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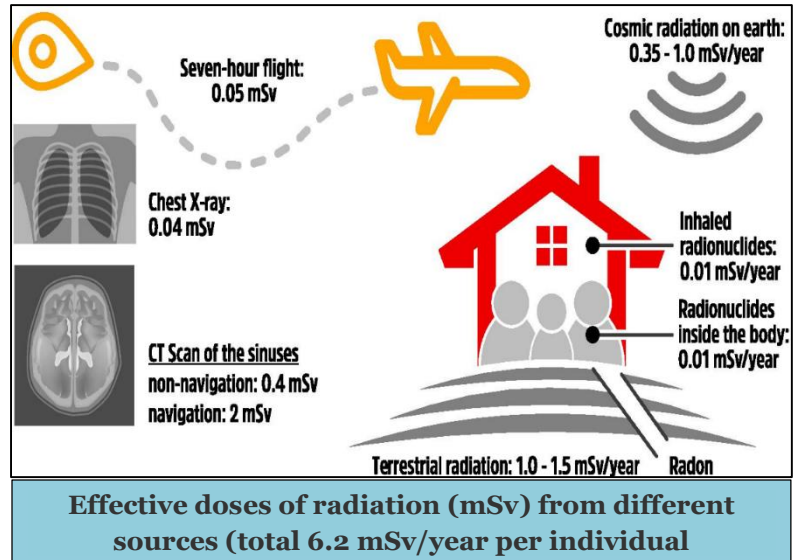
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3D SINUS CT SCANS AND ASSOCIATED RADIATION RISKS IN ADULTS AND PEDIATRIC PATIENTS

INTRODUCTION

Currently, navigation system is commonly used in neurosurgery and otolaryngology, especially for the pediatric patients.¹ 3D CT scans are useful in young population for proper visualization of the anatomically smaller structures and also to reduce risk of complications. However, the hazards of radiation are more in children due to higher radio sensitivity than adults and longer lifespan after radiation exposure. The most feared

complications include Radiation-induced cancers. Several strategies like modification in acquisition parameters, use of iterative reconstructive techniques, uses of eye lens shielding and the adoption of cone beam technologies have been studied. The best way to decrease radiation exposure is to avoid unnecessary scanner examinations.²



Around 3 dosimetry quantities have been defined to measure radiation, the absorbed dose, the equivalent dose and the effective dose. The absorbed dose corresponds to the amount of energy deposited in a substance and is measured in a unit called the gray. A dose of one gray is equivalent to a unit of energy deposited in one Kg of a substance. The equivalent dose is the damaging properties of the various types of radiation and is based on the absorbed dose by a tissue or an organ and is expressed in a unit called the Sievert. Lastly, the effective dose is a measure of the total detriment or risk, due to exposure to ionizing radiation. The effective dose calculation combines the absorbed dose to the whole body, the relative harm level of the radiation as well as the specific sensitivity of each organ to ionizing radiation.

No study either in children or adult patients has quantified the difference of effective dose of radiation caused by 3D navigation acquisition protocol compared to a standard protocol specifically for CT scans of the sinuses.

OBJECTIVES

The objectives of this study were to assess the frequency of prescribing 3D navigation CT and to compare the effective radiation doses for adults and children for a similar navigation procedure.

METHOD

Retrospective cohort study was done through electronic chart review of adult as well as pediatric patients who underwent navigation and non-navigation CT scan of sinuses. Out of 115 total CT Scans analysed, 68 were 3D Scans and 47 were standard CT Scans (of which, 31 were of children and 84 of adults) were included in the study. Student's T-Test was used to compare adequate radiation dose for 3D and Standard navigation protocols for both adults and children. The Kruskal-Wallis test was utilized to confirm the results as the sample size was less.

RESULTS

The mean effective dose was found to be 0.37 mSv for the standard CT scan of the total population, whereas, the mean effective dose for the 3D sinus CT Scan was 2.33 mSv. The mean difference between these groups was significant statistically at $p < 0.0001$. The radiation usage was found to be six times more for 3D navigation as compared to non-navigation/standard CT Scan.

		N	mSv (SD)	Difference (CI 95%)	P value
Total	Standard	47	0.37 (0.16)	-1.97 (-2.1 to -1.83)	<0.0001
	Navigation	68	2.33 (0.45)		
Adults	Standard	33	0.37 (0.18)	-2.06 (-2.17 to -1.96)	<0.0001
	Navigation	51	2.44 (0.26)		
Children	Standard	14	0.35 (0.11)	-1.68 (-2.07 to -1.29)	<0.0001
	Navigation	17	2.03 (0.71)		
Standard protocol	Children	14	0.35 (0.11)	-0.02 (-0.11 to 0.08)	0.65
	Adults	33	0.37 (0.18)		
Navigation protocol	Children	17	2.03 (0.71)	-0.41 (-0.64 to -0.17)	0.03
	Adults	51	2.44 (0.26)		

Summary of Results

In the pediatric 3D navigation group, the majority of patients had only 1 CT examination for the same indication. Around 4, patients had a standard CT before the 3D navigation sinus CT scan. Of the 17 patients, 11 underwent surgical intervention after the navigation CT scan. In 6 patients, the CT scan did not show any indications for surgical intervention. In both the population, most of the navigation CT scans were prescribed by otolaryngologists. In adult patients 33 (40%) non-navigation and 51 (60%) 3D navigation CT scans were observed. Of the 51 patients, only 25 underwent or had an indication for sinus surgery following 3D navigation CT scanning. In 26 patients, imaging results did not reach criteria to undergo sinus surgery. In the latter group, 21 patients had 1 or more sinus CT for the same indication. Majority of the patient had standard sinus CT protocols (14 patients) and less often, patients had another 3D navigation sinus CT scan (7 patients). The study also found that 20% more radiation was used in adults for 3D navigation than in pediatric population.

CONCLUSION

3D Navigation CT Scans have been useful in diagnosis as well as intervention (navigation based surgeries). However, the six-fold increase in radiation exposure and its associated complications cannot be ignored. Therefore, a patient-centered approach and close monitoring of radiation protocols is suggested to reduce the radiation exposure and ensure adequate radioprotection.

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Assessment of Apnoea-hypopnea index in paediatric patient undergoing Adenotonsillectomy

Introduction

Globally, Pediatric Adenotonsillectomy is the most commonly performed surgical procedures with over 500,000 surgeries annually, accounting for 16% of all ambulatory surgeries in children up to 16 years old. ¹A clinical practice guideline by the American Academy of Otolaryngology-Head and Neck Surgery was released in 2011 and revised in 2019, still there remains little evidence to guide clinicians in their postoperative monitoring and management of pediatric patients following adenotonsillectomy. ² Concern for postoperative airway obstruction and apnea has been increasing in recent years in conjunction with the observed increase in the percentage of adenotonsillectomies performed for obstructive sleep apnea rather than chronic or recurrent tonsillitis. Children with severe obstructive sleep apnea often suffer with significant residual obstruction during the 1st night following the surgery. Correlation between severity of obstructive sleep apnea based on apnea–hypopnea index and risk of adverse overnight events postoperatively has been demonstrated.

Objective

This study aimed to examine severity of apnea hypopnea index as an independent predictor of postoperative respiratory complications in pediatric patients undergoing adenotonsillectomy.

Methods

Retrospective chart review was performed in children 18 months to 18 years old undergoing adenotonsillectomy and the data like patient age, gender, obesity, minimum oxygen saturation (%) during admission, reason for adenotonsillectomy were collected. Each of the patient were subdivided into 2 groups either respiratory events group or “non-respiratory adverse events group” Respiratory events were defined as following: SpO₂ < 90%, supplemental oxygen requirement, administration of inhaled medications, pulmonary edema, laryngospasm, or bronchospasm. Non-respiratory adverse events were defined as prolonged hospital stay i.e. >24 hours, need for unplanned Pediatric-ICU admission, need for supplemental narcotics, steroids, or antibiotics. Patient were observed for total adverse events and respiratory events occurring during admission. To determine the statistical significance between continuous variables and relative risk values,

Unpaired T test was used and Two-tailed Fisher's exact test were calculated for categorical variables.

Results

Respiratory events were observed in 50.6% of patients with Apnea hypopnea index ≥ 10 and in 39.6% of patients with Apnea hypopnea index < 10 (Figure 1). The overall mean Apnea hypopnea index was 19.2, with a mean of 28.1 in the Apnea hypopnea index ≥ 10 subgroup vs 4.6 in the Apnea hypopnea index < 10 subgroup. Linear and logistic regression modelling was done based on Apnea hypopnea index vs total adverse events and respiratory events (Figure 2 and Figure 3). Pearson product-moment correlation coefficients revealed a weakly positive correlation between Apnea hypopnea index and total adverse events ($r = .13$).

No statistical correlation or increased risk between an Apnea hypopnea index ≥ 10 and having a pure respiratory event, with a relative risk of 1.19 was noted. Statistically significant difference between the mean Apnea hypopnea index of those with any adverse event and those without any adverse event were recorded. There is additionally an increased risk of any event with an Apnea hypopnea index over 10, with a relative risk of 1.51

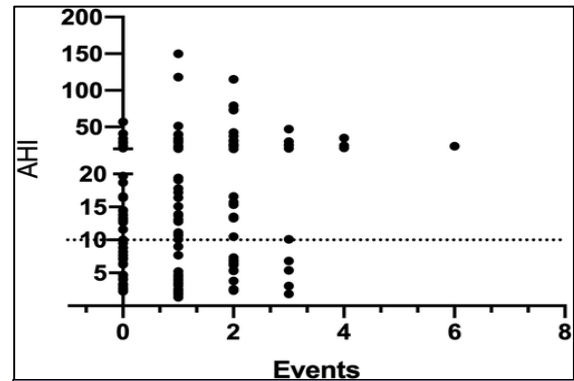


FIGURE 1: Scatterplot depicting pooled distribution of total overnight events vs AHI. The dotted line signifies an AHI of 10. AHI: apnea-hypopnea index.

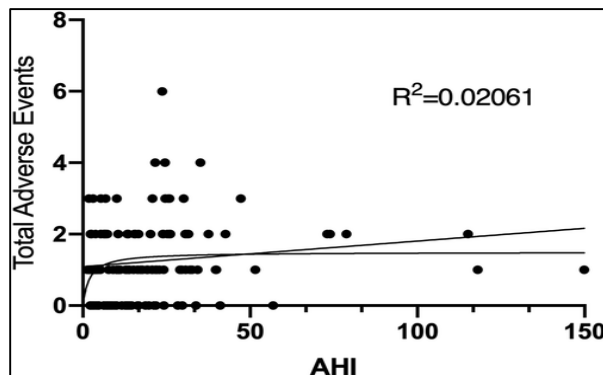


FIGURE 2: Linear and logistic regressions modeling AHI vs total adverse events

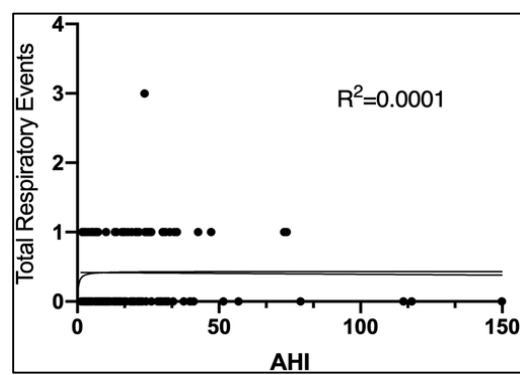


FIGURE 3: Linear and logistic regressions modeling AHI vs respiratory events

Conclusion

This study concluded that the Preoperative apnoea-hypopnea index of 10 events per hour is not a predictor of respiratory complications. Physicians should always give their best decision in

deciding whether a child warrants postoperative admission following adenotonsillectomy. However, further research will be required for more complete understanding of the significance of the severity of apnea–hypopnea index in the post-adenotonsillectomy setting.

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MOST EFFECTIVE SURGERY IN REVERSING ENDOLYMPHATIC HYDROPS IN MENIERE’S DISEASE: A COMPARISON STUDY

INTRODUCTION

Meniere’s disease is a syndrome characterized by a triad of symptoms: attacks of incapacitating vertigo, tinnitus and sensorineural hearing loss.¹ Meniere’s disease has an unknown etiology. However, the symptoms are assumed to be associated with the enlargement of cochlear and vestibular endolymphatic space, together known as endolymphatic hydrops (EH).¹ When conventional medical treatments for Meniere’s disease fails, endolymphatic sac surgery surgical procedure is usually considered according to the treatment guidelines for Meniere’s disease. The effectiveness of endolymphatic sac drainage surgery, according to Portmann (1927), was considered to be achieved through opening the endolymphatic sac, decreasing the endolymphatic pressure for Meniere’s disease. Endolymphatic sac decompression improves the absorption of endolymph in sac. Recently, a novel surgical sac technique used in the treatment of Meniere’s disease, endolymphatic duct blockage, was found effective without any noticeable cochlear and vestibular damage. This procedure decreases hydrops, by reducing in the volume of the endolymph in the inner ear coming from the sac. The efficacy of these treatments is yet to be proved, and the mechanisms underlying their effects remain speculative.²

OBJECTIVE

This comparative study aims to determine the most suitable surgical methods among endolymphatic duct blockage, endolymphatic sac drainage and endolymphatic sac decompression surgery in reversing endolymphatic hydrops in patients with intractable Meniere’s disease.

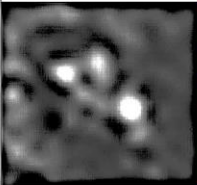
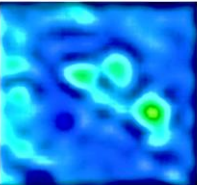
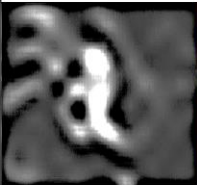
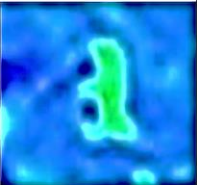
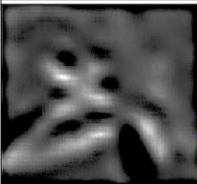
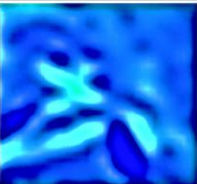
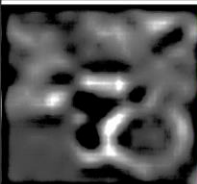
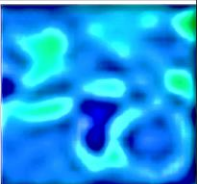
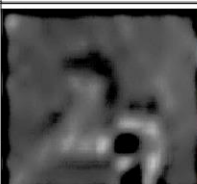
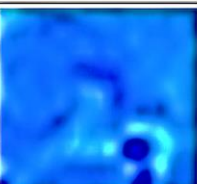
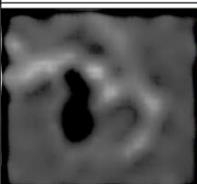
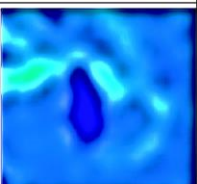
METHODS

A total of 27 patients with intractable Meniere’s disease (criteria: recurrent vertigo ≥ 6 months with a failure of all non-surgical interventions) who underwent endolymphatic duct blockage surgery (n=10), endolymphatic sac decompression surgery (n=8) and endolymphatic sac drainage surgery (n=9) were taken for the study. These patients were evaluated by gadolinium enhanced MRI

technique prior to, 2 weeks after and > 12 months’ interval after surgery. Paired T-test at $p<0.05$ was used for the analysis.

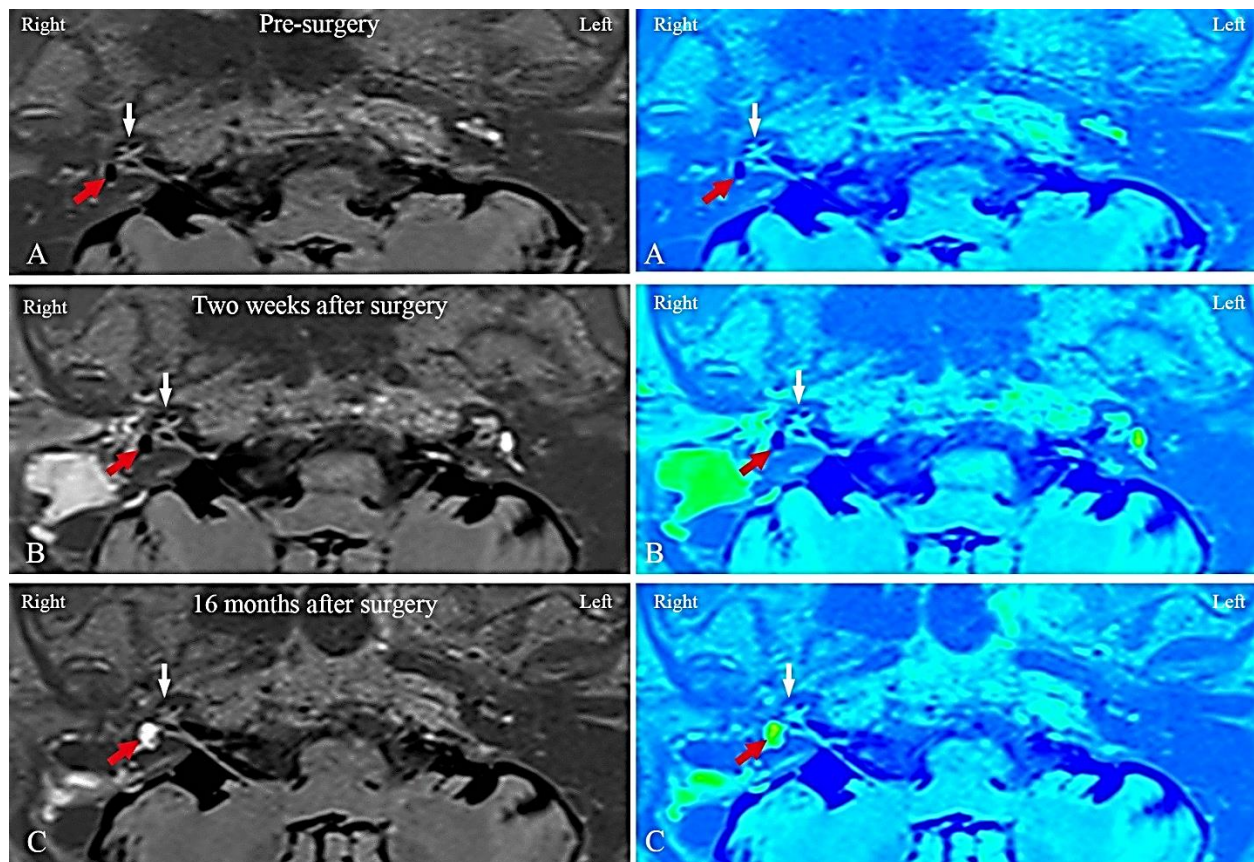
RESULTS

Out of 10 patients who underwent endolymphatic duct blockage, no reversal in endolymphatic hydrops was noted in the second MRI following 2 weeks of surgery, whereas, the third MRI showed reversal of vestibular endolymphatic hydrops in 3 patients of which 2 patients had improvement in cochlear hydrops. The remaining 6 patients did not have any change in endolymphatic hydrops even after the surgery.

EH-grade	Explanation cochlea	Example cochlea		Explanation vestibule	Example veatibule	
grade 0 (normal finding)	cEH grade 0: no dislocation of the Reissner's membrane			vEH grade 0: EVVR < 30%		
grade I (mild EH)	cEH grade I: dislocation of the Reissner's membrane but not reaching over the scala vestibuli			vEH grade I: EVVR 30-50%		
grade II (significant EH)	cEH grade II: endolymphatic space reaches over the scala vestibuli			vEH grade II: EVVR > 50%		

Criteria for grading of the cochlear and vestibular hydrops in three-dimensional fluid-attenuated inversion recovery MRI axial scans in the left column, and the corresponding MRI colored image in the right column. MRI, magnetic resonance imaging

For endolymphatic sac drainage group, out of 9 patients, 4 had reversal of endolymphatic hydrops within 2 weeks and the third MRI revealed recurrence of vestibular endolymphatic hydrops in one of these 4 patients. However, out of 8 patients, who underwent endolymphatic sac decompression, both second and third MRI witnessed no reversal of endolymphatic hydrops. It was also seen that in patients with endolymphatic duct blockage who had reversal of endolymphatic hydrops, there was complete control of vertigo and hearing was improved too. Whereas, in patients with reduced endolymphatic hydrops after endolymphatic sac drainage had control of vertigo but there was no change in hearing.



MRI axial scans (left column), and the corresponding MRI colored images (right column)

CONCLUSION

The findings of this study suggest that both endolymphatic duct blockage surgery and endolymphatic sac drainage surgery have potential to reduce endolymphatic hydrops in patients with Meniere's disease. However, endolymphatic sac decompression surgery did not reverse endolymphatic hydrops in Meniere's disease patients

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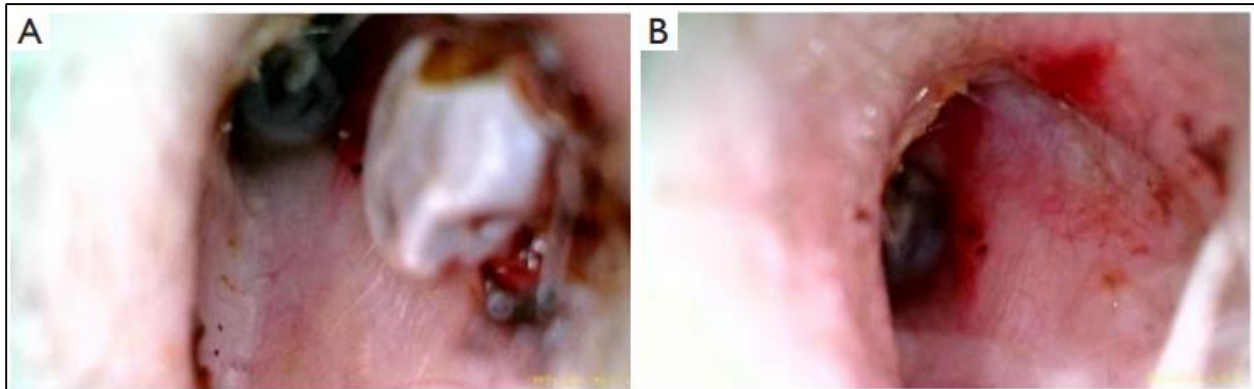
Tick induced Facial Nerve Palsy: A Case Report

Introduction

Out of 70 species of ticks, 16 of them feed on both humans and domestic animals and a few of them are capable of causing paralysis. The most potent Ticks worldwide is *Ixodes Holocyclus* and the less toxic is *Ixodes Cornuatus*. Conditions like moist and humid limits the distribution of ticks. Ticks are most seen between the month of September and March. Ticks have a life cycle consisting of different stages, such as egg, larva, nymph and adult. In order to moult and evolve, each stage requires a new host thus requiring 3 hosts to complete their full life cycle. Females host on human blood, while males host on female ticks. The clinical presentation of tick bite varies depending on the severity of the infection.

Clinical Presentation

A 66-year-old male patient was presented with a chief complaint of left sided facial weakness, since 2 days. The patient was then prescribed a 6-day course of ototopical antibiotics for a presumed left sided otitis externa. Patient complaint of an initial incident of stinging in the ear while cleaning, 10 days prior. Patient also complained of feeling unsteady on his feet 3 days back. No change in hearing, no reports of tinnitus, vertigo or otorrhea was recorded. Patient reported normal motor and sensory function in bilateral upper and lower limbs without any diplopia or vision changes. No past medical history was identified.



Patients external auditory canal. (A) Intra-aural tick, (B) post removal of tick from external canal.

On examination, vital signs were found to be normal, left ear and auricle appeared normal with no pain on palpation of the pinna and no herpetic lesions were observed. Otoscopy was performed, which revealed of having a live tick (*Ixodes Holocyclus*) in the posterior superior aspect of the lateral external auditory canal with an intact and aerated tympanic membrane. Cranial nerve examination showed paraesthesia in the left V1 distribution to light touch and a Grade 3 House Brackmann lower motor neuron palsy was noted. Other nerves examined were normal. Tone,

power, reflexes and sensation were normal in upper and lower limbs and ataxia was not observed during examination.

Patient was then immediately prescribed with 8mg dexamethasone and the left external auditory canal was filled with olive oil for 1 hour prior to removal with the aim to kill the ticks. The tick remained alive at time of removal, even after the application of oil. To remove the tick from the external auditory canal, Micro Alligator Forceps were used. Left out faecal material were removed with the help of suction. The patient was prescribed with Ciprofloxacin Hydrocortisone ear drops for 7 days, Prednisolone 60 mg for 10 days, oral doxycycline and frequent eye lubrication and protection at night was recommended.



After 6 days of discharge patient was asked to visit OPD for further follow up. Rickettsia serology showed negative as did testing for mammalian meat allergy. The patient described of a gradual resolution of forehead numbness and facial weakness and reported of complete resolution of facial weakness by day 3 and resolution of forehead paraesthesia on day 4, followed by resolution of imbalance on day 5. At time of examination, the ear canal was found to be normal with a slight frontalis muscle asymmetry with intense contraction, which was reported as pre-existing.

Conclusion

Vigilant examination of the face, scalp and external auditory canal should be done in patients with otalgia and facial nerve palsy. Quick removal of ticks should be conducted, to prevent the progression of disease. Steroids use has found to be benefitted in such cases.

Reference:

Porrett J, Albarki H, Honeybrook A. Tick induced facial nerve paresis. Australian Journal of Otolaryngology. 2021 Dec 15;4.



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