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Management of vertigo in pregnancy

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ABSTRACT

Background. Pregnancy is a specific female physiological period characterized by significant changes, included otological and neurotological manifestations. Vestibular disorders like vertigo and dizziness, are common complaints from pregnant women to primary care.
Objectives. The aim of this paper is to describe clinical pictures, evaluation methods and therapeutic options of acute vertigo in pregnancy with the related pathogenetic hypotheses.
Method. We describe 11 cases of vertigo in pregnancy. All patients underwent audio-vestibular evaluation, consisting of pure-tone audiometry, impedance and clinical testing of the vestibular function, the "bed side examination".
Results. Audiological evaluation showed normal pure-tone audiometry and impedance in 10 patients. Only in one case a sudden right total deafness was highlighted with vestibular areflexia, showing a secondary positional vertigo. Seven patients presented a benign paroxysmal positional vertigo (BPPV) effectively treated by liberatory maneuvers. Three patients had a diagnosis of vestibular neuritis and they were treated with corticosteroids therapy with a complete resolution of dizziness and vertigo in one month. **Conclusions**. Our results point out the importance of multidisciplinarity between otolaryngologist, neurologist and gynecologist. From a pathogenic point of view, the vascular etiology, strictly related to the gravidic hormonal variations, is often hypothesized.

SOMMARIO

Razionale. La gravidanza costituisce un periodo di vita per la donna, caratterizzato da significativi cambiamenti di tipo fisiologico e adattativo, incluse possibili manifestazioni otoneurologiche. Disturbi vestibolari quali vertigini e instabilità, costituiscono una sintomatologia frequente nelle donne in gravidanza.
Obiettivo. Scopo dell'articolo consiste nel descrivere specifici quadri clinici, metodi diagnostici e opzioni terapeutiche di vertigine acuta in gravidanza con relative ipotesi patogenetiche.
Materiali e metodi. Descriviamo 11 casi di vertigine in gravidanza. Tutte le pazienti sono state sottoposte ad esame cocleovestibolare, ossia ad esame audiometrico tonale, esame impedenzometrico e esame vestibolare, clinico, la cosiddetta "bed side examination".
Risultati. All'esame audiompedenzometrico, 10 pazienti risultavano normoacusiche. Solo in un caso è stata riscontrata un'anacusia destra improvvisa associata ad areflessia vestibolare e successiva vertigine posizionale. Sette pazienti hanno presentato una vertigine parossistica posizionale benigna (BPPV) trattata con le manovre liberatorie. A tre pazienti è stata diagnosticata una neurite vestibolare, trattata con terapia corticosteroidea e conseguente completa risoluzione della sintomatologia in un mese.
Conclusioni. Alla luce dei risultati ottenuti, si dimostra fondamentale la multidisciplinarietà tra otorinolaringoiatra, neurologo e ginecologo. Da un punto di vista patogenetico, l'eziologia vascolare, strettamente correlata alle variazioni ormonali durante la gravidanza, è spesso ipotizzata.

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INTRODUCTION

Pregnancy is a specific female physiological period, when symptoms and treatment of diseases should be carefully reasoned to avoid possible consequences to the child.
During this period significant physiological and adaptive changes occur in almost every organ and system such as cardiovascular, respiratory, haematological, renal, gastrointestinal, and endocrine for the development of the fetus and to prepare mother and child for the birth (1).
In particular, during the gestational period, various endocrinologic, metabolic, and physiologic changes might exacerbate otolaryngological manifestations such as patulous eustachian tube, nasal congestion, epistaxis, gingivitis, reflux and esophagitis (2). Moreover it is not infrequent that conditions affecting the ear and the hearing function could appear. Furthermore, concomitant pathologies that are not related to the pregnancy may arise.
During gestation otologic and neurotologic manifestations, which although transient, have important repercussions on the quality of life of women and affect the life routine involving family, social and professional environment thus causing a deterioration of physical and psychological well-being with the onset of frustration, depression and loss of self-confidence and concentration at work (3).
Vestibular symptoms include vertigo, unbalance, gait deviations, gait instability, feeling of floating, rotation and falls. However, during gestation, these same symptoms could be secondary to non-vestibular causes but they could be consequence of hormonal, anatomical and physiological factors affecting the musculoskeletal system occurring in pregnancy (4). The adaptation mechanisms occurring in the soft tissues, joints, and posture during pregnancy, cause an important discomfort with consequent pain, alteration of postural balance and increased risk of falling (5).
In literature there are only few articles about the care of ear problems in pregnancy and they consider just the management of hearing loss and tinnitus. Much less attention is given to the diagnostic and therapeutic procedure of the dizziness, despite they can be considered two important issues in the management of these patients.
Although there are few studies about dizziness and vertigo in pregnancy, they represent the most common complaints from pregnant women to primary care (6).
Probably this contrast is a consequence of the dizziness management in primary care that patients are rarely subjected to an otolaryngology examination because the dizziness is generally considered secondary to non-vestibular pathologies, so it's difficult for the otolaryngologists to define and study an adequate number of patients. Therefore otolaryngology specialists have little experience about management and treatment of vertigo in pregnant women and moreover, they are completely unaware of safety guide lines about the drug administration in pregnant. So patients are usually visited just by the gynecologist.
In this paper we describe different cases of vertigo in pregnancy and, in particular, the diagnostic approach we used to define the pathogenesis of dizziness and the possible autonomous and psychosomatic consequences.

MATERIALS AND METHODS

We describe a retrospective study of 11 cases of vertigo in pregnancy. Patients enrolled (31-42 years old, mean age 33.8, at gestational age 6-36 weeks, mean week 22.9) (**Table I**) came from the Obstetric Emergency Room to the ENT (Ear, Nose and Throat) Ambulatory Care Center of the Hospital.
All patients underwent audiological and vestibular evaluation, after otoscopy and complete medical history concerning symptoms and any comorbidities. History focused on related pathologies (hypotension or hypertension, cardiovascular pathologies, hypoglycemia, neuropathies, ophthalmological diseases), characteristics of dizziness, symptoms modifications by changes in head position or other triggers, oscillopsia (illusory movement of the environment), diplopia, neurological or otological symptoms (hearing loss, tinnitus, aural fullness, otalgia, otorrhea), onset and duration of symptoms, psychiatric contribution to the patient's symptoms and, moreover, information related to the gestational period. Audio-vestibular investigation consisted of pure-tone audiometry, impedance and clinical testing of the vestibular function.

Pure-tone audiometry (PTA) was obtained by averaging the air conduction thresholds at 0.125, 0.25, 0.5, 1, 2, 4 and 8 kHz and the bone conduction thresholds at 0.25, 0.5, 1, 2 and 4 kHz. A PTA between 20 and 40 dB (decibel) defined a mild hearing loss (HL), between 40 and 70 dB HL a moderate HL, between 70 and 90 dB HL a severe HL, and greater than 90 dB a profound HL. Audiological evaluation was completed by the execution of tympanometry and evaluation of acoustic-stapedius reflexes. The vestibular evaluation consisted of the bed side examination and the use of instrumental diagnostic when necessary.

At the bed side examination static vestibular balance was evaluated by identifying spontaneous nystagmus, vestibulo-spinal alterations (Romberg test, Fukuda test, star shaped march test, index finger test), otolithic signs (OTR- ocular tilt reaction-, skew deviation, ocular torsion -counter rolling- and head tilt). Dynamic vestibular function evaluation consisted of head impulse or Halmagyi test (HIT), Head shaking test (HST), positional tests (Semont, Dix Hallpike, Pagnini maneuvers), Vibratory test and Fistula test, Ocular motor testing (saccadic and smooth pursuit).

All procedures performed were in accordance with the ethical standards of our institutional ethical committee and all patients signed an informed consent.

Audiological evaluation showed normal puretone audiometry and impedance (tympanometry and evaluation of acoustic-stapedius reflexes) bilaterally in 10 patients (**Table I**). Only in one case the pregnant presented a sudden right total deafness with normal bilateral tympanograms and absence of right acoustic-stapedius reflexes.

The otoneurological examination showed the presence of several clinical signs of vestibular dysfunction (**Table I**). All patients underwent clinical neurological examination which resulted negative.

Analysis of the comorbidities demonstrated in 2 patients a condition of gestosis; one patient presented cardiac conduction disorder (first-degree atrioventricular block) and another patient was affected by type-2 diabetes mellitus and hypertension.

Another woman had a history of previous transient ischemic attack (TIA) already in ASA therapy, migraine with aura, heart disease (aneurysm of the interatrial septum with mitral valve prolapse and mild tricuspid dysplasia). There was also a case of patient with migraine and another one with migraine and celiac disease that referred the onset of vertigo after progesterone intake for amniocentesis. In another case the pregnant woman apparently had not risk factors for cocleo-vestibular syndrome, however, general examination and haematological tests demonstrated a condition of thrombophilia with increased D-dimer. This patient was treated with corticosteroids and anticoagulant therapy improving spontaneous vertigo in 4-5 days but without recovery of the auditory function. Positional secondary vertigo was efficacy treated by rehabilitative manoeuvres.

All patients with spontaneous nystagmus underwent neuro-radiological evaluation with contrast-enhanced magnetic resonance imaging (MRI) that resulted negative for pathological involvement (stroke, cerebral hemorrhage, brain tumors or cerebellopontine angle lesions).

RESULTS

Seven patients referred positional vertigo associated to neuro-vegetative symptoms (emesis) and presented positional nystagmus related to a benign paroxysmal positional vertigo (BPPV). In particular, in 4 patients posterior canal was involved (2 on the right and 2 on the left side) with a paroxysmal geotropic nystagmus at the Dix Hallpike and/or Semont maneuver. In the remaining 3 patients right horizontal canal was interested with a position geotropic paroxysmal bilateral nystagmus more evident on the right side. In these 7 patients the remaining vestibular clinical tests were negative. All the 7 patients were efficacy treated by liberatory maneuvers.

Three patients referred acute objective vertigo associated to neuro-vegetative symptoms (emesis) and they had a possible diagnosis of right vestibular neuritis showing: spontaneous horizontal left beating nystagmus, harmonic alteration of the vestibule-spinal test (Romberg test, Fukuda test, star shaped march test, index finger test), positivity of HIT, HST and vibratory test. These patients were treated with corticosteroids therapy with an improvement of the vertigo in 4-5 days. A complete resolution of dizziness and

vertigo was obtained in one month (central vestibular compensation).
Finally, one patient referred a sudden right hearing loss with tinnitus, acute objective vertigo and neuro-vegetative symptoms (emesis). Audiological tests showed a total right deafness with normal tympanograms and absent acoustic-stapedius reflexes stimulating right ear. She also showed a spontaneous horizontal left beating nystagmus, harmonic alteration of the vestibule-spinal test (Romberg test, Fukuda test, star shaped march test, index finger test), positivity of HIT, HST and vibratory test. In this woman we also performed caloric test demonstrating right vestibular areflexia. This patient also showed a secondary positional vertigo associated to positional nystagmus at the Semont maneuver related to a Lindsay-Hemenway syndrome (7).

DISCUSSION

Vertigo is frequently experienced during pregnancy and it is the most common complaint by pregnant women to primary care. In a prospective study by Schmidt et al. (8) the authors discovered that 52% of their pregnant cohort complained of vertigo, considering different manifestations of vestibular disorders, such as unbalance, gait deviations, gait instability, a feeling of floating, rotation and falls. These disorders affect the life routine; family, social and professional relations; cause loss of self-confidence, concentration and performance, concentration and work, causing frustration and depression (9).
This high percentage and our results indicate that vertigo in pregnancy must be carefully investigated. Unfortunately, the question concerning the incidence of these pathologies in pregnant patients remains open and often this symptom is underestimated, leaving patients without any treatment because of the difficult diagnostic and therapeutic management during the pregnancy period.
First of all, it must be considered that it's advisable to avoid radiological diagnostic tests (for example the brain CT) in these patients. Therefore the clinical vestibular evaluation takes on considerable importance both for the diagnosis of an otoneurological pathology and for the exclusion diagnosis.
In the current study we showed that vestibular system can be involved in the etiology of the symptoms. At the admission of patients detailed clinical history must be carefully considered in order to address the diagnostic management of patients. In our patients we found that vertigo has been described as objective spontaneous or positional, associated to emesis in all cases. These findings led to the indication to perform a clinical oto-neurological examination.
On the other hand results of vestibular evaluation showed in seven patients a BPPV and in four a vestibular neuritis, confirming the vestibular involvement.
BPPV in particular is a most frequent cause of vertigo in general population accounting for 20-40% of all cases, with a reported incidence of 0.6% per year, a prevalence between 10.7 and 64.0 cases per 100,000 population and a lifetime prevalence of 2.4% (10-11). Pathophysiology of the disease is still debated, however the role of different pathologies can be hypothesized. Also our study group has recently demonstrated that comorbidity is strictly related to the recurrence of BPPV (12). The role of vascular involvement has been extensively studied and confirmed by different authors (13-14). Also female sex represent a factor risk for BPPV with a pronounced female preponderance (6.8:1 female to male ratio) in BPPV in the teenage group (15) probably due to hormonal conditions (16). In our series of BPPV pregnant women we can hypothesize both a vascular and hormonal involvement in 5/7 patients. In the last two patients only hormonal factors could be considered. Some studies describe the association between dizziness, tinnitus and sudden hearing loss due to hearing and balance alterations with the action of estrogen and progesterone on the cochlea, posterior labyrinth and central auditory pathways (17-18-19-20).
In females, any change in the metabolism of steroid hormones (estrogen and progesterone), responsible for the ovarian cycle can cause complications, among them we list vestibular alterations. These alterations may be peripheral or central and they may occur not only during gestation, but also during the normal menstrual cycle, during menopause and during the pre-menstrual time (21).

In all cases of vestibular neuritis we have described, we can hypothesize a vascular etiology as suggested by the history of previous TIA, Heart disease and Migraine with aura in one patient; by the migraine present in another woman and by the thrombophilia (discovered just for vertigo) in another patient.

In literature is widely described that pregnancy is characterized by a high-flow and low-resistance state with progressive cardiovascular accommodations that persist in the postpartum period (22). Furthermore, it is assumed that estrogen induces vascular supply to the macula and otoconia due to varied glucose and lipid metabolism (23). In current literature, this peculiar topic has been investigated by few studies and the number of presented cases is very limited. Çoban et al. described four pregnant women diagnosed with BPPV during their gestational periods; the authors discussed the role of the hormonal instabilities and alterations as a cause of BPPV in this group of patients. Another possible cause for BPPV in pregnant women they presented is the prolonged bed rest. Moreover, three of the four patients described, were diagnosed during the late gestational weeks, when sleeping and daily activities are usually restricted. They also suppose the usual attitude to sleep on their left sides as another risk factor for BPPV in pregnant women (24).

Recently, there have been reports that calcium and vitamin D metabolism disorders are risk factors for BPPV. Calcium and vitamin D metabolism is usually affected in pregnancy, especially in the late trimesters due to the rapid growth of the fetus. This may be another risk factor for pregnant women suffering from BPPV (25).

A limitation of our study is the number of patients included (11 cases) who cannot be representative of pregnancy-related risk population. In addition, different kind of vertigo with an heterogeneous pathogenesis are included in the same group. About the diagnostic and therapeutic procedures, some maneuvers in pregnancy may be performed but the age of the pregnancy may represent a potential restriction for some types of maneuvers (26). It would be advisable to implement multidisciplinary dedicated protocols in which each specialist should play a specific role in the clinical diagnostic and therapeutic strategy.

Although our case series is small, our results are interesting and indicate the need to evaluate very carefully a vertigo during pregnancy, in all cases. Moreover comorbidity must be investigated because they often represent an important risk factor for vertigo. About the pathogenic mechanism, the vascular etiology, strictly related to the pregnancy hormonal variations, is often hypothesized, therefore the fundamental role of the screening for thrombophilia and the subsequent anticoagulant therapy is confirmed. So it's fundamental a multidisciplinary approach that involves otolaryngologist, neurologist and gynecologist both for diagnostic purposes and, about the therapy, for the possible toxicity and teratogenicity of some drugs. Finally, increasing the interest in this topic, a clearer definition about the roles of different diagnostic tool and specialist could be provided in order to define specific clinical protocols.

CONCLUSION

In conclusion, there are many otologic and neurotologic manifestations during pregnancy. Although most of them are benign and transient and sometimes they revert to normality in postpartum, the otolaryngologist should acknowledge these conditions and their appropriate management and treatment. Otolaryngologists should be familiar with the potential effects that pregnancy can determine on the vestibular system to be able to reassure the patient with an informed consultation. On the other hand, also gynecologists should be familiar with the otoneurological involvement in the pregnancy. Cooperation between gynecologists, neurologist and ENT specialists is strongly advisable for the choice of the appropriate rehabilitative and/or pharmacological treatment and it's essential to an optimal prognosis. In fact, an incorrect understanding of the therapeutic options often determines a suboptimal treatment because of the hesitation to prescribe any medication to pregnant women for the possible toxicity and teratogenicity, although many drugs can be considered safe, according to the current evidence.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

Table I. *Clinical features of patients included in the study*

Patient	Age	Gestational Weeks	Symptoms	PTA (dB)	Tympanogram	Acoustic-stapedius	Vestibular Evaluation	Comorbidity	Diagnosis	Neurological evaluation	Therapy
1	31	36	Positional Vertigo, Emesis	15	A-A	Normal	Positional Ny (Semont M)	None	PSC-BPPV (right)	Clinically negative	Rehabilitative
2	32	14	Positional Vertigo, Emesis	18	A-A	Normal	Positional Ny (Dix Hallpike M)	Gestosis	PSC-BPPV (left)	Clinically negative	Rehabilitative
3	33	12	Positional Vertigo, Emesis	10	A-A	Normal	Positional Ny (Dix Hallpike M)	AV Block	PSC-BPPV (left)	Clinically negative	Rehabilitative
4	30	35	Positional Vertigo, Emesis	15	A-A	Normal	Positional Ny (Semont M)	Diabetes and hypertension	PSC-BPPV (right)	Clinically negative	Rehabilitative
5	34	23	Positional Vertigo, Emesis	10	A-A	Normal	Geotropic Position Ny (Pagnini M)	Gestosis	HSC-BPPV (right)	Clinically negative	Rehabilitative
6	35	28	Positional Vertigo, Emesis	10	A-A	Normal	Geotropic Position Ny (Pagnini M)	Not	HSC-BPPV (right)	Clinically negative	Rehabilitative
7	33	25	Acute vertigo, Emesis	10	A-A	Normal	Spontaneous Horizontal Ny left beating	-Previous TIA, -Migraine with aura, -Heart disease (aneurysm of the interatrial septum with mitral valve prolapse and mild tricuspid dysplasia)	Vestibular right neuritis	Clinically negative MRI negative	Corticosteroids
8	38	16	Acute vertigo, Emesis	15	A-A	Normal	Spontaneous Horizontal Ny left beating	-Migraine, -Celiac disease, -Onset after progesterone intake for amniocentesis	Vestibular right neuritis	Clinically negative MRI negative	Corticosteroids
9	42	30	Acute vertigo, Emesis, monolateral deafness and tinnitus	Total right deafness; 10 left	A-A	Absent right; normal left	Spontaneous Horizontal Ny left beating (right vestibular areflexia); positional Ny (Semont M)	Thrombophilia with increased D-dimer	Right labirintopahy, Lindsay-Hemenway	Clinically negative MRI negative	Corticosteroids Anticoagulants (Heparin)
10	34	27	Acute vertigo, Emesis	15	A-A	Normal	Spontaneous Horizontal Ny left beating	Not	Vestibular right neuritis	Clinically negtive, Little altered signal intensity area (4 mm) at MRI	Corticosteroids
11	30	6	Positional vertigo, Emesis, Headache	10	A-A	Normal	Geotropic Position Ny (Pagnini M)	-Migraine -Recurrent Abortions: treatment with antiaggregants	HSC-BPPV (right)	Clinically negative	Rehabilitative

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