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ASPIRIN IN CARDIOVASCULAR DISEASES: AN EFFECTIVE TOOL FORPREVENTION AND TREATMENT

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ABSTRACT

Aspirin, a widely used drug with anti-inflammatory and anti-platelet properties, has demonstrated effectiveness in the prevention and treatment of cardiovascular diseases (CVD). This article provides an overview of aspirin's mechanisms of action, dosage considerations, risks, and clinical effectiveness in the context of cardiovascular health. Aspirin inhibits cyclooxygenase (COX)-1, reducing the production of thromboxane A2 and promoting vasodilation and platelet inhibition. Low doses of aspirin (75-325 mg/day) are recommended for most patients, with an initial loading dose for prompt anti-platelet effects. Risks of bleeding and gastrointestinal side effects exist, and caution is advised for individuals with a history of major bleeding or those taking blood thinners. Aspirin is beneficial in acute coronary syndrome, Kawasaki's disease, and thromboembolic stroke treatment, and it plays a significant role in secondary prevention of cardiovascular events. The use of aspirin for primary prevention requires careful consideration of individual risk factors. Further research is needed to refine dosage recommendations and explore aspirin's potential in primary prevention strategies for CVD.

KEYWORDS: Aspirin, cardiovascular diseases, thromboembolic stroke, anti inflammatory, anti-platelet effects.

INTRODUCTION

Aspirin, a widely used drug with multiple benefits, has proven to be highly effective in the prevention and treatment of cardiovascular diseases (CVD). Its anti-inflammatory and anti-platelet properties make it a valuable tool in managing various cardiac conditions.

Aspirin is recommended as a secondary CVD prophylaxis for individuals with a history of myocardial infarction (MI) or coronary artery disease (CAD) in current guidelines from the American Heart Association (AHA) and American College of Cardiology Foundation (ACCF).[3]

By combining salicylic acid with acetic acid, Von Gerhardt created the first synthetic form of acetylsalicylic acid in 1853. Acetyl salicylic acid was administered to Felix Hoffmann's father in 1894 by a Bayer company chemist in Elberfeld, Germany, to treat his rheumatoid arthritis; formal clinical studies soon followed. The Bayer Company patented acetylsalicylic acid in 1899 under the brand name Aspirin, where "a" stood for acetyl and "spir" for Spirsaure (the German word for salicylic acid).

So overwhelming was the popularity of acetylsalicylic acid, that its original trade name eventually became the generic name.[6]

This article explores the mechanisms of action, dosage considerations, risks, and clinical effectiveness of aspirin in the context of cardiovascular health.

1. MECHANISMS OF ACTION

Aspirin belongs to the family of non-steroidal anti-inflammatory drugs (NSAIDs) and acts as an irreversible inhibitor of cyclooxygenase (COX)-1 and -2 enzymes. It primarily inhibits COX-1 activity, leading to decreased production of thromboxane A2, a compound that promotes platelet clotting and vasoconstriction. By selectively inhibiting COX-1, aspirin reduces the risk of arterial thrombosis, myocardial infarction (MI), and stroke. Additionally, aspirin's COX-1 inhibition allows for the continued production of prostaglandin I2, a vasodilator and platelet inhibitor, which further contributes to its cardio-protective effects.[4]

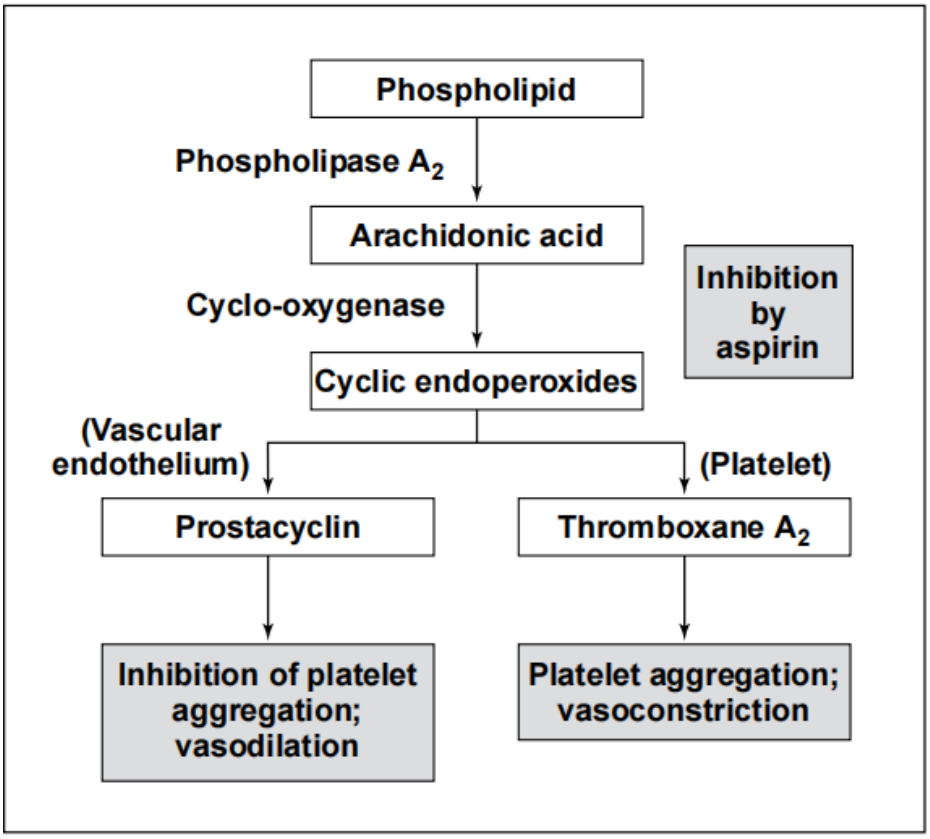

Fig 1: Mechanism of action of aspirin in platelets and vascular endothelium[6]

2. DOSAGE AND CLINICAL EFFECTIVENESS

The clinical benefits of aspirin have been observed across a wide range of dosages, from as low as 75 mg/day to higher doses. However, high aspirin doses do not show convincingly greater efficacy than lower doses and are associated with an increased risk of gastrointestinal side effects. For most patients, low doses of aspirin (75-325 mg/day) are recommended. An initial loading dose of 160-325 mg may be administered for a prompt anti-platelet effect. While the optimal dose for patients with cerebrovascular disease is still under investigation, low-dose aspirin has shown benefits, and further research is needed to establish strong recommendations.[1]

3. RISKS AND ADVERSE EFFECTS

The main risk associated with aspirin use is bleeding, particularly from the stomach or intestines. Although bleeding is rarely fatal, it can lead to serious illness and hospitalization. Individuals taking blood thinners or with a history of major bleeding should avoid aspirin. Even low-dose baby aspirin can increase the risk of bleeding. Aspirin-induced gastrointestinal toxicity, including nausea, heartburn, and epigastric pain, is dose-related. Buffered and enteric-coated aspirin preparations have been developed to mitigate gastric erosion. The overall risk of major extra-cranial and intracranial hemorrhage with anti-platelet drugs is low but should be considered.[5]

4) WHAT ARE THE RISKS OF TAKING ASPIRIN DAILY?

The main risk is bleeding, especially from the stomach or intestines. Although such bleeding seldom results in death, it can cause significant disease and require hospitalization.

In general, people taking blood thinners or who have a history of major bleeding should not take aspirin. Even low-dose baby aspirin can increase bleeding risk.[2]

5). ASPIRIN RESISTANCE

Aspirin resistance has been used to characterize aspirin's inability to prevent thrombotic problems, lengthen the time it takes for bleeding to stop, or lower the synthesis of TXA2. Aspirin resistance has not yet been given a common, precise, and distinct definition.

Increased platelet turnover, genetic polymorphisms of COX-1 and other thromboxane biosynthesis-related genes, over expression of non platelet sources of thromboxane production, and medication interactions are a few potential aspirin resistance pathways.

Once aspirin resistance is identified by laboratory tests, recommendations for modifying therapy (dosage adjustment or addition of an anti-platelet drug) and follow-up are required for significant clinical outcomes due to a number of adverse cardiovascular events linked to aspirin resistance.[5]

6. TREATMENT IN CARDIOVASCULAR DISEASE

6.1. Therapy for Acute Coronary Syndrome

Aspirin is strongly recommended for the acute treatment of acute coronary syndrome (ACS), including ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI), and unstable angina pectoris. It plays a crucial role in reducing the risk of recurrent cardiovascular events and improving patient outcomes.

6.2. Therapy for Kawasaki's Disease

In the treatment of Kawasaki's disease, high-dose aspirin is recommended during the acute phase for its anti-inflammatory effects. Subsequently, low-dose aspirin is prescribed for its anti-platelet effect, particularly in cases where coronary artery aneurysms have developed. Long-term anti-coagulation with warfarin and low-dose aspirin may be necessary in children with coronary aneurysms.

6.3. Therapy for Thromboembolic Stroke

Studies have shown that aspirin therapy reduces the risk of recurrent stroke and death in patients with acute ischemic stroke. Low-dose aspirin is commonly prescribed within 48 hours of stroke onset, effectively suppressing in vivo thromboxane A2 biosynthesis and platelet activation.

7. SECONDARY PREVENTION

Aspirin is widely recommended for secondary prevention in patients who have already experienced a cardiovascular event or are at high risk. The risk of major vascular events, such as nonfatal myocardial infarction, nonfatal stroke, or vascular mortality, is dramatically decreased with long-term aspirin therapy. While the risk of major bleeding is present, the benefits of aspirin therapy outweigh the risks in this context.

8. PRIMARY PREVENTION

For primary prevention, the benefits and risks of aspirin use are less clear. Current guidelines recommend aspirin for individuals at moderately raised risk of coronary heart disease. Age is a major determinant, and some experts suggest initiating daily aspirin for individuals above a specific age to reduce the risk of cardiovascular events.[5]

CONCLUSION

Aspirin has emerged as a valuable agent in the prevention and treatment of cardiovascular diseases. Its anti-inflammatory and anti-platelet effects make it a crucial tool in managing acute coronary syndrome, Kawasaki's disease, thromboembolic stroke, and for secondary prevention. However, the risks of bleeding and gastrointestinal toxicity must be carefully considered, and individualized treatment plans should be based on patient characteristics and risk factors. Further research is needed to optimize dosage recommendations and explore the potential of aspirin in primary prevention strategies for cardiovascular diseases.[5]

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