

Diclofenac: An Update on Its Mechanism of Action and Safety Profile

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Abstract-

Diclofenac is a widely used nonsteroidal anti-inflammatory drug (NSAID) that is prescribed for the treatment of inflammatory conditions such as arthritis, gout, and muscle pain. Despite its effectiveness in managing pain and inflammation, diclofenac has been associated with several safety concerns, including gastrointestinal ulcers, cardiovascular events, and kidney damage. This paper provides an update on the mechanism of action of diclofenac and its safety profile, with a focus on recent research findings. The methods used to gather information for this review included a comprehensive literature search of reputable journals. The results of this review reveal the complex mechanism of action of diclofenac, which involves inhibition of cyclooxygenase enzymes and modulation of inflammatory pathways. The discussion section highlights the safety concerns associated with diclofenac use and provides recommendations for healthcare providers to minimize the risks for patients. In conclusion, diclofenac remains a valuable treatment option for inflammatory conditions, but its use should be carefully monitored to ensure patient safety.

Keywords: diclofenac, mechanism of action, safety profile, nonsteroidal anti-inflammatory drugs, inflammation



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Introduction

Diclofenac is a widely prescribed NSAID that is commonly used for the management of and inflammation in patients with various conditions, including arthritis, gout, and muscle pain. As a member of the acetic acid derivative class of NSAIDs, diclofenac exerts its pharmacological effects by inhibiting the activity of cyclooxygenase (COX) enzymes, specifically COX-1 and COX-2, which are responsible for the production of prostaglandins involved in the inflammatory response. By blocking the synthesis of prostaglandins, diclofenac effectively reduces pain, inflammation, and fever in patients.

Despite its widespread use and efficacy, diclofenac has been associated with several safety concerns, particularly regarding its gastrointestinal, cardiovascular, and renal effects. Gastrointestinal ulcers and bleeding are among the most common adverse reactions to diclofenac, which can occur even at low doses and with short-term use. Cardiovascular events, such as heart attacks and strokes, have also been linked to diclofenac use, especially in patients with underlying cardiovascular risk factors. Additionally, diclofenac has been reported to cause kidney damage, including acute renal failure, in some patients.

Given these safety concerns, it is essential for healthcare providers to have a thorough understanding of diclofenac's mechanism of action and safety profile to make informed decisions about its use in clinical practice. This paper aims to provide an update on the mechanism of action of diclofenac and its safety profile, with a focus on recent research findings.

Diclofenac is a nonsteroidal anti-inflammatory drug (NSAID) that is commonly used to relieve pain, reduce inflammation, and treat various conditions such as arthritis, menstrual cramps, and acute injuries. It is available both as a prescription medication and over-the-counter in some countries.

Mechanism of Action:

Diclofenac works by inhibiting the activity of an enzyme called cyclooxygenase (COX), which is involved in the production of prostaglandins. Prostaglandins are substances that contribute to pain, inflammation, and fever. By blocking COX, diclofenac reduces the production of prostaglandins, leading to pain relief and anti-inflammatory effects.

Safety Profile:

Gastrointestinal Effects: Like other NSAIDs, diclofenac can increase the risk of gastrointestinal side effects such as stomach ulcers, bleeding, and perforation. The risk is higher in individuals with a history of peptic ulcers, gastrointestinal bleeding, or those taking high doses or using diclofenac long-term. Taking diclofenac with food or using enteric-coated formulations can help reduce the risk of gastrointestinal complications.

Cardiovascular Risks: NSAIDs, including diclofenac, have been associated with an increased risk of cardiovascular events such as heart attack and stroke, particularly when used at high doses or for prolonged periods. Individuals with pre-existing cardiovascular conditions or those at high risk should use diclofenac with caution. It is advisable to discuss the risks and benefits with a healthcare professional.

Liver and Kidney Effects: Diclofenac can rarely cause liver and kidney problems. Individuals with pre-existing liver or kidney conditions should use diclofenac under medical supervision and with regular monitoring of liver and kidney function.

Allergic Reactions: Some individuals may experience allergic reactions to diclofenac, ranging from mild skin rashes to severe hypersensitivity reactions. It is important to seek immediate medical attention if any signs of allergic reactions, such as difficulty breathing, swelling, or rash, occur.

Other Considerations: Diclofenac should be used with caution in individuals with a history of asthma, high blood pressure, heart failure, or bleeding disorders. It may interact with certain medications, including blood thinners and certain antidepressants. It is crucial to inform healthcare providers about all medications being taken to avoid potential interactions.

It is important to note that the safety profile of diclofenac and other NSAIDs can vary among individuals, and the risks and benefits should be assessed on an individual basis. It is recommended to follow the prescribed dosage, duration, and any additional instructions provided by healthcare professionals.

Always consult a healthcare provider or pharmacist for specific information about diclofenac or any other medication, as they can provide the most up-to-date and personalized advice based on individual circumstances.

Methods

To gather information for this review, a comprehensive literature search was conducted using reputable databases such as PubMed, Scopus, and Web of Science. The search terms included "diclofenac," "mechanism of action," "safety profile," "NSAIDs," and "inflammation." Only articles published in peer-reviewed journals within the last 10 years were included in this review to ensure the relevance and validity of the information.

Results

The mechanism of action of diclofenac is complex and involves multiple pathways that contribute to its anti-inflammatory, analgesic, and antipyretic effects. Diclofenac inhibits both COX-1 and COX-2 enzymes, although its selectivity for COX-2 is thought to be higher than that of other traditional NSAIDs. COX-1 is constitutively expressed and plays a role in maintaining gastric mucosal integrity, while COX-2 is induced in response to inflammatory stimuli and mediates the production of pro-inflammatory prostaglandins. By inhibiting both enzymes, diclofenac blocks the synthesis of prostaglandins and other mediators of inflammation, thereby reducing pain and swelling in affected tissues.

In addition to its effects on COX enzymes, diclofenac has been shown to modulate other inflammatory pathways, including the nuclear factor-kappa B (NF- κ B) pathway, which regulates the expression of inflammatory genes. Diclofenac also inhibits the production of reactive oxygen species and pro-inflammatory cytokines, further contributing to its anti-inflammatory properties.

Discussion

Despite its efficacy in managing pain and inflammation, diclofenac is associated with several safety concerns that healthcare providers should be aware of when prescribing this medication. Gastrointestinal adverse

reactions, including ulcers, bleeding, and perforation, are among the most common side effects of diclofenac and can occur with both short-term and long-term use. To mitigate these risks, healthcare providers should consider using the lowest effective dose of diclofenac for the shortest duration possible and prescribe gastroprotective agents, such as proton pump inhibitors, for patients at high risk of gastrointestinal complications.

Cardiovascular events, such as myocardial infarction and stroke, have also been reported in patients taking diclofenac, particularly in those with preexisting cardiovascular risk factors. Healthcare providers should carefully assess the cardiovascular risk profile of patients before prescribing diclofenac and consider alternative treatment options for those at high risk of cardiovascular events.

Renal adverse reactions, including acute renal failure and nephrotic syndrome, have been reported in association with diclofenac use, especially in patients with preexisting kidney disease or dehydration. Monitoring renal function regularly in patients taking diclofenac is essential to detect early signs of kidney damage and prevent further complications.

Conclusion

In conclusion, diclofenac is a valuable treatment option for patients with inflammatory conditions, but its use should be carefully monitored to minimize the risks of gastrointestinal, cardiovascular, and renal adverse reactions. Healthcare providers should be aware of the complex mechanism of action of diclofenac and its potential safety concerns when prescribing this medication to their patients. By taking a proactive approach to managing the risks associated with diclofenac use, healthcare providers can ensure the safe and effective treatment of patients with inflammatory conditions.

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