Bronchoscopic Criteria for the Diagnosis of Tuberculous Lymph Node Perforation into the Bronchial Tree of the Adult

A Critical Analysis of 700 Cases

J. ADLER, M.D., Z. HERMAN, M.D. and H. SPITZ, M.D.*
Beer Yaacov, Israel

Perforation of caseous lymph nodes into the bronchial tree is of relatively frequent occurrence in the course of tuberculosis in children. The importance of this complication in the pathogenesis of the disease as well as in certain clinical and roentgenological findings is well understood by clinicians and pathologists. It has also been known for many years that in elderly people anthracotic or caseous lymph nodes may occasionally break through into bronchi or into mediastinal structures, sometimes causing serious clinical manifestations. With the introduction of large-scale bronchoscopy, lymph node perforations were also observed in adolescents and young adults suffering from pulmonary tuberculosis especially in the primary or post-primary phase of the disease, but according to most observers active tuberculous processes of pulmonary lymph nodes are of no great practical importance in the adult type of pulmonary tuberculosis.

Pathologists like Schwartz⁴ and Ulmer⁵ oppose this generally accepted view. On careful systematic investigations on autopsy material of more than 700 cases Schwartz observed in a large proportion of cases lymph node penetrations into the airways of adults suffering from pulmonary tuberculosis in all stages. In his opinion, periodic re-activation and perforation of caseous pulmonary lymph nodes are responsible in most cases for endogenous re-infection and for the spread of the process in chronic pulmonary tuberculosis of the adult.

Some recent bronchoscopic observations seem to support the theory of Schwartz. In a number of publications from various clinics, bronchoscopists recorded perforations or residues of perforations with great frequency in adult patients. Lévi-Valensi, Zaffran and Morena⁶ describe 25 bronchial fistulae in Algerian patients 18 to 61 years of age. Vaksvik,⁷ on bronchoscopic examination of 1003 adult patients in Norway, found 134 cases with perforations or residues of perforations. Iselin and Suter⁸ and Meng⁹ report similar numbers from Switzerland: 131 perforations or scars in 1870 consecutive bronchoscopies. Tricoire¹⁰ in France observed 16 cases of lymph node perforation in adults and quoted a publication of Chatonnier and Zaffran¹¹ who found 37 fistulae in 120 adult patients. Most recently,

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Popper c. s.\textsuperscript{12} reported their experiences in 1257 patients, 950 of whom suffered from pulmonary tuberculosis. In 117 cases they found perforations of lymph nodes or bronchial fistulae (109 in the tuberculous group and eight in the non-tuberculous group).

The bronchial findings described by various authors may be grouped in pathognomonic and suggestive signs. Pathognomonic signs of lymph node perforation are broad irregular funnel-shaped openings in the bronchial wall, surrounded by, and partially filled with coarse granulation tissue. In the fistulous tracts caseous or anthracotic material from the lymph nodes is visible. Another characteristic picture is a furuncle-like elevation of the mucosa with central umbilication. In most cases, it is possible to expel by pressure with the bronchoscope some purulent material which usually contains tubercle bacilli. On repeated bronchoscopies one can observe that healing takes place by scar formation.

As suggestive signs of lymph node perforation other bronchoscopic pictures were described, e.g. round circumscribed openings in the mucosa, small ducts or as punched-out holes. The diameter of these mucosal holes varies from pin-point size to 2 to 3 mm. Frequently, the lumen widens during inspiration. The mucosa covering the holes is usually of normal appearance but at times may show signs of inflammation. Not infrequently mucous and even purulent secretion is observed and, in rare cases, smooth translucent granulation tissue is found in the wall or in the depth of the holes. The French authors emphasize that the appearance of these openings does not change on repeated bronchoscopic examinations.

Indirect signs of former lymph node penetration are described as mucosal scars—especially funnel-shaped or starlike retractions—humps or callosum prominences, local discoloration of the mucosa or isolated patches of anthracotic pigmentation. According to many authors, these findings make a diagnosis of a former perforation likely, particularly if they appear in combination with certain clinical symptoms and roentgenologic patterns. Vaksvik is of the opinion that most cases of bronchostenosis, ulceration or local proliferation of granulation tissue are caused by perforation of tuberculous lymph nodes.

\textit{Analysis of Our Material}

In an attempt to re-examine the theory of Schwartz and to re-evaluate the bronchoscopic findings of the above mentioned authors we made a survey of 700 consecutive patients who had undergone bronchoscopic examinations during the years 1951-1954.

At the Beer Yaacov Chest Hospital bronchoscopic examinations are performed on every patient in whom clinical symptoms or roentgenologic signs point to an involvement of the lymph nodes or of the bronchi and, furthermore, in every case that requires decision about possible operative intervention. At every examination, the bronchial tree including the orifices of the segmental bronchi is carefully inspected with telescopes.

Table I gives a summary of the most important lesions found. We adopted the terminology of Vaksvik in order to be able to compare our findings with
TABLE I

<table>
<thead>
<tr>
<th>Bronchoscopic findings at:</th>
<th>Glittre San. 1946 - 1952</th>
<th>Beer Yaacov Hospital 1951 - 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>1,003</td>
<td>700</td>
</tr>
<tr>
<td>Number of bronchoscopies</td>
<td>1,262</td>
<td>916</td>
</tr>
<tr>
<td>Definite lymph node perforation</td>
<td>20 (2%)</td>
<td>...</td>
</tr>
<tr>
<td>Suspected lymph node perforation</td>
<td>...</td>
<td>7 (8%)</td>
</tr>
<tr>
<td>Mucosal holes</td>
<td>81 (8%)</td>
<td>49</td>
</tr>
<tr>
<td>Mucosal scars</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>Stenosis</td>
<td>55</td>
<td>41</td>
</tr>
<tr>
<td>Granulations</td>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>Ulcerations</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>&quot;Cushions&quot;</td>
<td>12</td>
<td>1</td>
</tr>
</tbody>
</table>

those at Glittre Sanatorium. The above table shows that we also found pathological changes in the bronchial wall in a great number of our patients. For reasons which will be discussed later we do not accept many of the so-called indirect signs, described by other authors as characteristic for lymph node perforation and cases with such findings are not included in our analysis. We selected 64 cases for further study, 8 of whom showed star-shaped or funnel-shaped retractions and 56 presented holes in the bronchial mucosa.

With the exception of one boy of 16 all these 64 patients were adults, 18-57 years of age; the sex distribution was about equal. All were recent immigrants, more than one half of them from Europe, while the others hailed from Arabian countries or from North Africa.

Table II shows the number of bronchoscopies performed on individual patients. In half of our cases more than one examination was made. The time of observation was longer than six months in about one fourth of the cases. Especially, when perforations were suspected repeated bronchoscopies were performed up to several years following the initial examination.

TABLE II

<table>
<thead>
<tr>
<th>Nr. of examinations</th>
<th>1x</th>
<th>2x</th>
<th>3x</th>
<th>4x</th>
<th>5x</th>
<th>6x</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nr. of patients</td>
<td>32</td>
<td>19</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>Nr. of bronchoscopies</td>
<td>32</td>
<td>38</td>
<td>21</td>
<td>4</td>
<td>20</td>
<td>6</td>
<td>121</td>
</tr>
</tbody>
</table>

Interval between bronchoscopic observations:

<table>
<thead>
<tr>
<th></th>
<th>Mucosal Holes</th>
<th>Mucosal Scars</th>
<th>Suspected Perforations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 6 months</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7 - 12 months</td>
<td>5</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>13 - 24 months</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>25 - 36 months</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
In the eight cases with distinct mucosal scars, we compared the bronchoscopic findings with the tomographic pictures: All of them suffered from chronic phthisic form of tuberculosis and the mucosal scars were situated at the orifice of the bronchus leading to the main lesion. In five cases, a calcified lymph node was found in close contact with the bronchial wall at the site of the scar, and in five the roentgenologic appearance was typical for obstructive or peribronchial lesions.

As mucosal holes we considered circumscribed openings in the mucosa or small ducts from pin-head size to a diameter of 2 to 3 mm. In more than one half of our cases only a single lesion was observed, in one third there were two holes, usually in the same bronchus. In other patients we found a varying number of pathologic openings in different places; in two cases more than 10 holes were seen. In a total of 49 patients 98 holes were encountered. As may be seen in Figure 1a, the sites of predilection were the orifices of the right and left upper lobe bronchi, especially the anterior and lower walls, and to a lesser extent, the medial walls of the right and left main bronchi just beneath the carina. The mucosa covering the holes appeared normal in most of our cases. Frequently we observed inspiratory widening of the openings. In seven patients the mucosa was reddened and swollen, whereas the surrounding bronchial mucosa was generally unaltered. Mucous secretion was noted 14 times and minimal purulent secretion was found four times oozing from the openings. In none of the cases was it possible to obtain sufficient material for a bacteriological examination. In five we saw smooth translucent grayish-red granulations at the bottom of the holes. Our observations correspond to those of other authors concerning number, localization and appearance.

We do not think that these findings by themselves are sufficient to make a diagnosis of lymph node perforation. We agree with Vaksvik that there are all sorts of transitional forms between active perforation, fistulous tracts and other pathologic openings in the bronchial tree.

_Fig. 1a:_ Distribution of 98 mucosal holes in 49 cases._Fig. 1b:_ Localization of holes (○), crypts (△), and patches of anthracosis (□) in 15 post-mortem specimens of bronchial tree.
In the presence of larger openings the possibility of super-numerary or aberrant bronchi must be considered. Bronchographic and tomographic examination can classify the nature of such findings. The small holes, however, that were noted by us and by many authors quoted above* may represent fistulous tracts or pathologically enlarged ducts of the mucous glands.

The acini of the mucous glands are situated deep below the bronchial mucosa. A relatively long and narrow duct traverses the different layers of the bronchial wall in an oblique direction and widens before entering into the bronchial lumen. Under normal conditions the small openings cannot be visualized. Inflammatory processes involving the mucous glands or foreign material penetrating into the lumina of the ducts may cause abnormal dilatation. Inflammatory changes at the narrow neck of the ducts may cause local obstruction followed by cystic dilatation of the glands, accumulation of purulent secretion in these sacs and finally perforation into the bronchial lumen. Mechanical factors such as chronic cough possibly play also a part in the pathogenesis of these lesions.

It is possible to demonstrate the dilated ducts or cysts on bronchographic examination. They appear as small diverticuli or as isolated droplets. When there are multiple cysts the bronchial wall appears serrated or irregular. Huizinga13 and after him other authors described the typical roentgenologic appearance especially in patients suffering from bronchitis or from bronchial asthma. Figure 2 shows the bronchographic picture of glandular cysts in one of our patients, in whom we found more than 10 mucosal holes on bronchoscopic examination.

Duprez and Mampuys14 studied the topography of the mucosal glands and the occurrence of dilated glandular ducts by means of bronchial casts

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*Compare e.g., the illustrations in the paper by Lévi Valensi c. s. Rev. de la Tuberc., 15:410, 1951 pp. 412-413.
and of special preparations of the bronchial mucosa. They found the pathologic changes most frequently in the larger bronchi around the bifurcations. The authors compared their anatomic findings with the bronchoscopic appearance of mucosal holes and they stress that in most cases differentiation between glandular ducts and small fistulous tracts from bronchial lymph node perforations is impossible on bronchoscopic observation alone. They believe that, not realizing these facts, many clinicians report too high a percentage of perforations.

In our material none of the cases with mucosal holes, seen at bronchoscopy were available for anatomic study. There was no death among the patients examined and in cases that underwent lobectomy or segmentectomy the holes, which had been visualized were situated always proximally to the surgical plane of resection.

We, therefore, had to look for other comparable material and examined the tracheobronchial trees from individuals who died from various diseases. The trachea, bronchi and both lungs were removed in toto from the body and the same examiner who had done the bronchoscopic examinations in vivo introduced the bronchoscope into these preparations and searched for holes. However, none was found. The trachea and the bronchi were, then, opened posteriorly by cutting them longitudinally with scissors and a thorough search for holes was made with the magnifying lens by both the bronchoscopist and the pathologist. In this manner, a number of such lesions were discovered in spite of the negative findings on previous bronchoscopic examination by the lack of respiratory movements and dilatation so that the tiny holes remained collapsed and were further reduced in

FIGURE 3: Flask-shaped duct with fibrosis and lymphocytic infiltration. Atrophy and cystic dilatation of bronchial glands.
size by the postmortem contraction of the bronchial muscles. The lesions were found lying singly or in groups at a location corresponding closely to that of the bronchial holes seen in vivo (Fig. 1b).

Fifteen specimens were examined in this fashion and in six of them typical holes were found grossly. In the other nine cases the bronchoscopist designated the openings seen as “crypts.” These are considered as common findings—small shallow out pouchings or depression of the bronchial mucosa. The patients from whom these specimens had been taken varied in age from 37 to 82 years. Only one of them had advanced pulmonary tuberculosis and no hole was found in this case. Patients with positive findings died of a variety of causes, most of them unrelated to pulmonary disease. Five had signs of severe chronic bronchitis.

Histologic examinations were carried out on multiple blocks and some of them were sectioned in steps. Neighbouring sections were stained with hematoxylin-eosin and elastica-van Gieson. Basically a similar picture was found in all lesions examined and no clear-cut histologic differentiation was possible between so-called crypts and mucosal holes. The lesions represented either widened ducts of mucous glands, cone-shaped or flask-shaped, with narrow mouths, (Fig. 3) or globular depressions widely communicating with the bronchial lumen (Fig. 4). Inflammatory changes were present either in the depth of the ducts or at their necks. Some of the lesions showed no inflammatory changes. At times, the bronchial muscles were hypertrophic, forming a thick ring at the neck of a dilated duct. In the depth of the ducts and depressions, mucous glands were noted, some with mild chronic inflammatory infiltration, some without significant histologic changes and some with signs of mild atrophy.

FIGURE 4: Crypt with wide neck. Inflammatory and other changes as in Figure 3.
In our limited material, we never saw association of these dilated ducts with disease of adjacent bronchial lymph nodes. At times, anthraco-silicotic or fibrotic lymph nodes were found attached to the bronchial walls in areas of ductal dilatation but from the histologic appearance this association was considered fortuitous.

These anatomic findings confirmed our opinion that most of the mucosal holes found were actually diseased excretory ducts. Other facts pointed in the same direction. Careful tomographic examination especially of the hilar region of our 49 patients failed to reveal enlargement of lymph nodes, nor were there pathognomonic clinical or roentgenologic signs of recent perforation. By far the greatest number of orifices noted were covered with normal mucosa and showed only mucous secretion. But also in cases showing signs of inflammation, purulent secretion or small translucent granulations, these changes were probably caused by an infection of the dilated ducts, since all these changes had disappeared on subsequent examinations. There remained, ultimately, only a hole covered by normal mucosa. The fact that the appearance of these openings did not change even after one or two years also seems to indicate that they were not due to bronchial fistulae.

In 22 patients the mucosal holes were situated in the bronchus leading toward the main lesion. It is true that lymph node perforation at this location may be responsible for the development of such a lesion; on the other hand mucous gland involvement may be caused by the regional parenchymatous process, so that this localization is not sufficient to differentiate the nature of the bronchial lesion.

Only in seven of our patients was a lymph node perforation suspected although none of them showed the pathognomonic bronchoscopic appearance. Holes were seen in all of them, some of which were more than 3 mm. in diameter, and nearly all showed signs of severe inflammation and purulent secretion for a long time. Where repeated control examinations were done, we observed that healing took place with scar formation. In addition, the clinical and/or roentgenologic findings suggested an active specific process of the hilar lymph nodes. Of these seven adults, one suffered from primary tuberculosis, in four others the pulmonary lesions were considered as direct sequelae of the primary infection (post-primary lesions) and only two patients suffered from a chronic phthisic form of tuberculosis. Appearance and development of the lesions is demonstrated by the following two typical cases:

**Case 1:** A 26 year old woman from Hungary was admitted following an acute episode of fever, cough and weight loss. X-ray film examination showed calcified lymph nodes between the right upper and middle lobes and confluent patchy lesions with a prune-shaped cavity in the postero-lateral segment of the right lower lobe. At the first bronchoscopy in January 1953, a hole was noted at the entrance of the right upper lobe bronchus, measuring 1 x 2 mm. in diameter, partially covered by granulation tissue. Control bronchoscopies at 3-month intervals disclosed a continuous diminution in the size of the hole with epithelization in its depth. In May 1954, only a funnel-shaped scar remained with dilated capillaries traversing the area. At this stage, a resection of the right lower lobe was performed. During operation, a group of enlarged soft lymph nodes was palpated around the bronchi of the middle and upper lobes.
Conclusion: In this patient a cavernous pulmonary process in the right lower lobe was probably a sequela of a bronchogenous dissemination from perforated lymph nodes. A residual perforation in the right upper lobe bronchus healed in the course of a year.

Case 2: On routine examination, a cavernous pulmonary process was discovered in a 30 year old man from Rumania. There were no clinical symptoms, but tubercle bacilli were found in the sputum on rare occasions. The roentgen picture, on admission, revealed widespread infiltrative and dense peribronchial changes in the apical and posterior segments of the right upper lobe. Calcified lymph nodes were noted close to the posterior wall of the right upper lobe bronchus. On bronchoscopic examination a crater-shaped opening, the size of a rice grain, was found on the medial wall of the right main bronchus 2 cms. below the carina. The floor of the defect was covered with purulent secretion. Under antimicrobial treatment, constant improvement of pulmonary and bronchial changes was noted. Five months following the first bronchoscopy, the floor of the defect was covered by smooth granulation tissue and the size of the opening diminished gradually. After 15 months, there was only a mucosal scar left with a central depression and capillary dilatation. The pulmonary process, at that time, was apparently arrested, the peribronchial changes had completely disappeared.

Conclusion: The bronchoscopic appearance was highly suggestive of hilar lymph node perforation. The pulmonary and peribronchial changes in the right upper lobe might have been related to the lymph node lesion. Both lesions healed concomitantly.

Discussion

In an analysis of 700 consecutive bronchoscopies on adults suffering from pulmonary tuberculosis we were unable to find a single case showing the pathognomonic picture of recent lymph node perforation into the bronchial lumen. However, we observed a great number of pathologic changes in the bronchial mucosa that could be classified as either suggestive or indirect signs of lymph node perforation. With regard to the latter there arises the question, if we are allowed to draw the conclusion that lesions like stenosis, granulations, superficial ulcerations or slight alterations in the appearance of the bronchial mucosa are invariably caused by perforation of a tuberculous lymph node, even in the presence of so called typical clinical and roentgenologic findings. The involvement of the bronchial tree by a tuberculous process may occur through various pathways: Extension of an inflammatory process from adjacent structures, direct implantation of contaminated material from the lumen, hematogenous and lymphogenous dissemination into the bronchial wall; lymph node perforation is only one of the possible pathogenic mechanisms. 15, 16 For these reasons we excluded 58 cases with stenosis, granulations, ulcerations or "cushions" from further analysis and we accepted only star-shaped or funnel-shaped retractions of the bronchial mucosa as possible remnants of a former lymph node perforation. We observed eight such cases in our series.

As for so-called suggestive signs of lymph node perforation, we collected 64 cases with abnormal openings in the bronchial mucosa, an incidence similar to that reported from other institutions, especially those that differentiate between definite perforations and mucosal holes, as e.g. Glittre Sanatorium (8 per cent).

In only seven of our patients we suspected perforations of a tuberculous lymph node into the bronchial wall.
The low incidence in our material may be due in part to a different patient population. Most of our patients were new immigrants, adults with chronic pulmonary tuberculosis of long standing. In institutions, where more adolescents are admitted, suffering from the primary or post-primary phase of tuberculosis typical lymph node perforations will undoubtedly be observed with greater frequency.

The basic divergence, however, derives from a different interpretation of the bronchoscopic findings. We wonder whether many holes or so-called fistulae included in the records of other authors, are not actually diseased excretory ducts. Pathologic changes in the bronchial glands with consequent cystic degeneration of the glands or enlargement of the ducts occur certainly much more frequently in the adult than perforation of caseous lymph nodes. Especially persons with long standing infections of the respiratory tract and certainly those suffering from pulmonary tuberculosis are liable to develop these changes. We saw, of course, such lesions also in non-tuberculous patients with chronic inflammatory changes in the respiratory tract, e.g. with chronic bronchitis, asthma and emphysema. Of the six autopsy specimens with the typical holes, five showed evidence of severe chronic bronchitis. With contrast filling of the bronchial tree, we were able to demonstrate the typical picture of ductal dilatation in a great many patients suffering from chronic cough, pointing possibly to a pathogenetic relationship.

Differentiation between lymph node perforation and enlarged glandular ducts is often difficult only on bronchoscopic appearance. In rare instances, an actual perforation may heal and present a normal mucosal covering. On the other hand, active pathologic changes may occur within enlarged mucosal ducts in the absence of lymph node perforations. Infectious material may gain entrance into the glandular duct from the bronchial lumen and give rise to inflammatory changes within the glands.

In doubtful cases one must not rely on one single bronchoscopy. Additional clinical and roentgenologic data must be evaluated before a definite opinion is formed. If, on control examinations, signs of inflammation disappear and the caliber of the opening remains unchanged for a long period the lesion is probably an enlarged duct.

A correct diagnosis of lymph node perforation is, however, of great importance since it has serious implications for the patient. Major operations e.g. may have to be postponed for months. An active perforation, persisting after resection may lead to reactivation or spread of the specific process. Careful bronchoscopic evaluation is therefore mandatory prior to operation and in doubtful cases, it is better to repeat the examination in order to ascertain the character of the bronchial lesion noted.

Lymph node perforation in the adult in all stages of the disease does, of course, occur though it is rare. Seven of our observations probably belong to this category. The bronchoscopic observations alone were highly suggestive and they were further supported by clinical and/or roentgenologic signs of active tuberculous disease in adjacent lymph nodes. In the eight
cases, showing only residual scars, there was found a distinct correlation between the scar and the dominant pulmonary lesion. In five of these cases a calcified lymph node could be seen adjacent to the bronchial scar. Still, there was no indication as to the time of the lymph node perforation. It might have taken place much earlier, even during childhood.

Conclusion

In our experience, perforations of tuberculous lymph nodes into the bronchi are rarely observed on bronchoscopic examination of the adult, especially in patients suffering from the chronic phthisic form of pulmonary tuberculosis. Mucosal holes, however, as seen through the bronchoscope are more frequent and are apt to be diseased excretory ducts rather than fistulous tracts from caseous lymph nodes. We doubt therefore, that reports of frequent bronchoscopic diagnosis of lymph node perforation are convincing proof for the validity of Schwartz' concept of re-infection tuberculosis. Further clinical, bronchoscopic and careful anatomic studies are necessary in order to decide whether perforations of lymph nodes in all stages of adult tuberculosis are so common as to require a change in our views concerning the pathogenesis of the disease.

SUMMARY

Seven hundred consecutive bronchoscopies were analyzed for evidence of lymph node perforation into the bronchial tree without finding a single case with the pathognomonic appearance. Lesions suggestive of perforation were seen in seven cases and eight presented characteristic scars. Additional clinical and roentgenologic data corroborated the diagnosis in these 15 cases.

Pathologic openings in the bronchial mucosa were found with about the same frequency as in other institutions (8 per cent). Bronchoscopic, roentgenologic and anatomic features of these lesions are reviewed and described and their pathogenesis is discussed.

The difficulties in the interpretation of the bronchoscopic appearances of fistulous tracts due to lymph node perforation and diseased excretory ducts of mucous glands are noted.

RESUMEN

Se hicieron 700 broncoscopias consecutivas en busca de evidencias de perforación de ganglios hacia el árbol bronquial sin encontrar un solo caso patognomónico por la apariencia. Se vieron lesiones sugestivas de perforación en siete casos y ocho presentaban cicatrices características. Los datos clínicos y roentgenológicos adicionales corroboraron el diagnóstico en estos 15 casos.

Se encontraron aberturas patológicas en la mucosa bronquial con la misma frecuencia aproximada que en otras instituciones (8 por ciento).

Remark: By the time this article was completed, another 400 bronchoscopies had been analyzed, bringing the total of patients examined to over one thousand. Whereas the relative number of mucosal holes remained fairly constant (7 to 8 per cent) we did not find a single case of definite or suspected lymph node perforation.
Las características broncoscópicas, roentgenológicas y anatómicas de estas lesiones son objeto de revisión y su patogenia se discute.

Las dificultades en la interpretación de la apariencia broncoscópica de los conductos fistulosos debido a perforación ganglionar y la distinción con los conductos excretorios enfermos, se hacen notar.

RESUME

700 bronchoscopies consécutives furent analysées pour rechercher la preuve de la perforation ganglionnaire dans l’arbre bronchique sans qu’on puisse trouver un seul cas indiscutable. La perforation pouvait être suspectée dans sept cas et huit autres présentèrent des cicatrices caractéristiques. Des constatations cliniques et radiologiques supplémentaires furent en faveur du diagnostic dans ces quinze cas.

Ces perforations pathologiques de la muqueuse bronchique se présentèrent avec environ la même fréquence que dans les autres conditions (8%). Les caractéristiques broncoscopiques, radiologiques et anatomiques de ces lésions sont passées en revue et décrites et l’auteur discute leur pathogénie.

Il signale les difficultés d’interprétation broncoscopique des fistules imputables à une perforation ganglionnaire et des conduits excrétoires des glandes muqueuses.

ZUSAMMENFASSUNG

Es wurden 700 auf einander folgende Bronchioskopen analysiert auf Beweise einer Lymphknotenperforation in den Bronchialbaum ohne dass ein einziger Fall gefunden wurde mit pathognomonischen Erscheinungen.

Auf Perforation verdächtige Veränderungen waren in 7 Fällen zu sehen, und 8 boten charakteristische Narben. Zusätzliche klinische und röntgenologische Daten bestätigten die Diagnose in diesen 15 Fällen.

Pathologische Öffnungen in der Bronchialschleimhaut wurden in ungefähr derselben Häufigkeit gefunden, wie in anderen Anstalten (8%). Bronchoskopische, röntgenologische und anatomische Merkmale dieser Veränderungen werden besprochen und beschrieben und ihre Pathogenese diskutiert.

Die Schwierigkeit in der Deutung des bronchoskopischen Aussehens der Fistelgänge infolge Lymphknotenperforation und erkrankter Ausführungsgänge der Schleimdrüsen wird erwähnt.

REFERENCES