



A Review on Meniere's Disease: Clinical Features Pathological Changes and Management

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

The differential analysis of Meniere's contamination stays tough a hundred and forty-six years after its authentic description. The modern-day examine goals to look at present facts at the advantages and downsides of novel diagnostic strategies for Meniere's infection. The importance of accurate analysis for number one care structures is likewise emphasized. An assessment of the thesis became carried out the use of Pubmed, medline and so on and different to be had database sources. There became extra data from net hyperlinks and applicable publications. The following papers have been chosen: Cohort research studies, retrospective cohort research, cross-sectional research, case reports, written guidelines, systematic reviews, and novels are all examples of managed medical trials. Generally, the conventional scientific triad of vestibular and cochlear gadget signs and symptoms (recurrent vertigo, fluctuating sensorineural listening to loss, and tinnitus) is the important thing to medical prognosis. In present day practise, the principal diagnostic methods are the glycerol dehydration check and electrocochleography, even though vestibular potentials can be utilised within side the contamination grading. Imaging strategies aren't particular sufficient to rule out different illnesses, they'll be required to rule out Meniere's ailment. Meniere's infection is a steady supply of difficulty for patients and has a down effect on their best of life. Given the superiority of the circumstance in a few countries, measures to make certain correct analysis, short referral, and proper control are certainly reasonably-priced for healthcare structures.

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1. INTRODUCTION

Meniere's infection is an inner ear disorder that impacts auditory and stability gadget. This disorder can have an effect on any age group, generally affecting human beings among forty-50s [1]. Although that is a protracted lasting situation without a remedy, some of remedy of preference are to be had that may lower severity of signs. Although the particular aetiology of Miniere's is unknown, it's far idea to be associated with elevated stress within side the internal ear, that is full of a fluid known as endolymph [2]. Meniere's disorder is likewise called number one idiopathic endolymphatic hydrops, which refers to strange fluid with inside the internal ear [3]. Meniere's ailment is continual; however, remedies and way of life adjustments can assist ease signs. Many humans recognized with Meniere's ailment will move into remission inside some years after their analysis [4]. Injury to head, alcohol, stress, smoking, fatigue, migraines can result in Meniere's sickness.

2. OBJECTIVES

In this evaluate article, Meniere's sickness is mentioned beneath the headings of medical capabilities, control and histopathological adjustments.

3. METHODOLOGY

The facts of the subsequent assessment article turned into accrued throughout the duration from twenty fifth September, 2021.the point out statistics have been retrieved from pubmed, EMBASE, Medline and google student records base. Most relevent articles with latest traits concerning the medical functions and control, posted in English international have been used.

ETIOLOGY: In people with Meniere infection, studies on temporal bone found out endolymphatic pileup within side the spiral cochlea and vestibule canal organ. Endolymphatic hydrops has been connected to a listening to lack of greater than forty decibels in latest research. Fluids clog within side the labyrinth, a part of the interior of ear that homes systems that resource in listening to and stability. The extra fluid reasons dizziness and listening to problems through interfering with the messages

your mind receives. Vertigo might also additionally or might not be a contributing factor. As a consequence, endolymphatic hydrops isn't always best related with Meniere disorder, however also can be found in instances of idiopathic sensorineural listening to loss. Endolymphatic hydrops because of obstruction of endolymphatic duct and sac. Sac atrophy and lack of epithelial integrity Vestibular aqueduct hypoplasia. There is not any any periaqueductal pneumatisation. Short vestibular aqueduct. The vestibular aqueduct's outside aperture is narrow. Mastoid air mobileular machine length reduction. Lateral sinuses are positioned anteriorly and medially [5]. Genetic predisposition. Inflammatory situations like continual otitis media, trauma, osteosclerosis, syphilitic allergy, leukemic reactions, and autoimmune disorders. Trauma-bodily or acoustic. Radiological abnormalities like.

Hypocellularity of mastoid

Narrow trautmans triangle

Anterior displacement of sigmoid sinus

Massive otosclerotic focus. Immune complicated disorder, Hormonal factor (myxoedematous affected person), Ischemia of stria vascularis, extrade in microcirculation inflicting engorgement and obstruction of venous return. Vasomotor disturbances, Histamine sensitivity [6].

Why human beings get Meniere's isn't clear. Researchers have numerous theories approximately what would possibly have an effect on the fluid with inside the internal ear, alevn though:

Drainage problems (due to blockage or a strange shape on your ear)

When your frame's defence gadget attacks wholesome cells that is referred to as an autoimmune response.

Reaction to allergens

Infection with a virus

An inherited proclivity

Migraine complications are due to a blow to the head [7].

CLINICAL FEATURES

SYMPTOMS:

Dizziness or vertigo, which makes you experience as if you are spinning, is whirling round you. You might not be capable of rise up due to this. The uneasiness can last everywhere from a few minutes to many hours, and it is able to produce sweat, vomit and nausea. A feel of fullness or strain within side the auditory device. This commonly best impacts one ear. Your ability to listen is deteriorating [8]. This would possibly motivate a "muffled" impact. Low-frequency listening to loss is often the primary to cross, but better pitches can be misplaced as nicely. Between bouts, listening to loss may improve, however it'll preserve to become worse over time [5].

1. Vertigo assaults

Most not unusual place signs in Meniere's syndrome are

- a. spinning sensation
- b. sweating, nausea and vomiting
- c. Irregular heartbeat and dizziness

2. Loss of listening to: lack of listening to in Meniere's instances perhaps gift momentarily. Eventually, most of the sufferers have everlasting listening to loss.

3. Tinnitus: It's the ringing, buzzing, roaring sound to your ear [9]. People had been typically extra aware about it all through low instances or once they had been exhausted.

4. A feel of fullness within side the ear. Meniere's disorder customers generally stumble upon stress within side the impacted ear

5. The affected person feels as though his ears are clogged

6. The affected person is not able to stability

Stages in Meniere's ailment and sickness

First phase: During this degree, someone could have surprising and often unexpected episodes of vertigo that may last everywhere from 20 mins to an entire day. An individual's ear can also additionally sense blocked or complete, and

they'll go through a few listening to loss, which normally recovers while the episode has passed. Tinnitus is likewise often encountered.

Second phase: Vertigo signs generally develop much less excessive at this degree, however listening to loss and tinnitus grow to be greater extreme. Many sufferers will even have long-time period remission (the sickness will pass away) which could remaining many months.

Third phase: Patients within side the overdue levels of Meniere's ailment will revel in much less vertigo, and a few might be freed from it altogether. However, tinnitus and listening to loss are probably to get worse with time, and sufferers will probably go through unsteady stability on a common basis. Most humans at this level sense uneasy in low-mild situations. Age: 20-60 years are commonly affected

Initially unilateral then will become bilateral

Sex: Almost equal, male to girl ratio 1:3

Family records 10 to 20%

Associated with hypocoelular mastoid

Secondary to quantity of illnesses of otic pill like syphilis, trauma, infection (viral, bacterial)

PATHOLOGY:

Inner ear is fabricated from membrane parts (the "membranous labyrinth") which are surrounded in a bony shell. Endolymph, a K⁺ wealthy extracellular substance, fills the membrane systems; perilymph, a very distinctive fluid with an ionic composition corresponding to extracellular serum found in different webweb sites of frame, fills the empty area amongst them and the bony shell. The scala media of the cochlea incorporates endolymph, while the scala tympani and scala vestibuli comprise perilymph. In its posterior half, the utricle is hooked up to the semicircular canals.

Further tubular systems from the saccule (the saccular duct) and the utricle be part of to shape a unmarried spindle - fashioned membranous shape (the endolymphatic sinus) that sits in a groove at the vestibule's posteriomedial aspect. Patient's regularly skilled dilatation of the cochlear scala media with displacement of Reissner's membrane into the vestibular scala (endolymphatic hydrops). Reissner's membrane

can bulge into the helicotrema, in addition to thru the saccule into the semicircular canals (mainly the horizontal canal) 7 and onto the footplate of the stapes in excessive instances of Meniere's sickness.. Several current studies have checked out the genetics of Meniere's ailment households. Women are barely extra bothered than males, with fifty six percentage of instances being lady. Meniere's infection is greater not unusualplace in whites (eighty three percentage), even though it is unusual in blacks [10]. In 2.6 percentage to twelve percentage of Meniere's disorder sufferers, a hereditary susceptibility has been found. Autosomal dominant inheritance with imperfect penetrance (60 percentage) seems to be worried in familial situations, with symptoms of extra extreme medical signs in children. Early studies checked out the opportunity of a hyperlink among human leukocyte antigens (HLAs) and Meniere's ailment susceptibility, but there has been inconsistent findings. The genetics of Meniere's sickness households has been studied in a number of of latest research. Women are barely greater affected than men, accounting for fifty six percentage of instances. Meniere's sickness is extra common in white humans (eighty three percentage), at the same time as it's miles uncommon in black humans. fifty six A genetic vulnerability has been discovered in 2.6 percentage to twelve percentage of Meniere's sickness sufferers. In own circle of relative's settings, autosomal dominant inheritance with incomplete penetrance (60 percentage) seems to be implicated, with symptoms and symptoms of extra intense scientific signs and symptoms in offspring. The concept of a dating among human leukocyte antigens changed into investigated withinside the early ranges of observe (HLAs) [11].

Due to etiological factors, there may be overproduction of endolymph which accumulates in internal ear. There is alteration in manufacturing and absorption of endolymph [12]. This will increase stress and distension of endolymphatic sac which reasons rupture of membrane and everlasting lack of auditory and vestibular feature. This ends in vertigo, tinnitus, listening to loss Endolymphatic hydrops is assumed to arise because of a longitudinal obstruction in one of the drainage systems (together with the endolymphatic duct or Bast's valve) serving as a dam, growing backward quantity and endolymph strain [13]. Studies on temporal bones from cadaveric with Meniere's ailment confirmed that their endolymph drainage

device became reduced in length and quantity, and additionally that their endolymphatic duct and sac have been choked, giving legitimacy to this theory. Endolymph flows thru the membranous labyrinth thru concurrent mechanisms: radial (a fast, non-stop process) flow, that is critical for power metabolism and ion trade round sensory mobileular regions, and longitudinal (slow) flow, which permits for endolymph reabsorption and disposal of excessive-molecular waste merchandise and particles via way of means of the endolymphatic sac [14]. Those strategies are energetic on the identical time and in a non-stop cycle [12].

4. DIAGNOSIS

a. Exam with an audiometer. This will display the presence of listening to loss withinside the stricken ear. It can also additionally encompass a check to look how nicely you could distinguish among phrases like "fit" and "sit." This is called speech discrimination [15].

b. Electronystagmogram: This assesses your equilibrium. Your eye actions might be monitored as cold and heat air is blown into your ear canal in a darkened environment.

c. Electrocochleography: The fluid stress for your internal ear is measured with this tool [16].

d. Testing the usage of a rotary chair. This lets in your physician to take a look at how your internal ear is tormented by eye motion. You are seated on a pc-managed rotating chair.

e. Myogenic capacity generated through the vestibular device (VEMP). This check assesses your reactivity to loud, abrupt stimuli.

f. Posturography: This will placed your stability to the check and notice how properly you could preserve it. You are status barefoot on a platform which can circulate in any direction. Your medical doctor can look at the way you react while the platform movements in precise methods for the reason that you are carrying a harness.

g. Test of auditory brainstem response (ABR). You put on headphones at some stage in this exam, and a laptop facts your mind waves as you reply to diverse noises. It's typically reserved for humans who're not able to produce other kinds of listening to testing (together with newborns) or imaging exams [7].

5. TREATMENT AND MANAGEMENT

After analyzing your clinical records, the medical doctor can also additionally do a sequence of checks to assess whether or not you've got Meniere's ailment. The health practitioner may also advocate you to get a listening to check to rule out any irreversible listening to loss. In a take a look at referred to as caloric stimulation, you would possibly check a response among your internal ear stability machine (vestibular) and eye muscle groups through heat or cooling the internal ear fluid the use of heat and funky water. Other vestibular checks to evaluate your feel of stability can be suggested. A stark distinction mind MRI can be used to display out mind tumours or different viable reasons of dizziness and listening to loss.

There are quite a few remedy alternatives for Meniere infection, with massive variations among nations. None of the remedy selections are powerful in curing the situation Because many medicinal drugs have a big impact at the functioning of close by tissues, quasi processes with the fewest facet outcomes must be used initially, following through extra forceful approaches.

Na⁺ diet -low stage of sodium consumption may also lessen the risk of assault of Meniere's sickness [17].

Betahistine

Intratympanic steroid injections might also additionally lower the frequency of vertigo assaults in menieres ailment sufferers.

Injectible Gentamycin that is ntratympanic: it has excessive degree of movements towards vestibule cells. Because of a sure stage of toxicity toward cochlear cells, one of the aspect outcomes is sensorineural listening to loss.

Surgery of vestibular nerve or labyrinthectomy: Nerve segment is a remedy choice for sufferers who've couldn't avail conservative remedy alternatives, and labyrinthectomy is a desire of remedy for people who've failed surgical remedies. The broken facet of the labyrinthectomy suffers complete listening to loss [6]. With this method, the doctor gets rid of the stability part of the internal ear, thereby disposing of each stability and listening to feature from the affected ear. This manner is done simplest in

case you have already got near-general or overall listening to loss on your affected ear. In intense instances of vertigo, surgical operation can be a opportunity, however it is usually handiest explored while different treatments have failed. The usefulness of surgical procedure for Ménière's infection has been studied in only a few scientific research, that is why it's miles not often utilised [18].

Procedure at the endolymphatic sac: The endolymphatic sac controls the quantity of fluid withinside the internal ear. The endolymphatic sac is decompressed at some stage in the remedy that can assist to lessen extra fluid ranges. This surgical operation is now and again mixed with the insertion of a shunt that is a tube that drains more fluid out of your internal ear.

Section of the vestibular nerve: This surgical operation involves severing the nerve that connects the internal ear's stability and motion sensors to the mind (vestibular nerve). This technique is used to deal with vertigo even as additionally aiming to preserve the listening to withinside the stricken ear. It necessitates preferred anaesthesia and an in a single day live withinside the hospital [19].

If you have been got vertigo, movement illness medicinal drug may also help, and nausea medicinal drug might also additionally assist if vomiting is a aspect impact of your dizziness. Other medicinal drugs that can be used encompass.

Diuretics. Your medical doctor may also prescribe a diuretic, which prevents your frame from keeping fluids, to assist reduce the fluid on your ear. If you operate a diuretic, your physician might maximum in all likelihood suggest you to lessen your salt consumption [20].

Steroids. You can also be prescribed a short direction of steroids in case your medical doctor suspects you've got got an underlying immune device issue. Although there is not lots you may do to keep away from Meniere's ailment, there are some matters you may do to help control your signs. If you are struggling a vertigo assault, do the subsequent: Sit down and continue to be as immobile as feasible. Avoid shiny mild, loud noise, and different triggers through now no longer making speedy actions. Reading or maybe looking TV is probably detrimental. Fix your eyes on a solid object [16].

DIFFERENTIAL DIAGNOSIS

- a. Stroke of anterior circulation
- b. Thrombosis of basilar artery
- c. Benign positional vertigo
- d. Benign cranium tumor
- e. Gliomas of brainstem
- f. Cerumen clog removal
- g. Foreign frame removal
- h .Acute otitis media
- g. Subarachnoid haemorrhage
- h. Meningitis
- i. Hyperthyroidism and myxedema coma
- j. Inner ear labyrinthitis
- k. Lyme disorder
- l. Ischaemic stroke
- j. Multiple sclerosis
- k. Neurosyphilis
- l. number one tumors of cranium
- j. Toxicity of salicylate
- k. Viral encephalopathy
- l. Wernicke's encephalitis

If Menière's sickness is left however untreated for 10 years or extra, listening to can also additionally get worse because the vertiginous episodes lessen gradually. Caffeine, alcohol, and nicotine ought to be prevented as a part of remedy control. In extreme, unresponsive episodes, diuretics, antiemetics, antidepressants, and vestibular suppressants can be prescribed, and surgical procedure can be considered [21]. Hearing may also lower while the vertiginous episodes fade away if Menière's infection is left however untreated for 10 years or extra. Sodium restriction, in addition to the avoidance of caffeine, alcohol, and smoking, are all a part of clinical remedy. In extreme, unresponsive instances, diuretics, antiemetics, antidepressants, and vestibular suppressants

can be administered, and surgical procedure can be considered [22-27].

6. CONCLUSION

Meniere's ailment is an internal ear contamination. It can produce excessive dizziness, tinnitus (a roaring sound for your ears), fluctuating listening to loss, and the feeling of ear strain or discomfort. It typically best influences one ear. It is one of the maximum accepted reasons of listening to loss.

Dizziness assaults would possibly occur unexpectedly or after a quick duration of tinnitus or muted listening to. Single incidents of dizziness arise in a few people on an ordinary basis. Others can also additionally enjoy a chain of attacks spanning numerous days. Some individuals with Meniere's contamination revel in "drop assaults," which reason them to lose their equilibrium and fall.

The reason has but to be located through scientists. They agree with it has something to do with fluid stages or fluid blending within side the canals of your internal ear. Doctors diagnose it primarily based totally for your signs and a bodily examination. A listening to take a look at can decide how you're listening to has been broken. There isn't any any manner to prevent it. Dizziness medicinal drugs, a low-salt diet, and the usage of water pills are all alternatives for remedy. A tool that inserts within side the outer ear and sends air pulses to the center ear can be of assistance. Surgery can be required in extreme situations.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sajjadi H, Paparella MM. Meniere's sickness. *The Lancet*. 2008;372(9636): 406–14.

2. Aggarwal A, Venkatraman I, Prabakaran M. Evaluation of Giddiness with MRI. *Journal of Pharmaceutical Research International*. 2020;33-9.
3. Gürkov R, Pyykö I, Zou J, Kentala E. What is Ménière's disorder? A modern-day re-assessment of endolymphatic hydrops. *J Neurol*. 2016;263 Suppl 1:S71-81.
4. Ménière's Disease: Symptoms, Causes, Treatments, and More [Internet]. Healthline; 2012. [Cited 2021 Nov 17]. Available: <https://www.healthline.com/health/menieres-ailment>
5. Ménière's Disease: Causes, Symptoms, Diagnosis & Treatment [Internet]. Cleveland Clinic. [cited 2021 Nov 17]. Available from: <https://my.clevelandclinic.org/health/illnesses/15167-m%C3%A9ni%C3%A8res-ailment>
6. Koenen L, Andaloro C. Ménière disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021. [Cited 2021 Nov 17]. Available: <http://www.ncbi.nlm.nih.gov/books/NBK536955/>
7. Ménière's Disease [Internet]. WebMD. [cited 2021 Nov 17]. Available: <https://www.webmd.com/mind/what-is-meniere-ailment>
8. Ménière's Disease [Internet]. National Library of Medicine. [Cited 2021 Nov 17]. Available: <https://medlineplus.gov/menieres-disease.html>
9. Ménière Disease (Idiopathic Endolymphatic Hydrops) Clinical Presentation: History, Physical Examination, Complications [Internet]. [Cited 2021 Nov 17]. Available: <https://emedicine.medscape.com/article/1159069-medical>
10. Ballester M, Liard P, Vibert D, Häusler R. Ménière's disorder withinside the elderly. *Otol Neurotol Off Publ Am Otol Soc Am Neurotol Soc Eur Acad Otol Neurotol*. 2002;23(1):73–8.
11. Cureoglu S, da Costa Monsanto R, Paparella MM. Histopathology of Ménière's disorder. *Oper Tech Otolaryngol--Head Neck Surg*. 2016;27(4):194–204.
12. Paparella MM. Pathogenesis of Ménière's Disease and Ménière's Syndrome. *Acta Otolaryngol (Stockh)*. 1983;96(Sup 406):10–25.
13. Salvinelli F, Greco F, Trivelli M, Linthicum FH. Ménière's sickness. Histopathological modifications: a publish mortem look at on temporal bones. *Eur Rev Med Pharmacol Sci*. 1999;3(4):189–93.
14. ALTMAN F. Histological findings in Ménière's symptom complicated. *Ann Otol Rhinol Laryngol*. 1943;52:52–80.
15. Committee on Hearing and Equilibrium Guidelines for the Diagnosis and Evaluation of Therapy in Ménière's Disease. *Otolaryngol Neck Surg*. 1995;113(3):181–5.
16. Kim HH, Kumar A, Battista RA, Wiet RJ. Electrocochleography in sufferers with Ménière's ailment. *Am J Otolaryngol*. 2005;26(2):128–31.
17. Burgess A, Kundu S. Diuretics for Ménière's ailment or syndrome. Cochrane ENT Group, editor. *Cochrane Database Syst Rev* [Internet]; 200. [Cited 2021 Nov 17]; Available: <https://doi.wiley.com/10.1002/14651858.CD003599.pub2>
18. Ménière's ailment [Internet]. nhs.uk; 2017. [Cited 2021 Nov 17]. Available: <https://www.nhs.uk/situations/menieres-ailment/>
19. Ménière's ailment - Diagnosis and remedy - Mayo Clinic [Internet]. [Cited 2021 Nov 17]. Available: <https://www.mayoclinic.org/illnesses-situations/menieres-sickness/analysis-remedy/drc-20374916>
20. What are the differential diagnoses for Ménière Disease (Idiopathic Endolymphatic Hydrops)? [Internet]. [Cited 2021 Nov 17]. Available: <https://www.medscape.com/answers/1159069-84691/what-are-the-differential-diagnoses-for-meniere-ailment-idiopathic-endolymphatic-hydrops>
21. Knox GW, McPherson A. Ménière's ailment: Differential analysis and remedy. *Am Fam Physician*. 1997;55(4):1185–90, 1193–4.
22. Attyé A, Eliezer M, Galloux A, Pietras J, Tropes I, Schmerber S, et al. Endolymphatic hydrops imaging: Differential prognosis in sufferers with Ménière disorder signs and symptoms. *Diagn Interv Imaging*. 2017;98(10):699–706.
23. Jain, S., Jungade, S., Ranjan, A. et al. Revisiting "Ménière's Disease" as "Cervicogenic Endolymphatic Hydrops" and Other Vestibular and Cervicogenic

- Vertigo as "Spectrum of Same Disease": A Novel Concept. Indian J Otolaryngol Head Neck Surg. 2021;73:174–179.
24. Hathi, Deep, Ayush Somani, Anusha Gupta, Sourya Acharya. Neurocysticercosis presenting as complex partial seizures. Journal of evolution of medical and dental sciences-jemds. 2020; 9(13):1116–18.
25. Kshirsagar, Pooja Chandrakant, Neema Acharya, Sourya Acharya, Amardeep Tembhare. Seizures in pregnancy- A rare case of neurocysticercosis mimicking eclampsia. Journal of Evolution of Medical and Dental Sciences-JEMDS. 2020;9(12): 1012–14.
26. Raj N, Dhande RP. MRI Evaluation of seizures in pediatric age group patients in a rural hospital of central India. Journal of Pharmaceutical Research International. 2021;33(32B):167–72.
27. Bagga, Charan, Iftexhar Ansari, Amrutha Garikapathi, Irshadv, Srinivas Naik, Sachin Agrawal, and Sunil Kumar. Status epilepticus presenting feature of pulmonary embolism: Rarest of rare combination. Medical Science. 2020; 24(105):3277–80.

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