- possibility of malignant cells, one should abstain from diagnostic manipulations in patients with intrathoracic tumors or neoplasms who can be subjected to surgical treatment without great risk.

**Resumen**

La diseminación e implantación de células neoplásicas en las biopsias por acupuntura o excisión, es una posibilidad reconocida. Se ha observado tal implantación después de la extirpación de tumores intratorácicos o de punciones o incisiones pectorales y después de mediastinoscopias. El desarrollo de las implantaciones tumorales depende de ciertos factores favorecedores: 1) el tipo histológico de la neoplasia, 2) la cantidad de células implantadas, 3) la resistencia del organismo.

Al puncionar o excindir una lesión de etiología desconocida, pero sospechosa de ser de na-
turaleza tumoral, no es posible determinar a priori el estado de la resistencia orgánica, o cual es la estructura morfológica de la lesión o su grado en la clasificación de las neoplasias, o cuantas celulas tumorales son diseminadas por la manipulación.

Mediante la experimentación en ratas con tumores de Walker o el sarcoma de Yoshida, se ha determinado la frecuencia de ascitis tumorales y tumores intramusculares. Las implantaciones tumorales ocurrieron en un alto porcentaje a lo largo del canal de punción. La electrocoagulación de la aguja no impidió las metástasis de implantación. Las agujas usadas en la punción sin aspiración, de ascitis tumorales, debido a la adherencia de celulas neoplásicas, causaron la transferencia del tumor a ratas sanas en un 40 a 60 por ciento.

Dedícuo al peligro de la posible implantación de celulas malignas, el autor aconseja la abstención de manipulaciones diagnósticas en los casos de neoplasias intratorácicas operables.

ZUSAMMENFASSUNG

REFERENCES

For reprints, please write: Dr. Freise, Am Grossen Wannsee 90, 1 Berlin 39, Germany.

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