Thoracoplasty for Tuberculosis in the Twenty-first Century

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KEYWORDS

• Pulmonary tuberculosis • Extrapleural thoracoplasty • MDR TB • XDTR TB

KEY POINTS

- A new modification of osteoplastic collapse thoracoplasty performed with a minimally invasive approach has been proposed.
- This operation is a variant of extrapleural thoracoplasty used in the treatment of destructive tuberculosis.
- The benefits of the proposed method, the surgical techniques, and the results of the authors' research are described.
- Compared with the conventional variant of osteoplastic thoracoplasty, the chances of bacteriologic conversion (odds ratio [OR], 1.84; 95% confidence interval [CI], 1.72–1.97) and of the closure of cavities (OR, 2.13; 95% CI, 1.98–2.28) have been proved to be higher when the operation is performed with a minimally invasive approach.

INTRODUCTION

A complicated epidemiologic situation relating to tuberculosis (TB) is currently observed in the Russian Federation. The low efficiency of chemotherapy is confirmed by the number of cases of smear negativity (bacteriologic conversion) in patients with primary pulmonary TB (70%); closure of the decay cavities can be achieved in only 60% of patients with destructive TB. Thus, the number of smear-positive people is growing, jeopardizing the health of the surrounding people: the percentage of smear-positive TB patients reaches 40% of all patients with TB.[1,2]

Because of low compliance with chemotherapy, most such patients should be treated with modern surgical techniques, directed at smear negativity.[3,4] The main operations in the TB surgery are lung resections, designed to remove the main lesion foci.[2–4] However, because of various factors, lung resection may not be performed for all patients; it is contraindicated for many. These factors include the lesion size and its progress, poor lung function, tuberculous lesions of the bronchial tree, and severe concomitant disorders. These patients are smear positive with multidrug-resistant (MDR) TB and extensively drug-resistant (XDR) TB and present a real threat for the community.

Collapse thoracoplasty may be performed on patients with contraindications to lung resection.[4,5] Thoracoplasty has been performed to treat pulmonary TB for more than 100 years and had been successfully used all over the world before invention of the first anti-TB drugs.[5] Using this method has again become a necessity in the countries with a high burden of MRD/XDR TB.

However, the collapse surgical operations developed and described over the preceding decades

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are accompanied by a large number of complications; an expressed pain syndrome; a significant cosmetic defect; and, as a result, low adherence of patients to this method of treatment.

Therefore, the authors developed and are successfully using a new sparing method of osteoplastic thoracoplasty with a minimally invasive approach that is different from the conventional method in its low degree of invasion, the absence of a cosmetic defect, less intraoperative blood loss, and fewer postoperative complications.

TOPOGRAPHIC-ANATOMIC JUSTIFICATION OF MINIMALLY INVASIVE APPROACH FOR OSTEOPLASTIC THORACOPLASTY

In developing and studying the method of osteoplastic thoracoplasty with a minimally invasive approach, the authors presumed that the approach should be convenient for full-scale surgical intervention and that this impact of the intervention on the patient should be as small as possible. Our study proves the reasonable balance between minimal operative trauma and freedom of access to the posterior chest wall.

In conventional osteoplastic thoracoplasty, the rear segments of the upper 5 ribs and the extrapleural space are approached through a paravertebral incision around the scapular bone, up to 15 to 17 cm long. The trapezoid muscle and the underlying deep muscles of the back are almost completely divided. This approach is convenient because the rear segments of the ribs to be resected are well visualized, and fixation of the ribs to the sixth rib is technically easy after complete extrapleural pneumolysis. Cutting the intercostal muscles of the first and second intercostal spaces allowed surgeons to achieve mobility of the ribs. At the same time, this approach had specific disadvantages. One consisted in cutting the back muscles at length, resulting in serious intraoperative blood loss, the necessity for hemostasis, and the longer operative duration. The operative challenges were later followed by longer confinements for the rehabilitation of patients caused by a severe pain syndrome. A high percentage of purulent processes and hemorrhages in the early postoperative period prolonged the patients' stays in the surgical clinics. The cosmetic defect of the operated patients decreased their adherence to surgical treatment. These factors led us to search for a more sparing approach to this operation and to analyze the possibilities of performing osteoplastic thoracoplasty with a minimally invasive approach.

No studies devoted to objective assessment of approaches used in low-invasive extrapleural thoracoplasty and to their comparison with traditional approaches have been found in the literature. The method of performing osteoplastic thoracoplasty with a minimally invasive approach has not been investigated previously, and the minimal possible sizes of the operative approach have not been justified.

Important criteria for assessing a low-invasive approach are the extent of operative trauma, the view of the operative field, and the universal nature of the approach. In performing osteoplastic thoracoplasty with a minimally invasive approach, the back muscles are traumatized little, which is primarily related to a short incision of 5 cm or less. After dissecting the deep layers of the muscle, visualization of the rear segments of the crossed ribs is not difficult and presents no technical challenges. Installing a rib raspatory makes it easy to view the extrapleural space, which, in its turn, allows the surgeon to mobilize the first rib without any technical confinements. Note that we have refrained from dividing the intercostal muscles in order to reduce intraoperative blood loss and to create conditions for good collapse of the pulmonary tissue. The possibility of fixating the mobilized ribs behind the seventh rib is ensured by making a counteropening in the seventh intercostal space.

This approach to the extrapleural space allows surgeons to exercise direct control over all the anatomic structures of the operative field throughout the intervention, to perform timely homeostasis, and to achieve irreversible circulatory collapse of the pulmonary tissue.

THE SURGICAL TECHNIQUE

A paravertebral approach 4 to 5 cm long is applied to the patient lying in a prone position (Fig. 1).

To ensure the convenience of further manipulations, the skin incision is made in the projection of

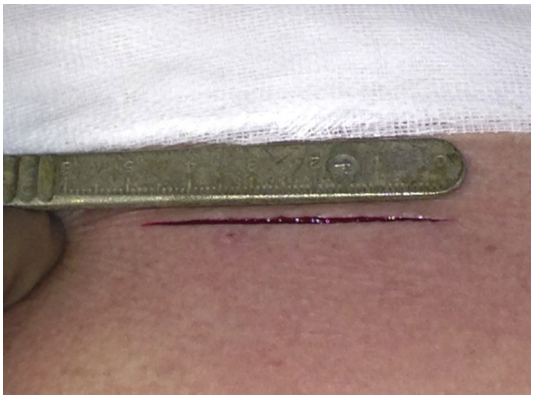

Fig. 1. The paravertebral approach 4 to 5 cm long.