Improvement of Treatment Methods of Acute Purulent Destructive Pulmonary Diseases Considering Non-Respiratory Function of Lungs

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Abstract
Program of pre-operative preparation was developed based on examination and treatment of 465 patients with acute purulent destructive pulmonary diseases (APDPD) with regard to process phase (Group 1 - septic process flow, Group 2 - stabilization, Group 3 - remission), endotoxemia severity, and non-respiratory function of lungs (NRFL). Group I patients under basic long-term intra-arterial catheter-based therapy (LIAC) followed our developed NRFL correction scheme and treated suppurative focuses with electrolyzed sodium hypochlorite solution. It has proven to be effective for 202 (79.9%) out 254 Group 1 patients, enabling withdrawal from surgery, while only 52 (40.6%) of Group 2 patients and 26 (31.3%) of Group 3 patients have not undergone surgery. Simultaneously, clear NRFL malfunction degree correction augmenting impact was achieved accompanied by limiting and stabilizing the process. It has enabled to limit lung resection numbers to 109 (60.9%) out of 179 Group 1 patients who undergone surgery with 8.7% of surgical complications comparing to 18.4% for Group 2 and 24.6% for Group 3, emphasizing the efficiency of the pre-operative preparation strategy we proposed.

Keywords: acute purulent destructive pulmonary diseases (APDPD), a non-respiratory function of lungs dysfunction extent (NRFLDE), diagnostics, conservative and operative treatment.

抽象的
根据对465名急性化脓性破坏性肺病(APDPD)患者的检查和治疗，制定了术前准备计划，包括治疗阶段（第1组-脓毒症流程，第2组-稳定，第3组-缓解）、内毒素血症严重程度和肺的非呼吸功能(NRFL)。接受基础长期动脉内导管治疗(LIAC)的1组患者遵循我们开发的NRFL矫正方案，并用电解次氯酸钠溶液治疗化脓性病灶。它已被证明对254名第1组患者中的202(79.9%)名有效，可以退出手术，而第2组患者中只有52名(40.6%)和第3组患者中有26名(31.3%)未接受手术。同时，在限制和稳定过程的同时，实现了清晰的NRFL故障度校正增强影响。它能够将179名接受手术的第1组患者中的肺切除数量限制为109(60.9%)名，手术并发症发生率为8.7%，而第2组为18.4%，第3组为24.6%，强调了效率我们提出的术前准备策略。


**Introduction**

Surgeons' dissatisfaction with the outcomes of acute purulent destructive pulmonary diseases (APDPD) treatment is determined by sustainably high mortality rates (up to 70%) in its gangrenous forms spurred numerous researches on various aspects of pathogenesis and treatment of this disease [1,2,3,4].

With the progress in resuscitation and intensive care recently, a combination of features of various bodies and systems malfunction is noted while APDPD treatment, defined by practicing clinicians as multiple organ failure [5,6,7].

We think that non-respiratory malfunction of lungs (NRFL) remains underestimated comparing to the other mechanisms of this syndrome development, though the lungs are the main protective barrier preventing the spread of infection and intoxication with further disruptions in critical systems of an organism [8,9,10].

APDPD treatment is a complex, long-term process accompanied by a number of complications. Moreover, there is still a lack of consensus on the treatment of APDPD. Usually, treatment starts with intensive, comprehensive therapy with antibacterial medicines, nonspecific anti-inflammatory drugs, detoxification therapy, tracheobronchial tree suction, correction of metabolism dysfunctions [11,12]. Lack of effect obtained from such treatment made within three weeks, process chronicity occurring, according to various authors, within 6-14 weeks term from the beginning of the disease, life-threatening complications are considered as indications for surgery [18,19]. The significance the researchers attach to these criteria is far from being unambiguous.

The abovementioned determined the purpose and tasks of this research, which is a clarification of indications for conservative pre-operative treatment for patients with APDPD with regard to NRFL malfunctions in order to improve direct and long-term outcomes of invasive treatment.

**Materials And Methods**

465 APDPD patients (age 28-60) were examined divided by clinic groups. Group 1 included 254 (54.6%) patients with clear clinic manifestation of the inflammatory lung destruction process. These patients underwent targeted correction of NRFL as per the method we developed alongside long-term selective intra-arterial catheter therapy (LIACT).

Group 2 was composed of 128 (27.5%) patients on stabilized path treated using a conventional LIACT scheme with commonly accepted metabolism dysfunctions correction [13,14].

Group 3 included 83 (17.9%) patients who underwent conventional treatment in other hospitals and transferred to our clinic to proceed with the treatment due to inflammatory process remission. Such treatment of APDPD patients reflects different stages of developing and introduction of these diseases diagnostics and treatment methods in the clinic of Tashkent Medical Academy.

An overwhelming majority of the patients - 341 (73.3%) persons were hospitalized within 2.5 months since the beginning of a disease, 119 (25.6%) patients were exposed to it up to 3 months, and only 5 (1.1%) patients experienced it for a longer time.
A group of researchers from our Academy developed a quantitative NRFL dysfunction extent assessment method - NRFLDE (compensatory, sub-compensatory, and de-compensatory degree of NRFL) for patients with chronic non-specific inflammatory lung diseases based on integral indicators of albumen, globulin, general phospholipid and lipids, phosphatidylcholine and sphingomyelin blood content. We used this method with minor supplements and modifications, reflecting an extent of the inflammatory process in the bronchopulmonary system, mainly of bacteria-induced origin, during the treatment of APDPD patients.

Formalized research data we're integrated into the following formula, describing NRFLDE in APDPD patients:

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NRFLDE = \frac{(AGR/2,3)-0,12}{(FLR/0,6)+(PCER/2,4)+(LII/0,8)+(3/R)+(3/S)}
\]

with AGR - Albumen-globulin ratio
FLR - Phospholipid and lipid ratio
PCER - Phosphatidylcholine-ethanol ratio
LII - Leukocytal intoxication index
R - Radiography examination data
S - Amount and features of sputum.

Comprehensive clinic and biochemical examination in APDPD patients at conservative and invasive treatment stages enabled us to conclude that they were initially exposed to a certain NRFLDE, complicated at early post-invasive stage due to apostem in pulmonary parenchyma, the impact of surgical invasion, and general anesthesia factors.

The major rule in the treatment of patients with APDPD is early endobronchial or transthoracic drainage and purulo-necrotic lung focus sanation fulfilled in a proper manner. In 54,3% of cases, these sanation methods were employed simultaneously.

Results And Discussion

Intravenous infusion of fatty emulsions (Nirpid) and protein synthesis enhancing drugs (PSED) was prescribed for Group 1 patients due to NRFLDE by means of daily intraarterial drip injections of 100 ml of 10% albumen or alvezin solution with intramuscular injection of Retabolil. 286 (61,5%) of patients with APDPD were treated based on conventional method obtaining certain positive results, 179 (38,5%) patients underwent surgery.

163 (78,4%) out of 208 Group 1 patients fully recovered, clinic remission was observed in 39 (18,7%) of APDPD patients. Only 6 (2,9%) patients showed further progress of a disease.

Only 4 (15.4%) out of 26 Group 3 patients fully recovered without surgery, and 8 (30.8%) patients demonstrated clinic remission. The positive impact was achieved mostly in patients in severe conditions. So far, 202 (97,1%) of Group 1 patients fully recovered and showed sustainable clinic remission. The treatment proved to be inefficient for 6 (2.9%) hospitalized with an extensive course of a disease, clearly observed endotoxification and respiratory failure; the disease extended further, resulting in their death of septic shock. Conventional treatment brought modest results in Group 2: only 16 (30.8%) patients fully recovered. Clinic remission was observed in 20 (38.5%) patients.

The treatment produced no impact on 14 (26.9%) patients, while 2 (3.8%) patients faced further advancement of the disease, resulting in death.

12 (46.1%) patients undergone treatment in Group 3 fully recovered and demonstrated clinic remission, while for 14 (53.8%) patients, the treatment proved to be inefficient. In general,
conventional treatment was efficient for 250 (87.4%) patients. 183 (64%) of them fully recovered, 67 (23.4%) withdrew from surgery upon achieving clinic remission. 28 (2.8%) patients showed no results from treatment, while 8 (2.8%) patients saw an extension of the pathological process with treatment measures producing no impact, and patients died due to various causes.

179 (38.5%) APDPD patients underwent surgery. 46 (18.1%) of them were from Group 1, 76 (59.4%) from Group 2, and 57 (68.7%) from Group 3. Lobectomy was the main type of surgery being performed in 109 (60.9%) patients. Extended surgeries such as pneumonectomy, bilobectomy, and lobectomy with segment resection were made in 70 patients. A prevailing number of organ-saving surgeries we explain with LIACT ensuring limitation and stabilization of destructive process in lungs [15].

Noteworthy, all the invasive treatments undertaken were complex and traumatic, determining post-operational complications for 32 patients. The majority of complications were related to bronchial patency dysfunction, causing atelectasis and pneumonia for the remaining part of a lung (13 and 5, respectively).

Empyema alongside bronchial stump fistula occurred in 2 patients. An excessive cavity in the early post-operational period emerged in 4 (2.23%) patients as an outcome of the incomplete spread of the remaining part of a lung. Post-operational bleeding were recorded in 1 (0.56%) patient.

Pulmonary Artery Thromboembolism was a cause of death for 3 (1.7%) patients who underwent surgery. Complications caused by post-operational wounds were rare, encountered in 2 (1.12%) patients. Recording the number and type of post-operational complications, we emphasize that they were observed in 14 (24.6%) examined patients from Group 3, 14 (18.4%) patients from Group 2, and 4 (8.7%) patients from Group 1. Analyzing and explaining the outcomes of conventional and invasive treatment in APDPD patients, we examined the dynamics of clinic manifestations of the inflammatory process at all major stages of treatment. 46 (25.7%) out of 179 patients who underwent surgery in the clinic were hospitalized with clear clinic manifestations of the inflammatory process, which required intensive preparatory treatment with regard to NRFLDE.

By employing conservative corrective methods, the disease course was stabilized, and remission was achieved in 171 (95.5%) patients. The disease course was stabilized in 42 (23.46%) of Group 1 patients, and remission was recorded in three (1.68%) of Group 1 and fourteen (7.82%) of Group 2 patients, pre-treatment produced no impact only in one of Group 1 patient, while seven patients with stabilized course experienced advancement of the disease. These patients underwent emergency surgery. So, by the time of surgery number of APDPD patients with clear manifestations of inflammatory process reduced to 4.47% as an outcome of conventional treatment, while stabilization number increased to 54.19%, remission was achieved in 41.3% of patients, proving the efficiency of the proposed conventional treatment actions. However, the explanation is still lacking on why pre-treatment outcomes in Group 2 and Group 3 APDPD patients were relatively worse compared to those with clear clinic manifestation of a disease. As we stated above, APDPD patients have a certain NRFLDE which is reflected in various combinations of dysfunction in systemic homeostasis and local protective reactions. Considering that compensatory and sub-
compensatory NRFLDE is usually a dynamic and reversible process [16] and pulmonary dysfunctions can vary across APDPD patients, we examined NRFLDE within clinic groups.

We identified that 179 (38.5%) of Group 1 patients had severe and moderate pulmonary dysfunctions specific to compensatory changes, while 75 (16.1%) patients had sub compensatory dysfunctions. Decompensatory NRFL dysfunctions were not recorded in Group 1 patients. 98 (21.1%) of Group 2 patients were revealed to have compensatory NRFL dysfunctions, and sub compensatory dysfunctions were rarely observed, recorded in 18 (3.9%) patients, decompensatory changes were even rarer, identified in 12 (2.58%) of examined patients.

Decompensatory and sub compensatory types were specific to Group 3 APDPD patients recorded in 56 (12%) and 27 (5.8%) persons, respectively.

Data provided prove that clinically defined stabilization and remission of a process in APDPD patients in the majority of cases are not accompanied by pulmonary dysfunction normalization. This requires appropriate treatment for APDPD patients considering the NRFLDE as per rehabilitation requirements [17]. As such, it ensures a growing number of fully recovered patients and patients experienced remission, and in staged invasive treatment facilitates reducing the number of pyoinflammatory complications in the post-operative period, improves direct and long-term outcomes of treatment.

Conclusion
1. Conventional treatment was efficient for 250 (53.76%) APDPD patients and 183 (64%) of patients fully recovered;
2. Conventional corrective pre-treatment we proposed enabled stabilizing the process and achieve pre-surgery remission in 171 (95.6%) APDPD patients who underwent surgery;
3. Efficient pre-treatment based on NRFLDE provide limitation and stabilization if the inflammatory process, enabling organ-saving lung resection in 109 (60.9%) APDPD patients with 17.9% of complications in the post-operational period;
4. Clinic stabilization and process remission are not always accompanied by pulmonary dysfunction normalization, requiring further rehabilitation of the patients considering their NRFLDE.

Conflict Of Interests And Contribution Of Authors
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