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RESEARCH ARTICLE

THE DIAGNOSTIC AND ETIOLOGICAL CONTRIBUTION OF SECTIONAL IMAGING IN DEAFNESS (ABOUT 80 CASES)

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Abstract

Introduction: Deafness is defined as hearing impairments that can occur at any age and can be of genetic or idiopathic origin. They can occur both abruptly and gradually. The aim of this work is to underline the diagnostic and above all etiological contribution of spiral CT and MRI during deafness, which makes it possible to orient the therapeutic conduct.

Materials and methods: We conducted a prospective work on patients explored in the radiology department of August 20 Hospital in Casablanca for deafness apart from chronic otitis media and post-traumatic deafness, between March 2012 and December 2013. 43 patients were explored by computed tomography (CT) of the rocks with multiplanar reconstructions (16 strips) and 37 patients were explored by magnetic resonance imaging (MRI) 1.5 Tesla.

Results: There were 80 patients with an average age of 42 years. There was a female predominance (55 women for 25 men). Hearing loss was bilateral (75%), usually symmetrical; 3 times greater than unilateral involvement (25%). This deafness was sudden in 30 patients (37.5%) and progressive installation in 50 patients (62.5%). Conductive hearing loss was found in 22 cases (27.5%), sensorineural hearing loss in 22 cases (27.5%) and mixed hearing loss in 36 cases (45%). The etiological diagnoses were as follows: 18 cases of otosclerosis (22.5%), 7 cases of CSL agenesis (8.75%), 10 cases of cerebellopontine angle tumor (12.5%), 12 cases of paraganglioma jugulo - tympanic (15%), 7 cases of vasculo-nervous crossing (8.75%) and 26 cases which turned out to be normal (32.5%).

Conclusion: The determination of the causes of deafness has greatly benefited from the development of medical imaging. They benefit from medical and/or surgical treatment essentially depending on their mechanism, their severity and the results of imaging based on the CT-MRI pair.

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Introduction:-

Deafness is defined as hearing impairments that can occur at any age and can be of genetic or idiopathic origin. Theys can occur suddenly as well as gradually [1]. Deafness is an invisible disability that is relatively unknown to the general public. It represents is the third cause of disabilities in Tunisia in 2013 [2] and 17% of cases in the world population to varying degrees. 2/3 of these people live in developing countries like Mali. The prevalence of deafness is 3 per thousand in children and 50% of deafness and hearing disorders are avoidable. Deafness can remain stable throughout life, but it can also be progressive [1, 3]. Currently, the para-clinical investigations, and in particular cross-sectional imaging (namely the scanner (CT) and (Magnetic resonance imaging (MRI)), make it possible more and more often to detect a cause or to suspect Finally, a factor helping to guide the therapeutic attitude. They should be requested only after complete clinical and audiometric assessment and CT remains the key examination for the morphological assessment of any ear [3,4,5]. The aim of this work is to underline the diagnostic and above all etiological contribution of spiral CT and MRI during deafness, which makes it possible to guide the therapeutic approach.

Materials And Methods:-

We conducted a prospective work on patients explored for deafness apart from chronic otitis media and post-traumatic deafness, between March 2012 and December 2013 in the radiology department of the August 20 hospital at the CHU Ibn Rochd in Casablanca. 43 patients were explored by computed tomography (CT) of the rocks in helical mode with multiplanar reconstructions. It was a 16-slice scanner with an acquisition time less than or equal to 60 seconds and a slice thickness of 0.6 to 0.3 mm. The reconstruction plane was parallel or perpendicular to the lateral Semicircular Canal. And 37 patients were explored by magnetic resonance imaging (MRI) of 1.5 Tesla with T1 and T2 Spin Echo sequences. The slice thickness was 1mm to 0.5 mm (axial) and 1.4 mm to 0.7 mm (sagittal) or a FIESTA sequence on the cerebellar pontine angle. An MRI with brain sections was always performed.

Results:-

There were 80 patients with an average age of 42 years. There was a female predominance (55 women or 68.75% of cases for 25 men or 31.25% of cases**) (Figure1)**

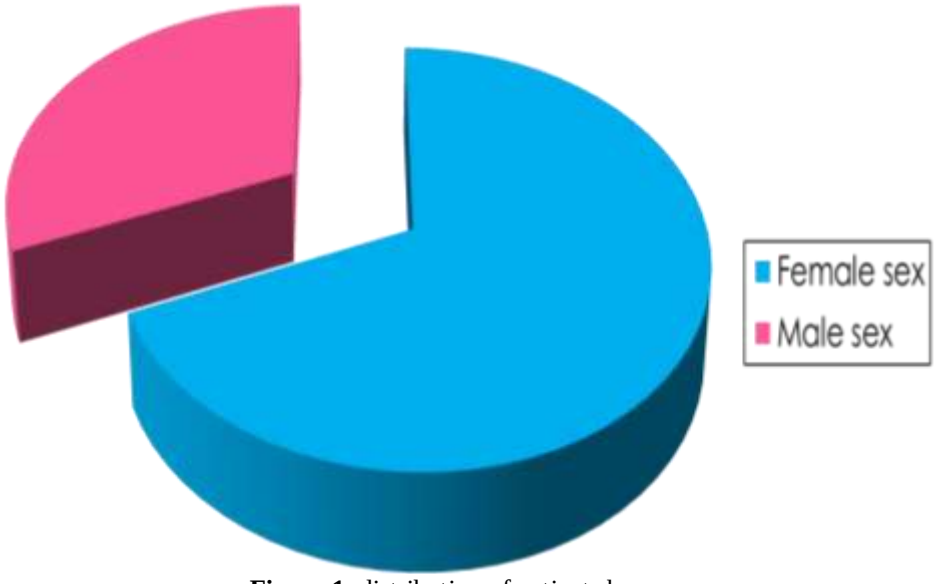

Figure 1: distribution of patients by sex.

Deafness was bilateral in 75% of cases, most often symmetrical; 3 times greater than unilateral involvement, which represented 25% of cases. The onset of deafness was sudden in 30 patients or 37.5% of cases and progressive installation in 50 patients or 62.5% of cases. Conductive hearing loss was found in 22 cases or 27.5% of cases, sensorineural hearing loss in 22 cases or 27.5% of cases and mixed hearing loss in 36 cases or 45% of cases (Table 1).

deafness	Number	Percentage (%)
Conductive hearing loss	22	27.5
sensorineural hearing loss	22	27.5
Mixed	36	45

Table 1:- Distribution of patients according to type of deafness.

The etiological diagnoses found on CT and MRI was represented as follows (Table2) :

etiologies	Number	Percentage (%)
Otosclerosis	18	22,5
Agénésis of the lateral semicircular canal	7	8,75
Tumeur of the pontocerebellar angle	10	12,5
Carotid-jugulal paraganglioma	12	15
Vascular- nervous crossing	7	8,75

Table 2:- Distribution according to etiologies found on imaging.

18 cases of otosclerosis i.e. 22.5% of cases (Figure 2), 7 cases of agenesis of the Lateral Semicircular Canal (LSC) i.e. 8.75% of cases, 10 cases of tumor of the cerebellopontine angle (APC) i.e. 12.5% of cases, 12 cases of jugulotympanic paraganglioma 15% of cases, 7 cases of vasculo-nervous crossing i.e. 8.75% of cases (Figures: 3, 4 and 5).

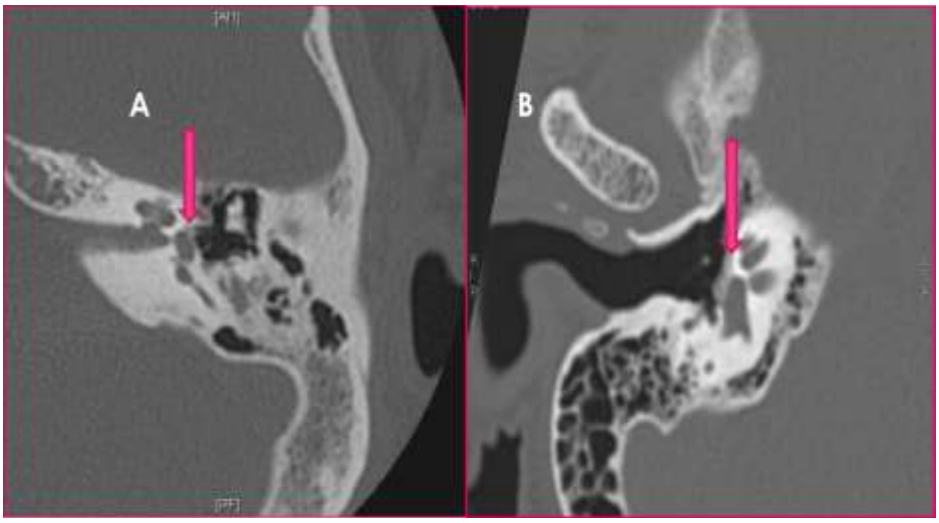

Figure 2:- (A and B): CT in axial section showing anterior foci of prestapedial hypodensity of otosclerosis.

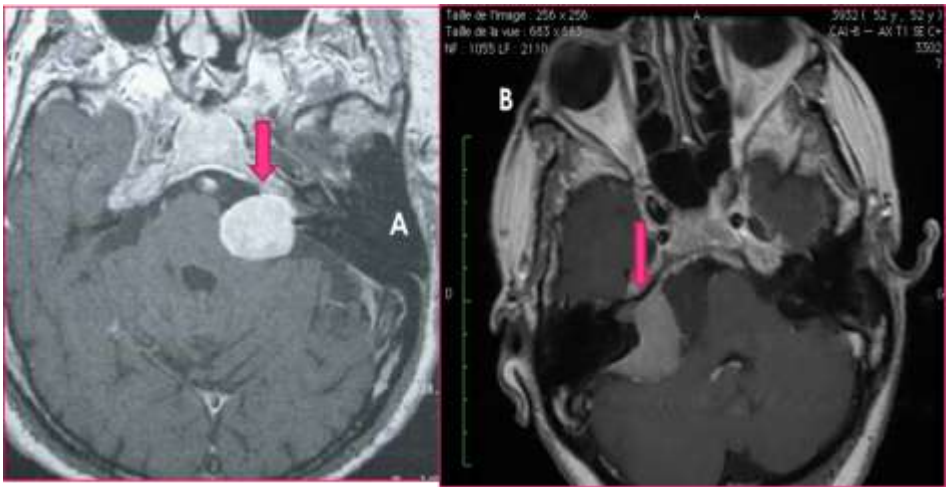

Figure 3:- (A and B): MRI after injection of gadolinium in T1 showing tumors of the cerebellopontine angle (neurinoma VII (A) and meningioma (B))

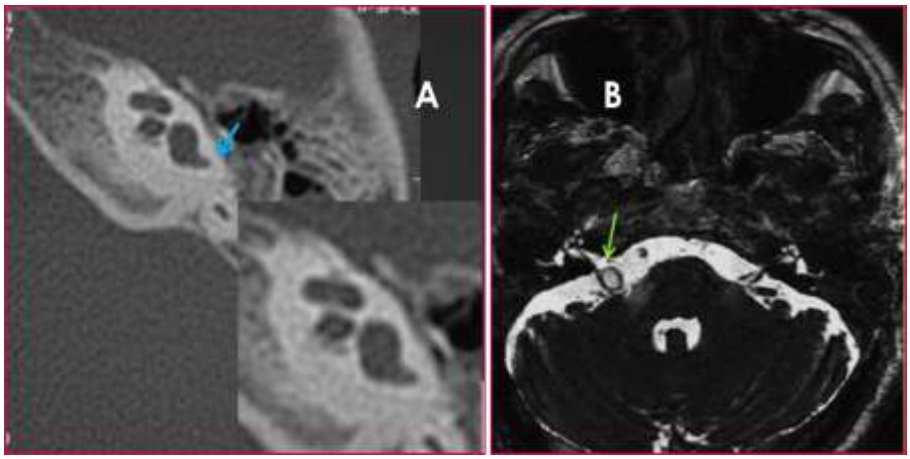

Figure 4:- (A and B): CT scan of the rocks (A) showing CSL agenesis and MRI (B) in FIESTA sequence showing vasculo-nervous conflict.

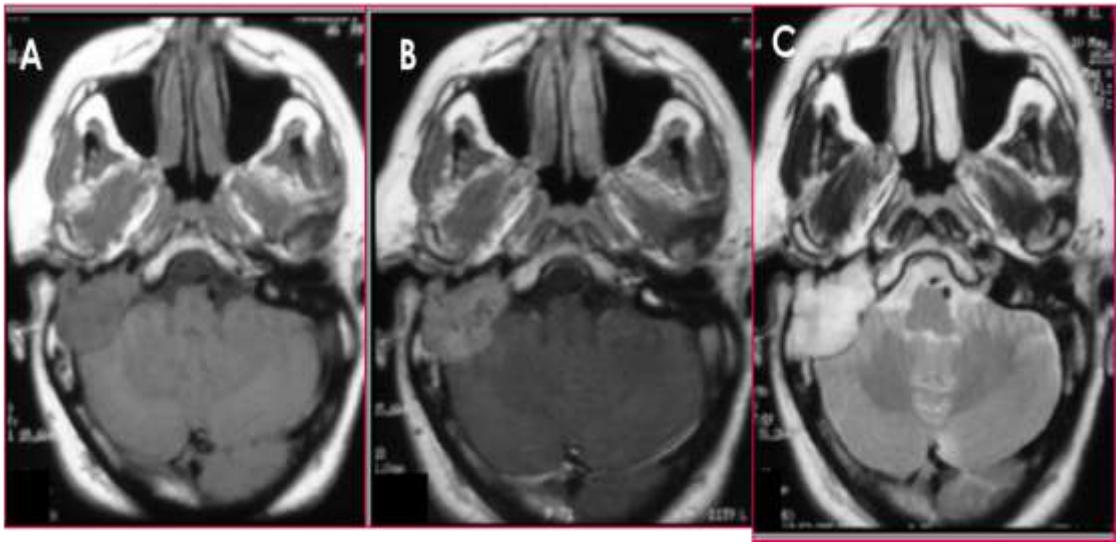

Figure 5:- (A, B and C): MRI showing a right jugulocarotidian paraganglioma in T1, Flair and T1 sequence after injection of gadolinium.

In our series, 26 patients (32.5% of cases) had a normal imaging result.

Discussion:-

Epidemiology:

Deafness is the first handicap in France [6] and is among the top 3 in Africa, including Tunisia [7]. But it is difficult to accurately estimate the number of people affected in Morocco. However, rare are the studies in Morocco which have been interested in the interest of the CT-MRI couple in deafness in adults. The average age of our population was 42 years 32 years. In the literature: S. Charfeddine et al [2], Farinetti et al. [2.8], Samaha et al. [2.9], Tom et al. [2.10], it was 32 years, 51.9 years, 51 years and 53.8 years respectively. This can be superimposed on the last three studies, but the difference with S.'s study could be explained by the small number of elderly consultants in his series. Indeed, the extreme age in the series of S. Charfeddine was 56 years but 80 years in our study. The female sex was predominant in our study (55 cases) for 25 male cases. In the study by S. Charfeddine et al [2.], the male sex was slightly predominant (22 cases) against 20 female cases and this could be explained by the non-influence of the phenotype in the different etiologies of deafness.

Clinical:

Clinical screening for deafness regardless of age is essential. Deafness leads to social isolation, depression and an accelerated decline in cognitive functions [11]. The clinical diagnosis requires careful questioning with knowledge of the history. It will begin with an otoscopy with confirmation of the type and degree of deafness by audiometry is strongly recommended. The deafness was of progressive installation in our series in 50 cases and brutal in 30 cases. In the study by S. Charfeddine, there were respectively 31 cases of progressive onset deafness and 11 cases of sudden onset deafness [2]. This difference can only be explained by the high number of sampling in our study (80 cases) almost double the series of S. Charfeddine (42 cases). Conductive hearing loss is damage to the transmission apparatus. The damage can be in the outer ear or the middle ear (lesion of the chain of ossicles)[11]. And a CT scan is the best means of exploration after a clinical diagnosis in search of etiology. In our series, conductive hearing loss was found in 22 cases, i.e. 27.5% of cases. Sensorineural or sensorineural hearing loss is due to a dysfunction of the sensory apparatus which is made up of the inner ear, the cochlear nerve, the central auditory pathways and the auditory cortex [11]. MRI would be more suitable for a exploration in sensorineural deafness. 37 patients were explored by MRI in series and including 22 cases or 27.5% of cases of sensorineural hearing loss. Mixed deafness has a transitional part and a neurosensory part (like an earwax plug in an elderly presbycusic patient)[11]. We will always think of the CT scan and we had 36 cases of mixed deafness, i.e. 45% of the cases. Hearing loss was bilateral in 75% of cases, 3 times greater than the most often symmetrical unilateral involvement. Deafness can be the mode of revelation of several genetic, malformative, tumoral or even vascular pathologies and must be explored more specifically by appropriate imaging.

Imaging:

Faced with deafness, two main imaging examinations are requested. These are the "rock CT scan" in thin sections and the MRI centered on the internal acoustic meatus and the cerebellopontine angle. Schematically, the CT scan of the rocks is requested in the face of conductive hearing loss. This examination allows a very precise evaluation of the ossicular chain, the state of aeration of the mastoid and the tympanic cavity [11]. Sensorineural hearing loss can be explored by MRI of the internal acoustic meatus and of the cerebellopontine angle in search of a cochleo-vestibular nerve lesion [11]. The role of imaging in deafness in general is to establish a positive diagnosis in 90% and to eliminate the differential diagnosis or evoke an associated condition [12]. It provides anatomo-surgical information (Size of the Oval Window, the position of the nerve VII and the obliterating shape) and informs us about the prognosis and the per cochlear extension, endosteal involvement [12]. In our study, an etiology was identified in 54 cases (67.50%), while it remained unknown in 26 cases (32.50%). In the series by S. Charfeddine et al and Farinetti et al. respectively on 42 cases and 168 cases, an etiology could be identified in 45.24% of the cases and 67.3% of the cases. Our results can be superimposed with that of Farinetti et al., and the constraint of that of S. Charfeddine et al, the majority of whose patients had normal imaging. This could be explained by the lower sampling volume in the series of S. Charfeddine et al. (42 cases). The main etiologies found on imaging were: genetic deafness in 22.5% of cases (otosclerosis), acquired deafness in 27.5% of cases (tumor of the cerebellopontine angle (12.5%) and paraganglioma jugulo -tympanic (15%) and idiopathic deafness in 14% of patients (8.75% of cases of CSL and 8.75% of cases of vasculo-nervous crossing).These results are comparable to those in the literature, including genetic deafness in 38, 1%, acquired in 29.2% and idiopathic in 32.7% of patients [2, 8]. Otosclerosis being the main etiology found in our series. It essentially affects the anterior region of the oval window, it is secondary to a remodeling of the bone which will mainly affect the footplate of the stapes and gradually reduce its mobility to initially cause conductive hearing loss. In less than 15% of cases, the remodeling also surrounds the cochlea, thus causing sensorineural deafness.[2, 13] This is called cochlear otosclerosis. It is most often bilateral and asymmetrical. It is an often family disease, affecting women more frequently and which generally manifests itself between the ages of 30 and 50. It is characterized by progressively worsening deafness often beginning at low frequencies, sometimes accompanied by tinnitus [2.13, 14].

Conclusion:-

Deafness is an invisible disability that can have consequences on the quality of life. The determination of the etiologies of deafness has largely benefited from the development of medical imaging which has made it possible to highlight diagnoses of otosclerosis, malformative pathologies, tumoral and vascular-nervous pathologies. They benefit from medical and/or surgical treatment essentially depending on their mechanism, their severity and the results of imaging based on the CT-MRI pair.

Ethical Considerations:

This study was conducted with respect for the rights and integrity of individuals, taking into account respect for medical ethics.

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