Introduction

Huntington’s Disease (HD) is an “inherited autosomal-dominant neurodegenerative disorder” (Tabrizi et al., 2019, p. 801) and is classified as a rare disease (Rossi & Oh, 2020). While chorea had been recognised long before, it was in 1872 that American physician George Huntington composed the pivotal characterisation of a ‘medical curiosity’, later referred to as ‘Huntington’s Chorea’ (Wexler et al., 2016 p. 2326; Osler, 1893, p. 1-2). ‘Chorea’, comes from the Greek word ‘choreia’ and describes dance-like movements, the involuntary and abnormal movements, affecting different parts of the body that is the most obvious symptom associated with what we now refer to as Huntington’s Disease (Burgunder, 2013). George Huntington described three characteristics of particular notice to him; the hereditary nature, the range of psychiatric symptoms and the adult onset of symptoms with ongoing disease progression (Wexler et al. 2016). Indeed, HD is characterised by three clinical features, “motor, cognitive and psychiatric” (Tabrizi et al., 2019, p. 801) that typically occur in middle age (Myers, 2004). HD prevalence in the Western hemisphere is estimated at 4-10 per 100,000 population (Tabrizi et al., 2009) but there is enormous variation across the globe, with prevalence amongst European, North American and Australian populations higher than in Asian populations (Rawlins et al., 2016).

The Gene HD is caused by an unstable CAG trinucleotide repeat expansion in the HD gene (McColgan & Tabrizi, 2018). The huntingtin (HTT) gene, or IT15 (‘interesting transcript 15’), located on chromosome 4 (4p16.3) in a coding region, was discovered in 1993 by The Huntington’s Disease Collaborative Network (The Huntington’s Disease Collaborative Research Group, 1993 and Wexler et al., 2016) and everyone has two copies of it, one from their mother and one from their father (Lahiri, 2011). Genes are made up of a combination of nucleotides; adenine (A), guanine (G), cytosine (C) and thymine (T) (Lahiri, 2011), with a trinucleotide repeat being a combination of three nucleotides occurring in a repeating pattern (Williams & Schutt, 2000). Normally, the group ‘CAG’ repeats less than 27 times, with the intermediate range being between 27 and 35 repeats and a reduced penetrance in a CAG repeat of between 36 and 39 (McColgan & Tabrizi, 2018). When CAG repeats more than 39 times the person will develop HD (McColgan & Tabrizi, 2018).

Abstract

Huntington’s disease (HD) is an inherited neurodegenerative disorder caused by a CAG trinucleotide repeat expansion in the HTT gene. The motor, cognitive and psychiatric features of HD are progressive and complex, requiring specialised care by medical, nursing and allied health care professionals. This paper discusses the role of the HD nurse as a valuable resource to assess, provide, facilitate and educate on the specialised needs of those living with HD.

Keywords: Huntington’s disease, chorea, Huntington’s nurse, neurodegenerative disorder
The HTT gene contains the instructions to make the huntingtin protein, or ‘wild-type’ protein, important for normal brain development and function (Patrick & Ritchie, 2020). However the genetic instability caused by an expanded CAG repeat in the HTT gene (mHTT) results in a ‘Mutant’ huntingtin protein (huntingtin) being produced (Sari, 2011, p. 89 and Wexler et al., 2016), resulting in damage and eventually neuronal dysfunction and death (McColgan & Tabrizi, 2018). Each child of a person with HD has a 50% chance of inheriting the mutation (Johnson & Paulsen, 2014) but the discovery of this gene has enabled at-risk individuals to find out if they carry the genetic mutation long before the onset of any symptoms (McCusker & Loy, 2017).

Clinical presentation

The basal ganglia is the part of the brain most affected by HD (Johnson & Paulsen, 2014), within which the striatum is the most affected area of neuronal death (Reiner et al., 2011), thus giving rise to the behavioural, cognitive, emotional and motor symptoms that are seen in HD (Johnson & Paulsen, 2014; Reiner et al., 2011). Neuronal death is irreversible and progressive over approximately a 20 year period from onset (Reiner et al., 2011). Age of onset is inversely related to the number of CAG repeats a person has (Langbehn et al., 2010), but most people will become symptomatic between the age of 30 and 50 years (Johnson & Paulsen, 2014), with the average duration of disease, from onset of symptoms to death being 17 to 20 years (Myers, 2004). Diagnosis is reliant on a neurological examination and motor findings as measured in the Unified Huntington’s Disease Rating Scale (UHDRS™), an assessment tool for measuring the clinical features and progression of HD (Kieburtz, 1996) in combination with a positive genetic test or confirmed family history (Frank, 2010; Paulsen, 2011).

Cognitive

Significant impairment in dual tasking amongst those in both the pre-manifest stage and in the very early stages of HD has been observed, specifically when concurrent cogni-}

tive and motor tasks are performed (Lo et al., 2020). While the presence of motor symptoms is required for a diagnosis, cognitive indicators of disease have been observed many years before any motor manifestation (Paulsen, 2011). Indeed loss of brain volume has been observed in pre-manifest and early manifest HD (Tabrizi et al., 2012). Some of the earliest cognitive findings include difficulty in estimating time and cognitive processing of everyday tasks, in turn leading to communication difficulties (Paulsen, 2011). Accurate identification of emotions and smell have also shown to be compromised in the early stages of disease, as are implicit memories, which can affect the ability to carry out previously learned skills (Paulsen, 2011).

Psychiatric

While the most common psychiatric condition in HD is depression, other diagnoses such as anxiety, mania, irritability, apathy, psychosis and obsessive-compulsions may also be present (Paoli et al., 2017). One of the areas requiring close assessment is suicide risk, for within the HD population the risk of suicide has shown to be 4 to 6 times higher compared to the general population (Paoli et al., 2017).

Motor

Many motor features can be present in HD, including myoclonus, tics, tremor, ballism, athetosis and bruxism, but it is the involuntary movements of chorea and dystonia that are the most common hyperkinetic features (McCusker & Loy, 2017). Chorea is present in approximately 90% of adults diagnosed with HD, peaking after 10 years (Burgunder et al., 2011). The functional and social implications that these motor features can have on a person’s life are significant and may also contribute to an exacerbation of psychiatric symptoms (Patrick & Ritchie, 2020). As the disease progresses, bradykinesia, hyper-reflexia and spasticity may be more prominent (McCusker & Loy, 2017).
Treatment of symptoms

Pharmacological treatment

Motor Symptoms: With the exception of botulinum toxin injections in certain cases of dystonia, the only motor symptom that has a therapeutic option is chorea (Burgunder et al., 2011), with Tetrabenazine the only drug registered by the US Food and Drug Administration for this treatment (Frank, 2010) and shown to improve the severity of chorea in the UHDRS™ (Huntington Study Group, 2006). While Tetrabenazine can be considered as a first line treatment for chorea in those who do not have severe depression, psychosis or aggressive behaviour (Burgunder, 2013), it is not an appropriate option for all as it can exacerbate depression (Frank, 2010). Prior to initiating any pharmacological treatment, a thorough assessment and consideration of a myriad factors must first be considered. The patient may not have a complete awareness of their movement disorder, therefore requiring a thorough assessment to ascertain whether medication is in fact necessary (Patrick & Ritchie, 2020). While expert opinion is varied on the type of treatment that should be prescribed, common indicators for commencing treatment include; stigma, physical injury, gait instability, sleep disturbance and work interference (Burgunder, 2013). An international survey of experts was carried out in Europe, North America and Australia to look at treatment preferences in the management of chorea (Burgunder et al., 2011). Dependant on the indications for treatment and whether there are any existing co-morbidities, Tetrabenazine or an antipsychotic were the first-line treatments recommended, with ongoing review and re-assessment (Burgunder et al., 2011).

Neuropsychiatric symptoms:

While there are limited evidence-based guidelines to treat the neuropsychiatric component of HD (Rossi & Oh, 2020), international expert committee guidelines have been published to include the treatment, both behavioural and pharmacologic, of “Agitation, Anxiety, Apathy, Psychosis and Sleep disorders” (Anderson et al., 2018, p. 356). Identifying the root cause of symptoms, whether HD-related or other, and regular assessment of prescribed pharmacologic treatment is necessary (Van Duijn, 2017) as the disease progresses and requirements change. Pharmacological treatment must consider potential side effects that could worsen existing cognitive or motor symptoms (Rossi & Oh, 2020). Likewise, leaving symptoms untreated can lead to exacerbation of other conditions, for example the potential worsening of chorea with anxiety (Anderson et al., 2018). Identifying the signs and providing timely and appropriate treatment of pre-existing psychiatric disorders and any pain or discomfort is crucial to avoid potential episodes of agitation from occurring (Rossi & Oh, 2020; Anderson et al., 2018). In circumstances where behavioural strategies are unsuccessful, benzodiazepines and antipsychotic medications are commonly used to treat agitation in HD (Anderson et al., 2018). Selective serotonin reuptake inhibitors (SSRIs) are a common treatment for depression, anxiety and obsessive perseverative symptoms of HD (Rossi & Oh, 2020, p. 4; Anderson et al., 2018). Depression has found to be predictive of suicidal ideation in gene expansion carriers, both pre-motor and with motor manifestation (Van Duijn, 2017) and it is therefore imperative that a depressed mood be recognised early to explore therapeutic treatments. Other antidepressants may be used, more specifically for the treatment of sleep disorders or obsessive perseverative behaviour (Anderson et al., 2018). Apathy may improve with the restructuring of the person’s routine and their physical environment but an assessment to ascertain the potential relationship with an existing medication or the need for an antidepressant should be made (Anderson et al., 2018). Psychosis is a feature of HD that is potentially under-diagnosed due to masked or missed symptoms and the difficulty of assessment of those with impaired communication ability (Anderson et al., 2018).

Non-pharmacological therapy

There are many types of non-pharmacological therapy or diversional therapies that can be considered when working with people affected by Huntington’s Disease. Alternative, adjunctive and comple-
mentary therapies have been discussed in various sources of literature as an intervention to de-escalate and prevent aggressive behaviour (Rosenblatt et al., 2010). For example, routine management (Rosenblatt et al., 2010), cognitive behaviour therapy (Novak & Tabrizi, 2011), environmental changes (Johnson & Paulsen, 2014), art therapy (Fisher & Brown, 2017), music therapy (van Bruggen-Rufi & Roos, 2015) and sensory modulation (Te Pou o te Whakaaro, 2011) are more effective than pharmacotherapy for some aspects of the disease. Diversional therapy is a patient-centred leisure therapy that helps patients to focus on improving social, spiritual, emotional well-being, physical and psychological needs (A’Campo et al., 2009; Fisher & Brown, 2017; Te Pou o te Whakaaro, 2011). Changes to the environment, cognitive behaviour therapy, routine management and sensory modulation - including art therapy and music therapy, have shown positive results in person-centred practice for people with HD, resulting in the successful reduction of seclusion and restraint use in the community (Brown & Fisher, 2015; Engel-Yeger, 2019; Fisher & Brown, 2017; Te Pou o te Whakaaro, 2011).

**Environment Changes**

Aggressive behaviour is more likely to occur in a poorly structured environment (Johnson & Paulsen, 2014). Managing and often reducing stimuli has shown to have a positive impact on adaptive social and leisure functioning, social interaction, improving concentration while swallowing and reducing inappropriate behaviour (Johnson & Paulsen, 2014; Rosenblatt et al., 2010).

**Cognitive Behaviour Therapy**

Cognitive Behaviour Therapy (CBT) is a range of psychotherapeutic methods using a problem-solving approach by identification of thoughts and behaviour that underpin emotional problems and disorders (Novak & Tabrizi, 2011). CBT can be effective to treat people with early stages of psychological disorders, such as depression, anxiety and stress management. However its success is dependent on the individual and the progression of the disease (Novak & Tabrizi, 2011; Rosenblatt et al., 2010). Development of a personalised plan using stress management techniques such as relaxation, meditation, exercise and psycho-education on how to cope with stressful situations together with reducing the individual’s sense of being stigmatised can help patients and their families to promote more adaptive strategies and resilience (Evan et al., 2016; Jongsma Jr et al., 2021; Johnson & Paulsen, 2014; Rosenblatt et al., 2010).

**Routine Management**

For those with HD, routine management can be important as it provides a daily activity schedule for people who have cognitive decline, memory impairment, poor perception of time and a lack of initiation that can result in frustration and aggressive outbursts (Anderson et al., 2018; Bourne et al., 2006; Novak & Tabrizi, 2011). To reduce aggression caused by confusion and frustration it is important to provide the patient with consistent schedules and routines. For example; facilitate and encourage the person to attend activities that the patient enjoys doing, maintain a highly structured environment for the patient to enjoy, provide verbal and visual prompts for each step of an activity to minimise stress levels and avoid open-ended questions as people with HD may take longer to process information (Anderson et al., 2018; Evan et al., 2016; Rosenblatt et al., 2010).

**Art Therapy**

Art therapy has been increasingly used as a therapeutic communication tool for people who have difficulty expressing their emotions, allowing them to communicate and connect with others (van Bruggen-Rufi & Roos, 2015). People with HD often have difficulty expressing their emotions; these may be boredom, hunger, fatigue, dehydration, undetected visual or hearing impairment, loneliness or effects of medication, and they may feel frustrated when these feelings are not acknowledged (Johnson & Paulsen, 2014). The aim of art therapy is to create art to express feelings, repress emotion, reduce stress, and provide the patient with a communication channel (Fisher & Brown, 2017; Fisher et al.,...
2014; Lee et al., 2010; Schwartz et al. 2019; Spring et al; 2011; Te Pou o te Whakaaro, 2011). The unique opportunity art therapy can provide is for people who are non-verbal or from a non-English speaking background to be able to express their feelings safely through art (Fitzgibbon & O’Sullivan, 2018; Te Pou o te Whakaaro, 2011; Uttley et al., 2015).

Music Therapy

Music therapy is a clinical and evidence-based therapy used to assess individual emotional well-being, cognitive skills, communication abilities and social function through musical responses (Papanikolaou et al. 2021; van Bruggen-Rufi & Roos, 2015; van Bruggen-Rufi et al. 2018). Music therapists design music gatherings for groups based on patient needs using approachable melody, listening, harmony improvisation, music and imagery, role play through music and performance (Bruggen-Rufi et al. 2010). Music and motor control share similar neuron circuits (van Bruggen-Rufi & Roos, 2015) and it has been shown that music therapy can help patients unlock self-expression and trigger happy memories that allow the patient to escape back in time to when they had more control of themselves (Juslin & Sloboda, 2011). Music therapy has been shown to improve mood and ability to focus while allowing a person to connect with family and friends (Bruggen-Rufi et al. 2010) as it can help initiate communication skills (Daveson, 2010). Music therapy assists patients with HD to reduce stress levels, decrease frustration, regain self-esteem, promote dialogue gestures, encourage rhythmical movement and motivate communication for those who may be speech dependent (van Bruggen-Rufi & Roos, 2015).

Nursing approach to Huntington’s Disease management

The role of the Huntington’s nurse is to help the community identify triggers that may lead to confusion, frustration and aggressive behaviour in HD, in order to help carers have a better understanding of the management of these behaviours to improve staff and patient safety. Aggression and agitation are common symptoms in HD, causing distress to victims, their family and nursing staff (Johnson & Paulsen, 2014). Recognising early triggers of aggression can help formulate a better care plan and improve the quality of life for the individual (Johnson & Paulsen, 2014; Rosenblatt et al., 2010). Understanding the behavioural features of HD, such as irritability, unpredictable responses to stimuli, explosive emotional outbursts, poor sleep, changes in daily routine, hunger & thirst, pain and perseveration, can help nursing staff develop interventions and behaviour strategies to prevent aggressive behaviour (Johnson & Paulsen, 2014; Rosenblatt et al., 2010).

Looking forward

Currently there is no cure or treatment that alters the progression of HD (Burgunder et al. 2011, p. 2). However, much research is being carried out around the world, from genetic therapeutics targeting DNA and RNA to symptom management (Harding, 2021; Wild & Tabrizi, 2017). One research approach to HD therapeutics is Huntingtin-lowering therapies that aim to slow or reverse the course of disease by reducing the amount of the mutant form of huntingtin protein, without having a detrimental effect on the wild-type huntingtin protein (Harding, 2021; Wild & Tabrizi, 2017). Anti-sense oligonucleotides (ASO’s) are a Huntingtin lowering therapy that disrupt a cells production of the huntingtin protein through targeting the mRNA (Harding, 2021). While ASO’s are large molecules that require a spinal injection to be administered, small-molecule alternatives that could be taken orally are also currently being explored (Harding, 2021). Observational studies are a core component of HD research to collect disease-specific data, contributing to our understanding of HD and providing valuable information required for the production of targeted therapies. Through the continual gaining of knowledge, using advancing technologies, ongoing collaboration of researchers from around the world and the dedication of individuals and families affected by HD, there is much cause for hope in looking forward, to the treatment and care for those at risk of, or living with HD.
Conclusion

While at the forefront of providing highly specialised and complex care, in both the clinical and community environment, the HD nurse is also an integral resource to utilise in furthering professional development amongst fellow healthcare workers who may be unfamiliar with the specific complexities of HD. The HD nurse can provide training and professional development for healthcare professionals to develop requisite skills and knowledge on appropriate interventions, identification of triggers and the management of challenging behaviours in the different stages of the disease. HD is a cruel and complex disease, relentless in its ability to transform the lives of those it touches. Through an understanding and an appreciation of the myriad symptoms and the physical and emotional effects on both the individual and those closest to them, health care professionals can input treatments and strategies to improve well-being and ultimately, quality of life.

Reference list


