OLD AND NEW – AN UPDATE IN TUBERCULOSIS SURGERY

Florin CHIRCULESCU[1]

ABSTRACT:
THE SURGERY OF THORACIC TB HAS A SERIOUS DRAWBACK: ITS VARIABLE TAXONOMY. THE VARIOUS CRITERIA DESIGNATED TO ESTABLISH THE SURGICAL INDICATIONS IN TB LACK THE CLARITY OF THOSE WE USE IN OTHER PATHOLOGIES. THEREFORE, THE BEGINNER THORACIC SURGEON FACES A CHALLENGE WHEN DEALING WITH THE CLASSIFICATIONS COMMONLY USED IN PHTHISIO-SURGERY. THIS ARTICLE TRIES TO SIMPLIFY THE ACTUAL TABLES CONCERNING THE SURGICAL INDICATIONS IN TB, IN ORDER TO CREATE A COMPREHENSIBLE ALGORITHM. WE ALSO PRESENT OUR EXPERIENCE ON 83 OPERATED PATIENTS, SUSTAINING OUR ALGORITHM.

KEY WORDS: TB, SURGERY, TAXONOMY, PROCEDURES, ALGORITHM

QUESTIONING THE PARADIGMA IN TB SURGERY

Classically, there are two major distinctions between the surgical indications in TB and the surgery performed for any other disease:

1. the deliberate postponing of the operation for 4 to 6 months in TB cases,
2. the microbiologic status of the patient, i.e. the presence of *M. tuberculosis* in sputum, which has a major impact upon performing surgery.

In theory, postponing surgery is determined by the need to treat the patient with an appropriate antituberculos regimen for 4 to 6 months. At first sight, this attitude might look paradoxical, as if tuberculous lesions were not as important as in other surgical diseases. In other words, a lesion that would otherwise lead to a prompt exeresis, as in pulmonary neoplasms, for example, obliges us to postpone the operation in a TB context. The rationale behind this is the necessity to sterilize as much as possible the airways, i.e. to negativate the sputum. If the patient still has positive sputum after 4 – 6 months, the classical phthisiosurgery prescribes more months of medical therapy.

However, one might ask: what happens with the MDR/XDR cases which do not respond to antituberculous chemotherapy? Why do such cases have a favorable outcome after exeresis, even if the lesions were M. tuberculosis „reservoirs" when we performed surgery? What is the real rate of „depletion" of the acid-fast bacilli from the lesions and

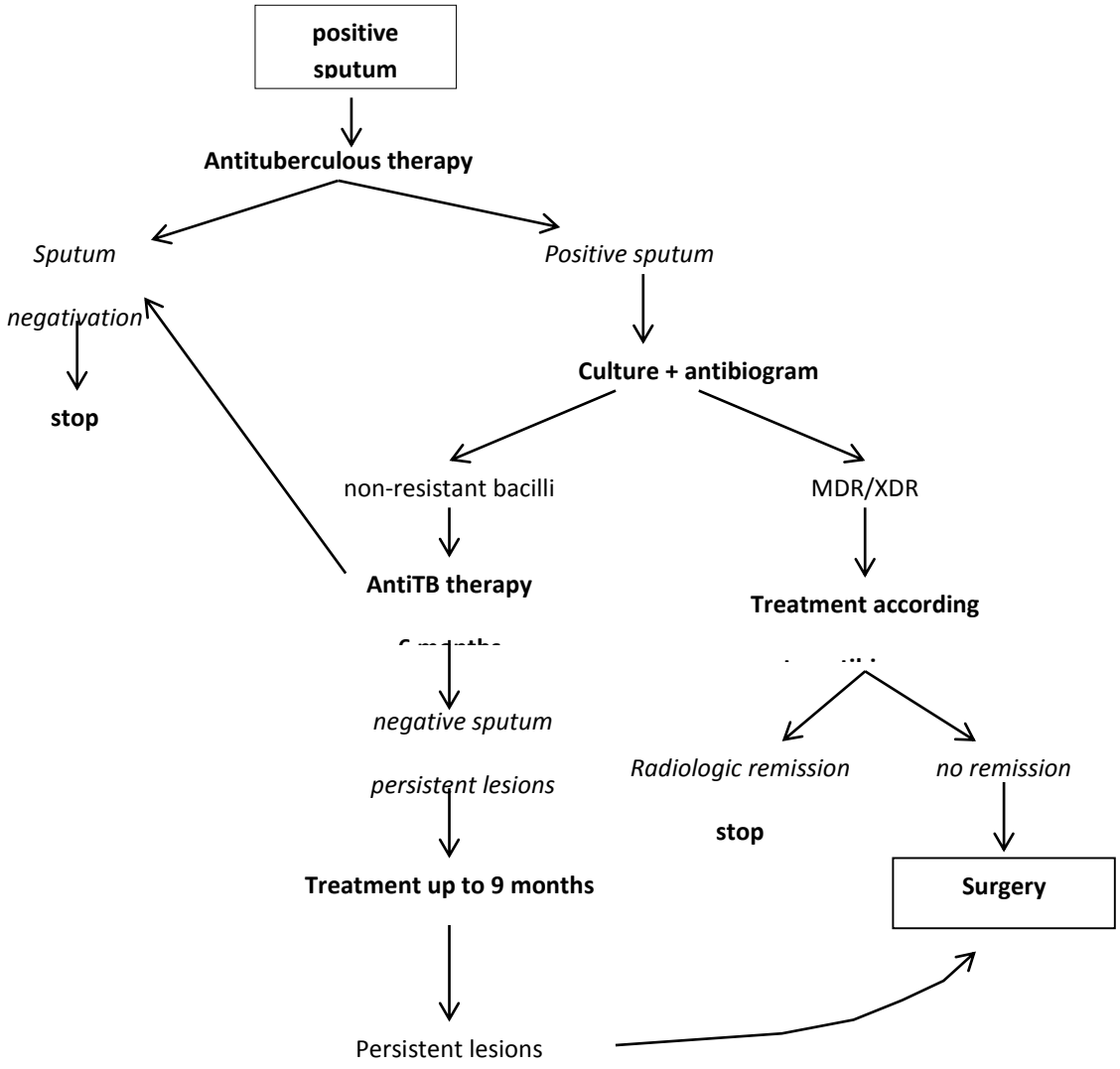
[1] * Consultant surgeon, Head of the Thoracic Surgery Department, The Universitary Emergency Hospital, Bucharest, florinchirculescu@hotmail.com

airways after 4 to 6 months of medical therapy? Why should we wait 4 to 6 months before performing surgery in patients with negative sputum for bK?

The classical indications do not answer to these questions. Moreover, if we add to this the variable lesional aspects in TB, we will easily understand why the surgical protocols in tuberculosis are so complexe and difficult to systematize.

Our wish is to simplify this.

Algorithm - the standard surgical attitude in pleuropulmonary TB



THE LESION CRITERION

The classical taxonomy of the TB lesions does not support a straightforward connexion between the lesion and the surgical indication – as a result, it is difficult to elaborate a simple algorithm. In order to simplify this, we lay down the following classification:

a) diffuse pulmonary lesions – rarely amenable to surgery,
b) focal pulmonary lesions – which usually need surgery,

c) pleural lesions – which often benefit from surgery,
d) parietal lesions (rib caries, parietal fistulae) – which usually need surgery,
e) mediastinal cold abscesses – which benefit from surgery (diagnostic, decompressive procedures),
f) pleuropulmonary lesions (mixed lesions) – which often need surgery,
g) bronchial lesions – amenable to surgery,
h) giant lymphadenopathies – which need surgery in certain circumstances: decompression of the airways (especially in children), amending a ganglio-bronchial fistula, diagnostic procedures.

The diffuse pulmonary lesions are the infiltrates, the disseminated nodules, the ulcerations, the fibrotic lesions. In the above classification we stated that these lesions are *rarely amenable* to surgery. Nevertheless, if we don't have a definite diagnostic, we might have to operate such lesions in order to exclude adenocarcinoma, carcinomatous lymphangitis, metastazis or non-specific fibrosis of the lung. As for the TB residual fibrosis, it may be biopsied too, in order to obtain a pathologic specimen, especially when we have to rule out a pulmonary diffuse malady.

Therefore, even if the diffuse TB pulmonary lesions are not usually amenable to surgery, they might benefit sometimes from an operation, *mostly for diagnostic purposes*.

There are some special situations of bilateral TB, in which resecable lesions in one side coexist with diffuse lesions in the controlateral hemithorax. In such occurences, some authors advance the concept of *adjuvant surgery* for the diffuse lesions. Krasnov and Andrenko, for example, perform an *artificial pneumothorax* with the purpose of setting the diffuse lesions at rest after segmental or lobar controlateral resections. The authors performed a study on 23 patients who needed pulmonary resections for TB; 18 patients had diffuse controlateral lesions and they benefitted by induced artificial pneumothorax. Other authors perform a homolateral pneumothorax after resecting focal lesions (cavities, tuberculomas) if the remaining lung presents associated diffuse lesions. Therewith, the artificial pneumothorax could be offered as a therapeutic alternative to the patients with low functional reserves that preclude resectional surgery.

The focal pulmonary lesions are the tuberculomas and the caverns. Such lesions receive a straightforward surgery: *exeresis*. This allegation is valid in almost all tuberculomas, but caverns need a more thorough evaluation, in order to rule out a pulmonary abscess, for example, since an exeresis performed „on the spot" in an infectious context might lead to catastrophic complications.

The pleural lesions are the pneumothoraxes, the pleurisies, the empyema and the hydropneumothoraxes. These lesions account largely for the surgical procedures in thoracic TB, because the pleural diseases usually oblige to *emergency maneuvers*. A pneumothorax or a hydropneumothorax often associate acute respiratory insufficiency, while pleurisies and empyema are accompanied by septic phenomena with a high cronicization potential.

The mixed lesions are various combinations between the above mentioned aspects, which culminate with the TB destroyed lung – a genuine lesional catastrophe: surgery in such cases is handicapped by serious risks. Commonly, surgery in this context is expensive and difficult, being in many times the consequence of neglected simpler lesions. As we see, the lack of surgery performed at the appropriate moment is an ethiology on its own in TB.

The parietal lesions are rare: rib caries, parietal fistulae, parietal abscesses. Surgery is straightforward, in order to stop the cronicization of the lesions or to avoid septic complications, especially in MDR/XDR context.

Mediastinal abscesses are a particular aspect. Although they have a parietal origin (sternum or thoracic spine), we shall discuss them apart from the parietal pathology because of the mediastinal progresion of the septic process, which raises problems in terms of surgical access.

The bronchial lesions comprise strictures, ulcerations and bronchiectasis. These lesions evolve to a gradual narrowing of the airways, followed by atelectasis, pneumonia and consecutive suppurative disease. The endoscopic dilation might solve not only the stricture, but also its ensuing complications. However, if the lesion cannot be dilated because of the bronchial fibrous damage, we are entitled to perform bronchial *resections* followed by *anastomosis*. If the dependent parenchyma is jeopardized, we might be obliged to resect it.

The giant mediastinal lymphadenopathies are rare lesions that develop especially in children, *compressing* their airways (which are particularly elastic at young ages) and progressing to respiratory insufficiency. Lymphadenectomy in such settings is an emergency (13). On the other hand, giant lymphadenopathies in adults may be misdiagnosed with *lymphoma*. In such occurences, surgery is necessary to establish a proper diagnostic. Peripheral lymphadenopathies, although more silent, oblige us to surgery in order to obtain a pathologic sample.

This brief review shows the wide array of surgical procedures performed in TB. We wish to emphasize that an ample constellation of TB lesions in the same patient does not develop in a short lapse of time – on the contrary, it builds up slowly. As a result, any complex lesion, which usually requires difficult surgery, is the consequence of a suboptimal therapy, i.e. a therapy that lacks a simple surgical procedure performed earlier.

THE MICROBIOLOGIC CRITERION

This criterion is discussed in detail in a separate article. Although the classical standpoints state that surgery should not be performed before 4 to 6 months of antituberculous chemotherapy, our opinion is that we should treat each case according to its own particularities. We therefore stick to Perelmann's advices (11):

1) the thoracic surgeon should readily examine a patient with an unfavourable evolution under standard regimens of antituberculous chemotherapy,
2) a long term antituberculous chemotherapy is not advisable if we envisage surgery,
3) pleuropulmonary TB needs an individualised approach, especially in difficult cases.

These advices are based on the long time experience of a surgeon who had the „chance" to see too many times the ill effects of the prolonged antituberculous therapy (aminoglycosid fibrosis, for example), ill effects that were not compensated by good results on medical therapy alone.

In our opinion, we must rediscuss the timing of the surgical procedures in TB on the following basis:

a) tuberculomas and caverns could be operated as soon as we reach a positive diagnostic, if the patient's status allows surgery,
b) empyema (with the exception of emmergencies like acute dispnoea) accept surgery after 2 – 4 months of onset (earlier than the classical indications),
c) obtaining negative acid-fast smears in sputum is advisable, but if we are not able to reach this status, we should not restrain surgery,
d) early surgery should always be an option; the decisions will be taken after periodic examinations that take into account, mainly, the actual state of the patient and not the classical benchmarks.

DO WE HAVE A CONSENSUS IN TB SURGERY?

The answer is no, since we didn't find a common taxonomy tying the various aspects of the TB lesions to the surgical procedures. The lack of a common taxonomy is the consequence of the dissimilar clinical and radiologic manifestations of the disease, based on the various geographical locations of the reporting centres. The incidence and prevalence of particular TB clinical aspects also differ from country to country, since the economic and educational status of the patients and the epidemiological aspects of TB differ too.

The series we have studied vary in term of number of surgical procedures: 212 in ten years (Malenic, Iakovic - Serbia), 62 in six years (Lee, Luh - Taiwan), 43 (Andrenko, Grischenko - Russia), 217 (Mlekody - Poland), 45 in ten years (Nicolau - Romania), 172 in 17 years (Pomerantz) etc. The most impressive series is discussed by Lahirir and Agranal (5) (India) which comprises 1655 cases treated in 20 years. The main problem when comparing these series is that it is at least difficult to find common lesional criteria. At same the time, in each of these series you do not find coherent criteria pointing to the lesional aspects.

Thus, in Malenic's study (7), we find on the same table surgical indications such as: primary TB, secondary TB, tuberculoma, cavitary TB, diffuse lesions. Mlekody's series (8) offers the following indications: empyema, hemoptysis, aspergilloma, bronchial strictures, failures of chemotherapy. Lahirir offers 4 indications: empyema with or whithout fistula, TB complications, parietal cold abscess, ribs' and sternal ostemyelitis. Etienne and Spiliopoulos (2), from Belgium, report 92 cases in 20 years, offering a sketchy classification: medical failure, pseudotumoral lesions, TB complications.

We found an interresting manner of classifying surgical TB in the study of Mouroux and Maalouf (9) – in 1996 they graded surgical TB as follows:

Grade I: lesions which ascertain the TB diagnostic after thoracotomy, although the operation was performed for another pathological suspicion,

Grade II: active lesions, which include: caverns, destroyed parenchyma and chronic encysted pleurisy,

Grade III: surgery for the TB sequels and/or complications: calcified pyothorax, empyema, ganglionar fistulae, bronchectasies, aspergilloma.

From the above mentioned studies we see clearly that discussing outside a coherent lesional classification raises difficulties in designing a surgical algorithm in TB.

ALGORITHM IN SURGICAL TB – IS IT FEASIBLE?

The answer is yes – such algorithms already exist in the classical TB surgery works, but we need to update and adapt them to the nowadays surgical TB, since the contemporary disease has specific particularities in term of clinical and imaging aspects, on one hand, and a distinct manner of response in MDR/XDR cases.

In our opinion, we must first resort to the lesional criterion, since the main surgical estimation is based on imagistic aspects, regardless of other conjectures, i.e. previous medical therapy, clinical manifestations etc. Then we must take into account the microbiological status, the rule being that the patient should have negative sputum for acid fast bacilli. If this is not possible, we stick to the rules we stated in the previous article.

Performing surgery in TB implies common preconditions with any other thoracic surgical pathologies, i.e. functional status and specific spirometric values that we won't elaborate now. We will emphasize a single constatation, however: the functional respiratory reserves may be lower in TB when compared to other diseases (neoplasms,

pulmonary abscesses), the reason being that, excepting pleural lesions, the TB patients adapt functionally to their disease.

OUR EXPERIENCE

We have operated 83 patients between in 6 years, 17 women and 66 men, aged between 17 and 75. We have performed 110 surgical procedures, grouped in 12 types of operation, as follows: 30 resections, 25 decortications, 34 pleurotomies, 3 fistulectomies, 1 operation for pneumothorax, 4 biopsies, 5 thoracoplasties, 3 Elloesser flaps, 1 mediastinal abscess drainage, 2 cavernoplicatures, 1 lymphadenectomy, 1 cavernostomy.

Out of the 83 patients, 19 (20%) were MDR and 6 had associated HIV infection. We recorded 2 deaths and we had to reoperate 2 times for hemostasis.

What is particular about our series is that we formulated the surgical indications according to the criteria itemized above, *centered around the lesional aspect*. As a result, we designed a table which tie every lesional aspect with a specific surgical procedure. We found this table useful and easy to work with. Moreover, indicating a procedure seemed to us unequivocal when we abided to the table.

SURGICAL INTERVENTIONS BASED ON LESIONAL CRITERIA

1) Pulmonary lesions
- destroyed lung +/- MDR/XDR: exeresis,
- caverns +/- MDR/XDR: exeresis or thoracoplasty for the cavities with less than 5 cm diameter, aged less than 5 years,
- thin-walled caverns: exeresis, cavernoplication or thoracoplasty,
- fibrous lobitis +/- MDR/XDR: exeresis,
- tuberculoma: exeresis,
- pseudotumors: exeresis,
- diffuse lesions (TB ulcerations +/- MDR/XDR +/- old lesions): exeresis or artificial pneumothorax.

Comments: quite often, exeresis in TB may be associated or combined (for example: upper lobectomy + apical segmentectomy of the lower lobe). We will chose thoracoplasty (a mutilant procedure) only when spirometric studies rule out exeresis. Cavernoplication will be preferred when spirometry rules out exeresis (FEV1 under 900 ml), but the lesion must have very thin walls and we must have several negative sputum exams before performing it. The large cavitary lesions associated with diffuse lesions and low spirometric values may benefit from artificial pneumothorax or, if not feasible, from a extrapleural plombage with balls or from a cavernostomy. However, in the last 10 years, such operations became very rare.

2) Pleural lesions

Purulent pleurisies, encysted pleurisies and empyema will benefit from:
- decortications – if the underlying parenchyma is reexpandable;
- thoracoplasties – if the underlying parenchyma cannot reexpand, as in diffuse fibrosis (same procedure in postpneumonectomy empyema);
- musculary flaps plombage – in dry pleural cavities, when we have proof that acid fast bacilli are absent.

3) Mixed pleuropulmonary lesions
- empyema + diffuse parenchymal lesions which would reactivate after the procedure (hiperdistension mechanism) : thoracoplasty + decortication;

- empyema + destructive parenchymal lesions: resection + decortication;
- empyema + destructive parenchymal lesions with inextensible remaining parenchyma: resection + thoracoplasty.

4) Parietal lesions : fistulectomies, exeresis, thoracoplasties.
5) Mediastinal cold abscess : mediastinotomy, abscess drainage.
6) Bronchial lesions

- bronchectasis: resection;
- stenosis with parenchymal destruction beyond the stenosis: resection;
- stenosis with sane parenchyma beyond the stenosis: bronchial resection and anastomosis.

Comments: we must rule out bronchial TB active lesions by bronchoscopy in *all* pulmonary resections since an active lesion on the bronchial stump would lead to a TB peripedicular abscess, with bronchial fistula and ensuing empyema.

7) TB lymphadenopathy

- primal TB compressive lymphadenitis: emergency lymphadenectomy;
- peripheral lymphadenopathies: lymphadenectomy.

CONCLUSIONS

We want to insist on our opinion concerning early surgery. If the status of the patient allows surgery, we must perform it as soon as possible, under specific chemotherapy and by taking serial blood samples for assessing ADA and ceruloplasmin activity, in order to have a proof of the favorable evolution of the case. However, we still find that the clinical assessment is the most valuable tool for evaluating the patient preoperatively. Hemoptysis and respiratory insufficiency in pleural effusions are emergencies and we treat them accordingly.

Surgery in thin walled caverns and tuberculomas is still a matter of debate. Pneumologists are tempted not to prescribe surgery in such cases, but there are even old studies (some are 50 years old) that show that the walls of thin caverns contain viable bacilli. This is why we recommend to operate upon such cases (exeresis). Surgery is also sustained by the potential evolution to pulmonary abscess or aspergilloma. As for the tuberculomas, we will cite a study performed in 1994 (3) which shows that out 16 tuberculomas, more than 50% hosted active bacilli. The authors tried to correlate the tuberculomas diameters to the presence of viable bacilli and they observed that all the tuberculomas with a diameter exceeding 3 cm hosted live *M. tuberculosis*.

Another matter of discussion is surgery in MDR/XDR cases. Our opinion is that well performed surgery leads to success by taking out the bacillifer sources. We think that it is preferable to study a lesion under a microscope or in Petri plates, rather than treat it in the patient's lung or pleura, provided the resection is performed in good functional settings.

As for the table we presented here, we find it useful and easy to work with. We have the strong tenet that in a surgical environment the lesion accounts for most of the indications, while conjectures, like controlling the microbiologic status, insure only the background of the cure.

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