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Effective headache management in the aneurysmal subarachnoid patient: a literature review.

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Abstract

Subarachnoid haemorrhage (SAH) is described throughout the literature as a devastating neurological disorder associated with significant mortality and morbidity rates, arising not just from the haemorrhage itself, but also as a result of the catastrophic multisystem sequelae that can accompany the condition. Rupture of an intracranial aneurysm accounts for up to 85% of instances of SAH, occurring in approximately 6–7 per 100,000 in most populations and costing an estimated £510 million annually in the United Kingdom alone (Rivero-Arias *et al*, 2010). Treatment of Aneurysmal Subarachnoid Haemorrhage (aSAH) includes prevention of re-bleeding, evacuation of space occupying haematomas, management of hydrocephalus and prevention of secondary cerebral insult. Headache has been highlighted as the predominant, most characteristic and often the only symptom of aSAH, its severity having a variety of physiological and psychological effects on the patient. This paper summarises the findings of a literature review conducted as part of a research study to examine existing practices in the assessment and management of headache in patients with aSAH in an Irish Neurosciences Centre. The review demonstrates that despite a wealth of published literature on the diagnosis and management of aSAH, evaluation and management of its main symptom, headache, remains suboptimal and under-researched. The lack of available literature demonstrates that such enquiry is both timely and necessary.

Keywords

Subarachnoid haemorrhage; headache; analgesia.

Key points

Headache in the patient with aSAH is understudied, under-assessed and under-managed. This review highlights the need for further research to be undertaken into the effects that headache following aSAH has on the patient. This review also highlights the need for further research to be undertaken into how best to assess and treat headache following aSAH.

Subarachnoid haemorrhage (SAH) occurs when blood is forced from the cerebral vasculature into the subarachnoid space surrounding the brain. The cause for this, in up to 85% of cases, is rupture of an intracranial aneurysm—aSAH (Wilson et al, 2005; van Gijn et al, 2007). The rupture of an intracranial aneurysm constitutes a neurological emergency requiring expertise to assess and manage the many actual and potential neurological and systemic complications (Rabinstein et al, 2010). Risk of re-bleeding in patients with aSAH is approximately 40% (van Gijn et al, 2007) resulting in death or permanent disability in up to 80% of those patients. The goal in the management of patients with aSAH is therefore to evacuate space-occupying haematomas, treat hydrocephalus and avert secondary cerebral injury as well as prevent rebleeding by securing the aneurysm (Beck et al, 2006; Randell et al, 2006). Even after the aneurysm is secured, the patient remains at risk of cerebral vasospasm, decreased cerebral perfusion and either localized, hemispheric or global cerebral ischaemia or infarction (Rabinstein et al, 2010).

Headache is the predominant characteristic symptom of aSAH developing almost instantaneously at ictus in 50% of cases and described by patients as sudden, severe and the ‘worst of their lives’ (Linn et al, 1998; Vermeulen and Schull, 2007; Bethel, 2010; Dorhout Mees et al, 2010). Such severity may have a variety of physiological and psychological effects on the patient, with the potential to negatively influence outcome. However, despite the potential adverse effects of headache pain on patients with aSAH, assessment and management of this common and enduring symptom remains suboptimal (Beydon et al, 2005; Binhas et al, 2006).

Significance of aneurysmal subarachnoid haemorrhage

It is well documented that 10–15% of patients with aSAH die before reaching hospital, up to 50% die within a month, and of those who survive, 20–40% are left permanently disabled (Sen et al, 2003; Randell et al, 2006; Rinkel and Klijn, 2009). Indeed, despite improvements in diagnostic and treatment modalities, aSAH remains one of the main causes of death and disability in relatively young people, with an economic burden estimated to be in the region of 80 000 life years or £510 million annually in the UK alone (Rivero-Arias et al, 2010).

Important aspects of early medical care in aSAH include anti-emesis, blood pressure control, prevention of re-bleeding and secondary damage—all of which can be confounded by unrelieved pain such as headache (Rabinstein et al, 2010). Headache may increase physiological parameters such as intracranial pressure (ICP), blood pressure and heart rate, which may predispose the patient to re-bleeding episodes and consequently increase morbidity and mortality. However, while the significance of adequate headache assessment and management in the care of patients with aSAH may be apparent, it is a topic that the literature fails to adequately address.

Search strategy

To form a theoretical framework and conceptual background to place the study within the context of existing practices, a comprehensive literature search was conducted across a range of electronic databases including PubMed, CINAHL, EMBASE and the Cochrane Library. A combination of MeSH and keyword searching was used covering the topics of SAH, headache management, pain measurement and neuroscience nursing. Searches yielded high numbers of results on each topic individually, but when combined indicated that headache management was under-researched compared to diagnosis, surgical management, complications and outcomes for the aSAH patient. PubMed searches retrieved 19 692 articles on SAH; 54 280 articles on headache; 1406 articles contained both topics. The majority of these articles described headache in relation to SAH diagnosis. The use of subheadings such as ‘drug therapy’, ‘treatment’, ‘therapeutic use’, ‘prevention’ and ‘control’ combined with ‘SAH and headache’, ‘pain’ and ‘analgesics’ when searching, reduced the results to 72 articles.

Two articles were identified that dealt specifically with aSAH and headache: Beydon et al (2005) and Binhas et al (2006). Both articles were published in *Annales Francaises d'Anesthesie et de Reanimation*, the journal of the French Society of Anaesthesia and Intensive Care. English language versions of the articles were not available as the journal only publishes in French. However, the primary author of each article kindly provided clarifications via email. Beydon et al (2005) conducted a literature review into the management of headache associated with SAH. They suggested that due to the paucity of empirical data, management strategies have had to be inferred from other areas of neurosurgery. It was proposed that the management of SAH is analogous to the management of traumatic brain injury, i.e. to restore an optimal homeostasis that analgesia and sedation facilitates while maintaining the clinical prerogatives of assessment and monitoring (Beydon et al, 2005). Binhas et al (2006) conducted a standardized postal survey into the assessment and management of pain associated with SAH. A questionnaire was sent to every senior doctor in every neuroscience intensive care unit in France to evaluate:

- How pain was assessed
- The type of analgesia used and method of administration
- The individuals' opinion regarding efficacy of pain management or lack thereof

The authors concluded that the majority of centres considered the assessment and management of headache associated with SAH to be inadequate and unsatisfactory. In contrast to Ireland, the majority of neuroscience centres in the study used morphine in their treatment regimen. The generalizability of results may be somewhat limited, however, due to the study setting (intensive care units only), questionnaire design (closed ended questions) and statistical analysis employed (descriptive only).

The search criteria were then broadened to include post-operative pain management and perceptions of headache pain in other categories of patients. Searches on nurse and patient perceptions of pain were conducted in PsycInfo and CINAHL. Broader results were found in this way, and given the limited information available for critical review regarding headache control in the aSAH patient, general concepts were extrapolated for our study including:

- The effect of pain on the patient
- Assessment and documentation of pain
- Analgesia provision: attitudes and agents

The effect of pain on the patient

Pain is a subjective, multifaceted phenomenon influenced by a number of factors including past experience of pain, culture, expectations and the context in which the person experiences pain (Bourbonnais et al 2004; Whelan et al, 2004). The patient can be affected physically and psychologically in general terms and may experience anxiety, fear, loss of sleep, fatigue, altered mental status, nausea and vomiting, hypertension, tachypnoea and tachycardia, depression, immobility, prolonged recovery time and increased length of hospital stay (Leith, 1998; Hader and Guy, 2004; McLafferty and Farley, 2008). Conversely, adequate analgesia may lead to improved cardiovascular functioning, decreased pulmonary comorbidity and mortality, earlier ambulation, decreased likelihood of deep vein thrombosis and improved patient outcomes (Leith, 1998).

Untreated pain can increase sympathetic activity leading to systemic hypertension, increased cerebral blood flow, oxygen consumption and intracranial pressure in patients with compromised cerebral autoregulation. Hypertension also increases the risk of re-bleeding (Leith, 1998) and can exacerbate the symptoms of SAH (Bethel, 2010). Such corollaries can have a deleterious effect on the patient with aSAH in whom headache may last for up to 2 weeks (Dorhout Mees et al, 2010). Despite the numerous potential adverse effects uncontrolled headache may have, and the range of treatment options and approaches available, pain management remains a significant problem (Hader and Guy, 2004) and is understudied in the context of headache associated with aSAH (Binhas et al, 2006).

Assessment and documentation of pain

Adequate assessment and management of headache is important in the aSAH patient due to the variety of potential problems that untreated headache and elevated ICP can cause (Cook, 2008). However, part of the problem of assessing and monitoring pain is related to the assessment and documentation techniques themselves, as pain cannot be said to be relieved unless it has been accurately measured (Wallace et al, 1999). The Agency for Health Care Policy and Research (1992) suggested that the absence of pain behaviours does not negate the presence of pain. Indeed, Binhas et al (2006) called for the development of a validated pain rating scale specifically aimed at SAH, because over half of the neurosurgical centres participating in their study sub-optimally assessed and managed pain in patients with SAH. Such results have been mirrored across a variety of clinical settings with many authors agreeing that the evaluation and treatment of pain is both unsystematic and inadequate despite technological advances, substantial research into the area and the existence of effective pain relief strategies (Chung and Lui, 2003; Kim et al, 2005; Dihle et al, 2006; Richards and Hubbert, 2007; Ene et al, 2008; Bell and Duffy, 2009).

Helfand and Freeman (2009) suggested that pain assessment tools must be simple to administer, easy for patients to understand and responsive to changes in pain over time. One such scale is the visual analogue scale (VAS). Linear and horizontal VASs have been shown to be equally valid for registry of pain intensity in conscious patients with headache pain (although not specifically aSAH headache) and non-headache pain (Lundqvist et al, 2009). Myles et al (1999) concluded that the VAS is linear for mild-to-moderate pain with changes in the VAS score representing a relative change in the magnitude of pain sensation. Further study is required to assess the validity and reliability of the VAS in aSAH patients.

Analgesia provision: attitudes and agents

There are many factors that contribute to ineffective analgesia provision such as inadequate prescribing, workload and organizational constraints, attitudes and beliefs regarding pain assessment and management, cultural factors, lack of time, or staffing shortages (Schafheutle et al, 2001; Chung and Lui, 2003; Sloman et al, 2005; Klopper et al, 2006; Bell and Duffy, 2009). Ene et al (2008) suggested that while nurses may have theoretical knowledge about pain management, this does not necessarily mean that they will successfully implement such knowledge into clinical practice. Nurses can underestimate patients' pain or believe that patients should not expect complete pain relief. Tasks such as answering the phone, looking for equipment, participating in doctors' rounds, assisting colleagues or attending to the business of the ward can often be prioritized over analgesia provision (Manias et al, 2002; Dihle et al, 2006). Patients can therefore be reluctant to distract a nurse by asking for pain relief again for fear of being regarded as a 'nuisance' or a 'problem patient', with more than half of patients being passive recipients of analgesia (Manias et al, 2006).

However, nurses have a professional, moral and ethical responsibility to make conscientious efforts to relieve patient suffering by providing adequate analgesia (Leith, 1998). In the context of aSAH headache, this can be difficult to achieve and often necessitates a polypharmacy approach to pain management. The literature frequently 'recommends' the use of paracetamol, codeine, tramadol or other opiate-based analgesia for controlling headache pain associated with aSAH without suggesting if such recommendations are based on anecdotal, consensual or empirical evidence (Cook, 2008; Rinkel and Klijn, 2009; Bethel, 2010). Beydon et al (2005) suggest that while paracetamol should be used in the treatment regime, it will not in itself be sufficient to control aSAH headache and other agents will be required. Codeine phosphate is a commonly used analgesic following craniotomy and aSAH. However, Roberts (2004) argued that codeine phosphate is an unpredictable pro-drug that does not equate to a safe and effective method of providing analgesia with efficacy dependant on the amount of active metabolite formed.

While morphine is often the drug of choice for post-operative patients, its use has been limited in the neurosurgical patient due to two main assumptions - that craniotomy patients suffer a low incidence and

severity of postoperative pain, and fear that opioid side-effects may mask neurological deterioration (Herbert, 2001; Roberts, 2004). Such assumptions are further validated by anecdotal evidence, exclusion of the subject from the literature and the discrepancies found among neurosurgical centres in the type of analgesia provided to patients with aSAH (Binhas et al, 2006). However, Roberts (2004) suggested that morphine is efficacious and does not hold the inherent risks attributed to it if administered under close observation in a high dependency unit by knowledgeable practitioners. Furthermore, Rinkel and Klijn (2009) proposed that those patients with aSAH whose headache remains severe should be treated with opiates. Doses should be titrated and patients observed to minimize the risk of overdose and maximize analgesic effect (Roberts, 2004; Binhas et al, 2006; Randell et al, 2006). In addition, when considering any form of therapeutic intervention, a risk-benefit calculation should be undertaken and the potential risks of withholding analgesia compared to those of administering. The ideal analgesic should provide sufficient analgesia to relieve moderate to severe headache pain whilst not masking symptoms of neurological deterioration or producing adverse side effects (Linn et al, 1998; Roberts, 2004; Binhas et al, 2006; Randell et al, 2006).

Discussion

There is a paucity of empirical evidence to critically discuss headache management in the aSAH patient. Most of the literature on the subject describes the severity and suddenness of onset of headache. Guidelines published by the American Heart Association (Bederson et al, 2009) regard the clinical presentation of aSAH headache as one of the most distinctive in medicine, yet headache management is not addressed. Those articles that do suggest management strategies fail to offer rationale for their choice of analgesia. Conclusions regarding analgesia in other clinical specialities and from other areas of neurosurgery such as post-craniotomy and traumatic brain injury can be extrapolated to the aSAH patient but to a vast extent they remain rational conjecture. There is no excuse for poor pain management (Haigh, 2008).

Conclusion

Although pain assessment and management are generally well explored concepts in nursing research, findings from empirical studies have not been implemented resulting in an inadequate and inconsistent approach to pain care (Gordon et al, 2002; Bell and Duffy, 2009). Specifically, there is a lack of empirical data regarding headache control in the aSAH patient from both a national and an international perspective. The literature that is available suggests that the assessment and management of headache associated with aSAH is suboptimal, without consensus and inconsistent with a clear need to develop a well-validated pain rating scale dedicated to aSAH patients (Binhas et al, 2006). While extrapolations can be made regarding analgesia within other areas of neurosurgery, concerns for maintaining the neurological integrity of the patient exist. This literature review has raised many questions that have informed our research study:

- Are patients with aSAH currently being adequately assessed for headache in the study hospital?
- How is this assessment documented and communicated?
- What changes to assessment and documentation techniques, if any, need to be made?
- What is the current analgesia regime in the study hospital with regard to patients with aSAH?
- Is this regime effective?
- What are the barriers to effective headache control in the patient with aSAH?
- What benchmarks, guidelines, standard operating procedures or total quality management / continuous quality improvement processes or initiatives are in place to ensure effective headache pain management in the study hospital and internationally?
- What is a reliable and valid method of pain assessment in the patient with aSAH?

Therefore, additional studies addressing the management of headache in aSAH are required to increase the knowledge base, and allow health professionals to make informed decisions.

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