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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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THE EFFECT OF LOW MOLECULAR WEIGHT HEPARIN SODIUM IN THE TREATMENT OF ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE COMORBID WITH PULMONARY HEART DISEASE ON PROMOTING THE BALANCE OF BLOOD VESSELS

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Abstract.

Background: Chronic obstructive pulmonary disease is a frequently occurring and common respiratory disease which has an incidence of 13.7% among people over 40 years in China, and now nearly 100 million people at home suffer from chronic obstructive pulmonary disease.

Objective: To observe the effect of Low molecular weight heparin sodium in the treatment of acute exacerbation of chronic obstructive pulmonary disease (AECOPD) comorbid with pulmonary heart disease (PHD) on blood vessels.

Methods: A total of 92 patients with AECOPD accompanied by PHD in our Hospital from January 2019 to May 2021 were randomly divided into two groups. The control group was given basic treatment while the observation group was treated with basic treatment in combination with Low molecular weight heparin sodium. The changes of blood gas, hemorheology, cardiac function and serum factors were recorded to analyze their curative effect and safety.

Results: The total effective rate of the observation group was 95.65% (44 cases per 46 cases), which was significantly higher than that of the control group with 82.61% (38 cases per 46 cases), with statistical significance (P<0.05). The left ventricular ejection fraction (LVEF), 6-min walking distance (6MWD), arterial partial pressure of oxygen (PaO2), pH, nitric oxide (NO), and oxygen saturation (SaO2) in the two groups were higher than those before treatment while 4-hydroxymenealdehyde (4-HNE), endothelin-1 (ET-1), arterial partial pressure of carbon dioxide (PaCO2), brain natriuretic peptide (BNP), high-sensitivity-C-reactive protein (hs -CRP), tumor necrosis factor-α (TNF-α) and hemorheology indexes were decreased compared with those before treatment. After treatment, the improvement of the above indexes in the observation group was higher than those in the control group (P<0.05) with no significant difference in adverse reactions between them(P>0.05).

Conclusion: Low molecular weight heparin sodium can reduce inflammation and improve hemorheology by regulating the balance of blood vessels, thus improve the curative effect in the treatment of AECOPD accompanied by PHD.

Key words. Seboli, Chronic obstructive pulmonary disease, PHD, Blood vessels.

Introduction.

Chronic obstructive pulmonary disease (COPD) can cause long-term airflow limitation. Patients in the state of hypoxemia and pulmonary hypertension will have an increase in pulmonary vascular resistance and right ventricular load, thus cause chronic pulmonary heart disease. COPD will transfer into AECOPD under various external stimuli with the body' s hypoxia symptoms and hypoxic pulmonary hypertension aggravating, resulting in acute exacerbation of heart disease and even right heart failure or death [1]. Conventional treatment such as anti-infection, oxygen inhalation, phlegm removing, cardiotonic and diuretic cannot achieve ideal curative effect [2].

Under hypoxic condition, the coagulation system is activated, and the blood viscosity is increased, which is beneficial to the formation of pulmonary arteriole thrombosis to promote pulmonary hypertension, thus further aggravate the condition of PHD [3]. Some scholars have proposed that active anticoagulant therapy contributed to the prognosis of patients. Low molecular weight heparin calcium is the degradation product of ordinary heparin with a better anticoagulant effect than that of ordinary heparin and small hemorrhagic adverse reactions and high safety [4]. In this study, the effect of low molecular weight heparin calcium treatment of AECOPD accompanied by PHD on 4-hydroxymenealdehyde (4-HNE), endothelin-1 (ET-1), nitric oxide (NO) has been observed for clinical reference. The report is as follows.

Materials and Methods.

General data:

A total of 92 patients with AECOPD accompanied by PHD who were admitted to our hospital (from January 2019 to May 2021) for a retrospective study were divided into two groups by simple random method, with 46 cases in each group. The general data were comparable (P>0.05). See Table 1.

Inclusion and exclusion criteria:

Inclusion criteria: (1) AECOPD meets the criteria of "Expert Consensus on Diagnosis and Treatment of AECOPD" [5]; (2) pulmonary heart disease meets the criteria of "Internal Medicine" [6]; (3) Age ≥18 years old, ≤80 years old; (4) Non-smoking or smoking cessation ≥10 years; (5) Voluntary participation in the study, and the study was approved by the ethics committee of the hospital.

Exclusion criteria: (1) patients with PHD not caused by COPD; (2) patients with bronchial asthma, lung cancer, pulmonary embolism, etc.; (3) patients with bleeding disorders or bleeding tendency; (4) mental disorders, unable to cooperate with treatment and curative effect evaluator; (5) allergic constitution or liver and kidney insufficiency.

Treatment methods:

The control group was given routine basic treatment of AECOPD, including low-flow oxygen inhalation, sensitive antibiotics or broad-spectrum antibiotics for anti-infection, ambroxol for eliminating phlegm, salmeterol for relieving asthma, digitalis drugs for cardiotonic, furosemide for diuresis, balancing water and electrolytes and nutritional support, etc. The observation group was additionally treated with low molecular

Table 1. *Comparison of general data.*

Group	Number of cases	Male/Female	Age (age)	Course of disease (year)	Body mass index kg/m²	NYHA classification
						Class II/Class III/Class IV
Control group	46	25/21	60.44±7.15	12.52±3.98	24.12±1.85	10/19/17
Observation group	46	21/24	60.71±7.25	12.17±4.15	23.84±1.91	9/23/14
χ^2		0.696	0.180	0.413	0.714	1.298
P		0.404	0.858	0.681	0.477	0.523

weight heparin sodium injection (manufacturing unit: Shenzhen Saibaoer Biopharmaceutical Co., Ltd.), which subcutaneously injected 5000AXa, bid. Both groups were treated for 7 days.

Detection method:

Radial artery blood was drawn from patients to detect the levels of PaO2, PaCO2, SaO2, pH and other blood gas indexes before and after 7-days treatment. Testing equipment: I-STAT-300G blood gas analyzer (Abbott, USA). Before and 7d after treatment, 5ml fasting venous blood samples were drawn from patients for centrifugation (parameters: 3000r/min, 10min) to get the upper serum to detect 4 - hydroxy-1 - enal (4 - HNE), endothelin-1 (ET-1), nitric oxide (NO), brain natriuretic peptide (BNP), high sensitivity-C reactive protein (hs-CRP), tumor necrosis factor-α (TNF-α) and other indicators by enzyme-linked immunosorbent assay (ELISA) kit (production unit: Nanjing Jiancheng Bioengineering Institute). The above indicators were detected by enzyme-labeled instrument (American BIO-TEK company, model ELX800). Another venous blood sample was taken to detect the whole blood viscosity at low shear and high shear, plasma viscosity and FIB level. The instrument was an automatic hemorheology analyzer (Beijing Saikexide Technology Co., Ltd., model SA-7000).

Efficacy criteria:

(1) Markedly effective: After treatment, symptoms and signs disappeared or markedly improved with existing hypoxemia, hypercapnia corrected; (2) Effective: After treatment, symptoms and signs were alleviated with the existing hypoxemia and hypercapnia alleviated; (3) Invalid: did not meet the aforesaid standards.

Statistical method:

SPSS 19.0 version was used for statistical analysis, in which the measurement indicators were expressed as $\chi \pm s$, comparison was expressed by t test, while case description was used for data counting, χ2 test was used for comparison between groups, when P<0.05 they were statistically significant.

Results.

Comparison of curative effect between two groups:

In the observation group, 25 cases were markedly effective, 19 cases effective and 2 cases ineffective, with the total effective rate of 95.65 %; in the control group, 18 cases were markedly effective, 20 cases were effective, and 8 cases were ineffective, with the total effective rate of 82.61 %, and the difference was statistically significant between groups (χ2 = 4.039, P = 0.044).

Comparison of LVEF, 6MWD and blood gas analysis between two groups:

The above indexes in the two groups increased when compared with those before treatment, while PaCO2 decreased compared with those before treatment (P<0.05). After treatment, compared with LVEF (41.78 ± 4.11 and 38.12 ± 3.24) %, 6MWD (438.56 ± 74.86 and 412.55 ± 70.47) m, PaO2 (73.12 ± 5.28 and 66.58 ± 6.12mmHg), PaCO2 (46.89 ± 4.58 and 52.12 ± 4.62), mmHgSaO2 (95.85 ± 3.74 and 88.98 ± 4.02) %, pH (7.36 ± 0.06 and 7.32 ± 0.09) in observation group and treatment group, there was statistically significant (P<0.05). See table 2.

Comparison of serum factors between two groups:

NO in the two groups was higher than that before treatment (P < 0.05), and 4 - HNE, ET-1, BNP, hs-CRP and TNF-α were lower than those before treatment (P < 0.05). After treatment, compared with NO (58.24 ± 6.14 and 44.69 ± 5.26) mg / L, 4 - HNE (14.22 ± 2.05 and 15.24 ± 2.31) mg / L, ET-1 (57.25 ± 12.43 and 71.25 ± 16.96) ng / mL, BNP (574.66 ± 63.23 and 814.36 ± 86.77) pg / mL, hs-CRP (8.25 ± 2.02 and 12.87 ± 2.88) mg / L, TNF-α (37.12 ± 4.11 and 45.39 ± 4.85) pg / mL in observation group and treatment group, there was statistically significant (P<0.05). See table 3.

Comparison of hemorheology between two groups:

The whole blood viscosity, plasma viscosity and FIB in the two groups were lower than those before treatment (P < 0.05). After treatment, compared with the whole blood low shear viscosity (8.98 ± 1.22 and 10.41 ± 1.52) mPa·s, whole blood high shear viscosity (6.56 ± 1.11 and 7.58 ± 1.02) mPa·s, plasma viscosity (1.62 ± 0.21 and 1.72 ± 0.31) mPa·s, FIB (5.72 ± 1.14 and 4.51 ± 1.06) g / L in observation group and treatment group, there was statistically significant (P<0.05). See table 4.

Comparison of adverse reactions between the two groups:

The incidence of adverse reactions in the observation group was 13.04 % (3 cases of subcutaneous ecchymosis, 2 cases of gastrointestinal reactions, and 1 case of increased hydrolase), which was not statistically significant compared with 4.35 % (1 case of gastrointestinal reactions and 1 case of increased hydrolase) in the control group (χ2 = 2.191, P = 0.139).

Discussion.

Characterized by incomplete reversibility of the airway and progressive airflow limitation, COPD is acutely aggravated under the stimulation of cold, infection, inhalation of harmful smoke and other incentives, showing symptoms like cough, wheezing worse, and sputum volume increasing in a short period of time. Long-term repeated infection and hypoxia stimulation can cause airway, pulmonary blood vessels, lung parenchyma lesions, immune-related cells secrete a variety of inflammatory cytokines, causing alveolar tissue, capillary peroxidation damage, activation of coagulation system. As a result, blood viscosity will increase and come into micro thrombosis, resulting in pulmonary arteriole blood flow blocked, and then cause lung structural remodelling, thus ultimately lead

Table 2. *Comparison of LVEF, 6MWD and blood gas analysis between the two groups.*

Group		Control group	Observation group
LVEF (%)	Before therapy	34.25±4.52	33.98±5.02
	After treatment	38.12±3.24*	41.78±4.11*#
6MWD (m)	Before therapy	225.02±84.68	231.75±82.59
	After treatment	412.55±70.47*	438.56±74.86*#
PaO_2 (mmHg)	Before therapy	54.02±5.14	52.47±5.86
	After treatment	66.58±6.12*	73.12±5.28*#
$PaCO_2$ (mmHg)	Before therapy	60.12±5.98	62.36±6.10
	After treatment	52.12±4.62*	46.89±4.58*#
SaO_2 (%)	Before therapy	80.21±4.96	78.96±5.22
	After treatment	88.98±4.02*	95.85±3.74*#
pH	Before therapy	7.28±0.10	7.30±0.11
	After treatment	7.32±0.09*	7.36±0.06*#

*Note: intra-group comparison, *P < 0.05; comparison between groups, #P < 0.05.*

Table 3. *Comparison of serum factors between the two groups (–χ±s).*

		Control group	Observation group
4-HNE (mg/L)	Before therapy	17.53±2.88	17.48±3.26
	After treatment	15.24±2.31*	14.22±2.05*#
ET-1 (ng/mL)	Before therapy	95.28±24.23	91.25±25.66
	After treatment	71.25±16.96*	57.25±12.43*#
NO (mg/L)	Before therapy	30.12±5.02	29.94±4.75
	After treatment	44.69±5.26*	58.24±6.14*#
BNP (pg/mL)	Before therapy	2105.63±314.25	2086.95±289.76
	After treatment	814.36±86.77*	574.66±63.23*#
hs-CRP (mg/L)	Before therapy	34.85±5.63	32.59±6.11
	After treatment	12.87±2.88*	8.25±2.02*#
TNF-α (pg/mL)	Before therapy	65.63±12.02	66.52±10.52
	After treatment	45.39±4.85*	37.12±4.11*#

*Note: intra-group comparison, *P < 0.05; comparison between groups, #P < 0.05.*

Table 4. *Comparison of hemorheology between the two groups (–χ±s).*

Group		Control group	Observation group
Number of cases		**46**	**46**
Whole blood viscosity low shear (mPa·s)	Before therapy	12.85±2.02	12.91±1.96
	After treatment	10.41±1.52*	8.98±1.22*#
Whole blood viscosity high shear (mPa·s)	Before therapy	7.91±1.28	7.95±1.23
	After treatment	7.58±1.02*	6.56±1.11*#
Plasma viscosity (mPa·s)	Before therapy	1.85±0.36	1.81±0.42
	After treatment	1.72±0.31*	1.62±0.21*#
FIB (g/L)	Before therapy	3.75±1.02	3.78±0.94
	After treatment	4.51±1.06*	5.72±1.14*#

*Note: intra-group comparison, *P < 0.05; comparison between groups, #P < 0.05.*

to chronic pulmonary heart disease [7]. Pulmonary heart disease can cause acute myocardial infarction, decompensated heart failure, acute heart failure, cardiogenic death and other serious adverse consequences [8].

Active anticoagulant therapy is helpful to correct hemodynamic disorders and reduce cardiac pump blood load, which is beneficial to the prognosis of AECOPD patients with pulmonary heart disease. Low molecular weight heparin sodium is a widely used anticoagulant in the prevention of venous thromboembolism, unstable angina and acute myocardial infarction after surgery [9]. Some studies have found that it has a good application effect in the treatment of AECOPD comorbid with pulmonary heart disease, which is helpful to improve the heart function of patients [10].

In this study, low molecular weight heparin sodium used in the treatment of AECOPD comorbid with pulmonary heart disease was found that the total effective rate was higher than that of conventional treatment. After treatment, LVEF, 6MWD, PaO2, SaO2 and pH levels were higher than those of conventional treatment, while PaCO2 was lower than that of conventional treatment. The results suggest that low molecular weight heparin calcium in the treatment of AECOPD comorbid with pulmonary heart disease can improve the curative effect, correct the body ' s hypoxic state and improve the heart function of patients. This

is because low molecular weight heparin calcium can improve alveolar capillary low blood flow state, inhibit local oxidative stress, decrease micro thrombosis, reduce cardiac preload and pulmonary vein pressure, so as to better protect the heart [11-12].

4-HNE is a aldehyde product in the process of lipid peroxidation, which can interfere with cell function and damage cell components, and its serum level can reflect the degree of lipid peroxidation damage [13]. ET-1 can not only increase pulmonary artery pressure and aggravate pulmonary heart disease, but also cause myocardial vasospasm and aggravate myocardial ischemia [14]. NO is a vasodilator, which can antagonize ET-1 and relieve vasospasm. BNP, a hormone secreted by ventricular myocytes, will be released by ventricular myocytes when ventricular load increases, resulting in elevated BNP levels in blood [15]. hs-CRP is an acute phase reaction protein synthesized by the liver, which increases rapidly after infection and inflammation [16]. TNF-α is a pro-inflammatory factor that can stimulate the release of other pro-inflammatory factors and cause the expansion of inflammatory response [17]. In this study, it was found that low molecular weight heparin calcium in the treatment of AECOPD comorbid with pulmonary heart disease could reduce lipid peroxidation damage and inflammatory damage and regulate vascular relaxation and contraction to protect myocardium by detecting the above indexes in serum.

Blood flow retardation is an important risk factor for microthrombosis. The increase of blood viscosity is conducive to the formation of pulmonary arterial thrombosis and thus promote pulmonary hypertension [18]. In this study, we found that the whole blood viscosity, plasma viscosity and FIB whole blood viscosity, plasma viscosity and FIB of the two groups were lower than those before treatment. Low molecular weight heparin calcium in the treatment of AECOPD comorbid with pulmonary heart disease could better reduce blood viscosity and improve hemorheology, as low molecular weight heparin calcium can selectively inhibit the activity of thrombin Xa, improve the hemodynamic disorder of alveolar capillaries, inhibit local oxidative stress injury and microthrombosis [19-20].

The study also found that the adverse reaction rates of the two groups were similar, which suggested that low molecular weight heparin sodium in the treatment of AECOPD with pulmonary heart disease did not increase the risk of adverse reactions, so it was safe.

AECOPD comorbid with pulmonary heart disease is complicated with poor prognosis. Due to the high blood coagulation and viscosity of these patients, low molecular weight heparin was used in this study. It was found that low molecular weight heparin has better curative effect in correcting hypoxia, improving cardiac function and hemorheology, which was basically consistent with the existing research conclusions. The innovation of this study is preliminary clear about that reduce lipid peroxidation damage and inflammatory injury and regulate vasoconstriction function are important mechanisms of low molecular weight heparin calcium in the treatment of AECOPD comorbid with pulmonary heart disease by detecting the level of peroxide index, inflammatory index and vasoconstriction factor. In summary, low molecular weight heparin calcium in the treatment of AECOPD comorbid with pulmonary heart disease can improve the hemorheology and blood gas indexes of patients, regulate the balance of vascular substances, reduce inflammatory reactions, and improve the efficacy.

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Conflict of Interest.

All authors certify that they have no affiliations

with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Ethical approval.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (name of institute/committee) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Data Availability: The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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