Recurrent strokes in a patient with bow hunter syndrome and comorbid atrial fibrillation: A case study

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Abstract

Bow hunter's syndrome (BHS) is a rare condition causing dynamic vertebral artery compression, which can result in recurrent strokes, posing unique challenges in patients with cardiovascular comorbidities like atrial fibrillation (AF). This case study describes the presentation, management and outcomes of a 75-year-old female with BHS and AF, who experienced recurrent posterior circulation strokes despite anticoagulation and antiplatelet therapy. A comprehensive stroke work-up, including advanced imaging, identified BHS as the primary cause. Despite adding aspirin to apixaban (Eliquis) and later switching to prasugrel (Efficient), the patient had another stroke, prompting vertebral artery embolisation. No further events occurred prior to the nine-month follow-up. Nurses play a crucial role throughout the patient's journey and were instrumental in recognising BHS symptoms early, advocating for timely advanced imaging, and educating the patient on avoiding head rotation to minimise vertebral artery compression. They also monitored for complications, provided ongoing support during recovery, and contributed to improved patient outcomes through vigilant care and coordination with the multidisciplinary team. This case underscores the complexity of managing BHS in AF patients, highlighting the need for nuanced, multidisciplinary approaches and further research into the management of BHS in the context of other stroke risk factors.

Keywords: Bow hunter syndrome; rotational vertebral artery occlusion; atrial fibrillation; posterior circulation stroke; endovascular intervention; rare stroke

Introduction:

A rare condition known as Bow Hunter's Syndrome (BHS), also referred to as rotational vertebral artery occlusion (RVAO), occurs when the vertebral artery (VA) becomes compressed during head rotation. This compression can reduce blood flow to the posterior circulation, resulting in ischaemia. Patients often present with symptoms such as vertigo, dizziness, and embolic strokes affecting the cerebellum, pons, or occipital lobe (Matsuyama et al., 1997; Zaidi et al., 2014; Tanaka and Steinfort, 2019).

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DOI: 10.2478/ajon-2025-0013

The condition is frequently associated with anatomical anomalies, including atlantoaxial instability, osteophytes, or facet joint hypertrophy, which mechanically compress the VA (Tominaga, 2002; Kim S et al., 2013). Management strategies for BHS range from conservative approaches, such as neck braces and antiplatelet therapy, to surgical or endovascular interventions, including decompression, fusion, or VA embolisation (Cornelius et al., 2012; Nakase et al., 2014; Tanaka and Steinfort, 2019).

The management of BHS becomes particularly complex in patients with AF, a common cardiovascular condition that increases the risk of cardioembolic strokes and typically requires therapeutic anticoagulation. In such cases, the mechanical aetiology of BHS-related strokes may be overlooked in the context of a presumed cardioembolic source, leading to delays in diagnosis and challenges in selecting appropriate interventions (Alghamdi & Benavente, 2016). The coexistence of AF and BHS presents unique management challenges, as anticoagulation may not address mechanical compression, and the risk of recurrent strokes remains high without definitive intervention (Zaidi et al., 2014; Takeshima et al., 2018).

This novel case study examines the management challenges and outcomes of BHS in a 75-year-old female patient with AF and recurrent strokes despite anticoagulation, a condition with limited reported cases. It highlights diagnostic and therapeutic complexities and identifies strategies to optimise patient outcomes.

Case Study:

Mrs B, a 75-year-old female, presented with a complex medical background, notably including AF, irritable bowel syndrome, gastritis, anxiety, depression, psoriasis, and tubulointerstitial diseases. Her surgical history encompassed a right hip replacement, gluteal tendon repair, and radiofrequency denervation of the right C4/5 facet joint. In late October 2023, she experienced an initial ischaemic stroke affecting the right cerebellar region, initially attributed to a cardioembolic aetiology due to the temporary discontinuation of apixaban for a joint injection procedure. A month after the initial stroke, Mrs B was admitted to a tertiary hospital with complaints of dizziness, instability, difficulty maintaining an upright posture, chest pain, episodes of vomiting, and tingling and numbness in the left hand. Diagnostic imaging revealed embolic ischaemic strokes involving both cerebellar hemispheres and the right occipital lobe, along with a new diagnosis of Takotsubo cardiomyopathy. She was treated with a beta-blocker for her cardiomyopathy but could not tolerate an ACE inhibitor due to low blood pressure. Apixaban was continued.

Six months later, Mrs B reported recurrent stroke symptoms, including acute vertigo and altered sensations in the left hand, with Magnetic Resonance Imaging (MRI) confirming multiple infarcts in the pons and cerebellar hemispheres, prompting the addition of aspirin to her apixaban regimen. Despite dual therapy, she experienced another stroke, affecting the right pons and thalamus. Digital Subtraction Angiography (DSA) performed confirmed dynamic stenosis of the right vertebral artery triggered by head turning, consistent with a diagnosis of BHS, with a possible VA dissec-

tion noted. Appearances of her cerebral vasculature were also consistent with fibromuscular dysplasia (FMD). Aspirin was then switched to prasugrel to optimise antiplatelet therapy. The multiplate assay to check the aspirin sensitivity revealed resistance to aspirin. One week later, she developed an unsteady gait, and a subsequent MRI revealed additional cerebellar infarcts. She underwent a right vertebral artery embolisation, which was complicated by a small stroke in the left middle cerebral artery, which was thought to be periprocedural. She also had adrenal insufficiency diagnosed in the context of persistent post-procedural hypotension.

During her hospital admission, multiple stroke code activations were initiated by nursing staff in response to new and worsening neurological symptoms. Nurses also advocated for advanced neuroimaging to facilitate timely diagnosis and management. In addition to providing clinical care, nurses supported allied health members during rehabilitation sessions. Mrs B, who was highly anxious and at times hesitant to attend therapy due to fear of new or recurring symptoms, was given consistent reassurance and emotional support by the nursing team. Nurses also delivered targeted education, advising Mrs B to avoid head rotation and to promptly report any neurological changes. Close monitoring throughout the hospital stays, particularly in the post-procedural phase, was critical in mitigating potential complications and supporting recovery.

Follow-up MRIs 2 weeks and a month from embolisation showed no new strokes, but she developed migraine-like headaches, managed with an increased dose of amitriptyline and riboflavin supplementation. Extra support at home was organised following discharge. Later that month, her medications were adjusted, switching prasugrel back to aspirin, and aspirin was discontinued 10 days later, with the patient maintained on apixaban alone. As of April 2025, Mrs B has experienced no further strokes but reported mild cognitive difficulties, occasional headaches, mild ongoing tremor and gait ataxia. A neuropsychological assessment revealed remarkable preservation of cognitive abilities despite her multiple strokes. Her executive functioning and visuospatial abilities had reduced from her baseline but remained within normal limits for her age. She now mobilises with a walking frame and has ceased driving. She attends physiotherapy and has returned to volunteer work.

Discussion:

Management Challenges in BHS with AF:

Managing BHS in AF patients is challenging, exemplified by a 75-year-old female with repeated strokes despite anticoagulation. Diagnosis is often delayed as strokes are initially attributed to AF rather than BHS. In this case, BHS was identified in June 2024 after multiple strokes and dynamic imaging. This issue is common as BHS is under-recognised in patients with other stroke risk factors, like AF. Studies by Miyamato et al. (2024) and Shimizu et al. (1999) highlight the difficulty in diagnosing BHS. The AF in such cases necessitates considering rarer causes like BHS for recurrent strokes. Anticoagulation and antiplatelet therapy often fail to manage BHS mechanical compression, as seen in this case, where the patient continued to have recurrent strokes despite treatment with apixaban, aspirin, and prasugrel. Consistent with the literature, such therapies are inadequate

for dynamic VA compression, as local thrombus formation isn't addressed. Alghamdi and Benavente (2016) noted angioplasty and VA occlusion may be needed, and Shingai et al. (2021) found C1-C2 fusion surgery to be effective.

Outcomes of Management Strategies:

The literature on BHS in patients with AF or similar cardiovascular issues is limited, though some studies offer insights into management strategies. Conservative management, including limiting head rotation and using medications, often fails to prevent recurrence in symptomatic patients. Mrs B's recurrent strokes despite apixaban, aspirin, and prasugrel reflect this pattern. Sakai et al. (1999) reported a BHS case where conservative treatment was refused, leading to risks without surgery. Mosora et al. (2020) saw symptom regression in a patient with medication, but long-term effectiveness was questionable due to unaddressed compression. Surgical and endovascular methods like decompression, fusion, or embolisation directly target VA compression. Mrs B's right VA embolisation stopped her recurrent strokes, with follow-up MRIs at nine months showing no new ischaemic events. This aligns with literature indicating that surgical interventions are more effective in preventing stroke recurrence. Zaidi et al. (2014) found decompression safe and effective in most patients. Takeshima et al. (2018) reported long-term symptom-free outcomes with cervical spinal fusion. Endovascular methods, effective for patients with high surgical risk, also show success. Thomas et al. (2015) reported no strokes during a 12-month follow-up after endovascular coil embolisation. Inoue et al. (2023) saw an 18-month stroke-free period after coil occlusion. Kutsuna (2022) also noted successful endovascular coil embolisation without recurrence.

The success of embolisation in this case stems from its direct approach to addressing the right VA's dynamic stenosis, avoiding further compression during head rotation. Kim et al. (2011) found endovascular stenting effective compared to surgical decompression in BHS patients but noted open surgery might offer better long-term results, though riskier for older patients or with comorbidities. Given the patient's age (75 years), conditions (AF, Takotsubo cardiomyopathy), and potential VA dissection, embolisation was preferred over surgery due to higher surgical risks. Cornelius et al. (2012) recommend surgical or endovascular intervention in BHS when medical treatment fails, as in this case. Nakase et al. (2014) reported favourable outcomes with customised treatments in BHS patients, though surgery had lower recurrence.

Factors Influencing Management and Outcomes:

Several factors influenced management challenges for Mrs B. Apixaban therapy for AF initially obscured her diagnosis since anticoagulation does not address the mechanical aspect of BHS and VA occlusion (Shingai et al., 2021). Distinguishing AF strokes from BHS strokes is difficult due to similar symptoms, a delay in BHS diagnosis by six months, which led to recurrent strokes and neurological deficits (Miyamato et al., 2024). Mrs B's age and comorbidities like Takotsubo cardiomyopathy and anxiety also complicated management, as older patients generally have poorer collateral circulation and higher atherosclerotic burden (Vilela, 2005). Her anxiety may have affected symptom interpretation, delaying triage. The AF confused the diagnos-

tic process, highlighting the need for awareness of mechanical causes in recurrent strokes within the same territory. Post-embolisation, Mrs B's symptoms, such as cognitive difficulties and gait issues, stemmed from multiple strokes and other medical conditions. Studies suggest earlier intervention improves outcomes (Takeshima et al., 2014; Inoue et al., 2023). The need for comprehensive post-care, especially in complex cases, is emphasised to improve quality of life. Her high cognitive reserve and active lifestyle may have mitigated post-stroke cognitive decline.

Implications for Nursing Practice:

This case highlights several contributions nurses can make in the care of patients with BHS and AF, offering opportunities to enhance patient outcomes through vigilant observation, education, and coordination.
Early Recognition and Advocacy. In an inpatient acute care setting, nurses are well-positioned to detect early signs of BHS, such as vertigo, dizziness, or sensory changes triggered by head rotation, even in patients with concurrent stroke risk factors like AF. In this instance, Mrs B's persistent symptoms—vertigo and unsteady gait— had prompted nurses to early escalation and advocated for advanced diagnostic imaging, such as DSA or computed tomography angiography (CTA). By facilitating timely investigation, nurses may help mitigate diagnostic delays, which are critical given the potential morbidity associated with untreated BHS (Shimizu et al., 1999; Miyamato et al., 2024).

Patient Education on Symptom Management:

Beyond recognition, nurses can empower patients with the knowledge to manage their condition effectively. This might involve educating and advising patients to avoid head rotation and recognise stroke-related symptoms, such as dizziness or numbness. Whilst such measures may not always prevent progression (Sakai et al., 1999; Alghamdi & Benavente, 2016) nurse-led patient education has the potential to improve outcomes for patients through providing regular reinforcement of the avoidance of head turning, which could otherwise be difficult for patients to adhere to.
Post-Intervention Care and Monitoring. Following therapeutic interventions, nurses could provide essential support in monitoring for complications and managing residual symptoms. In this case, the small stroke during embolisation, alongside persistent issues like headaches, tremors, and cognitive difficulties, illustrates the need for close oversight, particularly in the perioperative period. Mrs B's migraine-like headaches were treated with amitriptyline and riboflavin. The nurses monitored headache severity, location, and associated symptoms like nausea, vomiting, encouraging adequate hydration, rest in a calm setting, and teaching relaxation techniques like deep breathing. She was also instructed to promptly report worsening symptoms, such as severe headache, visual changes, or neurological deficits. These emphasise how nurses might contribute to alleviating post-procedural pain and neurological sequelae, ensuring comprehensive care (Thomas et al., 2015; Inoue et al., 2023).

Support for Functional Recovery:

Nurses may also offer valuable assistance in promoting functional recovery by linking patients to rehabilitation and support services. Here, the patient's evaluation is to secure as-

sistance with daily activities. In addition, nurses can provide emotional support by actively listening to their concerns, offering encouragement, and assessing for signs of anxiety. Through collaboration with occupational therapists, physiotherapists and social workers, nurses could help ensure that patients receive tailored resources to optimise their independence and quality of life (Zaidi et al., 2014; Takeshima et al., 2018).

Balancing Anticoagulation and Bleeding Risk:

In managing patients with AF, nurses are uniquely positioned to monitor the delicate interplay between anticoagulation or antiplatelet therapy and bleeding risk, particularly post-intervention. Mrs B's treatment adjustments from aspirin to prasugrel, back to aspirin, and eventual discontinuation reflect the ongoing challenge of preventing stroke while minimising haemorrhage. Nurses promoted the safety of Mrs B in this process by educating her about bleeding indicators and coordinating regular follow-ups, thereby improving adherence to therapy (Kim et al., 2011; Nakase et al., 2014). Collectively, these contributions highlight the multifaceted ways nurses can support the holistic management of complex cases of BHS and AF, bridging clinical vigilance with patient-centred care.

Gaps in the Literature and Future Directions:

Research on BHS in patients with AF is limited due to the infrequency of this dual diagnosis. Though studies show surgical interventions for BHS are effective, crucial gaps remain, especially with AF. These gaps highlight the need for further research to improve clinical management and patient outcomes. Firstly, evidence on managing BHS in AF patients is sparse, complicating diagnostic and treatment decisions due to the dual risk of cardioembolic and mechanical stroke. Understanding how to balance anticoagulation therapy with surgical interventions for BHS is essential. Secondly, long-term outcomes after BHS interventions are not well documented. Studies like Takeshima et al. (2018) and Inoue et al. (2023) show no stroke recurrence post-intervention, but data on cognitive function, motor recovery, and quality of life are lacking, particularly for older patients. Future research should focus on these aspects to aid clinical decision-making. Thirdly, multidisciplinary care's role in improving BHS patient outcomes needs exploration, with attention to the impact of nursing strategies like education, symptom monitoring, and rehabilitation support. Evaluating these approaches will help establish best practice. Lastly, the link between FMD and BHS is underresearched. Both conditions share thromboembolic risks. Understanding FMD's role could aid in managing BHS with AF. Studies should examine prevalence, pathophysiological links, and clinical implications to address combined vascular risks and develop tailored management strategies.

Conclusion:

This case of Mrs B, a 75-year-old female with BHS and AF, highlights the significant management challenges associated with this dual diagnosis, including diagnostic delays, the limited efficacy of anticoagulation in addressing dynamic mechanical compression, and the need for definitive intervention to prevent recurrent strokes. Despite anticoagulation and antiplatelet therapy, the patient experienced multiple strokes until a right VA embolisation

halted the ischaemic events, with no further strokes at the nine-month follow-up. Clinicians should maintain a high index of suspicion for BHS in patients with recurrent posterior circulation strokes despite anticoagulation.

For nursing practice, this case emphasises the importance of nurseled early recognition of BHS, patient education, postintervention monitoring, and support for functional recovery. Comorbid patients with BHS can greatly benefit from a multifaceted therapeutic approach that nurses are poised to provide. Future research may explore the longterm functional outcomes of BHS patients with AF and the role of nursing interventions in optimising recovery postintervention.

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