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THE EFFECT OF TIOTRIAZOLINE ON RADIOLOGICAL DYNAMICS AND REPARATIVE PROCESSES IN MULTIDRUG-RESISTANT PULMONARY TUBERCULOSIS

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Abstract: The second stage of the study involved evaluating the effect of tiotriazoline on radiological dynamics and reparative processes in lung tissue among patients with MDR-TB. A total of 142 patients were included, of whom 81 received tiotriazoline in addition to standard chemotherapy. The assessment included the rate of infiltrate resolution, cavity closure, the need for surgical intervention, and morphological characteristics of granulomas. The use of tiotriazoline resulted in faster healing of infiltrative lesions, a significantly higher rate of cavity closure, and a marked reduction in the need for surgical procedures. Morphological analysis confirmed accelerated formation of a connective tissue capsule and limitation of specific inflammation.

Keywords: tuberculosis, MDR-TB, tiotriazoline, radiology, pulmonary cavity, repair, granuloma.

Introduction

Destructive forms of MDR-TB are characterized by severe lung tissue damage, the formation of cavities, and impaired reparative processes. Effective closure of cavities and reduction of residual lesions are essential indicators of successful treatment outcomes. The antioxidant and membrane-protective effects of tiotriazoline may contribute to accelerated lung tissue repair; however, this aspect has not been adequately studied.

Materials and Methods

The study included radiological data from 142 patients with confirmed pulmonary multidrug-resistant tuberculosis who underwent inpatient treatment in specialized phthisiology centers between 2020 and 2023. All patients were in the intensive phase of therapy and were monitored dynamically with mandatory serial radiological examinations.
The following parameters were evaluated to determine the efficacy of tiotriazoline:

Resolution of infiltrates
Assessed monthly based on follow-up radiographs. The degree of improvement was classified as complete, marked, moderate, or minimal.

Cavity closure

Including the rate of spontaneous closure without surgical intervention. Assessment was based on serial radiographs and, when required, computed tomography.

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Need for surgical treatment
Including indications for resectional procedures (lobectomy, segmentectomy) in cases of persistent large cavities or progression of destructive changes.

Morphological characteristics of granulomas
Analyzed using material obtained from open biopsies, resected lung specimens, and intraoperative samples. Parameters included granuloma maturation, density of the connective tissue capsule, necrosis severity, cellular infiltrate activity, and reparative fibrosis.
Tiotriazoline was administered in the main group according to the standard regimen, combining intravenous and oral administration during the 60-day intensive therapy period.

Results

Radiological Improvement
Analysis demonstrated that patients receiving tiotriazoline exhibited significantly faster and more pronounced resolution of infiltrative lesions. By the end of the second month of treatment:

- 79% of the main group

versus

- 50% of the control group

showed complete or marked resolution of infiltrates ($p < 0.01$).
Thus, tiotriazoline increased the likelihood of rapid inflammatory regression by more than 1.5 times, indicating accelerated suppression of the active tuberculous process.

Cavity Closure
Cavity dynamics—an essential marker of disease severity—were a key focus of analysis. Spontaneous closure of cavities within two months was observed in:

- 74.1% of the main group,

compared with

- 32% of the control group.

This nearly 2.5-fold difference reflects the significant influence of antioxidant therapy on reparative processes and limitation of tissue destruction. Even in cases where full closure did not occur, patients in the tiotriazoline group demonstrated faster reduction in cavity size, improving conditions for further conservative or surgical management.

Need for Surgical Intervention
The requirement for surgical treatment differed substantially between study groups. Resection procedures were required in:

- 14.8% of patients receiving tiotriazoline

versus

- 65.6% of patients undergoing standard chemotherapy alone.

Thus, tiotriazoline reduced the need for surgery by more than fourfold, indicating a significant decrease in destructive pulmonary changes and enhanced effectiveness of conservative therapy.
The absence of progressive destruction and favorable radiological dynamics in the main group markedly reduced the frequency of extensive lung resections.

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Morphological Findings

Histological evaluation of biopsy and surgical specimens confirmed the pathogenetic effect of tiotriazoline at both the cellular and tissue levels.

The following features were identified in samples from the main group:

- Accelerated formation of a dense connective tissue capsule surrounding tuberculous granulomas, indicating earlier organization of inflammation and transition to reparative fibrosis.
- Significant limitation of caseous necrosis, demonstrating reduced destructive activity and diminished tissue injury.
- Reduction of perifocal inflammation, manifested by decreased neutrophilic infiltration and edema in adjacent lung parenchyma, supporting the anti-inflammatory action of the drug.
- Enhanced reparative activity, including the development of fibrous stroma and mature granulation tissue, consistent with active lung tissue restoration.
- These morphological findings demonstrate that tiotriazoline promotes faster completion of the acute inflammatory phase and transition to reparative regeneration.

Discussion

The obtained results demonstrate the substantial effect of tiotriazoline on lung tissue repair in MDR-TB. The drug accelerates regression of infiltrative changes, promotes cavity closure, and reduces the extent of residual lesions. A significant reduction in the need for surgical intervention is an important clinical and economic advantage. Morphological evidence confirms that tiotriazoline enhances reparative mechanisms while reducing the severity of pulmonary tissue damage.

Conclusion

Tiotriazoline significantly improves radiological and morphological outcomes in patients with MDR-TB. The drug accelerates healing of infiltrative lesions, promotes cavity closure, and reduces the requirement for surgical treatment. These findings underscore the pathogenetic relevance and clinical value of tiotriazoline in comprehensive MDR-TB therapy.

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