

## SELECTION OF PATIENTS FOR THORACOTOMY - WHO CAN BE CURED BY SURGERY?

J. Høie, G. Sæter, Ø.S. Bruland, Ø.P. Solheim

Department of Surgical Oncology and Department of Oncology and Radiotherapy,  
The Norwegian Radium Hospital, University of Oslo, Norway.

Three essential questions must be raised before cancer surgery

1. will the patient tolerate the surgical procedure
2. will surgery possibly relieve pain/suffering, prolong life or in best case cure the patient?
3. is removal of the tumor tissue feasible

Osteosarcoma patients are usually young, in good physical condition with normal cardio/pulmonary functions. Our first precondition is thus usually met, and need only a short deliberation. Even repeated thoracotomies are well tolerated. Extensive tissue excisions are not a part of metastasectomies, marginal excisions are advisable. An accepted rule of the thumb declares that a pneumonectomy in the metastatic situation is unwise. Pulmonary insufficiency is thus not an important issue. The effect of repeated thoracotomies is more prone to reduce the accuracy of further radiological diagnostics due to postoperative scar, fibrosis and distortion and make surgical complications more apt for the same reasons. Although the patients may tolerate another thoracotomy, the recurrence implies frustration and a new threat to the patient existence. To mobilize the trust and optimism that is necessary takes its toll. The benefit of another thoracotomy must be assessed with critic before it is offered to the patient. Biology is not the only focus. The value and goal of pulmonary metastasectomies are to assure prolongation of life. Relief of pain or diminished suffering are of less importance as pulmonary spread most often is silent and symptomless.

Life prolongation, cure, is the aim and goal, and metastasectomies should be restricted to those patients who will benefit from surgical interference.

There are ample notions that surgical excision of tumor tissue in cancer patients is beneficial, and might cure the patient. This experience refers to removal of clinically defined tumors also in the metastatic situation. It applies only to complete excision of the whole tumor, the benefit of debulking or reduction is much less convincing.

Those of us who have been around for some time do remember the disappointing results following metastasectomies in osteosarcoma patients 20-30 years ago, even in highly selected patients with a single metastasis and a long history before pulmonary spread. Metastasectomy in osteosarcoma patients was an inadequate undertaking, even though the metastases in osteosarcoma patients most often are restricted to the lungs. Success was limited to some very few individuals with slowly growing tumor tissue. The presence of tumor cells in blood, the growth of multiple micrometastases granted no victory by surgery alone.

In the late two decades the picture has altered, the cure rate in selected osteosarcoma patients with pulmonary metastases has passed 50% and is still improving with more effective chemotherapy and combined treatment.

Chemotherapy has definitely changed the scenery, has converted more osteosarcoma patients from individuals with widespread micro and macrometastases to individuals with a reduced number of micrometastases and some few macrometastases, rendering the possibility for surgical excision of a low number of metastases, excision that implies removal of the major part of the tumor burden that may be beyond salvage by chemotherapy.

Presenting improved survival rates in per centage is double-edged. We must mind that results are products of selections. If we select 50 patients and cure 30 of them, our cure-rate is 60%. If we include 75 patients from the same group for intensive therapy and cure 35 of them, our cure-rate has dropped, but 5 more patients are cured at the plausible price of more serious complications, higher cost, more frustrations. This is to say that selection of patients for cure by intensive therapy is not given at one time and for all patients. Osteosarcoma patients who may be cured by lung surgery following chemotherapy are not given by names or define by evident criteria. The selection criteria are modified with more effective diagnostics and chemotherapy. What might be called an aggressive attitude seems justified. We should however, be aware that the tyranny of small numbers may dictate wrong answers in this matter.

Our third regard before surgery : Is removal of evident pulmonary spread feasible? Complete excision is necessary. The promise of cure of metastases inheres of cause remedy of the primary tumor and effective chemotherapy of potential micrometastases that are not removed by surgery. Growth into pleural and thoracic wall may impede removal. Pulmonary metastases should be numbered precisely, if the radiologist once counts to 22, then next time to 19, I take it that complete metastasectomy is not practicable. The number of metastases has technical implications only, and the number may increase from plain x-ray, to CT scan and palpation on a well deflated lung. False positive radiological findings are not a major problem, but subpleural and intrapulmonary lymph nodes are more common than described in textbooks, and fibrosis and scars following previous lung surgery may cause difficulties.

Later recurrences following metastasectomies in osteosarcoma patients may be due to at least two components; growth of micro-metastases that would be undetectable during primary lung surgery, or enlargement of a minor metastasis that could have be localized and removed by more sophisticated diagnostics.

Peroperative radiodetection of pulmonary metastases offers a method that may optimize surgical removal. Radio-immune-guided surgery depends upon a suitable target seeking carrier of radioactivity and an appropriate isotope. Our experiences with  $^{99}\text{Tc}$ -methylene diphosphonate were not helpful in the operating theater, but bench experiences announce that point sources of  $^{125}\text{I}$ ,  $^{152}\text{Sm}$  and  $^{165}\text{Er}$  might detect metastases with a radius of 1 mm - and offer a diagnostic method that may add to the completeness of tumor removal. However, refinement of surgical technique will only have marginal impact. The growth of micrometastases that are demonstrated by refined diagnostic methods must be hampered by more effective chemotherapeutics.

I should like to illustrate the presence of micrometastases and the effect of treatment by a case I operated upon more than 10 years ago. The  $^{131}\text{I}$ -scintiscan shows black lungs following diffuse lung uptake in a patient with apparently complete normal lung tissue, judged by both by x-ray and peroperative inspection and palpation. A random pulmonary biopsy reveals however, abundant number of small micronoduli that are made up by tumor cells. As we had the optimal tumor-seeking carrier of radioactivity, the patients was cured and are completely free of tumor more than 10 years after.

This patient had micrometastases from an iodine-hungry follicular thyroid carcinoma. The case however, illustrates the result of a competent, effective tumor-seeking diagnostic and potent tumor-seeking therapeutics, and portray what is needed also in osteosarcoma patients.

Pulmonary metastases from osteosarcoma is a curable disease to-day. There are however, still many failures. On the road to improvement surgery of pulmonary metastases may not only contribute to the cure of the individual patient, but also to the adjustment of chemotherapeutic regimes and the accumulation of knowledge offered by examinations of tumor specimen in patients who are underway to recuperation or deterioration.