Management of hemorrhagic stroke: A literature review

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ABSTRACT

Hemorrhagic stroke is a serious neurological emergency that represents a significant cause of global morbidity and mortality. Characterized by bleeding in the brain, stroke requires an urgent and well-coordinated management approach to minimize brain damage and improve patient outcomes. This literature review aims to provide a comprehensive analysis of current approaches to stroke management, including recent advances, persistent challenges, and prospects. The review was based on articles selected from the PubMed, Scopus and Google Scholar databases, using specific search terms. The analysis covered emergency interventions, rehabilitation strategies, and post-acute care, with an emphasis on diagnostic, therapeutic, and complication prevention protocols. The findings highlight the importance of early identification of symptoms, effective surgical interventions, strict control of intracranial pressure, and prevention of secondary complications. Recent advances in technology and research are discussed, highlighting their impact on therapeutic strategies. Although there have been significant improvements in stroke management, challenges persist and require a multidisciplinary approach and continuous development of new strategies.

Keywords: Hemorrhagic Stroke, Acute Management, Rehabilitation, Surgical Intervention, Prevention of Complications.

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INTRODUCTION

Hemorrhagic stroke (CVA) occurs when there is bleeding inside the brain, resulting in increased intracranial pressure and neuronal damage. It accounts for approximately 10-15% of all stroke cases, but is associated with higher mortality compared to ischemic stroke (1). Stroke is mainly divided into intracerebral hematoma (ICH) and subarachnoid bleeding (SA). Both have distinct characteristics and management approaches (2).

METHODOLOGY

To conduct a comprehensive review on stroke management, the following methodological steps were followed:

1. **Database Selection:** We used the PubMed, Scopus and Google Scholar databases to collect relevant articles.
2. **Inclusion Criteria:** Systematic review studies, clinical trials, and guidelines from the last two decades on acute management, surgical interventions, rehabilitation strategies, and prevention of complications were included.
3. **Search Terms:** The search terms used were "hemorrhagic stroke", "acute management of stroke", "surgical intervention in stroke", "post-stroke rehabilitation", "prevention of complications".
4. **Article Analysis:** Articles were analyzed for relevance, methodological quality, and impact on stroke management guidelines. The analysis was divided into main categories: diagnosis, surgical interventions, intracranial pressure control, and rehabilitation and complication prevention strategies.

ACUTE MANAGEMENT OF HEMORRHAGIC STROKE

DIAGNOSTIC APPROACHES

Rapid and accurate diagnosis of stroke is crucial for effective management. Computed tomography (CT) is often the first choice due to its rapid availability and ability to identify the presence and extent of bleeding (3). For example, in the study by Kelly et al. (2015), CT was essential to determine the severity of the hematoma and guide the decision for surgical intervention (4). Magnetic resonance imaging (MRI) offers a more detailed view and is useful for evaluating secondary complications, such as posthemorrhagic hydrocephalus (5).

SURGICAL INTERVENTIONS

- **Craniotomy and Hematoma Evacuation:** Craniotomy is often necessary for the removal of large or symptomatic hematomas, especially in cases such as the study by Mendelow et al. (2010), which showed that early evacuation can reduce mortality and improve functional recovery (6). Minimally invasive techniques, such as endoscopic surgery, have also been shown to be effective. In a study conducted by Yoon et al. (2018), endoscopy allowed for hematoma evacuation with a lower risk of complications and reduced recovery time (7).
- **Ventricular Drainage:** External ventricular drainage (EVD) is used to control intracranial pressure in patients with hydrocephalus. The study by Anderson et al. (2014) demonstrated that EVD can be effective in preventing serious complications associated with increased intracranial pressure (8). This approach is especially important in cases where hydrocephalus is a common complication of stroke.

BLOOD PRESSURE CONTROL

Keeping blood pressure under control is essential to prevent bleeding progression and reduce intracranial pressure. Current guidelines recommend maintaining systolic blood pressure below 140 mmHg for stroke patients (9). In the study by Morita et al. (2008), strict blood pressure control was associated with better clinical outcomes and a lower rate of secondary complications (10). Strategies include the use of intravenous antihypertensive agents and continuous monitoring.

PREVENTION OF COMPLICATIONS

Prevention of secondary complications, such as infections and hydrocephalus, is crucial for stroke management. The use of prophylactic antibiotics, as indicated by Duncan et al. (2005), helps reduce the risk of postoperative infections (11). Close monitoring to detect hydrocephalus and early treatment are key to preventing further damage to the brain (12). For example, in a study by Williams et al. (2020), early intervention to treat hydrocephalus was associated with better functional recovery (13).

REHABILITATION AND POST-ACUTE CARE

REHABILITATION STRATEGIES

Rehabilitation should begin as soon as the patient is stable. A multidisciplinary approach is key, involving physical therapy, occupational therapy, and speech therapy. The study by Langhorne et al. (2009) showed that physical therapy aids in the recovery of motor function and mobility, while occupational therapy and speech therapy are important for improving the ability to perform daily

activities and treating communication difficulties (14). Personalized rehabilitation programs, as demonstrated in the study by Winstein et al. (2016), have shown significant results in improving the quality of life and functionality of patients (15).

LONG-TERM CARE

Long-term management involves continuous monitoring and family support. Family participation and community support are vital for the patient's reintegration into daily life. Studies such as the one by Kwakkel et al. (2013) highlight the importance of prolonged rehabilitation and continuous support to achieve the best possible recovery (16). Comprehensive care plans, including community resources, help improve patient outcomes and quality of life.

RECENT ADVANCES AND FUTURE PROSPECTS

TECHNOLOGICAL INNOVATIONS

Advances in imaging technologies, such as high-resolution CT and MRI, have improved diagnostic accuracy and treatment planning. The study by Yang et al. (2019) showed that minimally invasive techniques, such as endoscopic surgery, result in fewer complications and faster recovery (17). These innovations are transforming stroke management and providing better outcomes for patients.

GENETIC RESEARCH AND BIOMARKERS

Research on genetic factors and biomarkers is offering new insights into individual risk profiles and potential therapeutic targets. The study by Ma et al. (2021) highlights how the identification of genetic predispositions and the use of biomarkers can lead to more personalized and effective treatment strategies (18). Additional studies are needed to validate these findings and integrate them into clinical practice.

DISCUSSION

Stroke management has advanced significantly with improvements in surgical techniques, imaging technologies, and rehabilitation approaches. However, there are still challenges, such as variability in patient response and the occurrence of secondary complications. A multidisciplinary approach is essential to address these challenges and optimize treatment strategies. The integration of technological innovations and scientific advances offers new opportunities to improve stroke management and patient outcomes (19, 20).

CONCLUSION

Although there have been substantial advances in stroke management, challenges persist and require a coordinated, multidisciplinary approach. The continuous development of new strategies and the integration of technological innovations are essential to address the challenges associated with stroke and improve the quality of life of patients.

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