**MANAGEMENT PROTOCOL OF THE MÉNIÈRE’S DISEASE**

**Abstract**

Ménière’s disease is often associated with episodic dizziness that can result in vertigo attacks, tinnitus, and hearing loss. Normally the disease is characterised by vertigo episodic attacks that can last several hours leading to reduced hearing. There is confusion however on the right description of the disease which hampers efficacy of the management protocol. Several management protocols are recommended and they range from dietary therapy of restriction of intake of salts, diuretics, vestibular surgeries and tube delivery of steroids. The paper gives an overview of the Ménière’s disease and the charctieristics how it manifests. The paper equally discusses in depth the intra-tympanic gentamicin and intra-tympanic delivery of steroids as modes of treatment of Ménière’s disease. Equally the paper discuses some of the treatment protocols that are preferable in countries such as the US and UK and gives a recommendation of the appropriate mode of treatment of Ménière’s disease in Asia.

*Key words:* Ménière’s disease, Intra-tympanic gentamicin, steroids, vertigo, endolympahtic hydrops.

**Management Protocol of the Ménière’s Disease**

There are numerous diseases that can normally cause dysfunction of the inner ear such as the Ménière’s disease. The disease is characterized by with fluctuating and unstable vestibular functions and reduced hearing levels for the inner ear mechanisms that regulate afferent and efferent signaling, endolymph and perilymph signaling. The disease attacks the vertigo and thus leads to some sense of aural fullness, hearing loss and tinnitus. The disease was first described in 1861 although there has been confusion in its description with a narrow definition being available which has led to inclusion of disorders that are unrelated to Ménière’s diseases thus interfering with management protocol of the disease (Cruz, 2014). The disorder causes susceptibility to balance and hearing functions and equally it is characterized with external and internal factors which will result in hormonal variations, poor diet, stress and pressure changes. The disease normally has an active period of around 6-11 clusters annually although at times it is remission can at times last longer. Susceptible age groups are those in their fourth and fifty decade of life (Melville, 2014). The Vertigo episodes which are the main disabling feature of Ménière’s disease normally have a high frequency of occurrence in the first years of presentation but then they tend to reduce with time.

Similarly there is lack of consensus on which is the appropriate treatment mechanism for the disease and it has impaired progress in terms of treatment. Different proponents belief that Ménière’s disease and endolymphatic hydrops are the same and thus they should be treated by control of the symptoms while another faction hold that it can be termed as a migraine caused by ischemia as a result of Vasospasm (Frejo et al, 2016).  The presence of ion channelopathy and other genetic factors explain this association and thus the treatment focuses on neurosensory disturbances and vasospasm. Considering the two different views success of treatment is based on how successful the strategy has been to patients before rather than following a pathological rationale (Sajjadi & Paparella, 2008). Treatment of the Ménière’s disease is normally directed at controlling the vascular risk factors that tend to trigger vertigo spells and equally reduce the pressure of fluctuations and imbalances of the affected ear.

Ménière’s disease manifests itself inform of long hours of pain in which the victim can experience hearing loss, intense vertigo, some fullness in the ear and roaring tinnitus. There is no clear management process or treatment to prevent progressive loss of hearing but the spells can be managed although the means that are favored for this are very destructive such as the Gentamicin ablation, labrinthectomy and vestibular neurectomy (McCall et al, 2010). Therefore the management protocols preferable in controlling the effects of the Ménière’s disease aim at reducing the severity and frequency of the symptoms of the disease and thus improve the patient’s condition.  Consequently there is need to formulate a flexible management strategy for each patient through the different stages of the disease. Thus the best way to consider treatment of Ménière’s disease is through a symptom control viewpoint which can then lead to the administration of the appropriate therapy relative to its toxicity (Foster, 2015). The effectiveness of the therapies can sometimes be destructive and thus they have to be temporized for the periods when the symptom expresses itself.  Carrying the therapies in temporarily makes the destructive procedures necessary so that the physicians can have time to ascertain if it is only one year affected and thus administer interim treatment instead.

The therapeutic management of Ménière’s disease is a developing paradigm shift and it includes delivery of aminoglycosides and steroids to the inner ear. However the delivery process may have some drawbacks such as penetration to inner ear may be hampered by the cochlea barrier thus potentially causing undesirable side effects (Espinosa-Sanchez & Lopez-Escamez, 2016). Intra-tympanic delivery of gentamicin and steroids to the inner has become a routine strategy that is used to avoid occurrence of any side effects. However it equally has its setbacks such as loss during delivery down the Eustachian tube and absorption issues that may be a result of the window membrane (Coelho & Lalwani, 2008). Treatment may also be done systematically through dosing of the medication by means on intravenous and intramuscular delivery and oral consumption and they include systemic steroids and streptomycin that can be used for control of sensorineural hearing loss.

Gentamicin and steroids are preferable for inner ear absorption and they are delivered through intra-tympanic delivery which is among the local delivery mechanisms devised to deliver medication. Intra-tympanic delivery has grown in the clinical treatment of Ménière’s disease as a safe procedure and an effective means of drug delivery to the inner ear for most disorders (Kaplan et al , 2000). Among the management protocols followed for treatment of Ménière’s disease is the application of intra-tympanic gentamicin and it has grown in the world today to be the most common strategy used. The use of intra-tympanic gentamicin has evolved from treatment by use of intra-tympanic aminoglycoside and streptomycin. The development of intra-tympanic streptomycin delivery used to deliver medication to the middle ear through the tympanic annulus (Gayathri & Rao , 2016). However this form of delivery is efficacious for vertigo control where treatment is focused on reducing the cold caloric responses. Intra-tympanic delivery of streptomycin can at times have deleterious effects that can result in hearing loss which can be attributed to the change in medication therapy from vestibular ablation once there is a decline in hearing to arrested therapy.

Intra-tympanic gentamicin is an advanced standard form of therapy that is used in modern treatment of Ménière’s disease in all over the world today. It is a form of therapy that focuses in the treatment of the armamentarium and it is usually administered to patients who have vestibular symptoms even after they have tried conservative therapies such diuretics and low salt diet (Paragache, Panda & Ragunathan, 2005). However the dosage delivered is varied depending on the selected endpoint to curtail therapy. Gentamicin can be delivered in two variants of either low dosage or high dosage. Low doses are preferable where one gets 1-2 doses of gentamicin between months before administering again. The low dosage variant normally has minimal side effects and it has an estimated efficacy of close to 80% to stop vertigo. Normally the second dosage is delivered if there are episodes of vertigo within two weeks prior to a spell. The nature of action of gentamicin is that it causes destruction of the endolymph that secretes dark cells before having an effect on the vestibular epithelium (Patel, 2017).  The low dose protocol of intra-tympanic delivery of gentamicin sometimes it has recurrence after around a year and it is thus necessary to get the second dosage after although it might be impossible to restore hearing ability if an intense protocol had been performed before. However for older persons above 70 years it is recommended that very low doses be delivered less frequently and this should be half the normal gentamicin dose.

High dose intra-tympanic gentamicin delivery is normally administered over short periods and it has 90% efficacy although associated risks are profound.  The doses are given weekly up to 6 doses and treatment only stops following occurrence of vertigo which is an indicator that the inner ear is being affected by gentamicin. However vertigo normally tends to worsen once treatment is stopped and it can take up to a week or longer to be resolved. In the event of prolonged vertigo, vestibular suppressants are thus necessary to control symptoms and also use of medication that prevents nausea (Hain, 2012). Conventionally the intra-tympanic administration of gentamicin should be done slowly over long periods rather than giving large amount over short periods because that way it tends to be less risky to hearing.  However if a patient has lost practical hearing then the risk associated with either the low dosage or high dosage protocol is eliminated because there is no significant effect on hearing hence any protocol can be followed (Gayathri & Rao , 2016).  Nonetheless it is important to note that the low dosage protocol is normally less damaging to hearing whereas on the ether hand the high dosage maybe risk it is more likely to produce accurate results. The therapeutic regimens of intra-tympanic gentamicin thus have a frequency of delivery of either daily, weekly continuous and titration delivery. Titration delivery of intra-tympanic gentamicin is considered the best method to control vertigo and the daily delivery is the worst because of the higher rates of hearing loss that are associated with it.

Although intra-tympanic aminoglycosides have been widely used in Ménière’s disease, the use of intra-tympanic steroids is slowly growing into use as a therapeutic option in the management of the disease. Intra-tympanic delivery of steroids is widely used in treatment of patients who are showing progress in vertigo (Phillips & Westerberg, 2011). Intra-tympanic delivery of steroids is common where the patient has suddenly lost hearing ability and it is a non-ablative form of delivery that does not involve surgery. However intra-tympanic delivery of steroids to the inner ear has minimal effect in treatment of Ménière’s disease but it rather controls the unexpected idiopathic hearing loss that might be associated with the disease. The most common used steroid is dexamethasone in which continuous usage of 4mg/mL for five days indicates that close to 90% of the patients show improvement after administering of the intra-tympanic steroids and some might even not require treatment after two years. Therefore it is important for other autoimmune disorders of inner ear to be considered in circumstances where the patients show positive response to steroid treatment (Phillips & Westerberg, 2011). In patients with advanced Ménière’s disease there are nonetheless no signs of improvement even after intra-tympanic delivery as it has been noted that symptoms such as aural fullness, tinnitus and hearing loss seem to persist.

Intra-tympanic steroid delivery as a management protocol works best as a therapeutic option for idiopathic SSNHL. Success of the steroids in the treatment depends on a number of factors that from the inception period of hearing loss to the time intra-tympanic steroids starts being administered.  The use of systemic steroids has not been successful which has prompted to the wide spread usage of intra-tympanic steroids as a salvage therapy where hearing recovery attempts have failed. The steroids used such as dexamethasone and methylprednisolone  are thought to have a calming effect on the affected Ménière’s  ear and severity of the vertigo spells tends to reduce after two years of usage. Therapeutically the steroids cannot be considered to be useful when dealing with a migraine because there no possible mechanism through which the steroids can cause alteration of hydropic distention (Liu et al, 2016).  The steroids work effectively in improving the Ménière’s disease status where the hydrops are caused by autoimmune factors or inflammation. Since steroids are an important therapy in reduction of edema where a patient has had ischemic stroke then it means that the steroids responsible for improvement in Ménière’s patients support the notion that ischemia may be the source of attacks. The steroids have shown success in treatment of SSHL and such success can be attributed to improvement in the flow of blood to the cochlea and reduction in inflammation in the inner ear.

Success of the intra-tympanic steroids to control vertigo in Ménière’s disease varies because of the temporal nature of the steroids which is short lived. Patients who have the autoimmune variant of Ménière’s disease have been shown to have a positive response to steroid treatment compared to others (Liu et al, 2016). However response to intra-tympanic steroid treatment in some patients takes time and improvement is only noted after a series of therapies that can last up to two years to completely control vertigo. Intra-tympanic steroid delivery is considered to be the more appropriate form of treatment in terms of effectiveness compared to intra-tympanic gentamicin which is a one off mode of treatment. Similar to the intra-tympanic gentamicin the intra-tympanic steroids can be given in low and high concentration doses with the higher concentration having compete vertigo control and hearing improvement without any side effects (Patel, 2017). Steroids can equally be administered orally although their effectiveness cannot be compared to when they are administered through intra-tympanic. Of significant interest is the fact that the high dosage may give effective results but nonetheless the optimal dosage of steroids is yet to be established as the standard protocol for treatment of Ménière’s disease. There are around five variants of Ménière’s disease and considering the homeostatic processes of ear functions steroids may not work in some cases. Sometimes diagnosis Ménière’s disease may be clouded by the fact that a section of the population with migraines normally experience episodic vertigo attacks and hearing loss which could ultimately impact on the administration of steroids to treat the condition which may not be prevalent.

Intra-tympanic gentamicin and intra-tympanic steroids are normally considered to be the non-destructive management protocols for treatment of Ménière’s disease. However there are other strategies that are employed in the treatment of the disorder ranging from lifestyle changes to ablative surgery. Ménière’s disease has a correlation with allergies therefore avoiding allergy behaviors is very important since it has been established that vertigo symptoms tend reduce once someone starts immunotherapy or avoidance of allergies. Other lifestyle changes considered as prevention measures include limiting intake of alcohol salt, caffeine and chocolate which is very efficient in reduction of vertigo attacks (Cruz, 2014). Regulation on salts and taking of a diuretic helps in maintaining normal balance of body fluid within the inner ear. However taking of a diuretic is sometimes associated with side effects such as tingling hands and increase in urination. Other forms of medication are equally administered such as prednisone which can help in reducing the number of vertigo episodes per week but they are nonetheless related to complications and side effects in that one has to carry them around all the time and some may cause vomiting and nausea. They however have high levels of efficacy because they can reduce the severity and the length of vertigo attacks. Similarly, micro-pressure therapy can be used by means of the Meniette device where pressure pulses are delivered to the inner ear (Melville, 2014). The pressure change in the inner ear establishes a balance in the flow of the endolymph thus improving vertigo control. The process normally takes a few minutes and it should be done approximately thrice a day. Although the procedure has minimal complkications it nonetheless very expensive from the patient’s perspective considering third party payers normally do not include the Meniette device in their cover.

Different countries employ different management protocols for the treatment of the Ménière’s disease. For instance in the United States of America control of vertigo attacks is normally achieved through recommendation of lifestyle changes that are usually accompanied with medical and surgical procedures. Most patients will benefit from a change in their dietary intake especially avoiding salts, caffeine and alcohol but others have to undergo medical procedures and get medication for their condition (Sajjadi & Paparella, 2008). However the most common non-destructive procedure in the US is the intra-tympanic gentamicin and vestibular rehabilitation which is considered to be applicable in patients experiencing longer acute vertigo attacks that leave symptoms of unsteadiness and disequilibrium. Equally in the UK although all they perform all the medical and surgical therapies available there is no definitive form that is applicable to all patients. The often combine lifestyle, psychological and medical input in the management of Ménière’s disease depending on the severity of the condition and stage of illness (Smith, Sankar & Pfleidere, 2005). Some of the most common therapy procedures in the UK is the use of betahistine which is favored almost all the time. Betahistine is safer and it acts as a H1 agonist while at the same time acting as H3 antagonist so as to increase strai vascualris microcirculation. Lifestyle changes such as salt restriction and use of diuretic are recommended in equal proportion and the common diuretic is furosemide and hydrochlorothiazide. Around 50 % of Ménière’s disease cases in the UK are usually treated using the grommet insertion and endolymphatic sac decompression (Smith, Sankar & Pfleidere, 2005). The conventional treatment protocol that is normally considered in most countries is life style changes where patients are put on diet to avoid intake of salts and the use of diuretics. In addition to these therapies, corticosteroid injections and intra-tympanic gentamicin is becoming popular in most of the European countries.

There are several management protocols that can be recommended to treat Ménière’s disease in Asia. Perhaps recommending lifestyle change especially restriction on salts seems to be the most appropriate therapy that can be used in the management of the disorder. Normally dietary salts have a correlation with the level of endolymphatic hydrops and it equally increases the severity and frequency of vertigo attacks. From practices it has been established that restricting on salt intake can tremendously reduce the risk of vertigo episodes. Normally the recommended dietary intake of salts for a patient should range between 1 to 2 grams per day without adding any salt to table food (Coelho & Lalwani, 2008). This seems the ideal therapy strategy because it can be practiced by anyone all it needs is commitment and patients easily habituate to these conditions within a few weeks. There are no side effects or any other complications that may result from restricting salt intake.

In Asia where the management protocol aims at restoring the homeostatic functions of the ear it is therefore recommended that the use ablative procedures be considered. Intra-tympanic gentamicin and intra-tympanic use of steroids are recommended. Intra-tympanic gentamicin is one of the most successive treatment forms that can treat vertigo patients but it is nonetheless associated with permanent loss of hearing and disequilibrium. However the use of steroids seems to be the most appropriate model that can be used in Asia to restore complete hearing loss and reduce vertigo attacks because as much as it can be done through intra-tympanic delivery they can also be administered orally. Steroids have a multifactorial effect and they play a role in reducing edema where ischemia is the cause of the Ménière’s disease something that intra-tympanic gentamicin doesn’t solve.  The success rate of intra-tympanic steroids to treatment of sensorineural hearing loss is considerably higher because they improve blood flow to the cochlea while at the same time reducing inflammation of the ear and thus reducing vertigo episodes (Kaplan et al , 2000). Therefore the use of steroids can be recommended for use in Asia because it is safer and apart from reducing vertigo episodes it equally leads to improvement in hearing ability unlike intra-tympanic gentamicin that is likely to cause hearing loss. However it should be noted that as much as the intra-tympanic steroids may be recommended management protocol it should be observed that some variants of Ménière’s disease are non-responsive to this procedure and thus they need other forms of therapies (Patel, 2017). Equally there is no procedure that is 100% effective and thus what may be working for patient A may not work for Patient B depending on the severity and stage of the disease and this requires that all options be considered when treating the disease taking into consideration the side effects and drawbacks that may be associated with each procedure.

In conclusion therefore, Ménière’s diseases seem to be a tricky disease that cannot be treated but rather one whose symptoms can be controlled and managed. There are many management protocols that are available for the management of the disease that range from lifestyle changes, diuretics, surgery, pressure treatment and the most advanced procedures such as intra-tympanic delivery of steroids and gentamicin. The choice of the management protocol should thus be tailored to the needs of the patient depending on the severity and stage of the disease. Equally different countries across the globe have their own preferences like the preference of intra-tympanic gentamicin in the US and Betahistine in the UK. However it is important to note that regardless the preference it is not always the case and patients should be given options of the available procedures to choose from.

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