

Evaluation of the Anti-Inflammatory Effects of Glucocorticoids

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Abstract: The purpose of this article is to study the pros and cons of glucocorticoids in anti-inflammatory effects and to evaluate them. Because inflammation can play a positive role in removing pathogens and recovering the body on the one hand, it can also bring about adverse reactions such as redness, swelling, heat, and pain. Therefore, understanding the pros and cons of glucocorticoids in anti-inflammatory effects has the guiding significance in the clinical drug use.

Based on the complexity of the clinical effects of glucocorticoids on the patient's body, this article first analyzes the specific symptoms of inflammation, which are mainly manifested as redness, swelling, heat, pain, and dysfunction, and then analyzes the mechanism of inflammation, which is mainly due to body fluid leakage and the role of cytokines.

Then, based on the symptoms and mechanism of inflammatory episodes, the inflammatory episodes are divided into fatal and non-fatal attacks, and three dosage regimens are designed. On this basis, the three dosage regimens were evaluated in the treatment of fatal and non-fatal seizures from four indicators of safety, effectiveness, stability, and uniformity, and the following evaluation results were obtained.

In the treatment of fatal diseases, the evaluation weight of the A program is 0.587384, the evaluation weight of the B program is 0.202727, and the evaluation weight of the C program is 0.209809. In the treatment of non-fatal diseases, the evaluation weight of the A plan is 0.5462, the B plan is 0.261573, and the C plan is 0.192148.

Analyze the three programs in the fatal disease situation and the non-fatal disease situation respectively, and draw the experimental conclusion that the comprehensive evaluation result of the A program is better than the B and C programs whether it is to treat fatal or non-fatal diseases. In the treatment of fatal diseases, the C program is slightly better than the B program, and in the treatment of non-fatal diseases, the B program is better than the C program.

Keywords: Anti-Inflammatory Effect; Glucocorticoid; Analytic Hierarchy Process; Judgment Matrix

1. Introduction

1.1 The background of the topic and its significance

Inflammation is a physical sign that the body shows when it is stimulated by damage factors. On the one hand, the inflammatory reaction is the body's elimination of damage factors in the body to restore the body to normal, and on the other hand, it will cause redness, swelling, heat, pain, dysfunction and other adverse reactions.

Inflammation has a variety of pathogenic factors, such as bacteria, viruses, strong acids and bases. Mild inflammation is generally treated by directly eliminating the cause and relying on the patient's own immunity, such as local scalds and cuts. Severe inflammation generally requires the combination of anti-inflammatory drugs while eliminating the cause to reduce the damage to the body by inflammation. For example, in the treatment of acute bacterial infections, it is necessary to use antibiotics together with glucocorticoid anti-inflammatory drugs. However, for acute inflammatory episodes caused by viruses without antiviral drugs, due to the lack of effective treatment drugs for the cause, anti-inflammatory drugs are generally used for symptomatic treatment to relieve symptoms, such as the SARS virus in 2003 and the recent new coronavirus.

Therefore, in the treatment of such viral infections, on the one hand, it is necessary to prevent excessive use of anti-inflammatory drugs, thereby overly inhibiting the body's self-repair function, on the other hand, it is necessary to prevent

insufficient use of anti-inflammatory drugs, which may cause serious adverse inflammatory reactions to the body's organs. damage. In this case, the dosage of anti-inflammatory drugs is particularly important.

1.2. Research methods and ideas

Before evaluating the anti-inflammatory effects of glucocorticoids, it is necessary to understand the specific pathogenesis of inflammation and the effects of glucocorticoids involved in it. On this basis, the analytic hierarchy process is used to evaluate the anti-inflammatory effects of glucocorticoids from four perspectives: safety, effectiveness, compliance, and economy.

2. Mechanism of inflammation

First of all, when pathogens or other stimuli appear in the body, the body's first response is to produce an immune response against the pathogen. On the one hand, the immune system eliminates the pathogen, and on the other hand, it will cause red, swelling, heat, pain, and dysfunction. Immune response can be divided into innate immunity and specific immunity, and specific immunity can be divided into cellular immunity and humoral immunity. This article mainly analyzes the influence of the two factors of body fluid exudation and cytokines on the immune function in the process of inflammation.

2.1 Fluid exudation

On the one hand, the exudation of body fluids can promote the elimination of pathogens, and on the other hand, it can cause a series of adverse reactions. The therapeutic effect is embodied in three aspects: the role of body fluid itself, the exudation of white blood cells, and the auxiliary effect of cytokines. The adverse reactions are embodied in redness, swelling, heat, pain, and dysfunction.^[1]

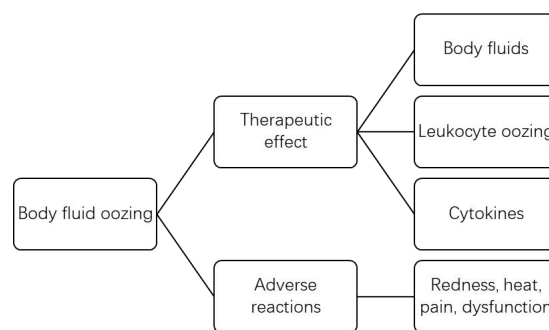


Figure 1 Humoral exudation

Because cytokines are substances that are released by lymphocytes and other cells that can regulate other inflammatory cells, inflammatory cells need to exudate with body fluids to the site of inflammation in order to have an effective anti-pathogen effect. It can be said that body fluids exudation is indispensable in the process of cytokine function.

2.2 The role of cytokines

Cytokines are substances secreted by immune cells that can enhance immune function. There are many types of cytokines. This article mainly introduces the role of interleukin (IL), tumor necrosis factor (TNF) and interferon (IFN) in inflammation.

The role of cytokines can be divided into direct action and indirect action. The direct action is to achieve the elimination of pathogens by increasing immunity, such as promoting the proliferation of immune cells, or by stimulating the immune cells themselves to enhance their ability to fight pathogens. It is functionally Enhance immune function. The indirect effect is to affect the elimination of pathogens through non-immune influencing factors, such as promoting hematopoiesis, and laying a good environment for immune function.^[4]

Interleukin was originally thought to be secreted by white blood cells, but now it is a type of cytokine secreted by other cells. The direct role of interleukin is to promote the proliferation and differentiation of immune cells and enhance innate immunity and adaptive immunity. The indirect effect is that white blood cells can also promote hematopoiesis. The actual effect is the same as the exudation of body fluids, laying the environment for the immune system to function.

The role of tumor necrosis factor is mainly direct action, which can eliminate pathogens by enhancing innate immunity and directly killing tumor cells.

The effect of interferon is also a direct effect, which can eliminate pathogens through direct anti-virus and enhancement of innate immunity

In the course of clinical use, glucocorticoids mainly inhibit the effects of cytokines.

2.3 Analytic Hierarchy Process Evaluation

2.3.1 The establishment of plans and indicators

The interaction between glucocorticoids and inflammatory diseases is more complicated. The evaluation of the clinical use of glucocorticoids here mainly considers the anti-inflammatory and anti-immune effects of glucocorticoids, which are important for safety, effectiveness, economy, and the four indicators of compliance are weighted separately and then evaluated. There are three main evaluation schemes:

Plan A: Use glucocorticoids plus effective drugs

Plan B: No drugs are used

Plan C: Use only glucocorticoids

Table 1 Judgment matrix of each index weight

	Safe	Effective	Compliance	Economic
Safe	1	1	2	6
Effective	1	1	2	6
Compliance	1/2	1/2	1	3
Economic	1/6	1/6	1/3	1

Through calculation, the weight of each indicator is obtained

Table 2 The weight of each indicator

	Safe	Effective	Compliance	Economic
Weights	0.3960	0.3960	0.1476	0.0603

2.3.2. Judgment matrix for different indicators

(1) Safety evaluation

On the one hand, A program can control the damage of symptoms to the body, on the other hand, it can eliminate pathogens by using antibacterial drugs in the process of suppressing immunity to prevent further deterioration of the disease, so it is safer than B and C programs.

Plan B and Plan C need to be analyzed in different situations in terms of safety. It is necessary to consider whether inflammatory symptoms are fatal. When the inflammatory symptoms do not induce fatal diseases, because plan B does not suppress the immune system, the disease can be controlled more quickly. It can prevent further deterioration of the condition and is safer. But if inflammatory symptoms can induce fatal diseases, then the C program will be much safer.

Table 3 Safety evaluation for the treatment of non-fatal diseases

	Plan A	Plan B	Plan C
Safety evaluation	0.6232	0.2395	0.1373

Table 4 Safety evaluation for the treatment of fatal diseases

	Plan A	Plan B	Plan C
Safety evaluation	0.7272	0.0909	0.1819

(2) Effectiveness evaluation

The evaluation of effectiveness, compliance, and economics has no obvious relationship with whether it will cause fatal diseases, so it is no need to classify.

It is believed that the therapeutic drugs used are better than the own immune system in terms of effectiveness. Plan C uses only glucocorticoids, which will suppress immunity, so it is not as effective as Plan A and Plan B.

Table 5 Evaluation of the effectiveness of treatment of diseases

	Plan A	Plan B	Plan C
Effectiveness evaluation	0.5714	0.2857	0.1429

(3) Compliance evaluation

Compliance is mainly analyzed from the patient's own treatment experience during the entire treatment process. Since both plan A and plan C use glucocorticoids and are symptomatic treatments, both treatments are better than plan B.

Table 6 Evaluation of the Compliance of treatment of diseases

	Plan A	Plan B	Plan C
Compliance evaluation	0.4286	0.1429	0.4286

(4) Economic evaluation

The economy is mainly considered from the price of drugs. Glucocorticoids and antibacterial drugs are under the protection of medical insurance, and the clinical use price is relatively low, and the economics are comparable.

Table 7 Evaluation of the economy of treatment of diseases

	Plan A	Plan B	Plan C
Economic evaluation	0.4286	0.1429	0.4286

Summarize the weight of each index evaluation, and get the following two tables

Table 8 Evaluation of indicators for treatment of fatal diseases

	Weights	Plan A	Plan B	Plan C
Safe	0.3960	0.7272	0.0909	0.1819
Effective	0.3960	0.5714	0.2857	0.1429
Compliance	0.1476	0.4286	0.1429	0.4286
Economic	0.0603	0.1638	0.5390	0.2973

Table 9 Evaluation of indicators for treatment of non-fatal diseases

	Weights	Plan A	Plan B	Plan C
Safe	0.3960	0.6232	0.2395	0.1373
Effective	0.3960	0.5714	0.2857	0.1429
Compliance	0.1476	0.4286	0.1429	0.4286
Economic	0.0603	0.1638	0.5390	0.2973

3. Evaluation results of anti-inflammatory effects of glucocorticoids

Calculate Table 8 to get the final evaluation results of each program

Table 10 Evaluation results of various programs for the treatment of fatal diseases

	Plan A	Plan B	Plan C
Evaluation results	0.587384	0.202727	0.209809

Table 10 Evaluation results of various programs for the treatment of non-fatal diseases

	Plan A	Plan B	Plan C
Evaluation results	0.5462	0.261573	0.192148

It is concluded from the experiment that whether program A is to treat fatal or non-fatal diseases, the comprehensive evaluation results are better than those of program B and C. In the treatment of fatal diseases, program C is slightly better than program B. For non-fatal diseases, plan B is better than plan C.

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