Chronic Pulmonary Suppuration

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The purpose of this paper is to focus attention on present antibiotic treatment of pulmonary suppurative disease, inasmuch as the current literature does not stress medical management. From the literature one receives the impression that in acute suppurative conditions of the lung surgical treatment is still the preferred method of management and that it should be instituted early. In fact, acute pulmonary abscess is still claimed to be a surgical problem from the beginning. While it is true that surgical intervention is required in some cases, it is also true that in other cases medical management alone renders surgery unnecessary. The authors hope that this article will indicate that the concept of surgery a priori as the proper treatment of pulmonary abscess is no longer true. Surgical treatment may be required—but not before medical treatment has first been tried and found to be incompletely effective. Although we believe that present day surgical opinion is no longer so restrictive, the literature does not make clear that a change in concept has occurred.

Although this discussion deals with suppurative disease of the lung in general, emphasis is given to lung abscess because that is l'exemple par excellence of pulmonary suppurative disease, concerning which so many articles have been written. In the literature great stress is given to preventing the acute condition from becoming chronic. But the dividing line between acute and chronic stages is at best a hazy and artificial one. Frequently the onset of illness can be only poorly established so that the transition into chronicity can be only poorly determined. Besides, with all the antibiotics that are freely administered today, the course of the disease is affected to a degree that makes the old dictum of six weeks the point where the acute stage ends, no longer true. Moreover, the importance of acute or chronic classification is further lessened by the fact that treatment, up to a certain point, is substantially the same.

A brief review of the literature at this point may be profitable. Allen and Blackman,1 in a series of more than 2,000 cases, collected up to 1936, found a mortality of 34.4 per cent for the medically treated cases. However, the drop in mortality for the cases in the series that received surgical treatment in addition to medical care was only 0.2 per cent. Early surgery was the only means of further lowering this mortality. As early as 1920, Heuer2 performed early drainage in a small group of cases with surprising success. This method became firmly established following the classic articles of Neuhof and Touloff3 who advocated surgical drainage as the best therapy for the acute, putrid lung abscess. The early mortality of 35 per cent was reduced by them to 5 per cent and later to approximately 3 per cent. This led to the era when the diagnosis of lung abscess automatically indicated surgical treatment by drainage. There was general acceptance of their results and conclusions. We, also, agree with them—but only for

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the period preceding the present era of antibiotics. D. T. Smith collected 2,166 cases between 1938 and 1948. The mortality of medically treated cases was 34.7 per cent while the mortality among the surgically treated cases was 32.7 per cent. This is not a significant difference. Yet the surgical cases included the series of Neuhof and Touloff with only a 2.6 per cent mortality. This was exceptionally low and not approached by any other surgeon. If Neuhof's series is excluded the mortality rises to 40.4 per cent for the surgical group. Neuhof's series was selective, in that he excluded what he called, "acute suppurative bronchopneumonia." Smith believed that medical treatment was responsible for conditions resulting in the death at one third of the patients who developed primary pulmonary abscesses. In contrast to the surgical series the cases coming under medical management, more often than otherwise, were more complicated. Smith observed that surgically treated patients fared better than those treated medically. Yet in his study of collected cases, contrasting surgical versus medical treatment, there are 10 authors who appear in both groups. When a comparison is made we find that eight of these 20 had fewer deaths not in the surgical series, but in the medical series. (Figure 1.) It is obvious from these statistics, that one may be justified if he regards them with some degree of skepticism. On the other hand, it is true that in the surgical series, chronicity developed in 12.8 per cent fewer patients.

In April, 1948, Glover and Clagett stated, "The advent of chemotherapy and the antibiotics has further tended to postpone a more definitively surgical attack, so that there is a tendency to revert to the so-called more conservative attitude in the hope that newer drugs can accomplish cures denied to earlier medical regimens." They undertook a study, the purpose of which was, "to forestall any such fallacious thought."

As late as January, 1954, Waterman and Domm, said, "Statements contending that the antibiotics have made lung abscess entirely a medical problem are both fallacious and dangerous." Also, quoting further, "lung abscess is a surgical disease from the outset." The same authors, in May, 1955, claimed that there are three fallacies commonly held by many physicians concerning lung abscess: (1) Lung abscess is so rare it is no longer of importance, (2) medical treatment alone suffices in practically all of the few cases encountered, (3) resection is the only surgical procedure to be considered in the remaining cases. We believe the first two of the fallacies mentioned above are exaggerated. Personally, we do not know anyone entertaining such ideas. As to the third fallacy—we do not believe it is a fallacy. It is a truism. In one recent article, the above authors state, "while our over-all mortality, since antibiotics have been used, has been gratifyingly low, we have actually seen no decrease, but rather an increase

<table>
<thead>
<tr>
<th>Authors</th>
<th>Number of Patients</th>
<th>Medical Mortality</th>
<th>Surgical Mortality</th>
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<tbody>
<tr>
<td>Allen &amp; Blackman</td>
<td>2114</td>
<td>34.4%</td>
<td>34.2%</td>
</tr>
<tr>
<td>D. T. Smith</td>
<td>2166</td>
<td>34.7%</td>
<td>32.7%</td>
</tr>
<tr>
<td>D. T. Smith, excluding Neuhoff &amp; Touloff</td>
<td>2014</td>
<td></td>
<td>40.4%</td>
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FIGURE 1
in the number of cases coming to surgery." On the other hand, Gittens and Mihaly, have said "Lung abscess is definitely decreasing in incidence," and that, "the number of patients requiring surgery will become increasingly smaller, if prompt and adequate antibiotics and ancillary medical measures are instituted early in the course of acute supplicative disease."

We believe that fewer lung abscesses are seen today, probably because ill patients are commonly treated early with penicillin or with other antibiotics. It should not be a maxim at present that acute suppuration indicates early surgical intervention. Under adequate medical management, the supplicative process will be either cured or rendered less hazardous for surgery. C. W. Holman, early in 1950, pointed out that the "Complications of persistent bronchocutaneous fistula or bronchiectasis at the site of the previous abscess have long been recognized as serious objections to simple drainage." He believes early surgical drainage is rarely necessary, and instead, conservative treatment with antibiotics should be used first. The initial sepsis and toxicity is usually readily controlled by antibiotic treatment and satisfactory response may be expected. Some patients progress to complete recovery; others pass into a chronic phase for which resection will be required, but which will allow conservation of greater lung volume. Prior to April, 1949, Holman successfully shelled out the lung abscess in three cases, thus avoiding the sacrifice of the entire lobe. In April of the following year, B. J. Ryan reported on 110 consecutive

**ORGANISM FREQUENCY OF ADMISSION SPUTUM**

<table>
<thead>
<tr>
<th>ORGANISM</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>STAPH. ALBUS</td>
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<tr>
<td>STAPH. AUREUS</td>
<td></td>
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<tr>
<td>STREPT. HEMOLYT.</td>
<td></td>
</tr>
<tr>
<td>DIPHTHERIODS</td>
<td></td>
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<tr>
<td>N. CATARRHALIS</td>
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<tr>
<td>YEASTS</td>
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<tr>
<td>STREPT. VIRIDANS</td>
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<td>PROTEUS VULGARIS</td>
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</tr>
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<tr>
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<tr>
<td>E. COLI</td>
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<tr>
<td>KLEBSIELLA</td>
<td></td>
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<tr>
<td>N. FLAVA</td>
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</tbody>
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**FIGURE 2**
Resections without operative mortality from May 1, 1946, to January 1, 1949. In three cases segmental resection only was done for chronic lung abscess. Such excellent results can only be obtained with the aid of chemotherapy. In March, 1954, Fox, Hughes, and Sutliff, reported on 32 cases of lung abscess treated without benefit of surgery. Twenty-eight were cured; one improved; and one died.

In this discussion bronchiectasis is included as one of the suppurative processes. Simple bronchiectasis, in which infection is not the dominant condition, is excluded. Infected bronchiectasis, demonstrated by infection with expectoration of sputum, slight elevation of temperature, and evidence of pulmonary pathology by x-ray examination, is essentially a suppurative process.

In our cases, we have seen patients with slight bronchiectasis, who were admitted with few or no symptoms, clear up the infiltrations seen by x-ray when treated with antibiotics. Patients who have bronchiectasis should not be rushed into surgery simply because this condition is present. Resection should be reserved, however, for the patient who has extensive bronchiectasis, persistent hemoptysis, or severe hemorrhage—the patient who requires relief from the pathologic process of his disease.

There is merit to the statement of Wynn-Williams that, "It may not be justifiable to advocate surgery whenever this is possible; a high proportion of bronchiectatic persons remain well and are little inconvenienced by their disease, if competently treated by postural drainage and antibiotics."

Frequently patients who presented themselves with lung abscess were found to have bronchiectasis. This was determined in some cases by bronchograms, when surgery was not done; and in other cases, where resection was performed, the pathologist reported bronchiectasis in the removed specimen.

Rosenblatt notes the importance of bronchography to determine residual cavitation, which often is not readily seen by ordinary x-ray film exposure. We now try to do bronchography on all patients with suppurative disease prior to discharge.

<table>
<thead>
<tr>
<th></th>
<th>Penicillin</th>
<th>Tetracycline</th>
<th>Oxytetracycline</th>
<th>Chloramphenicol</th>
<th>Erythromycin</th>
<th>Magnomycin</th>
<th>Streptomycin</th>
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<tr>
<td>Staph. Aureus (C+)</td>
<td>R</td>
<td>R</td>
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<td>S</td>
<td>R</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>N. Catarrhalis</td>
<td>R</td>
<td>S</td>
<td>S</td>
<td>S</td>
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<td>H. Influenzae</td>
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<td>Mixture</td>
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<td>S</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
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**FIGURE 3**
The cases in the present study form a selected group rather than the general run of cases seen in a non-specialty hospital. They are patients who were referred to us with the diagnosis of pulmonary tuberculosis, or, as tuberculosis suspects, and who, in reality, were suffering from lung abscess, bronchiectasis, or some other form of chronic pneumonitis. They were all managed in a similar manner so that, although they do not comprise a pathological entity, they do make up a clinical entity. In this series of 36 cases, the usually listed causes of suppuration, such as operative procedures on the oropharynx, were absent. There were eight chronic alcoholics, three epileptics, and two diabetics in the group. One had sustained significant chest wall trauma of the area that later developed an abscess. There was a marked preponderance of white (81 per cent) men (75 per cent) in the series. The age distribution ranged from the third to the eighth decade, with the majority falling in the age group from 35 to 65. Only one third of the group gave a history of previous major respiratory infection, usually pneumonia. Fourteen of the 36 had been inadequately and unsuccessfully treated with antibiotics prior to admission.

The most common symptoms were in decreasing order, productive cough, chest pain, weight loss, and fever. Dyspnea was reported in six and hemoptysis in 10, the latter sign almost wholly in patients with bronchiectasis. One complained only of arthritis on admission. Only 10 had an admitting temperature of over 101°F. Nineteen had significant leucocytosis. In 17 the tuberculin reaction was negative. Foul sputum was encountered in only four patients, probably indicating that physicians are less likely to confuse suppuration with tuberculosis, in the presence of foul sputum. Bronchoscopy revealed mucosal erythema or purulent secretions in 17 of the 26 (65 per cent) patients bronchoscoped. Roentgenograms showed a unilateral lesion in 30 of 36 patients.

Our policy, when suppurative disease is suspected, is to obtain a sputum specimen at the earliest opportunity, start penicillin immediately and then adjust the antibiotic in accordance with sensitivity studies.
commonly found in the sputum are frequently those considered not to be particularly pathogenic. The distribution we encountered is shown in Figure 2. To determine organism sensitivity to the various antibiotics we use the disc method, but realize fully its disadvantages. To run individual cultures on all organisms is too time consuming and requires a large laboratory staff, of a size which is not attainable at our institution. The disc method is a screening method of discovering which antibiotics are effective against the flora present. Sensitivity study is initiated as soon as the sputum is sent to the laboratory. Approximately 24 hours later the report is received and treatment with a suitable antibiotic is immediately begun. But the final bacteriological determination may require another 24 hours for final identification. If resistance to all common antibiotics is indicated, we will then subculture and determine the individual organism sensitivity. Figure 3 shows how the disc method may be misinforming. It is possible for the mixture to be totally resistant to all antibiotics because of overlapping of resistances. In this illustration the hemophilus is sensitive to many antibiotics which would not be suspected from the disc method, which shows only sensitivity to chloramphenicol.

Prolonged chemotherapy has been our policy. We have not infrequently watched a patient improve gradually over three months and occasionally over a six months period. We have recently seen a patient, not included in this series,* in whom a lung abscess secondary to bronchiectasis closed after more than one year of conservative management. However, we certainly do not advocate such prolonged treatment. In this case a diagnosis of pulmonary tuberculosis was made at another institution where the patient was hospitalized for six months. When the patient was transferred to us, we accepted the original diagnosis. There was slow, progressive clearing of a basal lesion of the left lung. During the entire period of hospitalization—before entering Kiefer, and while at Kiefer—no conclu-

*This case was studied after the series was completed.
sive proof of tuberculosis was found. Finally a bronchogram revealed the apparent tuberculosis infiltration to be due to bronchiectasis.

Early resection was performed only when we were uncertain whether we were or were not dealing with malignancy. Usually we have waited until a maximum response to medical treatment was obtained. Improvement may go on to complete resolution or may stop short of that desired goal. When resolution is incomplete, resection is advisable if the residual lesion is considered to be potentially hazardous to the patient's future health. In 21 of our patients, complete resolution occurred with medical management. The remainder had surgery. Ten were resected in less than three months, 4 in more than three months but less than six months, and one after six months. Eleven had one lobe or less resected, four had pneumonectomy (three of four bronchiectasis). There was no death among the surgical cases. Two patients expired, one of multiple brain abscesses, the other of pneumococcal meningitis.

Illustrative Case Summaries


Case 2: C. M. A 36 year old white man, was admitted on July 11, 1952, with a history of productive cough, fever, and right pleuritic chest pain starting suddenly the previous July. After three injections of penicillin, he felt better and returned to work. Early in October, he again became ill with fever and cough productive of large quantities of foul green sputum.


FIGURE 6A

FIGURE 6B
Case 3 (Figure 4): F. S. This 52 year old man was admitted on September 14, 1951, with a history of left chest pain and dyspnea of two months duration. He had lost 24 pounds in the preceding nine months. He denied cough and hemoptysis.

Admission temperature—99.6°F.; WBC—12,400; tuberculin—negative 1:1,000. 

Bacteriology reported only paracolon from bronchoscopy. Bronchoscopy report missing.

Surgery: Ten days after admission left upper lobe was resected because there was a strong suspicion that tumor was present. Pathologist reported chronic suppuration, purulent bronchitis and bronchiectasis. Twenty-four days hospitalization.

Case 4 (Figure 5): H. L. A 53 year old white man admitted April 1, 1953, with history of dyspnea for one week, productive cough and right pleuritic pain for one day. Fatigue for six months. Two years previously he had been in an auto accident. Several ribs had been broken and the lung punctured. He had had thoracotomy at that time.

Admission temperature—103°F.; WBC—15,000; hemoglobin—12.5 gm.; tuberculin—negative. 

Bacteriology: Streptococci and Staphylococcus albus. Treated with chlortetracycline and chloromycetin with good clearing of lesion. Discharged after 107 days of hospitalization.

Case 5: E. Y. This 30 year old white man, was well until two months prior to admission, when he began to have painful swelling of both knees and both ankles. In retrospect he recalled a severe cold with cough and fever three months before. He lost 15 pounds and felt tired. He was unsuccessfully treated for rheumatoid arthritis by his own physician until a routine chest film showed a pulmonary lesion.

Past History: Pleurisy two years before. Convulsions for two years—last episode three months prior to admission.

Physical Examination: Clubbing of fingers. Admission temperature—99.8°F.; 

WBC—17,900; Hemoglobin—normal. On treatment with penicillin followed by chloramphenicol, both the chest lesion and the osteoarthropathy improved, and he was discharged 34 days after admission, asymptomatic.

Case 6: M. E. A 33 year old negress admitted July 23, 1954, with a one month history of productive cough, weight loss, fever and hoarseness. She was treated with penicillin for three weeks at another hospital before transfer here.

Admission temperature—99.4°F.; WBC—9,900; hemoglobin—13.5 gms.; tuberculin—2+. 


Case 7 (Figure 6): J. M. This 72 year old white man was admitted May 3, 1952, critically ill, unable to give a history.

Admission temperature—100°F; WBC—11,750; tuberculin—negative. 

Bacteriology: B. proteus, staphylococcus albus, diptheriods, fusiforms, sensitive only to chloramphenicol and oxytetracycline. Later studies showed similar organisms, but they were sensitive to chlortetracynline and oxytetracycline only. Bronchoscopy: Narrowing of right main bronchus July 2, 1952; repeated on July 16, 1952, and reported as showing much less narrowing. Treatment: Penicillin May 13 to May 20, 1952. Chloramphenicol May 20 to June 24, 1952, and chlortetracycline July 2 to July 28, 1952. After considerable clearing, he was transferred to a general hospital. Eighty-seven days hospitalization.

FIGURE 7A

FIGURE 7B
Case 8: L. P. This white woman, 68 years old, was admitted July 22, 1953, with a history of having caught cold seven months before, following which she developed progressive weakness and chronic cough. In June, 1953, she had coughed up blood. She had pneumonia in 1948.

Admission temperature—98.8°F.; WBC—7,000; tuberculin—positive only in 1:100 dilution. Bacteriology: alkaligenes, diphtheroids, Streptococcus pyogenes, Staphylococcus aureus. Bronchoscopy: Edema of right main stem bronchus. Treated with chloramphenicol and streptomycin with good results. Discharged 44 days after admission.

Case 9 (Figure 7): W. S. This white man, 53 years old, was admitted July 31, 1951, with history of weakness and weight loss over a two months period.

Admission temperature—99°F.; WBC—14,600; moderate anemia; tuberculin—negative. Bacteriology: Staphylococcus albus, Hemolytic streptococcus. Treated with penicillin alone. The lesion cleared well, and he was discharged 45 days after admission.

Discussion

From the literature, it seems that there are two schools of thought regarding the treatment of pulmonary suppurative disease. The first regards suppurative disease—best exemplified by lung abscess—as a surgical problem from the outset. The second, that it is a medical problem. Among the supporters of the first group, there would seem to be some confused thinking. In practice they actually are using combined medicosurgical treatment. It would appear, then, that the proponents of surgical treatment would routinely do some resection after the patient has had the benefit of some medical management.

We believe that surgery should be considered secondarily—only after proper medical management has been used and has fallen short of cure. The end result of medical therapy may obviate the need for surgery, or, if the scalpel is still required, the result will be better and performed more safely.

The role of surgery is not being minimized, but, we should recognize the great advances made in medical management of the patient with suppurative disease.

We wish to emphasize that it is difficult for us to think of patients as surgical or medical cases. At first, they are neither—for we do not know what the result of medical management will be. They are simply patients to be treated, and, if possible, made well; and, the first part of the treatment must be medical. Whether it remains strictly medical or will encompass surgical treatment also, will depend upon the course of the disease.

We believe that the antibiotics available today have entirely changed the surgical treatment of pulmonary suppurative disease. With more patients surviving the acute stage of suppurative disease, the problem of treatment of the chronic stage becomes ever more important. We do not believe that pulmonary suppurative disease in the acute or chronic stage should be regarded as either medical or surgical. Our attitude is that this condition be approached medically, and as long as improvement continues, it should be allowed to go on.

CONCLUSION

1. Pulmonary suppurative disease is not primarily a surgical condition. It should always be treated medically initially. Whether or not surgical intervention will follow will be determined by the changes that occur in each case.
2. Bronchoscopy is indicated in almost every case, and may be used both diagnostically and therapeutically.
3. The laboratory should determine the pathogenic organism preferably from the bronchial secretions. Suitable antibiotics should be chosen on the basis of sensitivity study.
4. A lesion that is unresolved after a period of treatment, considered to be adequate, should be resected. In those cases where the suppurative process has resolved, but a slight degree of bronchectasis persists with few or no symptom, resection should not be done.
5. Bronchographic study should be made in every case. This is of importance not only in the current therapy, but also as a reference point if there is recurrence of illness.

CONCLUSIONES

1. La supuración pulmonar en principio no es un padecimiento quirúrgico. Siempre debe tratarse medicamente al principio. Si se ha de usar o no más tarde la cirugía será de determinación más tarde según la evolución.
2. La broncoscopia está indicada en casi todos los casos y puede usarse con fines diagnóstico y terapéutico.
3. El laboratorio determinará el organismo patógeno de preferencia a partir de las secreciones bronquiales. Deben escogerse los antibióticos necesarios según las pruebas de sensibilidad de los gérmenes a ellos.
4. Una lesión que no se resuelve después de cierto período de tratamiento que se considere adecuado, debe resecarse. En los casos en que el proceso supurante se ha
resuelto pero persiste la bronquiektasia en cierto grado con pocos o ningunos síntomas, la resección no debe hacerse.

5. Debe hacerse estudio broncográfico en todos los casos. Esto es de importancia no sólo en la actualidad, sino como punto de comparación para las recurrencias.

RESUME

1. Les suppurations pulmonaires ne constituent pas d'embée une indication chirurgicale. Elles devraient toujours être traitées d'abord médicalement. L'intervention chirurgicale éventuelle sera déterminée par l'évolution de chaque cas.

2. La bronchososcopie est indiquée dans presque tous les cas, et peut être utilisée à la fois dans un but diagnostic et thérapeutique.


4. Une lésion qui ne s'est pas améliorée après une période de traitement considérée comme adéquate, devrait être réséquée. Dans les cas où le processus suppuratif a été jugulé, mais où il persiste un certain degré de bronchectasie avec peu ou pas de symptômes, la résection devrait être pratiquée.

5. Une étude bronchographique devrait être faite dans chaque cas. Elle est importante non seulement en thérapeutique courante, mais aussi comme élément de référence s'il y a récidive de l'affection.

ZUSAMMENFASSUNG


2. Eine Bronchoskopie ist fast in jedem Fall angezeigt und kann sowohl diagnostisch als auch therapeutisch von Nutzen sein.

3. Im Laboratorium müssen die pathogenen Keime vorzugsweise des Bronchialsékretes analysiert werden. Entsprechende Antibiotica müssen auf der Basis von Sensibilitätstests gewählt werden.


5. Bronchographische Untersuchungen müssen in jedem Fall unternommen werden. Das ist von Wichtigkeit nicht nur für die laufende Behandlung, sondern auch als ein Merkzeichen, wenn es zu einem Rückfall der Erkrankung kommt.

REFERENCES


