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In This Issue:

Editorial

Editor - Vicki Evans

This edition is packed with interesting and challenging papers on a wide variety of topics. They will provide you with a resource to turn to, pose questions for you to consider and will keep you occupied for some time!

Neurosurgeon, Dr Stephen Honeybul has provided us with an interesting paper describing the insights of decompressive craniectomy.

Jessica Child is the recipient of the Louie Blundell Award for her paper on glioblastoma multiforme. She looks at the disease and the way it affects the patient as well as the family.

We begin with our Guest Editorial, by a leading AANN nurse—Dr Jan Hinkle, encouraging you to think about your abstract for the upcoming WFNN Congress. This "knowledge translation" defines our practice, supports the body of professional knowledge and at the same time enhances optimal patient care.

~ Cheers, *Vicki*

Guest Editorial

Janice L Hinkle Ph.D. RN, CNRN Director-at-large, AANN janhinkle@hotmail.com

Integrating Neuroscience Nursing Knowledge and Skill, clinical practice and education.
The dictionary definition of integration is 'the combining and coordinating of separate parts or elements into a unified whole' (http://www.merriam-webster.com/medical/integration). Perhaps more pertinent and relevant to neuroscience nursing, the term integration can also mean the coordination of mental processes into a normal effective personality or the incorporation of mental processes with the individual's environment. It can also mean adding, mixing, incorporating, amalgamating, or assimilating.

I have been thinking and wondering quite a bit about integration recently. That's because "Integration of knowledge and skill, clinical practice and education" is the theme of the next World Federation of Neuroscience Nursing (WFNN) meeting. If you don't already know, this meeting is scheduled for Sept 13-16, 2013 at the Nagaragawa Convention Center, Gifu, Japan. I am very excited about this upcoming meeting.

I have been thinking of the theme as I have been trying to come up with an abstract that I think would be relevant and interesting to neuroscience nurses worldwide. When I think of the theme I think of how neuroscience nursing in the United States is trying to use evidence based research to integrate neuroscience nursing knowledge and skills, clinical practice and education. When contemplating evidence based neuroscience nursing practice, just like I began with the definition of integration, I start with the definition of 'evidence based'. I know that some people think of the process of the diffusion and use of research as 'knowledge translation'.

When I think about what I'd like to hear about in Japan I know that I'd be interested in how different countries define, identify, and generate evidence based neuroscience research. I'd also be really interested to learn how different countries are using knowledge translation or evidence based neuroscience research to integrate neuroscience nursing knowledge and skills, clinical practice and education. It seems to me that this is what we, as neuroscience nurses, need to do to improve our practice and thus positively impact the outcomes of the patients and families for whom we provide care.

So if you have an idea or an example of how your country is translating knowledge or using evidence based neuroscience research to integrate neuroscience nursing knowledge and skills, clinical practice and education I encourage you to submit an abstract. Abstract submission opens Sept 1, 2012 and closes on December 1, 2012. To learn more check out: www.wfnn2013.jp

I hope to see you in Japan and discuss integrating neuroscience nursing knowledge and skills, clinical practice and education.

Jan Hinkle.

Medullablastoma in adults, never too old.

Idrees Sher, Linda Nichols

Abstract

Despite being the most common paediatric tumour medulloblastoma remain a rare diagnosis in adults, this resulting in a paucity of data and guidance for treatment options. Utilising a case presentation of a 42 year old patient, we *reviews the distinct characteristics, presentation and treatment options for adult medulloblastoma, also examining the incidence and outcomes comparing our case with current evidenced based literature.*

Key Words: Adult, medulloblastoma, treatment, surgery, radiotherapy, chemotherapy, surgery.

Introduction

Medulloblastoma is the most common paediatric brain tumour however; they are a rare diagnosis in adults representing less than 1% of adult cerebral tumours (Padovani, Andre, Carrie & Muracciole 2009**)**. Given this rarity there is a paucity of data and guidance for the treatment of medulloblastomas in adults. Treatment options are generally based on extrapolations from paediatric trials with the focus being on maximal surgical resection, cranio-spinal radiation including a posterior fossa boost, and chemotherapy (Ang, Hauerstock, Guiot, Roberge, Kavan & Muanza 2008). Despite this progression free and survival rates as well as treatment options are still undefined for adults. Coupled with this is the devastating physical, psychosocial and neuro-cognitive consequences of treatment options. In light of this the quality of life for survivors is a major issue (Packer & Vezina 2008). Utilising a case study the following paper reviews the distinct characteristics, presentation and treatment options for adult medulloblastoma, also examining the incidence and outcomes comparing our case with current evidenced based literature.

The following case study reviews a 42 year old male who presented following a six week history of headaches, intermittent nausea and vomiting. With no significant past history, the patient presented as alert and fully oriented, his vital signs were normal and blood biochemistry and laboratory tests were unremarkable. The patient worked full time in a managerial position and was partnered. Following presentation to his General Practitioner a computed tomography (CT) scan identified a 45-48 mm posterior fossa mass that extended into his 4th ventricle. Magnetic resonance imaging was utilised to provide further enhancement and greater anatomical detail and three days following his admission surgery was undertaken to debulk the tumour. The patient also received radiation therapy and high dose chemotherapy with autologous stem cell rescue. The following paper reviews the distinct characteristics, presentation and treatment options for adult medulloblastoma, also examining the incidence and outcomes comparing our case with current evidenced based literature.

Questions or comments about this article should be directed to Linda Nichols, Lecturer School of Nursing and Midwifery. University of Tasmania at Linda.Nichols@utas.edu.au

Epidemiology and Etiology

Medulloblastomas are the most commonly diagnosed childhood brain tumour (Huppmann, Orenstein & Jones 2009; Korshunov, Remke, Werft, Benner, Ryzhova, Witt, Strum, Wittmann, Schöttler, Felsberg, Reifenberger, Rutkowski, Scheurlen, Kulozik, von Deimling, Lichter& Pfister 2010), accounting for 20-25% of brain tumours in children. Close to 80% of cases are diagnosed in the first 15 years of life with a peak age at diagnosis of 3-7 years (Etame, Smith, Abori & Rutka 2011). It is estimated that only 25% of patients that are diagnosed are 15 years of age or older (Brandes, Franceschi, Tosoni, Renib, Vecht & Kortmann 2009). The diagnosis of medulloblastoma in adults does occur although rarely after the age of 50 years (Bezircioglu, Sucu, Minoglu, Tunakan & Olmezoglu 2009). In

adults the occurrence of medulloblastoma diagnosis is approximately 5 individuals per million per year (Brandes, Franceschi, Tosoni, Blatt & Ermani 2007).

The etiology of medulloblastoma in adults is not well established, although ionizing radiation has been extensively documented as a risk for developing a brain tumour. In relation to ethnicity, Breneman (2011) reports a higher incidence in caucasians than in black individuals however this remains unsubstantiated. Gender is also a debatable prognostic factor in adult and paediatric series. Parkin, Whelan, Ferlay, Teppo & Thomas (2002) extrapolate the incidence in adults as being 1.1/million/ year in men and 0.8/million/year in women, with Breneman (2011) supporting this incidence as being approximately 3:2, with the female gender documented to be a significant favourable prognostic factor (Prados, Warnick, Warra, Larson, Lamborn & Wilson 1995; Chan, Tarbell, Black, Louis, Frosch, Ancukiewicz, Chapman & Loeffler 2000). The incidence of medulloblastoma is generally sporadic, however familial have been reported and there is an increased frequency in various syndromes (Packer, DeBraganca & Kadom 2011). In our case there was no evidence of any of the genetic or familial syndromes associated with an increased risk of medulloblastoma such as Gorlin syndrome, Turcot syndrome and Rubenstein-Taybi syndrome. These mutations remain rare and account for fewer 5% of all cases, (Brandes et al., 2009). The potential role of polyomaviruses viruses continues to be a developing area of interest, due to their affiliation with a number of central nervous system tumours.

Clinical Presentation

Adult medulloblastomas have characteristics distinct from paediatric medulloblastomas in their histological characteristics, proliferative and apoptotic indices. Adult medulloblastoma also shows more tendency toward cerebellar hemispheric origin, with a lateral cerebral hemisphere presentation in approximately 50% of adults compared with less than 10% in children, where paediatric tumours are more likely to occur in the midline at the floor of the forth ventricle and vermis (Padovani, Sunyach, Perol, Mercier, Alapetite, Haie-Meder, Hoffstetter, Muracciole, Kerr, Wagner, Lagrange, Maire, Cowen, Frappaz & Carrie 2007; El- Bahy 2008; Breneman 2011). The correlation between anatomical location and age is conjectured to be associated with the lateral and superior migration of the undifferentiated cells from which tumours arise, from their original location in the midline of the roof of the fourth ventricle and posterior medullary. (Ang et al., 2008). The lateral location of medulloblastomas is also surgically significant, Chan et al., (2000) discusses the non-vermian location as being more amenable to complete resection, this being directly associated with improved long term outcomes for adults. However as Menon, Krishnakumar & Nair (2008) highlight there is a higher incidence of brainstem infiltration in the adult population and this is associated with a high incidence of subtotal excision and poorer outcomes.

Symptoms associated with medulloblastomas are generally associated with cerebrospinal fluid obstruction and/or direct damage to cerebellar or other brainstem structures (Bohan, Gallia & Brem 2008; Brandes et al., 2009). Children commonly present with vomiting and headache associated with the obstruction of cerebrospinal fluid flow at the outlet of the third or fourth ventricle and secondary hydrocephalus at the time of diagnosis (Packer, DeBraganca & Kadom 2011), with headaches upon awaking and presenting as those classically associated with increased intracranial pressure. In comparison to children, Packer, DeBraganca & Kadom (2011) also suggest that adults are more likely to have a longer time from the occurrence of initial symptoms to diagnosis, with most adults developing headaches, ataxia and nausea by the time of diagnosis. The more lateral location of tumours in adults is generally attributed to a lower incidence of hydrocephalus (Menon, Krishnakumar & Nair 2008). Bezircioglu et al., (2009) highlight the most common presenting symptoms for adults include headache (92%), ataxia (76%) and vomiting (69%). Packer, DeBraganca & Kadom (2011) identify that whilst unsteadiness and gait disturbances are often ill defined and under reported the incidence is between 50 and 80% of patients, with this unsteadiness frequently presenting as truncal than lateralized due to the midline location of tumours.

Other clinical findings that have been documented in the literature include; weight loss, head tilt, stiff neck, papilledema, nystagmus, diplopia and ophthalmologica. Palsy of the cranial nerves indicate infiltration of the floor of the fourth ventricle and spinal metastases may cause neurological deficits related to the sites of the lesions (Brandes et al., 2009). The incidence of loss of consciousness, seizures and cranial nerve palsies are predicted to be higher in the adult population, with Bloom &

Bessell (1990) attributing this to the lateral presentation of tumours in adults.

Treatment Options

In the Paediatric population the treatment of medulloblastoma is well defined consisting of imaging assessment of the brain and spinal cord, maximal surgical resection, craniospinal radiation and chemotherapy (Ang et al., 2008; Menon, **Krishnakumar & Nair 2008;** Padovani et al., 2009). Since adult medulloblastomas are a rare diagnosis in adults the majority of studies are retrospective from single institutions and have had limited numbers in small series. Studies have either had a short follow up or have spanned decades, during which diagnostic and surgical procedures have changed (Wendland, Shrieve, Watson, Chin & Blumenthal 2006; Lai 2008). Also the lack of international standards, prospective comparative trials and evolving diagnostic procedures and techniques has resulted in a multitude of differing treatment regimens complicating the task of assessing survival rates and prognostic factors (Brandes et al., 2007; Franceschia, Tosoni, Reni & Gatta 2009). Without sufficient data available to confidently define the best treatment for adults, most practitioners continue to treat adult patients as high risk, often following paediatric models of care that include standard dose craniospinal radiation therapy and high dose chemotherapy (Ang et al., 2008). This translation of paediatric models of care to the adult population has had some success, however adult medulloblastoma remains an arguably a biologically distinct challenge.

Neuroimaging

In general, medulloblastomas present as high-density lesions with moderate to strong homogeneous contrast enhancement on CT scan. (Miyata, Ikawa & Ohama 1998). Magnetic resonance imaging findings of adult patients with medulloblastoma can mimic other posterior fossa tumours (Bezircioglu **et al.,** 2009). Adult medulloblastoma MRI findings are often not specific. The classic well-defined homogeneouseous vermian tumor with intense contrast enhancement seems to be rare in adults, whose tumors are predominantly in the cerebellar hemisphere, poorly defined and enhance less and often with a high rate of cystic and necrotic degeneration (Bezircioglu **et al.,** 2009). Figure 1 & 2 illustrate our patient's lesion, located it the cerebellar vermis, with the axial images demonstrating the compression of the forth ventricle.

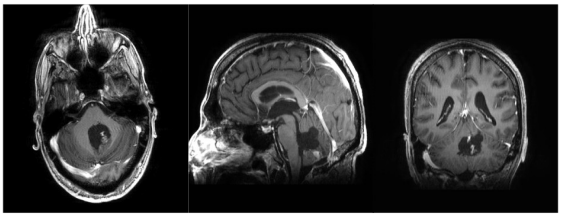

Figure 1: *(Above)* T1 gadolinium enhanced axial, sagittal and coronal images demonstrates the low signal, well defined large 43 x 38 x 50mm lesion in the cerebellar vermis with regions of contrast enhancement and large central fluid filled cavity.

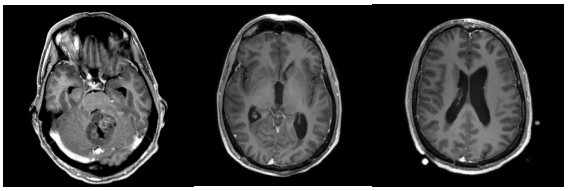

Figure 2: *(Above)* Axial images of the fourth, third and lateral ventricles demonstrating compression of the fourth ventricle resulting obstructive hydocephalus. The saggital image in Figure 1 demonstrates the mass effect deforming the pons and medulla oblongata.

Surgical Intervention

Surgery and the extent of resection of a medulloblastoma is an important criterion and in all cases there is considerable effort to safely achieve as close to a complete resection (Herrlinger et al. 2005; Mueller & Chang 2011; Sedik, Azzazi, Sakr & Salem 2010). The extent of surgical resection is a predictor for prognosis; however Bezircioglu, Sucu, Minoglu, Tunakan & Olmezoglu (2009) advocate for a less radical approach highlighting that subtotal removed tumours that are treated with radiotherapy demonstrate limited recurrence. They further add that significant morbidity and even mortality can result from surgical aggressiveness. The following images (figure 3&4) taken immediately post operatively and 16 months post surgical resection demonstrate a resumption of normal brainstem architecture and no evidence of recurrence.

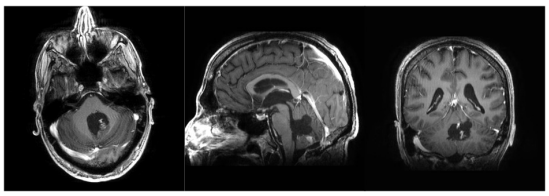

Figure 3: ***(Above)*** Postop MRI scan demonstrating satisfactory excision of the lesion. Note the mass effect is no longer evident and the brainstem has resumed its normal architecture.

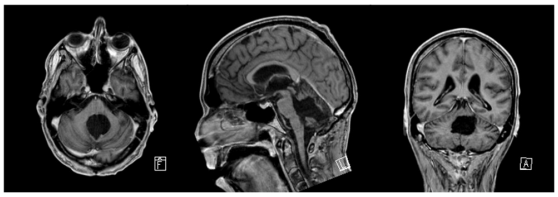

Figure 4*: (Above)* Progress MRI scan at 16 months demonstrating no recurrence.

Histopathology

As defined by the World Health Organisation medulloblastomas are grade IV, malignant and invasive embryonal tumours of the cerebellum (Etame et al., 2011). Medulloblastomas are a highly cellular primitive neuroectodermal tumour (PNET), that are believed to originate from the neuroepithelial cells in the lining of the roof of the fourth ventricle (Brandes et al., 2007; Rieken, Gaiser, Mohr, Welzel, Witt, Kulozik, Wick, Debus & Combs 2010). Medulloblastomas also arise from germinal zones in the cerebellum including the external granular layer that lines the outside of the cerebellum, or the ventricular zone that forms the inner most boundary of the cerebellum. (Packer, DeBraganca & Kadom 2011). Medulloblastomas are histologically different with a number of subtypes demonstrating varying neuronal differentiation. The World Health Organisation lists classic medulloblastoma that make up to 80% of cases and several variants including desmoplastic, anaplastic, large cell medulloblastoma and medulloblastoma with extensive nodularity, with the majority of paediatric patients being diagnosed with the classical variation (Bezircioglu et al., 2009; Rieken et al., 2010).

The desmoplastic variant, that originate from specific cerebellar progenitor cells and is identifiable for its nodular articture, is more frequently diagnosed in adults with up to 50% of desmoplastic variant diagnosed compared to the paediatric population where only 15% of diagnosed medulloblastomas as are of desmoplastic variation (Chan et al., 2000; Brandes et al., 2009). The prognostic significance associated with variants, particularly the desmoplastic variation, is widely debated with the evidence from some series identifying the desmoplastic variant as a favourable prognostic factor although this is balanced with a number of series where the authors disagree, or the evidence presented is inconclusive (Menon, Krishnakumar & Nair 2008). Large cell medulloblastomas have a significantly worse prognosis compared to other variants (Bezircioglu et al., 2009).

Radiation

Radiotherapy has been acknowledged as the most effective post-operative adjunct treatment. The techniques and doses for adult medulloblastoma are similar to those used in children, except that two adjacent spinal fields are often necessary because of the adult patient's height (Breneman 2011). Following surgical removal of the tumour radiation is administered to the entire craniospinal axis with a boost to both the primary tumor site and focal CNS metastatic sites (Menon, Krishnakumar & Nair 2008). Like most patients our patient received conventional radiotherapy doses of approximately 36 Gy in adults are delivered to the craniospinal axis in 20 fractions of 1.8 Gy/5 fractions per week, followed by a boost of 18 to 20 Gy in 10 fractions to the posterior fossa with a total of 54.8 Gy (Brandes et al., 2007; Brandes, Franceschi, Tosoni, Frezza, Agati, Maestri, Ghimenton, Mazzocchi, Scopece & Ermani 2010).

Where there is a lack of consensus is the timing of radiotherapy, with Abacioglu, Uzel, Sengoz, Turkan & Ober (2002) suggesting that the time interval between surgery and commencing radiotherapy is a significant prognostic factor. However, Chan et al., (2000); El-Bahy (2008) advocate for radiotherapy to be completed as soon as possible after surgery. Whereas Menon, Krishnakumar & Nair (2008) report that the interval between surgery and radiotherapy did not influence survival in their study. A number of practitioners prefer to use radiotherapy as the sole modality for average risk adult patients (Breneman 2011), with Brandes et al., (2007) purporting that radiotherapy is more vital and chemotherapy should only be administered post radiation therapy. Whilst the effectiveness and dose of the radiotherapy for medulloblastomas is well established, the literature continues to contest the timing and duration of radiation therapy.

Chemotherapy

The role of chemotherapy for adults diagnosed with a medulloblastoma is controversial and has long been debated. Until the mid-2000's post-radiation chemotherapy was reserved primarily for poor risk patients however since 2005, the majority of patients have been given concurrent standard dose radiation and chemotherapy followed by maintenance chemotherapy (Ang et al., 2008). There is a relative paucity of literature regarding the use of salvage chemotherapy in adults with medulloblastoma and most of the data available are from single institution, retrospective reviews

(Wendland et al., 2006). For patients who experience a relapse the survival rates are extremely low and there remains no standard therapy for recurrent medulloblastoma in the adult population. In light of the poor prognosis of recurrent medulloblastoma a number of chemotherapy agents have been trialled as salvage treatment including the oral alkylating agent Temozolimide that is licensed for the treatment of recurrent high-grade gliomas, anaplastic astrocytoma and Glioblastoma multiforme. The literature supports the use of Temozolimide for salvage treatment with, Durando, Thivat, Gilliot, Irthum, Verrelle, Vincent & Bay (2007) examining the use of Temozolimide for relapsing medulloblastoma and supporting its use due to its low toxicity profile, the fact that it can be orally administered in the community and its relatively few side effects. There remains a limited amount of research into the in vitro anti-tumour activity of Temozolimide against medulloblastoma cells, however the cases presented have provided encouraging results, with hardly any side effects. Temozolimide is therefore considered by many as an appropriate choice when treating recurrent and metastatic medulloblastoma (Poelen, Bernsen & Prick 2007).

The introduction of chemotherapy before or after radiotherapy greatly improved survival both children and adults diagnosed with medulloblastoma (Dunkel, Gardner, Garvin, Goldman, Shi & Finlay 2010). The increasing trend towards the use of high dose chemotherapy with stem cell rescue for patients diagnosed with medulloblastoma is based on the evidence that medulloblastomas are sensitive to treatment with chemotherapeutic agents such as vincristine, cisplatin, carboplatin, lomustine, cyclophosphamide, metphalan and methotrexate, which for the majority have hematologic toxicity as their main dose-limiting toxicity (Gill, Litzow, Buckner, Arndt, Moynihan, Christianson, Ansell & Galanis 2008). The reinfusion of previously harvested and cryopreserved stem cells after the administration and clearance of high-dose chemotherapy allows for significantly higher doses of chemotherapeutic agents to be utilised. There are also a number of strategies including the hematopoietic growth factor granulocyte colony-stimulating factor (G-CSF) that facilitate faster recovery of the blood counts enabling shorter intervals between treatments (Dunkel & Finlay 1996). Several protocols for high-dose chemotherapy followed by stem cell rescue are currently utilised.

Our patient received the St Jude protocol MB03 which includes high dose chemotherapy and autologous stem cell transplantation and G-CSF. Six week after receiving radiotherapy our patient received high dose chemotherapy comprising Vincristine, Cisplatin and cyclophosphamide with autologous stem cell transplantation. The seminal research that was published in 2006 by Gajjar, Chintagumpala, Ashlay, Kellie, Kun, Merchant, Woo, Wheeler, Ahern, Krasin, Fouladi, Broniscer, Krance, Hale, Stewart, Dauser, Stanford, Fuller, Lau, Boyett, Wallace & Gilbertson (2006) presented the St Jude Medulloblastoma [SJMB]-9 protocol that consists of a four month dose intense regimen of cyclophosphamide, cisplatin, and vincristine that should be started 6 weeks after completion of risk adapted radiotherapy. The authors demonstrated a 5-year event-free survival of 83% (73 –93) for those at average risk and 70% (55– 85) for those at high risk Gajjar et al., (2006). The success of short, dose-intensive regimes has been related to stem cell transplantation; originally sourced from bone marrow, hematopoietic stem cells are now commonly harvested from peripheral blood, the number of stem cells circulating is increased at recovery from a previously administered cycle of chemotherapy or after priming with G-CSF (Dunkel & Finlay 1996). Patients often face poor stem cell mobilisation with Gill et al., (2008) questioning whether previous radiation is a contributing factor to poor stem cell mobilisation. High dose chemotherapy with stem cell rescue is associated with significant toxicity with Dunkel & Finlay (1996) reporting a 10% risk of toxic mortality. Our patient's transient bone marrow suppression resolved rapidly, allowing for the administration of subsequent cycles without any impeding toxicities.

Nursing Considerations

Post operatively our patient's recovery was hampered by facial nerve deficits (swallowing and inability to close his mouth) and motor and sensory deficits (hiccups, ataxia poor coordination, and dysphagia). This delayed further treatment and significantly extended his hospital admission, leaving him prone to constant mucositis and thus complicating his treatment options. For our patient the adverse effect of his surgery left him with devastating side effects, as Larsson, Hedelin & Athlin (2007) highlight not only the visual part of the body is affected but also functions including eating and speaking. Agre & Shaftic (2007) maintain that the importance of patient education cannot be underestimated and whilst we

can impart multiple pieces of information, this is often ineffective unless patients can easily comprehend the information being imparted (Abbott et al. 2008). Finding and locating current evidenced based literature was difficult, although our patient was fully aware and cognitively intact he was unable to communicate effectively and his ability to interact was severely impaired. Larsson, Hedelin & Athlin (2007) identify that it is common place for patients to be left alone with questions unanswered.

Through patience, skilful communication and the help of a communication board potential questions were identified and subsequently answered. Coyle & Sculco (2003) discuss how both verbal and nonverbal communication contributes to patient's feelings and their experience as being a person and not just a body. Assisting patients to gain empowerment involves helping them to develop coping mechanisms and finding ways to express their personality. Carel (2011) highlights the importance of moving beyond the medical condition, and how improved quality of life can be achieved through maintaining a positive perception, tailoring interventions rather than assuming needs and by engaging family and friends to help which is vital to adaption and empowerment (Haynes & Watt 2008). With care firmly rooted in medicine, all too often the wider determinants of a patient's health are neglected (Baum 2009). An essential part of care is identifying that cancer survivorship does expand beyond the acute setting (Cooper, Loeb & Smith 2010). Setting goals and working together to collaborate on a plan is fundamental to ensuring that patients received timely treatment including radiotherapy and chemotherapy. Our patient's journey was fragmented as he initially faced the uncertainty of being well enough for further treatment and then battled to regain the physical capability to communicate, eat, walk and care for himself. Supportive care, adaptability and positivity were indispensable as our patient faced the biggest challenge of achieving a healthy illness (Mashino & Jandolo 2005; Carel 2007). While the physical changes are often long term and possibly permanent, guiding patients to be healthy and well is fundamental to enabling patients to adapt to an altered body, gain empowerment and lead a more fulfilling life (Wilde 2003). Empowering patients is essential to enabling him to cope with the side effects from surgery and treatment.

Outcomes

There are a number of predictors to outcome including histological subtype, location, brain stem infiltration and infiltration of the floor of the 4th ventricle that are confirmed as negative predictors (Abaciogluet et al., 2002). Favourable prognostic indicators include a vermian location in adults, and a desmoplastic variant in children, with Menon, Krishnakumar & Nair (2008) indicating no correlation of classical outcome determinants like age, extent of excision and residual tumour in their series. Although adult medulloblastomas are often more amenable to complete surgical resection and the advancement in treatment for medulloblastoma the five year survival rates vary from 26% to 83%, with progression free rates often significantly worse, with up to 20–30% of patients experiencing recurrence. This in part is due to the primitive nature and inherent tendency of medulloblastoma to infiltrate to the leptomeninges and metastasize via cerebrospinal fluid pathways. This tendency for metastatic spread is significantly lower in adults than in children, however the differing proliferative and apoptotic indices associated with adult medulloblastomas are associated with a tendency of late relapses particularly in the posterior fossa (Ang et al., 2008; El-Bahy 2008). Extraneural metastases are rare and occur in 10–30% of cases and most commonly involve bone; rarely lymph nodes, visceral organs and bone marrow may be involved with disease (El- Bahy 2008). Metastatic spread to the bone is the most common feature both in adults and in children accounting for 80% of metastases outside the central nervous system (Rochkind, Blatt, Sadeh & Goldhammer 1991). Brandes et al., (2009) further identify that lung metastases occur more frequently in adults as compared to children, whereas metastatic disease to the liver occurs more frequently in children.

Future Directions

As recently as a decade ago the cellular origins of medulloblastoma were still unknown. Packer & Vezina (2008) highlight that our increased understanding of the genetic underpinnings of syndromes associated with a higher incidence of medulloblastoma are fundamental to understanding the specific molecular genetic abnormalities and cellular signaling pathways integral in medulloblastoma development and progression. With this knowledge of the molecular biology of medulloblastoma it is hoped that future treatment can be tailored to the molecular genetic composition of each individual tumor. The identification of the specific genetic patterns of patients with a better

or a worse prognosis is vital to improving treatment options and the prognosis for medulloblastoma. Long-term survival is possible in adults treated for medulloblastoma, with Riffaus, Saikali, Leray, Hamlat, Haegelen, Vauleon, Lesimple (2009) supporting the need for close follow-up of patients due to the incidence of delayed recurrence.

Conclusion

Aside from the physical impact of medulloblastoma, the psychosocial and neurocognitive consequences deserve equal attention. As evidenced from our patient, despite suffering no cognitive deficits he endured the devastating psychosocial effects associated with facial palsy. At the time of this report our patient is continuing to recover, his last MRI (see figure 4) was promising and his communication and mobility continues to improve. Adult medulloblastoma remains distinctly different from that in children, being characterised by a number of distinct factors including location, histopathological subtype, metastatic spread and the incidence of relapse. However, without large International prospective trails, the treatment recommendations for adults diagnosed with a medulloblastoma are likely to continue to follow paediatric protocols. The retrospective data analysed for this rare diagnosis in adults has provided the foundation for treatment and continues to be essential in establishing optimal treatment outcomes however further research is required.

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The current role of decompressive craniectomy.

Stephen Honeybul

Abstract

Over the past two decades, there has been an increasing number of publications reporting the clinical efficacy of decompressive craniectomy not only for patients with traumatic brain injury (TBI) and stroke but more recently in the context of a subarachnoid haemorrhage, dural sinus thrombosis, intracranial infection and demyelinating disorders. In addition, the last decade has seen the successful completion of a number of randomised controlled trials investigating its clinical efficacy. These trials have provided the first level 1 evidence for the role of decompressive surgery within the context of stroke and TBI. Whilst it was hoped that this evidence could be used to guide clinical practice the results of the trials have in many provided more questions than answers. The aim of this narrative review is to critically appraise the existing research evidence for decompressive craniectomy, establish the current role of surgical intervention in the context of the different neurological emergencies and highlight the clinical and ethical issues that remain unresolved.

Key Words: Decompressive craniectomy, traumatic brain injury, stroke

Introduction

Decompressive craniectomy is a technically straightforward and usually involves temporary removal of a large segment of the skull in order to provide extra space into which the injured or ischaemic brain can expand. The rationale is that by reducing the intracranial pressure (ICP), life threatening herniation of the cerebellar tonsils is prevented and cerebral perfusion is improved (Jaeger, Soehle, & Meixensberger 2003; Yamakami & Yamaura 1993).

Over the past two decades there has been a gradual increase in the number of publications in the medical and surgical literature that demonstrated the clinical efficacy of the technique not only in the context of traumatic brain injury (TBI) (Polin, Shaffrey, Bogaey, Tisdale, Germanson, Bocchicchio & Jane 1997; Guerra, Gaab, Dietz, Mueller, Piek & Fritsch 1999) and stroke (Schwab, Steiner, Aschoff, Schwarz, Steiner, Jansen & Hacke 1998; Holtkamp, Buchheim, Unterberg, Hoffmann, Schielke, Weber & Masuhr 2001), but more recently following subarachnoid haemorrhage (Güresir, Schuss, Vatter, Raabe, Seifert & Beck 2009), severe intracranial infection (González Rabelino, Fons, Rey, Roussos & Campistol 2008) dural sinus thrombosis (Lanterna, Gritti, Manara, Grimod, Bortolotti & Biroli 2009) and inflammatory conditions (Nilsson, Larsson, Kahlon, Nordström & Norrving 2009) (Table 1). Despite these encouraging results the concern amongst clinicians has always been that whilst the procedure itself may be lifesaving it may leave many survivors with severe neurological impairment, which may be unacceptable to the patient and their family (Gillett, Honeybul, Ho & Lind).

In an attempt to address these issues a number of prospective randomised controlled clinical trials have been conducted in the last decade that investigated the role of decompressive craniectomy in the context of ischaemic stroke (Jüttler, Schwab, Schmiedek, Unterberg, Hennerici, Woitzik, Witte, Jenetzky, & Hacke 2007; Vahedi, Vicaut, Mateo, Kurtz, & Orabi 2007; Hofmeijer, Kappelle, Algra, Amelink, van Gijn, & van der Worp 2009) and TBI (Cooper, Rosenfeld, Murray, Arabi, Davies, D'Urso, Kossmann, Ponsford, Seppelt, Reilly & Wolfe 2011). It was hoped that the results of these trials would provide level 1 evidence upon which to base clinical practice. However in many ways the evidence obtained so far has provided more questions than answers. The aim of this narrative review is to critically appraise the existing evidence for decompres-

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Clinical indication for Decompressive Craniectomy	Evidence available
"Malignant Cerebral Artery Infarction	Three randomised controlled trials One meta analysis 22 cohort studies
Traumatic Brain Injury	Adults: One randomised controlled trial comparing decompressive craniectomy versus standard medical therapy Two randomised controlled trials comparing limited with extended craniectomy 35 cohort studies Children: One randomised controlled trial 10 cohort studies
Subarachnoid Haemorrhage	11 cohort studies
Cerebral Venous Thrombosis	13 case reports Two cohort studies One registry
Intracranial infection Encephalitis Meningitis Subdural Empyema Toxoplasmosis	 16 case reports Two case reports Two case reports Two case reports
Demyelination disorders	Six case reports
Reyes Syndrome	Two case reports
Acute Hyperammonemia Encephalopathy	One case report
Cerebral oedema from Diabetic ketoacidosis	One case report

Table 1. *(Above) Clinical indications for decompressive craniectomy and evidence available*

sive craniectomy and establish the current role of surgical intervention in the context of different neurological emergencies. The evidence obtained from the recent trials will be discussed initially, followed by surgical decompression for the less common indications will be considered.

Decompressive craniectomy for ischaemic stroke

Between 1 – 10 % of patients who have a supratentorial infarct will develop life threatening cerebral oedema. The prognosis for patients with so called "malignant" middle cerebral artery infarctions is poor with a fatality rate in the region of 80% (Hacke, Schwab, Horn, Spranger, De Georgia & von Kummer R 1996) . Throughout the 1980s and 90s a number of non-randomised studies demonstrated that in the context of clinical deterioration following "malignant" infarction, decompressive hemicraniectomy could significantly reduced mortality. In addition, a number of studies demonstrated that this reduction in mortality did not necessarily occur at the expense of an increase in the number of survivors with severe disability (Schwab et al., 1998; Mori, Nakao, Yamamoto & Maeda 2004).

(i) Outcome assessment – What is an unfavourable outcome?

Traditionally stroke outcome has been assessed using the modified Rankin score and an unfavourable outcome defined as a mRS of 4 or 5 (Table 2 below).

Score	Description
6	Dead
5	Severe disability; bedridden, incontinent and requiring constant nursing care and attention
4	Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
3	Moderate disability; requiring some help, but able to walk without assistance
2	Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
1	No significant disability despite symptoms; able to carry out all usual duties and activities
0	No symptoms at all

Table 2. *(Above)* The Modified Rankin Scale

Favourable outcome is defined as a mRS of 0-3. There are some limitations with the mRS as a means of assessment as it tends to focus on the physical aspects of recovery and gives limited insight into the neuropsychological and psychosocial impairments that have a significant impact on return to work outcomes, social re integration, mental health and overall quality of life. Nevertheless, it is a relatively robust and reproducible assessment tool and notwithstanding the aforementioned limitations, the fundamental issue that

denotes an unfavourable outcome is that the patient has lost their independence.

(ii) Evidence from non randomised studies - the prognostic significance of age and surgical timing

These earlier studies established the prognostic significance of age with a number of reports detailing the poor prognosis for patients over 60 years of age (Schwab et al., 1998; Holtkamp et al., 2001). Indeed, more detailed assessments confirmed that for many survivors in this age group the levels of psychological and psychosocial impairment were so high that many patients found the outcome to be unacceptable and retrospective consent would not have been provided. (Holtkamp et al., 2001; Leonhardt, Wilhelm, Doerfler, Ehrenfeld, Schoch, Rauhut, Hufnagel & Diener 2002).

Some of the earlier studies also suggested that timing of surgery was critical, however, this was by no means conclusive (Gupta, Connolly, Mayer & Elkind 2004). Experimental data in the mid 1990's demonstrated that in animal models early decompression could reduce stroke volume (Doerfler, Forsting, Reith, Staff, Heiland, Schäbitz, von Kummer, Hacke & Sartor 1996; Forsting, Reith, Schäbitz, Heiland, von Kummer, Hack & Sartor 1995). These findings led a number of investigators to suggest that early, or even ultra early decompression should be performed prior to the development of clinical deterioration and uncontrolled cerebral swelling (Schwab et al., 1998; Cho, Chen & Lee 2003; Mori et al., 2004). However, other studies reported precisely the opposite, which probably reflects an earlier intervention for a more rapid clinical deterioration and therefore more severe underlying disease (Kilincer, Asil, Utku, Hamamcioglu, Turgut, Hicdonmez, Simsek, Ekuklu & Cobanoglu 2005).

The main problem with early intervention prior to clinical deterioration is predicting which patients will develop more malignant brain oedema following an MCA stroke. Whilst this particular group of patients (i.e. those that develop malignant oedema) may indeed benefit from prophylactic decompression, a treatment protocol of "Ultra early surgery" (within 6 hours of symptom onset), may involve submitting some patients to surgical decompression who would otherwise have been managed conservatively.

(iii) The European randomised controlled trials

In order to provide evidence of clinical efficacy three European randomised controlled trials were conducted. All three trials had an age limit of 60 and patients were randomised to either standard medical management or decompressive hemicraniectomy. Two of these trials interrupted recruitment early in 2006: The DECIMAL trial because of slow recruitment and a significant difference in mortality between the treatment groups favouring surgery (Vahedi et al., 2007);- The DESTINY trial because a predefined sequential analysis showed a significant benefit of surgery on mortality (Jüttler et al., 2007). The third study, the HAMLET trial was stopped because it was thought to be highly unlikely that a statistically significant difference would be seen for the primary outcome measure, which was defined as good (mRS 0-3) or poor (mRS 4–6) (Hofmeijer et al., 2009). It should be noted that for statistical purposes death was given a score of 6.

Essentially each of these trials established that in the context of malignant cerebral swelling following ischaemia stroke decompressive craniectomy considerably reduced mortality but there was insufficient statistical power to determine whether there was an improvement in favourable outcome (Table 3).

	Pooled analysis	
mRS	Hemicraniectomy *n =51 patients (%)*	Conservative *n = 42 patients (%)*
6	11 pts (22%)	30 pts (71%)
5	2 pts (4%)	2 pts (5%)
4	16 pts (31%)	1 pt (2%)
3	15 pts (29%)	8 pts (19%)
2	7 pts (14%)	1 pt(2%)

Table 3. *(Above)* Pooled analysis from the European randomized controlled trials (Vahedi et al., 2007)

(iv) The pooled analysis of the European trials

In view of the limitations found in the above trials, a pooled analysis was performed of the 93 patients involved in all three trials and this confirmed the dramatic reduction in mortality from 78% for those patients treated medically to 29% for those patients who had a decompressive hemicraniectomy (Vahedi, Hofmeijer, Juettler, Vicaut, George, Algra, Amelink, Schmiedeck, Schwab, Rothwell, Bousser, van der Worp & Hacke 2007). The analysis concluded that there was an improvement in the number of patients who survived with a favourable outcome from 75% for those patients treated medically to 24% for those patients who were treated surgically.

On superficial examination, such survival and health outcomes would appear to provide compelling evidence for the efficacy of surgical decompression for patients under 60 years of age (as per the trial enrolment criteria) however, there are some problems with this analysis. Unfortunately, in order to obtain this "positive result" a favourable outcome was redefined as a mRS of 0-4 rather than the usual definition of 0-3. Consequently, patients who were unable to walk unaided and were unable to attend to their own bodily functions independently were included. Indeed, closer examination of the data confirms that the increase in survival came almost directly at the expense of an increase in the number patients with a mRS of 4 (Puetz, Campos, Eliasziw, & Demchuk 2007). Amongst the survivors who were randomised to receive standard medical care 75% (9 of 12) had a mRS of three or less, an outcome previously defined as favourable. A similar favourable outcome was only achieved in the 55% of the patients treated surgically (22 of 40). It would seem that the most likely outcome following medical therapy is either death or a favourable outcome (mRS 0 – 3) whereas surgery considerably increases the risk of survival with a mRS of 4.

(v) What is a "favourable" outcome?

This raises the obvious question as to whether a mRS of 4 can really be deemed favourable. The authors of the pooled analysis have contended that a favourable outcome is neither synonymous with a desirable nor an acceptable outcome (Puetz et al., 2007). They have also stated that most investigators feel obliged to define a score of 4 on the mRS as favourable. However, there is clearly no evidence to support this position. Reviewing the historical and contemporary literature for all pathological conditions reveals that the overwhelming majority of studies continue to adjudge a favourable outcome as either mRS 3 or less or a Glasgow Outcome Score of 4 or 5. This would seem to indicate that being unable to walk unaided and requiring assistance to attend to bodily needs has been and continues to be deemed unfavourable by most investigators (Cooper et al., 2011).

(vi) Decompressive hemicraniectomy for ischaemic stroke – The level 1 evidence

Overall, based on the results of the pooled analysis there is now compelling evidence that in the context of malignant cerebral ischaemia decompressive craniectomy significantly reduces mortality in patients less than 60 years of age. In addition, there was no difference in functional outcome when comparing those patients treated in less than 24 hours after symptom onset with those treated in 24 to 48 hours. This is clinically useful information because it provides clear evidence that "ultra early" decompression is probably unnecessary and the 24 to 48 hours represents a more realistic time frame in which to make clinical decisions regarding surgical intervention. Indeed adopting this policy may well avoid submitting patients to surgery who might otherwise have remained clinically stable. The role of surgery beyond 48 hours has not been clearly established. The HAMLET study included patients who had decompressive surgery up to 96 hours after symptom onset and secondary outcome analysis showed that whilst surgery within 48 hours significantly reduced the probability of severe disability or death (mRS 5 or 6) surgery beyond 48 hours provided no such benefit (Hofmeijer et al., 2009). This would appear to confirm that in patients with middle cerebral artery stroke the decision making timeframe is at 24-48 hours following clinical presentation.

(vi) Decompressive hemicraniectomy for ischaemic stroke – Unanswered questions

One of the most important issues that remain a source of debate is how those patients that survive with severe disability perceive their own quality of life and whether they feel that the decision to surgically intervene was appropriate. Given the inherent publication bias and the tendency in the medical literature to publish "positive" results, caution must be exercised when accepting reports that demonstrate that retrospective consent would have been obtained because this is by no means always the case (Rieke, Schwab, Krieger, von Kummer, Aschoff, Schuchardt &

Hacke 1995). Indeed, it is becoming increasingly apparent that for many patients who survive with a poor functional outcome, not only do they exhibit very high levels of anxiety and depression but also they would not have agreed to surgical intervention if they had known their eventual outcome. (Kiphuth, Köhrmann, Lichy, Schwab & Huttner 2010) Before it is deemed that an mRS of 4 is "favourable" we have to determine that it is acceptable to the patients on whom life saving surgery is being performed and this must be the focus of future research.

Decompressive craniectomy for Traumatic Brain Injury

The role of decompressive craniectomy in the management of severe traumatic brain injury has evolved in a similar fashion. Over the past two decades there were a steadily increasing number of retrospective studies that demonstrated that decompressive craniectomy could successfully lower the intracranial pressure in the context of intractable intracranial hypertension (Polin et al., 1997, Guerra et al., 1999). In addition, many studies reported favourable clinical outcomes and confirmed the prognostic importance of age (Ucar, Akyuz, Kazan S & Tuncer 2005; Albanèse, Leone, Alliez, Kaya, Antonini, Alliez & Martin 2003). However, until recently there have been no studies, in the adult population, that can be adjudged to provide class 1 evidence on which to base clinical practice.

(i) The DECRA study – Trial hypothesis

The DECRA study was the first randomised controlled trial of any neurosurgical technique to be completed in the adult neurotrauma population (Cooper et al., 2011). The trial hypothesis was that early decompressive surgery would prevent secondary brain injury and this was based on the clear association between raised intracranial pressure and poor outcome following TBI (Marmarou, Anderson & Ward 1991). At the time of the trial inception a number of studies had demonstrated that not only did surgical decompression lower the intracranial pressure but also that cerebral blood flow was improved (Yamakami & Yamaura 1993; Jaeger, Soehle & Meixensberge 2003). Based on these observations the rationale behind the trial was to determine whether outcome could be improved by performing an early decompression in order to lower the intracranial pressure, improve cerebral blood flow and prevent or reduce secondary brain injury.

(ii) The DECRA study – Design and clinical findings

The DECRA trial compared early decompressive craniectomy for diffuse traumatic brain injury with standard medical therapy. One hundred and fifty five patients were randomised and 100% follow up was achieved at 6 months (Cooper et al., 2011). The entry criterion was an ICP of greater than 20mmHg for more than 15 minutes in an hour despite first tier medical therapy. The results of the trial were that the patients undergoing craniectomy had lower intracranial pressures (ICP) and spent less time in intensive care; however, at six month follow up 51 (70%) of patients in the craniectomy group has an unfavourable outcome compared with 42 (51%) of patients in the standard care group (OR = 2.21 [95%CI: 1.14-4.26] p=0.02). Based on these findings the authors concluded that in the context of this trial the use of decompressive craniectomy was associated with unfavourable outcomes and this finding would appear to unequivocal. Unfortunately, these sentiments have not been shared by all commentators and the general response throughout the global literature has been fairly critical so much so that some authorities have gone so far as to proclaim "no conclusions regarding management of the use of decompressive craniectomy in patients with traumatic brain injury should be drawn from this trial and clinical practice should not be changed on the basis of these results" (Timmons, Ullman & Eisenberg 2005).

Whilst some of the criticisms would appear to be valid it is perhaps premature and certainly a little unfair to disregard the trial entirely. Indeed rather than adopting diametrically opposing views an alternative interpretation would be that not only does the trial provide clinically significant information, but also objective analysis of the criticisms will improve the design and execution of future trials.

(iii) Criticisms of the DECRA study

The main sources of criticism have revolved around problems with baseline randomisation, crossover from the standard medical care arm to the surgical arm of the trial and the ICP levels that were used as the threshold for enrolment.

(a) Randomisation issues

At baseline time point, there were some discrepancies in randomisation such that the patients in the surgical arm of the trial appeared to have sustained a more severe primary injury (Honeybul, Ho, Lind & Gillett

2011). More patients in the surgical group had bilateral non-reactive pupils than in the standard care group (27% versus 12%; p=0.04). The radiological findings as adjudged by the Marshall grading were more severe (grade III & non-evacuated haematoma: total 77% versus 67%) and the Glasgow Coma Scale (GCS) was lower (median 5 versus 6) compared to those patients in the standard care group. All these factors are significant prognostically and when the pupil reactivity was adjusted for in the multivariate analysis, there was no statistically significant difference between the two groups (Cooper et al., 2011). Whilst in isolation the differences in radiological findings and GCS fail to reach univariate statistical significance the cumulative effect of these adverse presentation variables is well known (Perel, Arango, Claydon, Edwards, Komolafe, Poccock, Roberts, Shakur, Steyerberg & Yutthakasemsunt 2008).

(b) Crossover from the standard medical care to surgical decompression

Four patients in the standard care group had a decompressive craniectomy as a life-saving procedure less than 72 hours after randomisation (contrary to the trial protocol) and a further fifteen patients had surgery greater than 72 hours after randomisation (in accordance with the trial protocol) (Marion 2011). This would seem to indicate that for these patients' neurosurgeons were no longer in equipoise because they developed what they considered to be genuinely raised ICP. Indeed, for those patients who were randomised to receive standard care, either the raised ICP was insufficiently intractable to justify surgery or those patients with genuine medically intractable ICP had decompressive surgery regardless of allocation.

(c) Intracranial pressure threshold for enrolment

It is regarding the intracranial threshold used for enrolement that there has been most confusion. Many authorities have commented that the entry criteria for the study were such that the patients selected would not usually be considered for decompressive surgery and therefore the trial will have no impact on neurosurgical practice (Servadi 2011; Timmons et al., 2011). However, adopting this position fails to acknowledge the hypothesis upon which the trial was based which was that early decompression, prior to the development of intractable intracranial hypertension would prevent secondary brain injury. If the trial had shown clinical benefit then rather than the patients in the trial not being representative of normal clinical practice, the patients in the trial would in fact come to represent the clinical practice of the future and this would have significant impact on neurosurgical resources.

What the trial clearly demonstrated is that in the context of diffuse cerebral swelling when there is a relatively transient rise in pressure any benefit provided by decompression is offset by surgical morbidity. This in itself is an extremely important finding and it has established this trial as a landmark study against which all further studies would be compared.

What remains to be established is the role decompressive craniectomy when the ICP continues to rise above 20mmHg and beyond and the ongoing RESCUEicp (Randomised Evaluation of Surgery with Craniectomy for Uncontrollable Elevation of Intra-Cranial Pressure) hopes to address this issue (Hutchinson, Corteen, Czosnyka, Mendelow, Menon, Mitchell, Murray, Pickard, Rickels, Sahuquillo, Servadei, Teasdale, Timofeev, Unterberg & Kirkpatrick 2006).

Whilst many authorities appear convinced of the efficacy of decompressive surgery it has to be accepted this remains scientifically unproven (Vashu & Sohail 2011).

Notwithstanding the outcome of this trial the interpretation of any study attempting to demonstrate an improvement in outcome over and above standard medical therapy must be tempered with the realisation that this is not necessarily a reflection of clinical practice. In most centres, a decompressive craniectomy is carried out not so much to prevent secondary brain injury but rather once all medical therapy has failed and the patient is though unlikely to survive without surgical intervention (Polin et al., 1997; Guerra et al., 1999). This raises two important and perhaps insurmountable ethical issues. In the first instance once a patient has failed medical therapy can they realistically be randomised to further medical therapy? Secondly, there has to come a point where the primary brain injury is so severe that if a patient survives the most likely long term outcome is one of severe neurological disability and this may be unacceptable to the person on whom the procedure is being performed (Gillett et al., 2010). Until recently, the difficulty has always been how to accurately assess the severity of the primary brain injury and there-

by deciding at what point serious consideration must be given to this issues.

Outcome prediction following decompressive craniectomy

The CRASH collaborators (corticosteroid randomization after significant head injury) web based outcome prediction model has gone some way to addressing the problem of reliable outcome prediction (Perel et al., 2008). The model is based on the data obtained from the CRASH study that investigated whether steroids would improve outcome following TBI (Roberts, Yates, Sandercock, Farrell, Wassenberg, Lomas, Cottingham, Svodoba, Brayley, Mazairac, Laloe, Munoz – Sanchez, Arango, Hartzenberg, Khamis, Yutthakasemsunt, Komolafe, Olldashi, Yadav, Murillo-Cabezas, Shakur & Edwards 2004). Whilst the results of the trial were negative, the significant amount of clinical data enabled the investigators to develop a prediction model incorporating this data; age, initial GCS, pupil reactivity, extracranial injuries and radiological appearances that are known to have prognostic significance (Perel et al., 2008).

The model provides a percentage predicted risk of unfavourable outcome at six months (defined by the Glasgow Outcome Scale (GOS) as dead, persistent vegetative state or severely disabled) (Figure 1, below).

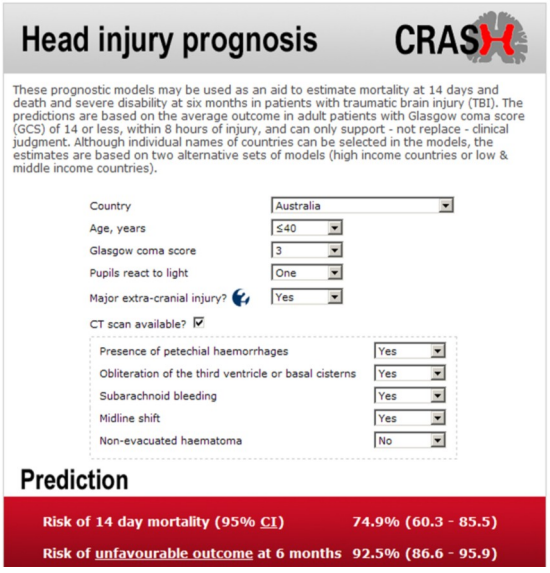

Figure 1: *(Above)* The prediction of an unfavourable outcome at six months (x axis) and the observed outcome at eighteen months among the 137 patients who had had a decompressive craniectomy and on whom follow up was available. Numbers within the bar chart represent absolute patient numbers. (Reproduce with kind permission Mary Ann Liebert, Inc. Publisher)

Previous studies have demonstrated how the value of the predicted risk can be used to stratify patients according to injury severity and compare the predicted risk with the observed long-term outcome (Honeybul, Ho, Lind & Gillett 2009; Honeybul, Ho, Lind & Gillett 2010). Figure 2 (below) demonstrates how this methodology can provide an objective assessment of the most likely long-term outcome following decompressive surgery for patients who have either failed medical therapy or who have had a craniectomy following evacuation of a mass lesion such as an acute subdural haematoma. It can be seen from these results that as the percentage risk of unfavourable outcome increases (i.e. the severity of the primary brain injury) so does the possibility of survival with severe disability. Opinion regarding survival with severe disability.

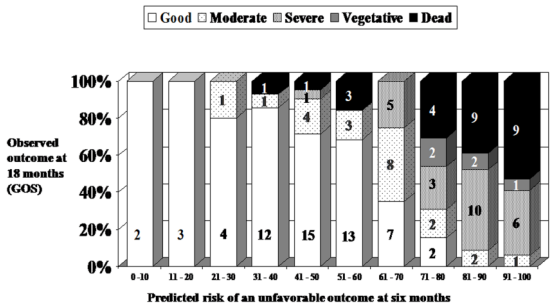

Figure 2 : *(Above)* A snapshot of the CRASH collaborators web based outcome prediction model. The patients' clinical variables and the radiological findings on presentation have been entered and the prediction of an unfavourable outcome is provided. (Reproduce with kind permission CRASH collaborators)

Opinion regarding survival with severe disability

The obvious question is whether this type of information would be clinically useful and a number of studies have investigated opinion amongst healthcare workers regarding the possibility of surviving a severe traumatic brain injury only to be left with severe disability (Honeybul, O'Hanlon & Ho 2011; Honeybul, O'Hanlon, Ho & Gillett 2011; Honeybul, O'Hanlon & Ho 2012). Participants were presented with the data shown in Figure 3 and asked if they would provide consent for decompressive surgery in three separate scenarios where they themselves were the injured party and the injury prediction placed them sequentially in the outcome categories

70-80%, 80-90% and 90-100%. The implication, which was clearly stated, was whether they would provide consent in these circumstances. The responses given clearly demonstrated that the majority of participants felt that for themselves, survival with severe disability, without independence was unacceptable.

There are currently no such models available for patients with ischemic stroke; however, there are a similar number of parameters that have prognostic significance including. These include age, GCS on admission, involvement of territories other than the MCA region, anisocoria, early clinical deterioration, coronary artery disease and internal artery occlusion, and midline shift (Schwab et al., 1998; Gupta et al., 2004; Kilincer et al., 2005). It would seem logical to aim for similar models that combine these prognostic elements which can provide an objective assessment of the most likely outcome following life saving but none restorative decompressive surgery.

The role of decompressive craniectomy for other neurological emergencies

In a similar fashion to the stroke and TBI studies, the last decade has seen a gradual increase in the number of a reports describing decompressive craniectomy in a variety of neurological pathologies including subarachnoid haemorrhage (Güresir et al., 2009), severe intracranial infection (González Rabelino., 2008) and dural sinus thrombosis (Lanterna et al., 2009).

Although many of these studies emphasis the lifesaving nature of the intervention and the favourable outcomes that are achieved considerable caution must be exercised before decompressive craniectomy becomes part of routine neurosurgical practice for these neurological conditions.

Most studies have been small cohort studies, case series or case reports and there is a strong publication bias to report cases with a positive outcome. Whilst in certain cases surgical decompression may be life saving this is by no means always the case and a number of reports have documented very poor outcomes in cases of poor grade subarachnoid haemorrhage (Nagel, Graetz, Vajkoczy & Sarrafzadeh 2009) and infection (Ono, Manabe, Nishimura, Kono, Narai, Omori, Nanba & Abe 2009). Prior to the findings of the DECRA study it was almost assumed that lowering the intracranial pressure by surgical decompression would be beneficial and whilst many authorities remain convinced of clinical efficacy it has to be accepted that this remains scientifically unproven (Vashu et al., 2011). There will also be significant limitations associated with extrapolating the data from the traumatic brain injury and stroke trials to other pathological processes and ongoing research is required in order to provide clinical evidence on which to base practice.

Conclusions

There would appear little doubt that decompressive craniectomy is effective in reducing intracranial pressure in many neurological emergencies, however, its current role remains controversial. The decision to intervene surgically requires many factors to taken into consideration not least of which is the long outcome achieved and whether that outcome is acceptable to the patient and their families. Judging by the current evidence decompressive surgery is a life saving intervention. Nevertheless, evidence that it improves outcome over and above standard medical therapy is not forthcoming. Ongoing research will be required to explore the issues of outcome and to consider the ethical issues regarding potentially life saving but non restorative surgical intervention.

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The Louie Blundell Prize

This prize is in honour of our colleague Louie Blundell and will be awarded for the best neuroscience nursing paper by a student submitted to the Australasian Neuroscience Nurses Association (ANNA) for inclusion in the *Australasian Journal of Neuroscience* by the designated date each year. The monetary value of the prize is AUD$500.

Louie Blundell, was born in England, and although she wanted to be a nurse she had to wait until after World War II to start her training as a mature student in her late twenties. Later she and her family moved to Western Australia in 1959. She worked for a General Practice surgery in Perth until a move to the Eastern Goldfields in 1963. Subsequently, she worked at Southern Cross Hospital and then Meriden Hospital. During this time she undertook post basic education to maintain her currency of knowledge and practice, especially in coronary care.

Louie was also active in the community. She joined the Country Women's Association and over the years held branch, division and state executive positions until shortly before her death in 2007. She was especially involved in supporting the welfare of students at secondary school, serving on a high school hostel board for some time.

She felt strongly that education was important for women and was a strong supporter and advocate of the move of nursing education to the tertiary sector, of post graduate study in nursing and the development of nursing scholarship and research, strongly defending this view to others over the years.

For further details and criteria guidelines please visit the ANNA website at www.anna.asn.au

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Glioblastoma Multiforme

Jessica Child

Abstract

Glioblastoma multiforme (GBM) is the most common and aggressive adult brain tumour. Treatment of glioblastoma multiforme usually focuses on increasing patient survival time with a satisfactory quality of life, not a cure. Although treatment has extended life for some patients, neurocognitive changes, worsening of neurological deficits and treatment associated symptoms may impair their quality of life. Glioblastomas are difficult to treat but are usually treated with: surgery, radiation therapy, steroids, and chemotherapy which have shown the ability to prolong survival but these are usually palliative measures. Glioblastoma multiforme will result in loss of life. The diagnosis is frightening to the patient and family, and the adjustment and adaptation to cognitive and neurological impairments can be stressful. It is important to manage the symptoms associated with the illness and side effects of treatment to enhance quality of life and to provide emotional support to the patient and their family throughout the illness.

This paper will discuss the pathophysiology of glioblastoma multiforme, clinical manifestations, diagnosis and the current management and recommendations of the illness including current evidence based practice.

Key Words: glioblastoma multiform (GBM), astrocytoma, temazolamide.

Introduction

"Glioblastoma Multiforme (GBM) is the most common and aggressive adult brain tumour" (Hentschel & Lang, 2003). According to the clinical practice guidelines for the management of adult gliomas from that Australian cancer network (2009), the median survival rate after resection for patients with GBM is one year, and median survival at recurrence is 7 months. At present the exact cause of GBM's is unknown.

There are many different types of malignant or cancerous brain tumours. In most cases, a brain tumour is named after the cell type of origin. The most common type of primary tumours is the glioma. Gliomas arise from glial cells which are supportive cells that surround, nourish and protect neurons. One type is the astrocytoma. Astrocytomas are graded I through to IV, depending on the degree of aggressiveness.

The WHO Classification of tumours of the central nervous system (2007), classifies the tumours as:-

Grade I— pilocytic astrocytoma- primarily pediatric tumor
Grade II — diffuse astrocytoma
Grade III — anaplastic (malignant) astrocytoma
Grade IV — glioblastoma multiforme (GBM)

The most aggressive astrocytoma is Grade IV - GBM. Of all the different types of brain tumours GBMs have the highest growth rate. They are mainly located in the cerebral hemispheres usually in the white matter, the main portions of the brain, but they can also occur in the brainstem, cerebellum or spinal cord.

The pathophysiology of symptom development in astrocytic tumours may be related to the infiltration of the normal neural tissue, pressure effect of the tumour on the normal tissue, or vasogenic oedema development around the tumour (BMJ Best Practice Guidelines YEAR 'Astrocytic Brain Tumours'). Risk factors for GBM's include: male gender, white ancestry, history of neurofibromatosis type 1, tuberous sclerosis, Li-Fraumeni syndrome, Turcot's cancer syndrome, or history of exposure to ionising radiation. People exposed to certain chemicals, such as petro-

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chemicals, pesticides and formaldehyde, appear to be at higher risk of developing a malignant brain tumour than those who are not exposed. In laboratory experiments, some viruses caused brain tumours in animals. It is unknown whether viruses can cause brain tumours in humans. Electromagnetic fields have been under study for some time as there appears to be a connection to brain tumours, ('International Radiosurgery Association, clinical practice guidelines' 2012).
There are many environmental and genetic factors that can cause brain tumours. However, in most cases, it is uncertain as to the exact causes of brain tumours. (Hickey, 2009).
Symptoms of Glioblastoma's vary depending on the size and location in the brain (refer to Figure 1—below).

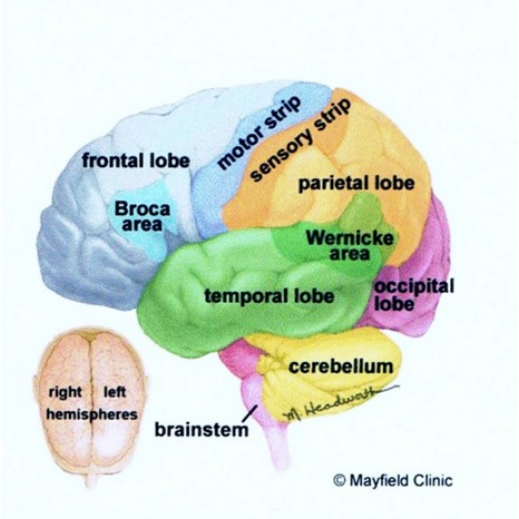

Figure 1: (*Above) Diagram showing the lobes of the brain.* (Mayfield Clinic).

General symptoms include:

- Headaches that worsen in the morning
- Stumbling, dizziness, difficulty walking
- Speech problems (dysphagia)
- Vision problems, abnormal eye movements
- Weakness on one side of the body (hemiparesis)
- Increased intracranial pressure, which causes drowsiness, headaches, nausea and vomiting and sluggish responses.

Specific symptoms related to location of glioblastomas include:

- Frontal lobe tumours may cause behavioural and emotional changes, impaired judgment, impaired sense of smell, memory loss, hemiparesis, reduced cognitive ability and vision loss.
- Parietal lobe tumours may cause dysphagia and memory difficulty.
- Brainstem tumours may cause behavioural and emotional changes, dysphagia, fatigue, hearing loss, muscle weakness on one side of face, muscle weakness on one side of body, uncoordinated gait, drooping eyelid or double vision, nausea and vomiting.

When a brain tumour is suspected, imaging such as CT scan and MRI should be performed to confirm diagnosis. A biopsy is required to confirm pathology.
A CT scan is the most useful method of imaging to show calcifications (usually indicative of low grade or progression from low grade) and haemorrhage. If a mass lesion is diagnosed on CT, an MRI scan is then done to assess more accurately grade and location (unless there is an emergency surgical indication). A CT scan is used mostly in an emergency situation (acute new neurological symptoms, suspicion of raised intracranial pressure).

Biopsy or resection of tissue is recommended for all patients except if the tumour location is not accessible. If the tumour is accessible, maximal safe resection is performed, and samples are then sent for histological confirmation before initiating further management.

Treatment of glioblastoma multiforme usually focuses on increasing patient survival time with a satisfactory quality of life, not a cure. Although treatment has extended life for some patients, neuro-cognitive changes, worsening of neurological deficits and treatment associated symptoms may impair their quality of life. Glioblastomas are difficult to treat but are usually treated with: surgery, radiation therapy, steroids, and chemotherapy which have prolonged survival but are usually palliative measures (Nichols 2011).

Surgery is commonly the initial treatment of GBM and involves surgical resection and a biopsy. The goal of the biopsy is to provide the required tissue to determine the diagnosis. The goal of surgical resection is to decrease tumour volume and decompress nearby brain structures thereby improving signs and symptoms. Advances in surgical techniques and technologies make it safe to resect GBM's, even when they are located near functionally critical areas of the brain. It is therefore recommended that total resection is

the initial management strategy of patients with GBM (Hentschel & Lang, 2003). Patients with glioblastoma are also treated with radiotherapy and chemotherapy. Temozolomide is an oral chemotherapeutic drug that penetrates the blood brain barrier and has low incidence of adverse effects. According to a systematic review (Hart, Grant, Garside, Rogers, Somerville & Stein, 2008), temozolomide is an effective therapy in GBM for prolonging survival and delaying progression as part of primary therapy without impacting quality of life and with low incidence of early adverse events. These findings were from three random controlled trials (RCTs) of over 900 patients in total.

There is evidence that the insertion of chemotherapy wafers into the resection cavity at the time of primary surgery for high-grade glioma is associated with a prolongation of survival without an increased incidence of adverse effects (Hart, Grant, Garside, Rogers, Somerville, Stein, 2011).

Nursing management of a patient with glioblastoma multiforme includes:

- Patient education and emotional support early in the diagnostic process
- Patient awareness of signs and symptoms associated with their illness and managing these symptoms to enhance quality of life
- Assisting patients with their activities of daily living and involving family members in their care.
- Referring patients to other members of the multidisciplinary team such as, social worker, physiotherapist, speech therapist, occupational therapist.
- Pain management

It is important to understand the side effects of treatment and to manage those side effects to promote well-being. The most common adverse reactions associated with radiation and chemotherapy include, fatigue, neutropenia, thrombocytopenia nausea and vomiting and constipation (Armstrong & Cahill, 2011). Administering anti-emetics and aperients will aid in the management of these symptoms resulting in patient comfort and well-being.

Day-to-Day nursing assessment should include:

- Neurological assessment (Glasgow Coma Scale)
- Falls risk assessment
- Pressure area risk assessment (Waterlow scale)
- Vital signs (respirations, temperature, pulse, blood pressure, O2 saturation levels
- Wound care
- Input and output
- Food chart
- Application of TED stockings

Patients who have been newly diagnosed with GBM and their family members are often in emotional shock. The diagnosis and treatment of patients with glioblastoma multiforme involves a multidisciplinary team of health care professionals, including social workers and case managers who assist with arrangements for home care treatment or temporary facility care (Lucas 2010).

Prior to discharge, it is important to assist family members in identifying the extent of home care requirements for the patient. A consultation with physio and occupational therapists is recommended to discuss aides for self-care and mobilisation such as wheelchairs, bathroom rails, and speech aides and where and how they can be obtained develop an appropriate rehabilitation plan for the patient before discharge.

It is important to educate the patient and family about the early signs and symptoms of GBM recurrence so they can notify their primary healthcare provider if they occur and to provide information on support networks such as the Cancer Council, Brain Tumour Alliance Australia, and James Croft Hope Foundation to assist with the palliative care process.

Conclusion

Glioblastoma Multiforme is an aggressive form of brain tumour that will result in loss of life. The diagnosis is frightening to the patient and family, and the adjustment and adaptation to cognitive and neurological impairments can be stressful. It is important to manage the symptoms associated with the illness and side effects of treatment to enhance quality of life and to provide emotional support to the patient and their family throughout the illness.

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A pilot study of post discharge needs of people who had removal of a primary brain tumour.

Bernice Appiah

Abstract

The transition from hospital to home following surgical removal of a brain tumour is critical, yet discharge information is usually general and poor. Lack of appropriate discharge information has been linked with return to healthcare facilities, sometimes, merely for reassurance. Inadequate information and support prior to discharge from hospital can leave patients feeling incompetent to continue their care.

The aim of this study was to identify the post discharge needs of people who have had a craniotomy to remove a primary brain tumour in the hope of supporting the discharge management of future patients. Nine women who had benign brain tumours were recruited from three private hospitals via convenience sampling. Structured telephone interviews were conducted with each of these former patients three to seven weeks post discharge from hospital.

The findings of the research revealed that participants had a variety of concerns, challenges and needs after discharge. Participants concerns included fear of tumour recurrence, uncertainty of symptoms, uncertainty of length of time needed for total recovery, and change in personal appearance. Challenges experienced post discharge included visual deficits which impinged on their ability to perform daily tasks, and emotional distress which was difficult to control. The most significant needs were the need for specific information about meningiomas at discharge, information about how to manage at home, and appropriate physical activities patients can engage in once at home. Current discharge management of primary brain tumour patients is fair, but it is believed that patients would benefit if recommended changes would be implemented.

Keywords: discharge management, primary brain tumour, patient education.

Introduction

Appropriate support is paramount to the brain tumour patients' ability to effectively manage their care post discharge (Schubart, Kinzie, & Farace, 2008). However, it is not until people have had the opportunity to manage their day-to-day living after discharge home that they realise the type of support they actually require (Henderson & Zernike, 2001; Schubart, et al., 2008). Support can be in many forms; emotional, psychological, physical, and or appropriate supportive services and networks. Support services, such as brain tumour support groups (BTSG), are one of the main avenues that healthcare workers currently use postoperatively to provide assistance for people who have had brain tumours. These groups offer practical information and emotional support as they provide an environment where individuals with similar experiences can meet and discuss their struggles relating to their illness (Barr, 2003). Whilst it is a good initiative in that it creates a forum for people who require assistance to cope with having had a brain tumour, this source of support is limited. Supported in the literature, people who are unable to get transportation to attend support group meetings due to lack of family assistance, restrictions in mobility, remoteness of residence, or due to debilitating conditions, are disadvantaged (Arber, Faithfull, Plaskota, Lucas, & De Cries, 2010; Barr 2003; Janda, Eakin, Bailey, Walker, & Troy, 2006). Hence brain tumour support groups have their place; however merely gaining access to one does not necessarily eliminate people's needs.

Curren (2001) explored the use of a telephone service in assisting both carers and people with primary malignant brain tumours (i.e. low, intermediate, and high grade glial tumours, non-glial primary brain tumours including benign tumours and recurrent or progressive disease) in better coping with the complexities of the illness. The telephone service was established in a rural area of Scotland, and was run by a specialist

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nurse, who provided comprehensive information to clients. The aims of the phone service were to support the continuity of care, and to help people access information, advice and support whenever they had a question. It also sought to improve the communication between patients and the healthcare providers. Results from the two-year telephone audit revealed that patients and their carers were interested in gaining emotional support, financial and appointment advice, information on dealing with the side effects of steroids, as well as advice about reducing the steroid dosages. Face to face consultations with healthcare workers was found to be insufficient for participants in Curren's study (2001), as people required additional information and support through the telephone service.

The needs of people with brain tumours are diverse and they change as the disease progresses (Schubart, et al., 2008). Knowingly, Halkett, Lobb, Oldham and Nowak (2010), sought to understand the needs of people with high grade glioma (HGG) by investigating how they lived with their disease. At the same time the study examined their information and support needs along the disease continuum (during chemo-radiotherapy, adjuvant chemotherapy or at disease recurrence). Four themes emerged from that study namely; "uncertainty, the need for information, dependence on their carer and communication with health professionals" (Halkett, et al., 2010, p. 115). Their participants referred to many uncertainties such as the effect that high grade glioma would have on their lives, and the side effects of treatment. Moreover they had varying needs for information about their prognosis and a restriction on driving was an issue for some people. Comparatively, Barr's (2003) support group participants requested information about how to deal with side effects of treatment. They also required, among other things, information about the types and causes of tumours. In Curren's study (2001), people also sought advice on how to deal with the side effects of the steroids and needed emotional support. Halkett et al.'s (2010) HGG patients were no exception, as they expressed uncertainties about the side effects of treatments. These are recurring themes amongst the different studies which highlights the grave need that brain tumour patients have for support and assistance.

It appears that as the progression of disease worsens to the "end of life stage", people's needs become much greater. Arber et al.'s (2010) sample of primary malignant brain tumour (PMBT) patients were certainly a prime example. The researchers in this study investigated the experience of symptoms, access to supportive services and rehabilitation of patients with PMBT (p. 24) using a retrospective review of the interdisciplinary case notes of seventy patients in five different palliative care settings (p. 25). Arber et al.'s (2010) findings indicated that participants had a need for support services including physiotherapy, occupational therapy, and even speech and language therapy for a small number of them.

Brain tumour patients, regardless of what stage of the disease trajectory they were in, require immense support. However, some researchers agree that patients receive minimal information and support whilst in hospital (Barr, 2003, p. 12) and that outpatient support services are merely useful for reinforcing education provided (Curren, 2001, p. 334) in hospital. This puts greater emphasis on nurses' provision of appropriate and timely pre-discharge education .The difficulty in attaining this however is that hospital length of stay has significantly shortened (Barr, 2003), which means that patients are virtually still in the process of healing when discharged. Moreover, this brief stay leads to the inability for patients to fully comprehend the effect that the diagnosis may have on their lives (p. 12). In consideration of the issues discussed, whilst brain tumour support services are necessary, they do not negate the need for appropriate provision of discharge information.

In recent years, various researchers have shifted their focus to the informational needs of brain tumour patients. Some of these researchers have devoted studies specifically to this topic (Halkett, et al., 2010; O'Donnell, 2005; Rozmovits, Khu, Osman, Gentil, Guha, & Bernstein, 2010), whilst others have touched on it during separate investigations (Barr, 2003; Janda, et al., 2006; Lepola, Toljamo, Aho, & Louet, 2001; Schubart, et al., 2008).

According to O'Donnell's (2005) research, nurses tend to give priority to patients' physical aspect of care, and overlook their need for information. A dilemma in rectifying this situation is that not only do patients not allow themselves to ponder their recovery period until following surgery (Rozmovits, et al., 2010), they actually are unsure of the type of information they will need until they have

gone home (Henderson & Zernike, 2001). It flows from this that appropriate pre-discharge information that supports patients' transition from hospital to home-based care is vital, as inpatients have limited time to absorb the education provided (Barr, 2003).

Healthcare workers have a responsibility to provide patients with appropriate education, yet the diversity and scope of information people desire varies (Halkett, et al., 2010; O'Donnell, 2005; Rozmovits, et al., 2010). This variation has been attributed to the person's age, personality, educational, social and ethnic background, as well as their support network (O'Donnell, 2005; Rozmovits, et al., 2010). Reportedly, family members and the internet have been elected as good sources for deriving useful information (O'Donnell, 2005).
In Finland, Lepola et al. (2001) found that participants' experiences of being a brain tumour patient was coupled with fears of disease reoccurrence, and desire for more postoperative information. Patients had great concern about what their future would be like, and how to manage their daily care needs post discharge. This finding corresponds with Rozmovits et al. (2010).
According to Spalding (2003), if patients know what to expect, they feel less anxious and better able to cope. Even amongst general surgical patients, researchers (Henderson & Zernike, 2001) found that additional information about what people could expect from their wound healing process would have been beneficial to their recovery process.

Patients informational needs are not always known at the time of clinical visits (Schubart, et al., 2008) and in fact change over time as the disease progresses (Arber, et al., 2010; Schubart, et al., 2008). It is thus suggested that the period of transition from hospital to home is pivotal for information support, as discharge information is usually very limited (Schubart, et al., 2008). Although only scarce education can be offered to patients whilst in hospital (Barr, 2003), according to Lepola et al. (2001), "successful discharge is necessary for adequate postoperative coping at home" (p. 146).

As the diagnosis of a brain tumour can lead to immense distress and feelings of helplessness (Lucas, 2010), healthcare professionals must endeavour to assist patients in their desire for information. Inadequate information has been linked to increase in people accessing medical facilities, often just for reassurance, which increases healthcare costs and creates unnecessary strain on the healthcare system (Henderson & Zernike, 2001).

Aim

In order to effectively support discharge management of patients with primary brain tumour (PBT) and provide them with information which meets their needs, the present study aims to identify the perceived needs of previous PBT patients who have been recently discharged from hospital (three to seven weeks post discharge). Understanding their needs whether of a physical, social or emotional nature, will allow recommendations to be made as to how best future patients can be advised and equipped by nurses to manage their own care at home.

Method

An exploratory descriptive design was used for this study. To recruit participants, convenience sampling was used in three private hospitals (under the umbrella of one organisation) in Australia. Prospective participants who met the inclusion criteria were briefed about the study (in person) by the researcher and those who returned their signed consent forms were interviewed post-discharge home.

Criteria for inclusion in the study were first time craniotomy patients as the researcher was interested in finding out needs of people who did not have a preset knowledge (due to past experience) of how their recovery would be post discharge. In order to minimize costs and difficulty in contacting patients by telephone post discharge from hospital, the researcher required participants to be residing in NSW. Finally, in light of the ethical considerations pertaining to the vulnerability of brain tumour patients, participants had to be capable of giving informed consent.

Interviews were digitally recorded and notes to responses were written down as each interview progressed. Immediately following the interview, participants' information was entered into a pre-prepared data sheet (via Microsoft Word) and verbatim transcriptions of participant responses were entered for data analysis purposes. To maintain the anonymity of participants, and to ensure that only the researcher could re-identify them, each participant was allocated a pseudonym directly after her interview.

The data obtained was analysed by the re-

searcher using Microsoft processor 2007 and an excel spreadsheet. Descriptive analysis was used in the present study and some information was presented in the form of tables.

Collected data was recorded digitally and transcribed onto Microsoft word processor for scrutiny. The content was printed, read and re-read. This allowed for the categorization of similar and dissimilar ideas. Further analysis of content allowed for broader categories to be formed, which were merged to generate the overall themes for the study.

Results

Fourteen people who met the inclusion criteria from the three private hospitals were approached and invited to participate in the study. Nine agreed to take part (64% response rate). The average age of participants was 57.5 years (range of 27 to 76). The others (n=5) who did not take part in the study either refused participation, did not return their consent form or were not contactable by phone. All participants were female and had craniotomy to remove a meningioma. With the exception of one person, all of them lived with their families (or husband), and all were self-caring with respect to personal hygiene and mobility post-discharge.

Participants in this study had varying experiences post discharge. Major issues that were reported by former patients included vision deficits, difficulty in dealing with emotional distress relating to having a brain tumour, and a need for increased rest periods due to low energy levels.

Vision deficits, such as drooping eyelids and peripheral vision loss, impacted greatly on the lives of some participants once at home. Those who experienced this reported needing assistance to mobilize so as to avoid colliding into objects, they reported feelings of imbalance when walking in crowded areas and when walking through shopping aisles, a fear of driving, and a reluctance to return to work.

Emotional distress such as anxiety and depression was also reported by some participants. These related to the reality of having had a brain tumour, uncertainty about how to manage the symptoms they were experiencing and a lack of knowledge about which symptoms were normal, and which ones they should be worried about.

All participants who received an educational "support package" (brain tumour support package) from one of the private hospitals reported that the information was inappropriate. All reported that the information was not specific to meningioma and that it did not make any difference to their recovery process. Whilst the majority of people did not search for information about their condition post discharge, the few that did spoke of the difficulty in accessing specific information about the management of symptoms in the recovery phase (post discharge).

Many of the former patients experienced low energy levels and identified a need for increased rest periods. As the majority had no guidelines for activities and exercises, some had difficulty gauging how much activity was too much and the majority of them reported that they were slowly easing back into usual activity. At the time of interview, none of the participants who were gainfully employed had returned to work, however they showed a desire to do so in the near future. There was a mismatch between the expected times for total recovery post discharge and what was really experienced. Some participants expected to be back at work within a few weeks, but realised that they were unable to concentrate or focus properly, or that their energy levels remained low. Others expected that for example, their facial disfigurement would resolve earlier, but this was not the case, so they were reluctant to return to work.

One person was re-admitted to hospital for a wound infection, and another presented at an emergency centre due to lack of information about possible symptoms that could occur as a result of having had a brain tumour. Family support was evident amongst participants and the need for assistance with house chores was deemed important by most participants in the first few weeks post discharge.

In this study, participants had a variety of experiences and expectations about the effect that a brain tumour and surgery would have on their lives. Whilst the majority did not encounter deficits or major issues, there were those who experienced grave emotional and physical distress. Although the findings of the present study may not be generalised, it gives a clear picture of what the participants in this study had to struggle with. It also reveals what information could ease the emotional and physical uncertainties of patients

who find themselves on their own after discharge.

Discussion

Participants in the present study had various concerns, challenges and needs during their post discharge period.

Uncertainties about their future regarding what to expect from their recovery period, the possibility of tumour reoccurrence as well as the exact length of time it would take for full recovery were major concerns for some patients. These findings were compatible with that of several research findings (Lepola, et al., 2001; Ownsworth, Chambers, Hawkes, Walker, & Shum, 2011; Rozmovits, et al., 2010; Spalding, 2003) that people tend to be unclear about what to expect in future.

A small number of individuals in the present study expressed concerns about their change in physical appearance after craniotomy, and they felt self-conscious in public. Findings reported previously by Diccini, Yoshinaga and Marcolan (2009) placed higher emphasis on the detrimental effects that craniotomy could have on patients' self-image. This was not so in the present study. The majority of participants had no problem with their head scar and some even used humour to express it.

A number of participants encountered physical and emotional challenges. Major physical challenges were visual deficits and low energy levels which impacted on participants' ability and desire to return to work. Whilst fatigue amongst brain tumour patients is commonly documented (Janda, Steginga, Dunn, Langbecker, Walker, & Eakin, 2008, p. 254; Lucas, 2010, p. 105; Molassiotis, Wilson, Brunton, Chaudhary, Gattamaneni, & McBain, 2010), visual deficits were not found to be a major focus in examined studies.

Emotional distress such as depression and anxiety was a major problem for a small number of participants. Difficulty coping with the effects of having a brain tumour and poor concentration levels were also reported by a few. Curren (2001) had previously addressed the reality of these issues.

Family support was found to be a very important coping mechanism after discharge from hospital. The need for family assistance with transportation and house duties is not a new finding; its importance has been previously reported by other researchers (Janda, et al., 2006; O'Donnell, 2005; Ownsworth, et al., 2011; Schubart, et al., 2008).

An unexpected finding that emerged from the present study was that participants who desired specific information regarding their diagnosis of a meningioma felt overwhelming distress about uncertainty of the normality of symptoms they experienced post discharge. Additionally, participants unanimously felt that their brain tumour support package (information) made no difference to their recovery process, warranting the need for a review of this information package to all patients with benign meningioma in the three private hospitals involved in this study.

A number of experiences that participants reported were confirmed in the literature, and thus solidifies the findings of the current study. Although participant numbers were small, and the population was homogenous, the findings about the concerns, challenges and needs of former patients is valuable in assisting healthcare workers in improving the discharge management of future patients.

Conclusion

It is believed that by taking into consideration the concerns, challenges and needs of participants in the present study, nurses may be able to adequately allay patients' fears prior to their discharge. This in turn will promote a less stressful recovery. It follows that patient healthcare costs and burden on the healthcare system may be decreased if information that caters for patients' needs are addressed and supplied. Information pertinent to people's diagnosis that explains amongst other things, possible side effects of benign brain tumours and the management of symptoms would be of immense help.

Participants encountered various issues post discharge, although "trivial" when compared with those that people with a more "serious" diagnosis experience in other studies. This does not discount the needs of the participants involved in the present study, as their concerns were equally valid. Participants were concerned about the possibility of tumour recurrence; the impact of the tumour on future lifestyle; normality of post-surgical symptoms and the length of time they should allow for recovery.

The post discharge needs of people in the current study centred on the need for assistance with transportation and mobility, particularly when in an unfamiliar environment (i.e. in public) due to visual deficits, assistance with house duties, need for assistance to manage emotional distress, need for moral support and family involvement, the need for information specific to meningiomas

(particularly possibility of symptoms) at discharge, need for a guideline on how much activity people should engage in, and need for extra rest periods due to low energy levels.

A new finding which emerged from the present study was that people were reluctant to return to social activities and strenuous exercises weeks after discharge for fear of evoking a seizure due to over-exertion. Clear guidelines of activity regime post discharge may assist in allaying these fears.
As the sample size was small and non-representative of the general primary brain tumour population, results from the current study cannot be generalised. Nevertheless, the findings are compelling and necessary in guiding nurses in how best to advice future patients about their discharge.

Recommendations

- As part of the brain tumour support information given to patients, it is suggested that the development of a "this is what you might experience" list, indicating possible symptoms that individuals may suffer post discharge would be beneficial. It is believed that this would ensure patients are well informed at discharge and equipped with information that is specific to their diagnosis and needs.
- Closely related to the above is the proposal to supply a detailed physical activity guideline to inform people about the types and amount of exercise that can be safely done at home shortly following discharge.
- As emotional distress and anxiety post discharge can prove to be challenging setbacks, it is recommended the contact details of professionals and relevant support groups be made available for people at time of discharge. Moreover, nurses should collate a list of reliable resource websites to be included in the discharge brochure.
- With particular interest in the elderly population who live on their own after discharge, provision of information about services coordinated by the local Council such as meals on wheels and home cleaning is encouraged.
- The research reinforces the importance of regular nurse education perhaps in the form of in-services where the needs and concerns of brain tumour patients are discussed so as to improve the overall discharge management of this group of people.
- Finally, this study identified an opportunity for further research using larger samples of both males and females with primary and secondary brain tumours in public and private hospitals in Australia.

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2012 ANNA Conference Abstracts

A Nurse Manager's challenge: setting up Australia's first Gamma Knife.

Salena Barrett

In August 2010 Macquarie University Hospital in conjunction with Genesis Cancer Care treated the first patient in Australia with gamma knife radiosurgery. This treatment has been used for over 25 years overseas to treatment a range of neurological conditions and has finally come to Australia.
Setting up the programme and preparing for the first patient was an interesting challenge for me as a nurse manager and I would like to share the experience with my nursing colleagues.
My presentation will involve a description of what Gamma knife is and the neurological conditions it can be used for. Brief history of worldwide experience with gamma knife.
Role of the GK team and multi-disciplinary team meetings. How patients are chosen for treatment. Pre-procedure workup.
Process for the first Gamma knife patient. How the treatment day would flow, type of local anaesthetic, the use of sedation.
Nurse's role and responsibilities on the day of treatment. Aftercare and post procedure patient support.
Moving forward- types of patients treated since, how we are monitoring them and challenges ahead.

Objectives:
To inform my nursing colleagues of this technology and share the experience of setting up a new treatment in Australia.

Central Diabetes insipidus post Transsphenoidal hypophysectomy vs. Adipsic DI post clipping of ACom aneurysm

Eun Hee (Sue) Shin

Diabetes insipidus (DI) is an uncommon endocrine condition associated with hypotonic polyuria, polydypsia and imbalanced fluid and electrolytes. DI can be neurogenic, nephrogenic, gestational and dipsogenic. This presentation will be focused on central diabetes insipidus (CDI).
Central, neurogenic or cranial diabetes insipidus is caused by the lack of anti-diuretic hormone (ADH) due to hypothalamic dysfunction. CDI is associated with significant mortality and morbidity due to hypernatremia and dehydration, but most patients with CDI are polydipsic, which means the lost fluid can be replaced relatively easily as patients can complain of thirst and ask for drinks.
There have been reports and studies on adipsic diabetes insipidus (ADI) as well as CDI with intact thirst mechanism. ADI is highly associated with post neurosurgical treatments, such as clipping of anterior communicating artery (ACom) aneurysm, evacuation of craniopharyngioma and pituitary macroprolactinoma. As patients with ADI do not feel thirsty, the diagnosis is delayed resulting in higher mortality and morbidity.
In this presentation, the development of CDI post transsphenoidal hypophysectomy for pituitary macroadenoma and ADI post clipping of ACom aneurysm will be discussed by introducing and comparing two case studies. Anatomy and pathophysiology of CDI and ADI will be explored and nursing interventions will be discussed. This presentation aims to stress that patients with DI can be adipsic so that nurses can detect signs and symptoms of ADI as early as possible for better patient outcome.

2012 ANNA Conference Abstracts

Better the Devil you Know??? 'Boswellia serrata' as an alternative to 'Dexamethasone' to treat peritumoural oedema

Kylie Wright

One of the most common complications of brain tumour growth is peritumoral odema . Such oedema and its inflammatory processes are major contributors to neurological symptoms and morbidity in brain tumour patients and the treatment of these phenomena has always been of high importance.
The first choice treatment of symptomatic cerebral oedema is the corticosteroid Dexamethasone. Despite significant adverse side effects such as cushingoid habitus, immunosupression, hyperglycaemia and proximal myopathy, this drug is widely used and considered a necessary evil in neuro-oncology management . There is evidence that dexamethasone influences cancer therapies through stabilisation of blood-brain and blood -tumour barriers and reduction of tumour perfusion 1 and it has been shown to interfere with the efficacy of chemotherapy by directly inhibiting apoptosis in malignant glioma cells 2,3 .
Boswellia serrata, a traditional herbal extract of the Indian frankincense tree, could be considered as a promising alternative to corticosteroids in the treatment of cerebral oedema with less adverse effects and additional induction of apoptosis 1. Boswellia serrata is virtually unknown, however clinical research has shown its use can significantly reduce cerebral oedema.
Throughout this paper peritumoral oedema and the indications for corticosteroid use will be explored. The challenging side effects of Dexamethasone therapy will be highlighted through the use of a case study, and the literature surrounding the effectiveness of boswellia serrata and its potential use as a way to reduce or replace steroid use in treating cerebral oedema will be reviewed.

"A Pain in the Neck!" - The Challenges of C-spine fractures in the Elderly.

Kathleen Naughton

Cervical spine fractures in the elderly carry a risk of mortality as high as 26% 1 and accompanying neurologic deficits suggest an increased risk of death 2 . Older adults represent a unique component of the cervically injured population due to changes in bone structure, physiologic reserve, and accumulated chronic illnesses. Management of such injuries with prolonged bed rest is recognised as poorly tolerated by the elderly. Common techniques employed for c-spine stabilisation include operative fixation, halo traction, and rigid collars 3.

To be able to reduce the significant risk of death after such an injury it is important to understand the possible and actual complications a patient might face. A single case study design will be used to explore the nursing process and interventions undertaken to aid a 91 year old female's recovery from a c-spine injury with associated neurological deficits sustained from a fall in the home. Clinical, radiological and pathological findings will be described along with discussion and analysis of the potential and actual problems experienced.

Objectives:
With a rapidly aging population this single case study aims to raise the level of nursing awareness of the potential and actual problems faced by an elderly patient post cervical spine injury and the health care management utilised to aid this patient's return to life in the community.

2012 ANNA Conference Abstracts

Journey of a patient who underwent decompressive craniectomy after severe head trauma (Poster)

Marinelle Doctor; Jose Sinaguinan

After severe traumatic head trauma, medical and surgical therapies are performed to minimise secondary brain injury. Increased intracranial pressure is an important secondary insult. In many cases, elevated intracranial pressure is unresponsive to maximal medical therapy. In such instances, surgical decompressive craniectomy (DC) is required to remove part of the skull vault over a swollen brain as a life saving measure.

The journey of Mr S., a 72 year old gentleman who sustained bilateral frontal intracranial haematoma after a fall, is highlighted. Mr. S had decompressive hemicraniectomy after evacuation of subdural haematoma to manage cerebral oedema. The poster explains indications for DC, procedures for storing the bone flap, reimplantation and nursing management of the patient. It also aims to provide information on the complications and long term effects of DC, including reversal with cranioplasty.
To present a poster explaining decompressive craniectomy and patient management.

The devil is in the detail: A complex case of Cavernoma

Sarah Smith, Christine Holland, Prue Hough

David is a typical suburban middle class family man. He has a good professional job, house in the suburbs a loving wife and a young family. With good health and financial security his world is perfect. Following the onset of an acute viral illness, David progressed to develop dizziness, nausea and vomiting. He was admitted to hospital and underwent several investigations during which time there was rapid progression of symptoms involving multiple cranial nerves. A diagnosis of Cavernoma was made and surgical intervention considered the only option. The cavernoma was successfully removed but the patient's clinical presentation, evolving clinical signs and symptoms, rare complications and subsequent management were a challenge to all the Neuroscience team caring for him.

Objectives:
To discuss the complex care of nursing patient's with multiple cranial nerve deficits.

2012 ANNA Conference Abstracts

Glioblastoma Multiforme

Jessica Child

** Inaugural ANNA Louie Blundell Prize Winner*

Glioblastoma Multiforme (GBM) is the most common and aggressive adult brain tumour. Treatment of Glioblastoma Multiforme usually focuses on increasing patient survival time with a satisfactory quality of life, not a cure. Although treatment has extended life for some patients, neuro-cognitive changes, worsening of neurological deficits and treatment associated symptoms may impair their quality of life. Glioblastomas are difficult to treat.

Glioblastoma Multiforme is an aggressive form of brain tumour that will result in loss of life. The diagnosis is frightening to the patient and family, and the adjustment and adaptation to cognitive and neurological impairments can be stressful. It is important to manage the symptoms associated with the illness and side effects of treatment to enhance quality of life and to provide emotional support to the patient and their family throughout the illness.

Working in an acute surgical ward specialising in neurosurgery for almost two years I have come across patients who are diagnosed with Glioblastoma Multiforme and this inspired me to learn more about the illness and how to effectively manage the patient who have unfortunately been diagnosed with GBM and their families.

In this presentation I will discuss the pathophysiology of Glioblastoma Multiforme, clinical manifestations, diagnosis and the current management and recommendations of the illness including current evidence based practice.

Objectives:

Share knowledge and experience of the nursing management and support requirements of this disease.

Falls from ladders - a common occurrence in our hospital system

Jane Raftesath, Karleen Allen

There is a common belief within the healthcare system that falls from ladders especially in the elderly population are a frequent presentation. These patients can have severe head injuries along with other multiple traumatic injuries. They often require extended length of stays with a significant burden on the health care system. We will review the current data from Royal prince Alfred and look at case studies of patients who have been admitted under the neurosurgery service.We will also review current falls prevention programs within the community.

To review current data on falls from ladders including demograpnics and patient outcomes.

Identify factors that contribute to poor outcome.

Objectives:

Review current falls prevention programs.

Use case studies to highlight the intensity of these group of patients

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2012 ANNA Conference Abstracts

The comfy GCS – does the shoe fit?

Jacqueline Baker, Caleb Ferguson, Sonia Matiuk.

The Glasgow Coma Scale, developed by Teasdale and Jennett in 1974, is the most widespread tool used to measure consciousness in general practice. The tool was developed to provide consistent terminology to convey the results of assessment of conscious level in acute head injury patients. Nevertheless, it would appear that the GCS has morphed into assessment of non acute head injury patient conscious level. Consequently, the GCS is unable to identify or record the more subtly changes that might be seen in such patients.

Assessing clinical changes in patients with neurological disturbance that demonstrate subtle changes in consciousness can be problematic. For example, patients can be confused but be orientated to time, place and person. In this paper, the GCS will be reviewed in terms of its relevancy to neuroscience practice, as well as how clinicians use the tool in practice. In addition, reliable and valid tools that assess consciousness and confusion in the neuroscience patient population will be discussed. Each tool will be evaluated assessment accuracy. Advancements and novel methods for neurological assessment are also considered.

Objectives:
Each tool will be evaluated assessment accuracy. Advancements and novel methods for neurological assessment are also considered.

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Surgical site infections - What can I do?

Joanne McLoughlin

Surgical site infections (SSIs) are an issue for most surgical departments they increase the length of stay, increase costs with further surgery, use of antibiotics, analgesics, readmissions and cause pain and discomfort with our patients. The Australian Council for Safety and Quality in Health Care (2003) suggested the national incidence for SSIs was between 2-13%, which contributes to 7,000 deaths annually.
Amongst the neurosurgeons infections are of great concern and monitoring infections rates is of value to them and their patients. By monitoring the number of patients with infections at Wollongong Hospital over a 12 month period in 2009 I identified there were 20 SSIs for 362 operations (0.055%). This was discussed and a number of changes occurred including the type of dressing used, length of time the dressing remained intact and the gradual changes in the operating theatres which were accepted by all the neurosurgeons. By the end of 2011 the number of wound infections were 8 for 412 operations (0.019%). I will also discuss the type of wound (deep vs superficial) and the impact this had on the patients'hospital stay. I will discuss the changes mentioned and some of the resistence encountered and my team's next step to decrease the rate even further.

Objectives:
1. Discuss monitoring and identifying number of SSIs
2. Discuss changes in practice and improvements made
3. Outcome - decrease in number of SSIs

2012 ANNA Conference Abstracts

A model of care for primary brain tumour from early stage diagnosis

Andrea Hammond, Lisa Greskie, Martin Nettle

Brain tumours pose significant impact on patients and the health care system.
The Tasmanian Neurosurgical Unit is the primary referral centre for patients with brain tumours around the state. A significant void existed in our practice and the management of these patients. This unique group face the challenges of poor prognosis and minimal support services that do not adequately address their needs. Nurses and allied health from the ward were motivated to change the journey of this patient population.

We have developed a brain tumour clinical pathway to provide mapping of the patient's journey from admission to follow up at home. The next step was to implement an education program to improve staff awareness and ensure consistent information is provided to patient. Finally patients were followed up to ensure they are linked with the services required.

In starting this project we acknowledge we have opened pandora's box and are uncertain of where this journey will lead us. We hope that in the future patients will have ready access to information and a seamless integrated approach to their care.

Objectives:
- To provide a coordinated, multi disciplinary service beginning at initial presentation.

- To improve patient and family understanding and provide ongoing education to staff.

- To implicate best practice guidelines for this patient population.

The value of a Neurosurgical Unit led Brain Tumour Education Forum for patients and care-givers

Andrea Hammond, Sonya Wilson

The diagnosis of a primary brain tumour can have a significant physical, social, emotional and functional impact on the individual and those close to them. The Tasmanian Neurosurgical Unit have identified that from initial presentation, patients can have a fragmented journey through the healthcare system with unclear access to resources and support. A small working group from the unit implemented a Royal Hobart Hospital Patient and Care-Giver Brain Tumour Education Day in August 2011 with the intention to improve access to resources.

The Brain Tumour Education Day aimed to share current information on diagnosis, treatment, management and research with both patients and care-givers. The group intended the program to highlight the journey of patients through the healthcare system. Support Services were also invited to provide information to participants on the services available.

The multidisciplinary team of specialised Clinicians provided participants with practical and accurate information about aspects of the patient journey. Participant evaluation forms indicated the day was informative and relevant to their situation. The average score was for the overall quality of the day was 9.3 out of a total score of 10. The sessions that were most highly valued by patients and care -givers addressed the emotional support of the patient. It is intended that this will become an annual event that is widely accessible by the community.

2012 ANNA Conference Abstracts

Intracranial Hypertension and neurological deterioration - from the straight forward to the unexpected.

Andrew Latham, Luke Dare

Through the use of three case studies, this presentation will aim to illustrate that there can be many and varied signs and symptoms that present as a result of Intracranial Hypertension (IC-HTN) and Herniation Syndromes.

The clinical manifestations of IC-HTN can present in some situations obviously, almost in a predictable fashion, while on other occasions the signs of impending deterioration can be very subtle and harder to pick up.

All three cases involved increased ICP from cerebral oedema, one as a result of a cerebral lesion, and the other two from closed head injuries. Although all three cases shared some similarities, each presented differently. The first case is of a young woman who was admitted with a large intracerebral lesion and exhibited a number of the classic signs and symptoms associated with IC-HTN. The second case involves a young male who presented post closed head injury, displaying some of the usual clinical signs of IC-HTN, but in a less obvious fashion. The third case impacted on the unit significantly, involving a young male in late adolescence, who was admitted also post closed head injury, but rapidly and unexpectedly deteriorated and died.

Objectives:
To raise awareness of the clinical manifestations of Intracranial Hypertension both preceding and during herniation syndromes.

Treatment of Hydrocephalus

Linda Bulger

Hydrocephalus is often seen as a congenital condition. There are actually several different types of Hydocephalus. The anatomy and physiology around this condition are similar regardless of the causal factors. Humans produce between 500 to 600 mls of CSF in a 24hour period. CSF cushions the brain and spine and after circulating around these structures it is absorbed into the blood system and eventually excreted through the kidneys. Treatment of Hydrocephalus has traditionally been by the insertion of a Ventricular Peritoneal or Atrial Catheter. More recently Endoscopic Third Ventriculostomy has become an alternative. It is my intention to discuss the types of Hydrocepalus, the treatments and the advantages of such as well as the financial implications of treatment choices.

Objectives:
To share advances in treatment of Hydrocephalus from a surgical perspective

2012 ANNA Conference Abstracts

"She'll be right mate - it's just a concussion".

Vicki Evans

Concussion, once thought to be insignificant has over the last year been drawn into the public arena as something a lot more than "insignificant". Television dramas and news coverage have covered this type of insidious brain injury, showing that it has ramifications for the individual's future – including schooling, work life and lifespan.
Whilst current technology can highlight significant head injury showing up lesions such as extradural haematomas, subdural haematomas and the like, concussion does not impact visually on a scan – yet.

Sporting codes have become drawn into the concussion debate and as of this year, the NRL, AFL and American NFL all have guidelines for concussion identification and treatment management plans. Whilst this is a step in the right direction, the education department could do with a more in depth plan. The main message that needs a platform is that it is not alright to send a player, no matter what age, back into play if they still have neurological symptoms –"she (won't) be alright mate"!

Objectives:
1. define concussion
2. describe signs & symptoms of concussion
3. identify treatment options
4. identify preventative strategies

Seizure Management for neuro-oncology patients — why evidence is not reality.

Linda Nichols

For patients diagnosed with a brain tumour, seizure management is a fundamental aspect of care. Whether associated with treatment or as a symptom of progressive disease, seizures result in increased morbidity and reduced quality of life. This presentation reviews the multifaceted and controversial practice of seizure management for patients diagnosed with a brain tumour.

Methodology: A review of the literature was undertaken concerning evidence based practice within the neuro-oncology setting and current International strategies for seizure management.

Results: The literature supports that the prescription of anticonvulsant drugs is driven by personal preferences and historical practices, contrasted with what Shaneyfelt et al. (2006) describes as the pragmatic evidence based approach, where clinical expertise and evidence are integrated. It is difficult to disagree that evidence based practice should involve a reassessment of tumour related seizure management. Two themes were identified and are explored; challenging habitual experienced based practices and the dissemination and implementation of current evidence into the clinical setting.

Conclusions: The fundamental principles of tumour related seizure management are widely acknowledged, however the greatest challenge is changing clinical behaviour so that evidence is implemented. This presentation discusses current best practice for tumour related seizure management and the barriers to integrating clinical expertise with clinical evidence.

2012 ANNA Conference Abstracts

What the hell is a Twitter? The potential uses of social media in neuroscience clinical care.

Caleb Ferguson, Patricia M Davidson

Communication is an essential form of human interaction. For many individuals the Internet is a primary form of communication, therefore denying access is failing to address many people's needs. Since the turn of Web2.0 the face of the Internet has been rapidly changing. We have witnessed Internet users adjust from passive consumption to active creators of content. Facebook, Google+, LinkedIn, Pinterest, Yammer, Tumblr, YouTube, Flickr, Instagram, Wikipedia and Twitter to name a few, all with users actively creating content and sharing information and ideas. Whilst the health field has been slow to catch onto the boom, the potential uses within clinical care are extremely innovative and should be harnessed. Novel examples include clinic reminders, virtual brain tumour and epilepsy support groups, the provision of reliable patient information, and as a medium for health promotion. This review aims to describe and explore the use of Web 2.0, with a primary focus on Twitter and its potential use within neuroscience clinical care today.

Objectives:
This review aims to describe and explore the use of Web 2.0, with a primary focus on Twitter and its potential use within neuroscience clinical care today.

I can't read what I've just written.

Shae Miller

I can't read what I've just written

Alexia without dysgraphia is an unusual alexic syndrome that results in an inability to read without losing the ability to write. This syndrome was first described by Dejerine in 1891. It is also known as pure alexia, word blindness, posterior alexia, occipital alexia and letter by letter alexia. The disorder results from a lesion to the occipto-temporal region in particular the area of the left angular gyrus.

Our presentation is a case study of a patient who was recently admitted to our Stroke unit. The man's stroke impairment was alexia without dygraphia. In our presentation we will describe the alexia, the case and the challenges that both the patient and the stroke team faced as his condition became apparent.

Objectives:
To describe this unsual condition
To describe the challenges that result from the condition

2012 ANNA Conference Abstracts

Can nursing care decrease death & dependency? Final results of the Quality in Acute Stroke Care (QASC) Trial

Sandy Middleton, Chris Levi, Simeon Dale, Peta Drury, Jeremy Grimshaw, Jeanette Ward, Cate D'Este, Patrick McElduff, N Wah Cheung, Rhonda Griffiths, Malcolm Evans, Clare Quinn, Dominique Cadilhac.

Background: The Quality in Acute Stroke Trial (QASC), a single blind cluster randomized controlled trial of a multidisciplinary implementation intervention, targeted clinicians' evidence-based management of fever, hyperglycaemia and swallowing dysfunction following acute stroke.
Methods: 19 NSW acute stroke units (ASUs) were randomised to the intervention (n=10) or control (n=9) group. The intervention consisted of evidence-based treatment protocols to manage fever, hyperglycaemia and swallowing dysfunction, multidisciplinary team building workshops, staff education and local ASU coordinator engagement. The control group ASUs received an abridged copy of the Australian acute stroke guidelines relevant to the management of fever, hyperglycaemia and swallowing. Patient outcome data were obtained via computerized assisted telephone interviews 90 -days post-admission. Intention-to-treat analyses were undertaken adjusting for baseline data and clustering.
Results: A total of 1699 patients participated (690 pre-intervention; 1009 post-intervention). Patients from intervention ASUs were significantly less likely to be dead or dependent at 90-days (42% vs 58%) (p=0.002) than patients from control ASUs with improved SF-36 mean physical health scores (45.6 vs 42.5, p=0.002), irrespective of stroke severity. Our intervention resulted in significant reductions in: mean temperature reading (p=0.001); number of febrile (>37.5ºC) patients (p<0.001); mean blood glucose (p=0.02); and improved swallowing screening within 24 hours of admission (p<0.001).
Conclusion: Patients who received care in ASUs delivering the multidisciplinary intervention demonstrated an absolute reduction for 90-day death or dependency of 16%. This effect is larger than any drug or organisational treatment of proven effectiveness for stroke. This finding is of international significance, made all the more compelling in that it resulted from teamwork and evidence-based nursing care.

Healthy Mind Healthy Body

Jodie Hughson, Toni Simpson

The Gold Coast Health Service District were successful in gaining funding through the Commonwealth Government National Partnership Agreement to conduct outpatient clinics for Healthy Ageing.

The Falls and Balance Clinic provides comprehensive assessment, early diagnosis, preventative treatment, initial care planning and referral to community agencies whilst delegating ongoing review and monitoring to General Practitioners in the context of a formal multidisciplinary care plan.

Entry Criteria—45yrs or over and
• Recent recurrent falls or near falls or
• Significant gait instability as determined by a medical practitioner, a nurse or an allied health professional, or
• Falls with significant complications (skin tears, extensive soft tissue bruising, fractures), or
• Falls with presentations to GP or Emergency Department
• Vestibular symptoms for assessment and treatment
What staff are involved in the clinics?
• Consultant and Registrar
• Pharmacist
• Physiotherapist
• Nurse Practitioner, CNC, RN
• Allied Health

The memory/cognition clinics will deliver specialist expertise in the early diagnosis of dementia and long term management planning including; testamentary capacity, carer stress reduction, advanced health care planning, strategies to manage difficult behaviours and linkage with community supports.

It will also provide a forum for ongoing education, training and research for our future Geriatricians, Nurse practitioners and Advanced Allied Health professionals, as well as supporting General Practice to appropriately manage dementia clients in the community.

2012 ANNA Conference Abstracts

Current advances in the treatment of hydrocephalus: the Tasmanian Experience

Mujic A, Hunn A

Improvement in our understanding of the pathophysiology of hydrocephalus has led to advancements in treatment. This paper will present our results in treating 189 patients with various forms of hydrocephalus (including hypertensive, negative and normal pressure hydrocephalus) using advanced neurosurgical techniques such as third ventriculostomy, aqueduct stenting and implantation of extracranial adjustable pressure shunts.

Head Injury Case Study

Dr Reece Sher

Head injuries are a major source of morbidity and mortality in trauma and neurosurgery. The aim of treatment in these patients is prevention of secondary injury. We present some of the important principles in this process as well as cases relying on attention to details leading to good outcomes. In particular, we present a rare and very special case of trauma and severe head injury in a 12 year old boy who defied all odds to make a magnificent recovery. This case demonstrates how good multidisciplinary management can lead to extraordinary outcomes.

2012 ANNA Conference Abstracts

Constructively Aligning Online Learning for Neuroscience Nurses (Poster)

Linda Nichols

Exploring the philosophy of constructive alignment and the established teaching and learning theories coined by Biggs' this poster outlines the challenges associated with redesigning a Postgraduate Neuroscience Course.

Whilst the online environment provides available, accessible and convenient learning, merging theory and practice provides one of the greatest challenges. For a specialty where human contact is the fundamental, the move to online Postgraduate Neuroscience nursing learning risks the production of academic nurses who lack the skills and emotional intelligence to apply learning in the practice setting. Fundamental to addressing this is the development of an online environment that enhances graduate attributes and fosters reflection and critical thinking skills. This extends students declarative or theoretical knowledge as they are required to demonstrate the skills to apply procedural knowledge with an awareness of the circumstance in which to apply it. The change in focus from the acquisition of knowledge towards conceptual change that is not only constructive and sequential engages students with progressively higher order cognitive processes.

Objectives:

This poster offers an evaluation of online learning environments and offers insight and recommendations for enhancing the online teaching and learning experience for Neuroscience nurses. A shift in the philosophy of teaching towards constructive alignment of teaching and learning reveals a true paradigm shift in perception of the Neuroscience nurse educator.

Stimulation: - How's your technique? *(Poster)*

Stephanie Gilmore, Danielle Wheelwright

Background: Sternal rub has been shown to cause marked bruising and skin breakdown and should be used with extreme caution. (1) Similarly, supra orbital ridge pressure can cause harm to patients if the patient moves during the examination. (2) The trapezius pinch appears to be the safest technique for healthcare workers to use.

Aim: To compare knowledge and practice of nurses working in the neurosciences versus non neurosciences areas in regards to painful stimulation administered during the Glasgow Coma Scale assessment.

Method: 20 nurses- 10 working in the neuroscience specialty and 10 working in other clinical areas of the hospital were given a survey to complete. Questions asked were:

1. What types of painful stimuli do you use as part of the GCS assessment?
2. Can you list any reasons to avoid certain stimuli (list given).
3. Do you know the difference between central and peripheral painful stimuli?
4. Do you feel that St Vincent's policy and procedure on neurological assessment provides clear guidance of best techniques to use?

Results: Results have been collated and will be summarised in table/graph format if abstract is accepted.

Discussion: When conducting the GCS assessment, a high percentage of both neuroscience nurses and non neuroscience nurses are still using techniques of painful stimulation that are not in line with current literature. Nurses need to be educated about the difference between central and peripheral painful stimulation and its use in the GCS. It is clear that there needs to be more education and clearer guidelines surrounding this in all areas of the hospital.

Nagaragawa Convention Center.
Gifu, Japan 13-16 September, 2013.

Congress abstract submissions **are now open.** Please visit **www.wfnn2013.jp** or **www.wfnn.org** for submission information. Abstracts close December 3rd.

The social program is going to be a highlight. Adventures include Ukai (Cormorant fishing on the Nagara River), this includes dinner on the boat as well. Throughout the Congress there will be "Table Top" sessions on origami, sushi lessons, all things Japanese!

The Gifu Miyako Hotel is connected to the Nagarawa Convention Center for easy access and is a lovely place to stay. If you prefer more of a nightlife, then stay in one of the suggested hotels near Gifu Station (approx. 20min walk to the Convention Center).

Once again Linda Littlejohns has agreed to assist us with the Pre Conference session —"Tying Neuroanatomy to your Assessment" (Stroke & Trauma). This extra session is well worth it!

Currency conversion: (approximately)
AUD$1 = 80.38JPY
Registration: 30,000JPY (early-bird)

Please don't hesitate to contact me if you require further information or have any questions.

Vicki Evans, *WFNN Vice President.*

Calendar of Events

2013:

- **American Association of Neuroscience Nurses Conference**

March 9 – 12.
Charlotte Convention Centre
Westin Charlotte
Charlotte, NC.
USA

www.aann.org

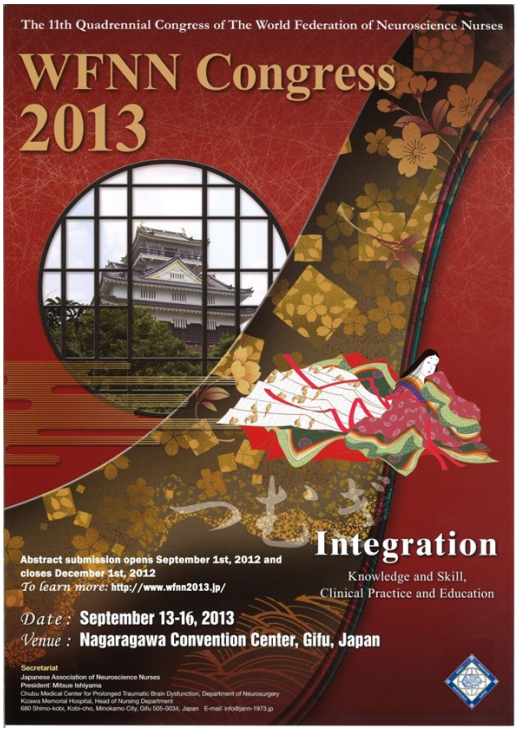
- **World Federation of Neuroscience Nurses Congress**

September 13 - 17. www.wfnn.org
Nagaragawa Convention Centre.
Gifu, Japan.

www.wfnn2013.jp

- **World Parkinson Congress**

October 1—4.
Montreal Canada.
www.worldpdcongress.org
Email: info@worldpdcongress.org



2015:

- **European Association of Neuroscience Nurses Congress**

Belgrade, Serbia.

Dates: TBC

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All manuscripts are subject to blind review by a minimum of two reviewers. Following editorial revision, the order of publications is at the discretion of the Editor.

Submission

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Manuscripts should be typed using 10 font Arial in MS Word format. It should be double-spaced with 2cm margins. Number all pages. Manuscripts should be emailed to the AJON Editor at: **editor@anna.asn.au**

TITLE PAGE: Should include the title of the article; details of all authors: first name, middle initial, last name, qualifications, position, title, department name, institution: name, address, telephone numbers of corresponding author; and sources of support (e.g. funding, equipment supplied etc.).

ABSTRACT: The abstract should be no longer than 250 words.

KEY WORDS: 3 to 6 key words or short phrases should be provided, below the abstract, that will assist in indexing the paper.

TEXT: Use of headings within the text may enhance the readability of the text. Abbreviations are only to be used after the term has been used in full with the abbreviation in parentheses. Generic names of drugs are to be used.

REFERENCES: In the text, references should be cited by author's name and year of publication in parentheses. For example (Lloyd, 2002). The reference list, which appears at the end of the manuscript, should list alphabetically all authors. References should be quoted in full or by use of abbreviations conforming to Index Medicus or Cumulative Index to Nursing and Allied Health Literature. The sequence for a standard journal article is: author(s), year, title, journal, volume, number, first and last page numbers. The sequence for a book is: author(s), year, title of book, edition number, place of publication, publisher, first and last pages of reference. The sequence for an author(s) in an edited book is: author(s), year, title of reference (chapter/article), in editor(s), year, title of book, place of publication, first and last pages of reference.

Example — electronic material:
author, editor or compiler; date of creation or latest revision of document, title, name of sponsor, date viewed, URL

Example – journal article:
Chew, D and Woodman, S (2001) 'Making Clinical Decision in Neuroscience Nursing', Australasian Journal of Neuroscience Nursing, Vol. 14 , No 4: pp.5-6.

Example – book:
Buckland, C (1996) Caring: A Nursing Dilemma. Sydney: WB Saunders.

Three or more authors:
List all authors the first time the reference is cited. Thereafter cite first author and et al. Example: (Thompson, Skene, Parkinson, and Baker, 2000). Thereafter (Thompson, et al., 2000).

Example electronic document in web site:
Brown, LG (2005) R*eview of nursing journals*, 30 June, Department of Nursing Knowledge, Penrith, viewed 30 September 2007, http://www.nurs.journ-index/ju_22/.html

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Letter of submission; all text 10 font Arial typed double-spaced with 2cm margins; manuscript with title page, author(s) details, abstract, key words, text pages, references; illustrations (numbered and with captions); permission for the use of unpublished material, email manuscript to **editor@anna.asn.au**

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